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Addressing Policy, Practice, and Research That Matters  
Yash Bhagwanji, Editor

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Addressing Policy, Practice, and Research That Matters  
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## Planning and Building Children's Outdoor Play Zones for Multiple Affordances: A Community-Engaged Process

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### ABSTRACT

A robust emergence of outdoor nature-based play areas in several European, Australian, Asian countries, as well as North America Canadian provinces, has occurred recently. This study explored the rationale for and construction of different play zones and affordances for children at a United States Central Kentucky local arboretum and research forest. The study provided background information and guidance for constructing an outdoor nature-based play zone for various learning venues (e.g., nature centers, schools, city parks, day-care centers, etc.). The study used a convenience sampling technique wherein two planning personnel were interviewed during nine site visits (6 in-person; 3 virtual) for a total of nine hours of audio/video recordings. Exploratory qualitative methods were used to code planning documents and 114 pages of transcription. The data indicated five themes: organic relationships, play self-reflection, site research/experimenting, site accessibility/safety/risk affordance, and fiscal opportunities. This study outlined several factors (e.g., access, materials, use, personnel, risk, funding) to consider during the planning phase prior to construction as well as during the actual building phase. It also supported the idea of embracing "failure and change" in that some of the affordances may not work during or after construction.

**Keywords:** building outdoor play areas, affordances in outdoor play, natural playscapes, early childhood education

There has been a robust emergence of outdoor nature-based play areas in several European, Australian, and Asian countries, as well as North America Canadian provinces. In 2020 amid a global pandemic, Dr. Anthony Fauci, director of the National Institute for Allergy and Infectious Diseases, suggested that school districts "should find ways to offer as many outdoor activities as possible, from classes to recess and lunchtime. ...Get as much outdoors as you can. If you look at the super spreader events that have occurred, they're almost always inside" (Associated Press, 2020, para. 1 & 3). Thus, emergence of outdoor nature-based environments in childcare and public/private school settings have increased across the United States (U.S.). A question then emerges regarding how schools, day care providers, and informal learning centers plan for and construct appropriate outdoor nature-based play areas. Acar (2014), Keeler (2015), and Loebach (2004) have reported on purposeful play area design; however, additional research is needed, specifically for United States-based settings.

In exploring the rationale for and construction of different play zones and affordances for children at a United States Central Kentucky local arboretum and research forest, this study provides background information and guidance for constructing an outdoor nature-based play zone for various learning venues (e.g., nature centers, schools, city parks, day-care centers, etc.). To characterize the play zones, the local arboretum and research forest designers coined the term *Playcosystem*, which is a riff of "Ecosystem" combined with "Play." Natural playscapes, as described by the

Natural Playscape Initiative (Luken et al., 2011), are founded on a set of design principles specific to encouraging young children's interest and comfort in nature. Such principles include the affordance of risk-taking through play in areas, and with materials, that are designed for undetermined, open-ended uses. Playcosystem, used herein, reimagines a natural playscape, with the inclusion of three distinct areas, or zones, as part of a system of natural areas that offers graduated opportunities for risk and engagement for children beyond early childhood. For example, Zone 1, the subject of this study, is entirely fenced and includes risky, though not hazardous, fall heights. Plans for Zones 2 and 3 do not include fencing and propose higher fall heights, offering appropriate risk for children who are bigger and/or experienced in previous risk assessment. The origin of the Playcosystem's "graduated opportunity idea" coincided with an employee's daughter's birth. Reflections on children's play expanded as his daughter moved through developmental stages. This experiential knowledge informed decisions that contributed to the evolution of Playcosystem.

The three zones of Playcosystem consists of 17 continuous acres embedded within 17,000 acres of the nonprofit Bernheim Arboretum and Research Forest (<https://bernheim.org/>) located in Central Kentucky. With over 40 miles of sloped hiking trails, three lakes, several gardens, and artist renderings, visitors can engage with and learn from nature and art during four distinct seasons. Depending on the season, temperatures range from below zero to over 100° degrees Fahrenheit within a deciduous forest where native animals roam freely. The fenced Playcosystem's Zone 1, the subject of this study, consists of one and half acres of mostly flat grass and earthen areas with several deciduous trees (e.g., Sycamore, Weeping Willow, Red Bud, Sumac, Magnolia, Maple), coniferous trees, (e.g., Arborvitae, Cypress) and shrubs (e.g., Bottlebrush Buckeye, Witchhazel).

### Theoretical Framework and Literature Review

A foundational tenet of Playcosystem was that the constructed play zone areas would have thoughtful design, meaning the intended use of the space would align with children's sense of play. Roger Barker's (1968; 1976) *Theory of Behavior Setting (TBS)* as described by Khan et. al (2020) underscored that "certain environments or settings elicit particular kinds of behaviour and different sets of people and objects exhibit the same patterns of behaviour within the same behaviour setting" (p. 147). Scott (2005) provided an overview of Barker's *TBS* as specific, identifiable units of the physical and social "elements of an environment which have very powerful influences on human behavior" (p. 297). Within Scott's analysis of eight oral histories including Barker's wife, doctoral students, and colleagues, she provided a nuanced view of the history and trajectory of the *TBS*. In conclusion, Scott (2005) reported the *TBS* as

"strong empirically because settings have been repeatedly shown to have very strong influences on behavior. This is not to say that individual differences do not also play a role in behavior, but they are often less influential than the behavior setting." (p. 321)

We applied a broad lens of *TBS* in that the Playcosystem environment afforded opportunities for children's play behaviors; this is similar to the broad approach that adults display certain behaviors in a grocery store, at an athletic event, or inside a hair salon, etc. In applying *TBS*, we intended to explore the complexity of designing a children's play environment (i.e., Playcosystem) with the understanding that the constructed play zone would be the medium of ecological units wherein children would display episodes (e.g., climbing, sitting, walking) with object props (e.g., tree logs, sand, rocks, loose parts).

To explore the ecological visual perception of a system (Gibson, 1979), such as Playcosystem, we applied the *Theory of Affordance*, where "affordances are properties of the environment as they are related to animals' [humans'] capabilities for using them" (Gibson & Pick, 2000, p. 15). The perception-action reciprocity aspect of an affordance was notable as the human individual "must take into account the environmental resources presented in relation to the capabilities and dimensions of its own body" (Gibson & Pick, 2000, p. 16). For children to interact with the environment, they must perceive what the environment affords before taking any action. For example, a child may approach going down a sloped terrain from varying possibilities (i.e., crawling, scooting, rolling, walking, skipping, or running); these choices and actions imply a myriad of action possibilities based upon the child's learned developmental skills (Gibson, 2019).

In a summary of widely accepted, descriptive essentials of an affordance, Heft (2010) elaborated that an affordance is a “specifiable property of the environment taken relative to the person” (p. 19). This relational property was explained in an affordance of a six-inch ledge, wherein an older-aged individual perceived the ledge as a potential tripping hazard, and a young child perceived the same ledge as a potential resting or climbing spot. When applying the lens of affordance functionality, Heft cautioned the use of a passive perceiver stance, but rather claimed the need for an “action” lens. Using Roger Barker’s observational data of a day in the life of a nine-year-old boy, Heft enumerated, listed, categorized, and then clustered the boy’s actions. Heft concluded that even though the affordance list was not an exhaustive list, it was an initial approximation of functionalities of the nine-year-old boy and positionally others like him. In summary, affordances are essentially about functions and the possibilities of action within a particular setting. Heft cautioned against the use of causality, where affordances can “cause” an action, but rather he focused on the individual’s consideration of functional possibilities and meaningful experiences for action.

Lastly, a model for outdoor play space design that prioritized the use of natural materials was the Canadian based *Seven Cs*, which consist of character, context, connectivity, clarity, change, chance and challenge (Herrington et al., 2007). Brussoni et al. (2017) investigated an intervention on children’s health and well-being that used the *Seven Cs* criteria to increase natural risky play environments. They found that “providing high quality, natural outdoor play environments for children does not require expensive equipment, nor complex interventions to have a significant and positive impact on children’s health and wellbeing” (Brussoni et al., 2017, p. 148). In fact, simple tree climbing provided benefits that outweighed potential risks according to Gull et al.’s (2021) study of 415 United States personnel working within early childhood settings with ages two through eight. Parents’ (n=1602) view of simple tree climbing was that children

“have the potential to grow socially, emotionally, physically, cognitively, and creatively, and have increased resiliency. Bans on tree climbing and other risky play pose problems such as limiting access to natural spaces, creating fear of participation in adventurous activities, and fewer opportunities to negotiate risk and develop resiliency.” (Gull et al., 2018, p. 24)

Our study explores the detailed rationale and documents the planning and building of a Playcosystem of different play areas and affordances. Our analysis of the rationale and construction process provides findings which add to the current research on designing nature-based play affordances while tangentially supporting the learning disciplines of Child Psychology and Development and Early Childhood Education Research. As Khan et al. (2020) reported, “these attributes of the ecological environment are important in order to understand how much an environment can influence children’s behavior” (p. 147).

## **Methodology**

### **Participants and Data Collection**

From July 2020-July 2021, the authors interviewed two arboretum and research forest planning personnel, which we will refer to as “Designers” herein, during several Playcosystem site visits (6 in-person; 3 virtual). During each face-to-face site visit, all attendees adhered to CDC social distancing and mask guidelines. The six in-person site visit interactions were audiotaped, while the three virtual visits were videotaped; all interactions were then transcribed verbatim. Upon immediate return of each in-person site visit, the first author revisited personal notes and added photographic documentation (see Figures 1, 2, and 3).



*Figure 1: Entrance to Zone 1 from Visitor Center.*  
Cores of limestone rock from drilling flagpole holes were on rock table.



*Figure 2: Compacted rocks and dirt, or berms, were added to initial stream after observing flow of water.*



Figure 3: Another view of berms that were created to assist flow of water.

The following interview questions were used as a guide for each visit wherein authors asked clarification or expansion questions.

1. Based upon your personal opinion, what was the impetus for considering and designing the planned natural environment for children (Playcosystem)?
2. What previous research, if any, did you access and apply to the planning phase?
3. What stakeholders, if any, were involved in the planning process?
4. What consultants (e.g., agencies, landscape designers, play work specialists, early childhood professionals), if any, were involved in the planning process?
5. What is the rationale for Playcosystem?
6. Based upon your personal opinion, explain the rationale for selecting the play affordances in Playcosystem.
7. Were there any affordances or structural elements dismissed within the planning iterations, and if so, why?

Throughout the year, the Designers shared digital planning documents that included email correspondence, schematics/drawings, aerial photographs, and external meetings notes. Pre-existing photographs, designs and meeting notes were provided during in-person site visits as additional planning documents.

*Note:* To comply with *Procedures to Ensure Ethical Considerations in Research with Human Subjects*, each Designers signed an IRB-approved consent. There were no foreseen risks to participating in this research; an unforeseen risk is that the Designers identities may not be masked.



## Data Analysis and Findings

To explore the ideas for the planning, constructing, and modifying Playcosystem environment, the authors transcribed individual site visit audio/video-taped conversations and reviewed all planning documents (e.g., email communication, schematics/drawings, photographs, meetings notes). Total transcribed data included 69,802 words within 114 pages from 534 minutes ( $\approx$ 9 hrs.) of audio or video recordings. Exploratory qualitative methods (Saldana, 2013; Strauss & Corbin, 1998) of open and axial coding of all data sources were used to determine and report upon initial themes. Each author began the initial coding by reading all transcript data for a first impression, or 'feel' of data. Next, each author conducted line-by-line coding by labeling/highlighting reoccurring relevant words or phrases. Each author decided on the most important/prevalent words and created categories based on those (i.e., axial coding). Authors individually sorted the categories and examined connections between categories (i.e., theming data). Authors then collectively met to discuss and compare themes as well as provide any new knowledge from an individual's perspective. Authors determined if a hierarchy existed among categories (i.e., if some categories were more important than others) and described the resulting categories (themes) with supportive quotes. Authors conducted "member checking" with the Designers regarding final themes with supportive quotes.

The data indicated five themes: organic relationships, play self-reflection, site research/experimenting, site accessibility/safety/risk affordance, and fiscal opportunities. Below include the five themes with discussion and select evidence.

### ***Organic Relationships***

During each in-person or virtual site visit, the Designers mentioned in immense detail the networking and collaborating with organizations external to the arboretum; therefore, the authors did not directly ask interview Questions 3 or 4. In reviewing the transcript data, we noted the integral nature and importance of personnel with "brighter minds" and their involvement with the planning phase. Designers' comments included that

"we want to work in the larger community, so we're building those relationships and keeping those relationships and nurturing those relationships throughout this process so that more people can be a part of it and feel ownership of it and build the kinds of relationships that make people feel comfortable about going to a place like this [Playcosystem]" (personal communication, July 23, 2020)

and "to the extent possible, everything we do is informed by others" (personal communication, July 13, 2020). External personnel who provided some type of input or experience varied across disciplines and included artists, welders, engineers, children, schoolteachers, as well as personnel from community associations, local parks, nature centers, and businesses. Additionally, the Designers wanted to work with as many constituents as possible to "find out what their constraints [were] so that when [they] design [the Playcosystem], it becomes adoptable or adaptable by other organizations" (personal communication, July 13, 2020). In essence, they wanted to create a "menu of things" that one could consider implementing across a broad range of institutions. A full listing of influential personnel who were specifically mentioned is included in Appendix A.

### ***Play Self-reflection***

Immersed in a decade-long reading of literature of *loose parts theory* and *theories of play*, as well as being a "keen observer of play for a very long time," one Designer explained the impetus or rationale for Playcosystem. He frequently provided his definition of "play" as activities "defined by the player, initiated by the player. The rewards are intrinsic. There can be rules, but if there are rules, those are provided by the player, not by the rules of a game like baseball or soccer" (personal communication, July 13, 2020). He elaborated that "anywhere a child is, [that] is the playground" and "children are good at what they do: play" (personal communication, July 13, 2020).

Based on reading and experience, the Designers wanted children taking control doing things on their own and “free of directed play” in Playcosystem. Because one of the designers had several years of experience in working with teachers, parents/guardians, and school directors, he wanted to create comfortable places so that adults could pull themselves away from the children; thus, he planned to “talk to adults about free play and why it’s valuable and what it is [to be] able to help the adult remove direct supervision of the child” (personal communication, July 13, 2020). In designing Playcosystem, he selected any opportunity that provided the child more play autonomy; for example, he opted for a single rope swing over a double-roped swing. A double-roped swing is intended for a singular, predictable direction, whereas a “singular rope swing can go in 360 degrees and is turning over more control to the child” (personal communication, July 23, 2020). Based on research, he also knew that a fence blending into and encompassing the Playcosystem landscape would be needed which adults would “have to trust.”

### ***Site Research/Experimenting***

The Designers made seemingly startling statements such as the “work that we do is based in ignorance” to explain why research was important and intended. They believe that you would not actively seek to do research, unless in fact, you were not ignorant about something. “You would only do research to find out things that you don't know. If you do research to find out things that you do know, that's not research, that's self-confirming actions” (personal communication, July 13, 2020).

Playcosystem Designers applied thoughtful intentionality in choosing materials, locales, and quantities; in fact, at the outset, they expected “25% of everything built would go away within 2-3 years because it wasn't right” (personal communication, July 13, 2020). In fact, literally everything in Playcosystem environment, except for a large steel-framed dome, posed an opportunity for investigation (e.g., color and location of sails, size and location of rocks, meanderings and location of stream, materiality and size of logs, etc.). That said, Sycamore trees were planted along the dome's steel beams allowing for study of the tree type and growth. The Designers elaborated on the experimental nature about the living environment: “What is the life span of different species of plants going to be in a play environment? We will experiment with species of trees and pruning of trees to create trees that are particularly helpful in a play environment” (personal communication, July 23, 2020).

In discussing the use of “loose parts” in Playcosystem environment, often the word “laboratory/model” arose in reference to areas that researchers could manipulate the “loose parts accessibility” to increase site visit time and/or child's autonomy (i.e., parent withdrawal from child's interactions). The Designers explained that one of the “hardest parts of this whole project is going to be how do we provide the loose parts in a public setting outdoors” (personal communication, August 13, 2020). There was also the strong impetus to be a living laboratory of various aspects that others could visit and emulate or transfer to their own sites.

Continuous evaluation was planned for various areas and items of Playcosystem upon the completion of initial construction. Queries included, for example, what materials migrate (pea gravel, sand, rocks); what soil areas are impacted; what amount of water is retained after rainfall; what trees are thriving; what trees are declining; what tree textures allow safe climbing; what shade areas are beneficial; etc. There were numerous references to ambiguity, such as, we “don't know what it'll do” referring to sand migration; “but now we are reconsidering” regarding a mulch area; “play with it and see how much of it we remove” referring to texture on stationary logs; “we don't know; we are going to think about that” referring to log placement; “so that is a down-the-road decision ... whether or not that's even a wise decision, we don't know, but it's an option” referring to making a five sided pyramid over steel structure (personal communication, October 1, 2020), “we think we don't know, but that's part of it” regarding use of ferns; and “we are going to start with those and see what happens” regarding Sycamores on steel structure (personal communication, October 15, 2020).

Honesty about the unknown (i.e., ambiguity) continued throughout the year-long construction phase of Playcosystem. The area was designed so that, if needed, big equipment could re-enter to alter or create a new experience in the space. The overarching goal would be to make changes that would “make it more playful from suggestions from children ... we can even turn it over to a bunch of children to ask, would you like to move the balance beam logs” (personal communication, March 17, 2021). The common reference of “we'll keep our eye on

it” was made regarding the stream, plants, drainage, rocks, logs, benches, etc. Variables that could potentially be controlled include the quantity, type, and arrangement of loose parts introduced into the area (personal communication, April 1, 2021). The experimental nature of “see how people use” Playcosystem offers short and long-term study opportunities.

### ***Site Accessibility/Safety/Risk affordance***

Often the Designers’ perspectives shifted among varying points-of-view based upon who would be using Playcosystem. Example perspectives included guardians of children, teachers of students, children who play, visitors with disabilities, communicators of English as second language, etc. When considering the risk affordance of the space, the Designers attempted to include all participants who would potentially engage with the site. They noted that “we will make mistakes here and there and we are willing to own those mistakes and share those mistakes” (personal communication, July 23, 2020). For example, “we have rope and we’re careful with rope because that is statistically one of the most dangerous things that children can have, and we understand that, and we accept that risk carefully” (personal communication, July 23, 2020). Surface texture/type (e.g., pea gravel, sand) and graduation (e.g., height, slope, berms) were considered for use of young children of varying ages (e.g., toddlers who are practicing their footing; young children who are testing their agility skills). Fall zones or challenges were calculated so that if children were standing on top of the cedar logs, for example, they would fall to a slope. A “fall to a slope is less impactful than a fall to a flat surface” (personal communication, October 1, 2020). If the area provided “enough appropriate risk, it’s actually safer than providing objects that are supposed to be super safe.” The perception that an object is “super safe” allows one to “quit focusing and rely on the equipment to keep you safe or use the equipment to do inappropriate things and that’s when injuries occur” (personal communication, October 15, 2020). To allow children to move through affordances with appropriate risk, they realized the need to scaffold adults’ supervision:

“We are creating a hiding spot on the other side of those hills; when the kids go down the other side of those hills they’ll [e.g., children] be out of sight. That’s practice for adults to let their children out of sight into a zone that they know is fenced, that they will get nervous, they will want to go over there and over time that we have repeat visitors we can work with. Your child survived last time; we think they’re going to survive this time.” (personal communication, July 13, 2020)

Accessibility for all was pervasive throughout the planning and construction process as points-of-view from varying visitors were considered. In fact, they said we “are actually designing to what’s called Universal Design Standards (UDS), which has very clear descriptions of what that means. We will also work with wheelchair communities and others as we step into those areas” (personal communication, July 13, 2020). For example, the Designers referenced that any slope had to be adjusted for wheelchair accessibility with “rise of one foot for every twelve feet” (personal communication, April 1, 2021). When considering accessibility, they said, “the image that pops into the average brain is a wheelchair. But the number one condition, a human condition that needs to be addressed in terms of accessibility and design, is autism” (personal communication, March 17, 2021). To demonstrate that the Designers sought opportunities to enhance the inclusivity of the Playcosystem environment for visitors regardless of age or ability, initial visitors provided information regarding limitations or barriers to play that any member of their group experienced.

### ***Fiscal Opportunities***

The final theme regarding fiscal opportunities was supported with the reoccurring reference to “funders.” The previous reference to “ignorance” leading to research was used to capture funders’ attention because

“people don’t typically say that they’re an institution of ignorance. I will tell you this, though; I use it and I use it in front of funders and funders dig it. We get their attention when we tell them we don’t know what we’re doing because everybody else that’s coming and talking to them about getting their money is coming to them and saying, we know exactly what we’re doing and that’s why you need to fund us. So, it separates us from a herd.” (personal communication, July 13, 2020)

Playcosystem endeavors helped broaden the type of site visit experience and research possibilities, which in turn helped financially with broader grant opportunities. “Sustainability, including financial sustainability was a part of this” (personal communication, July 23, 2020). Increased time and repeated Playcosystem visits on behalf of funders help with revenue and with a potentially new capital campaign, which has not been completed in over 20 years.

Fiduciary responsibility was at the forefront of several conversations. Comparable informal institutions spent 1 to 2 million per acre with similar designs; design and construction of Playcosystem was “one tenth of the amount” of other institutions embarking on this work because of “doing it in-house” on a “shoestring” budget (personal communication, August 13, 2020). Description of Playcosystem will become self-evident upon a site visit because the “storytelling shifts and people will see the general feel of what we’re doing” (personal communication, October 15, 2020). Rather than having to imagine Playcosystem’s features and potential play affordances, a funder would be able potentially to physically interact with the site and/or observe the effects. Thus, Playcosystem experiences become a fundraising tool in providing meaningful and important connections to funders. The Designers explained that limestone cores from the drilled rock for flag poles were intended to be used meaningfully in acknowledgment of donors:

“these are the cores that came out. I'm going to cut them in half and will mount them to boards and put a little plaque on them. And those will be gifts to the funders as opposed to, you know, a little plaque that doesn't have anything from the playground.” (personal communication, March 17, 2021)

### Discussion

This unique study showcased the thought processes around planning and building of a nature-based, children’s play area (Playcosystem) “in-house on a shoestring budget.” The study underscored Brussoni et al.’s (2017) finding that neither expensive equipment nor complex interventions are required for impactful play-based affordances or experiences. The articulated themes showed the involvement of purposeful relationships and inclusion of prior research. The mindset that 25% or more of the entire Playcosystem site would change within a 2-3-year time frame of use emphasized the welcomed thought of ongoing research and change. In fact, anticipating changes or improvements was built into the overall design by allowing site access to large equipment, collecting data on site use, interviewing site visitors, etc. Our evidence also showed an ongoing stance of considering multiple perspectives from various visitors to Playcosystem. Such visitors include populations previously marginalized by constraints including transportation, personal mobility, or language that either prohibited or made difficult the access to natural, outdoor play spaces. Considering access for individuals of all abilities was at the forefront of design and safety. Explicit consideration for accessibility and mobility is precisely what Hunt (2010) claimed should “occur early in the design process rather than as an afterthought” (p. 23). Lastly, the ongoing priority of self-sustaining fiscal measures to include future research and development was apparent for providing continued use of the site (i.e., replenishing sand and loose parts).

### Conclusion

As the growing need for outdoor, play-based nature areas rises, this study can be used by anyone (e.g., parent, informal learning center, school, city) wishing to replicate similar affordances or experiences. The transference of similar scaled experiences as those found within the Playcosystem to other sites is achievable. This study provides a template to consider several entities during the planning phase prior to construction as well as during the actual building phase. It also allows designers to embrace “failure and change” in that some of the affordances may not work during or after construction.

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### Appendix A

#### Listing of Influential Personnel

- artists (sculptor, painter)
- local welders/metal workers
- visiting adults, children play facilitators
- “actual real” engineers, construction crew, superintendent
- Site personnel (director, education directors, horticulture team, visiting artist, wildlife management biologists)
- community agencies (Play Cousins Collective, Bridge Kids International, Children at Play Network)
- associations (American Public Gardens Association, American Society of Landscape Architects, Nature Rich Louisville Association, Kentucky Association for Environmental Education)
- nature centers (Creasey Mahan Nature Preserve, Cincinnati Nature Center, Morton Arboretum, Denver Botanical Garden, Atlanta Botanical Garden, Missouri Botanical Garden)
- School teachers and leadership personnel (Jefferson County Public School, Bullitt County, Nelson County, Second Presbyterian Preschool, Sacred Heart, Backside Learning Center, Homeschool, YouthBuild Louisville/Summer Works Program, Bluegrass Development Center)
- University School of Public Health and College of Education
- parks (Metro government, Lexington, Kentucky Children’s Garden in Lexington)
- community businesses (Jim Beam, insurance companies)
- donors

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## Psychometric Validation of a Game-based Testing Instrument to Measure Preschool Children's Environmental Knowledge and Connection to Nature

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### ABSTRACT

In this study, we use face and content validity to determine whether a modified game-based testing instrument is appropriate and relevant for quantifying preschool children's emotional, cognitive, and attitudinal affinity with nature. Six environmental psychology experts completed a questionnaire and subsequent interviews with three of them provided insight into whether the features of the tool can measure a child's affinity with nature. Interrater agreement and content validity indexes establish whether the instrument meets four established validation criteria: clarity; ease of use; appropriateness; and relevancy. Results indicate that the modified device does not measure the original core concept: affinity with nature, and that face and content validation outcomes do not yield acceptable outputs. As a result, the foundation and key characteristics of the instrument were revised to enhance its ability to produce trustworthy results and more accurately measure the revised core concept of connection to nature and environmental knowledge.

**Keywords:** connection to nature, environmental knowledge, psychometric evaluation, validity, nature

Exposure to the natural world is known to be one of the most essential components during the early stages of a child's physical, attitudinal, intellectual, and moral development (Kahn & Kellert, 2002). Studies indicate that spending time outdoors correlates with increased physical activity, leading to many health benefits such as building and maintaining healthy bones and muscles, and reducing risk of chronic diseases, depression, and anxiety (McCurdy *et al.*, 2010; Mygind *et al.*, 2019). One's emotional and attitudinal connection to nature (CTN) is largely influenced by positive and frequent experiences in outdoor environments (Clayton & Opatow, 2003). These exposures have been proven to increase the development of pro-environmental attitudes, knowledge, and beliefs as an adult (Chipeniuk, 1995; Ewert *et al.*, 2005; Rickinson, 2001), and the probability of conservation behaviours and attitudes later in life (Dresner *et al.*, 2015; Zhang *et al.*, 2014). Other studies in the field have found that time spent in nature enhances children's development of imagination, creativity, and problem-solving skills and their overall connection to nature (Chawla, 2015; MacKeen & Wright, 2020; Malone & Tranter, 2003; Omidvar, 2018; Omidvar *et al.*, 2019).

Understanding the variety of relationships young children experience with nature is critical for enhancing education systems, children's relationships with others, and their physical and psychological development (Braus & Milligan-Toffler, 2018; Kahn & Kellert, 2002). Further, by studying and supporting children and their connections to nature,

we gain a sense of how caring for the environment can be fostered at these impressionable ages. Despite the growing amount of literature exploring children's CTN, information and measurement of the impacts nature has on children during various stages of development are sparse, and gaps remain, such as whether young children can form deep connections with nature and how direct or indirect contact with nature plays a role in their relationships with the natural world (Kahn & Kellert, 2002).

Connection to nature looks different for each individual, especially young children. Studies have started to acknowledge that there is no single right way to interact with nature, and as a result, there is no single effective way for researchers to study human nature connection (Braus & Milligan-Toffler, 2018). Because of this variety, researchers have measured these relationships using an assortment of constructs. The construct is a fundamental concept a researcher intends to explore through methods such as psychological testing instruments (Cronbach & Meehl, 1955). Constructs related to children's connection to nature have been defined as nature relatedness (Nisbet et al., 2009), the inclusion of nature in self (Schultz, 2002), eco-affinity and eco-awareness (Larson et al., 2011), and nature connection (Braus & Milligan-Toffler, 2018; J. C.-H. Cheng & Monroe, 2012; Kellert, 2012; Mayer & Frantz, 2004). While these concepts are not the same, they do encompass the affective, cognitive, and experiential aspects associated with measuring nature relationships (Barrable & Booth, 2020; Tam, 2013). The debate remains on which method is more effective at measuring psychological attributes; aggregating similar concepts into a broader construct or narrowing the concepts to be more specific (Tam, 2013). Nevertheless, precise definitions are essential to ensure that a construct is feasible for measuring the targeted concepts.

A select number of psychological testing instruments strive to explore children's different relationships with nature (Giusti et al., 2014; Larson et al., 2011; MacKeen & Wright, 2020; Mayer & Frantz, 2004; Nisbet et al., 2009). Both Larson et al., (2011) and Nisbet et al., (2009) studied the affective and cognitive aspects of an individual's CTN via survey-based scales. Mayer and Frantz (2004) utilized an instrument built to measure one's emotional connection with nature and suggested that this connection is an essential predictor of ecological behaviour and personal well-being. While these devices and others alike have been psychometrically evaluated for validity and reliability, there is no evidence of a trustworthy game-based testing instrument built for measuring preschool children's CTN and environmental knowledge. The only known tool of this kind was conceptualized in 2012 and created in 2014, where Giusti et al. developed a measure that was said to assess 5-year-old children's emotional, cognitive, and attitudinal affinity with nature.

Giusti et al. (2014) found that students in local Reggio-Emilia (nature-based philosophy) schools had increased bioaffinity (CTN) and the device yielded strong internal consistency reliability results. Using the Giusti et al. (2014) tool, Omidvar et al. (2019) conducted a similar study in Nova Scotia, Canada, with 3-5-year-old children attending a Reggio-Emilia preschool but results indicate their affinity with nature was much weaker than hypothesized. As a result, Omidvar et al. (2019) recommended that further studies determine the appropriateness of the Giusti et al. (2014) measure for younger Canadian children. As a result, MacKeen & Wright (2020) modified the Giusti et al. (2014) tool to be more culturally, geographically, and developmentally relevant for young children in Canada, and then pilot tested the revised version. Modifications primarily included changes to the game design and the content (i.e., pictures and language). Results showed that the revisions effectively enhanced the children's understanding of the game's testing for a Canadian context. However, for psychological instruments to be considered trustworthy and produce generalizable results, they must undergo psychometric assessment (DeVellis & Thorpe, 2021). While Giusti et al., (2014) established initial reliability results for the original version of the testing instrument, neither the 2014 or modified 2020 version have undergone any type of validity assessment.

## Validation in Research

Validity is a vital step in producing effective and quality research. Validation procedures emerged as a means to determine the degree to which a psychological or educational test evaluates what it proposes to measure (Sireci, 1998). Throughout its evolution, new versions of validity testing have emerged to aid in assessing different characteristics of instruments, such as face, content, criterion-related, construct, external and others (Cohen et al., 2002). For example, construct validity is used to investigate the foundational concept that the device is built to



measure, and external validity looks at the degree to which the results are generalizable to greater populations and locations (Cohen *et al.*, 2002). Given the variety of available tests, researchers utilize the type that is most appropriate for their device and field. Limpo *et al.* (2020), examine construct, convergent/discriminant, and predictive validity for an instrument that measures Portuguese third graders' self-efficacy, and motivations for writing and story-telling. These methods were used to examine factorial structure and invariance across two independent samples of third graders, which were used as a procedure for assessing text quality across different genres and grade levels (Limpo *et al.*, 2020). Another study investigated the concurrent validity of a tool that measures students' science attitudes, pro-environmental behaviour, climate change attitudes, and knowledge (Dijkstra & Goedhart, 2012). An expert panel was asked to assess these variables amongst different groups within the study population (Dijkstra & Goedhart, 2012). However, Giusti *et al.*, (2014) did not establish any form of validity for the original Games Testing for Emotional Affinity, Cognitive Affinity, and Attitudinal Affinity with the Biosphere instrument.

Preliminary validity testing involves looking at the basic foundations of the tool, which could include but is not limited to assessing face, content, and construct validity criteria. Face and content validity analyses were chosen for this study because they assess the whether the premise of the instrument is effective for measuring the foundational concept. Face validity seeks to determine whether the tool's items are sensible, appropriate, and relevant to the participant audience (Connell *et al.*, 2018). This method relies on knowledgeable experts reviewing the suitability of the items within an instrument pertaining to the measured psychological criteria (Connell *et al.*, 2018; Holden, 2010). Slater *et al.* (2009) recruited an expert panel of 6 individuals comprised of nurses and psychologists with experience in clinical practice, research, and survey design due to their instrument being focused on measuring nurses' working environments. Similarly, a study by Piredda *et al.* (2017) utilized a panel of 6 experts to assess an instrument's items for clarity and appropriateness of a tool that sought to measure nurses' caring behaviour in Italian acute care settings. Both studies used a survey, semi-structured or structured interviews with the experts to gather the information, which was then transcribed and analyzed for common consensus (Njelesani *et al.*, 2020; Piredda *et al.*, 2017; Slater *et al.*, 2009).

Throughout the literature, face validity is often paired with content validity (Connell *et al.*, 2018; Krause, 2012; Njelesani *et al.*, 2020; Piredda *et al.*, 2017; Slater *et al.*, 2009). Haynes *et al.* (1995) defines content validity as "the degree to which elements of an assessment instrument are relevant to and representative of the targeted construct for a particular assessment purpose" (p. 238). The construct refers to the concept that the tool intends to measure, which in the case of the MacKeen and Wright (2020) version of the tool is the cognitive, emotional, and attitudinal bioaffinity (CTN) of preschoolers (Haynes *et al.*, 1995). Content validity can be established via quantitative, qualitative, or a mixed-methods approach, and primarily relies on the following criteria: establish a clear definition of the construct or concept the tool aims to measure, gather expert opinions for the items within the tool using formalized scaling procedures, and examine the proportional representations of the items to determine whether the tool is interpreted in a way that reflects the construct or concept (Haynes *et al.*, 1995). Silva *et al.*, (2020) followed these steps by recruiting 10 expert raters and asking them to rate the items as relevant or not relevant on a formalized scale during the interview process. Validity allows the researcher to determine whether the items in an instrument are useful for measuring the targeted concept and identify areas that could be enhanced to better measure the construct (Roberts *et al.*, 2006). It is apparent that validity is an important step in creating a sound psychological instrument, yet both the original (Giusti *et al.*, 2014) and modified (MacKeen and Wright, 2020) versions of the game-based testing instrument lack validation. Establishing validity of the MacKeen and Wright 2020 instrument will highlight whether the instrument and its components are useful for measuring young children's environmental knowledge and connection to nature.

An apparent gap exists concerning a recognised valid connection to nature and environmental knowledge scale using a game-based testing strategy, specifically for young children. Task-based learning can help children learn more effectively due to multiple parts of the brain being engaged, thus allowing the child to stay focused (Buyukkarci, 2009; Littlewood, 2004). The game-based instrument includes high-level concepts that may not have been previously introduced or particularly interesting to a young audience. The game-based format increases the chance of engagement and the probability of the information having a lasting impression on the child (Buyukkarci, 2009). Though there is substantial literature concerning the validity of psychological CTN related testing tools (i.e.,

questionnaires and surveys), there is a lack of literature exploring a testing tool similar to the modified Giusti *et al.* (2014) games testing tool. Existing literature focuses on developing individual tools that measure different human behaviours, and some of these studies do investigate connection to nature (Cheng & Monroe, 2012; Mayer & Frantz, 2004; Nisbet *et al.*, 2009). However, none of the existing research seeks to evaluate this criterion through a games testing tool.

The current research seeks to establish preliminary validity assessments for the MacKee and Wright 2020 modified game-based testing instrument for measuring Canadian preschool children's CTN. Specifically, face and content validation will be explored through applying a mixed-methods approach by testing whether the newly modified 2020 tool is more valid than the original 2014 tool in terms of face (ability) and content. Appraisal of the face and content psychometrics includes the use of an expert panel who are asked to review and be interviewed about the ability and suitability of the modified instrument based on four criteria: clarity, ease of use, appropriateness, and relevancy (Connell *et al.*, 2018; Haynes *et al.*, 1995; Holden, 2010). These two types of substantiation provide a foundation for other forms of validity and psychometric evaluation to take place as the tool moves towards becoming trustworthy and generalizable. Further, by initiating the validation of the device, it has the potential to have an interdisciplinary impact and contribute to various research sectors by allowing future studies to further determine whether time spent in nature and environmentally-focused school situations can increase a preschooler's CTN and environmental knowledge.

## Methods

Before a tool can undergo psychometric reliability testing, validity must be evaluated as it determines whether the criterion within the tool is useful for measuring the intent of the tool. Once validity has been assessed, the tool can be used in a chain of pilot studies where reliability can be evaluated. In this study, a mixed-methods approach is used to assess the face and content criteria for the MacKee and Wright (2020) modified CTN game-based testing instrument. Both face and content validity are confirmed via an expert (i.e., practitioners and academics) panel providing feedback and insight through a questionnaire and follow-up semi-structured online interviews. Ethics approval was granted before data collection commenced via the Dalhousie University Research Ethics board. For this research, the use of face and content criteria served the purpose of establishing a foundational understanding of the intent and ability of the characteristics in the modified instrument used to measure CTN and environmental knowledge. Further, these forms of validation are critical steppingstones for other types of validity to be later established.

### The tool

The game-based testing instrument used in this research was initially designed by Giusti *et al.* (2014) with games that were meant to be played on a standard size piece of paper (8.5 x 11 inches); however, the varying types of images (cartoon and real pictures), and much of the language was not appropriate for a Canadian context. As such, the tool was modified by MacKee and Wright (2020), primarily including changes to the game design, pictures and language (please note that a full copy of the instrument is available by contacting the authors or by visiting this [link](#)). The modified instrument that was used for this portion of the study contained six unique task-oriented games that utilize monochromatic photos of real-life items (i.e., a real photo of a tree or people cleaning up a beach) and culturally and developmentally appropriate language for Canadian preschoolers.

The first game (game 1a, see Table 1) seeks to explore children's environmental sensitivity by using a sorting game that asks the child whether certain inanimate objects and animals can get hurt. It includes cut-outs of particular photos (i.e., a tree and a bird), and the child is asked to sort the pictures into 'yes' or 'no' bins based on the question posed. The second game (game 1b) is also used to test environmental sensitivity by employing a game of happy and sad faces, where there is a board of pictures (i.e., water pollution and planting a tree) and cut out happy and sad faces. The children are then asked for each picture on the board, whether they want to associate a happy or sad face with that picture.

The next two games gauge children's environmental awareness. Game 2a is a matching game that includes a board of pictures and cut-outs. The board displays photos such as eggs and paper, and then for each cut-out, they are asked to match them with the corresponding ecosystem service (i.e., chicken and wood). The fourth game (game 2b) is completed in two parts. First, the child is asked to verbally explain their definition of particular pollutants (i.e., water pollution). Secondly, they are shown a list of the pollutants and asked whether they can hurt things, such as cars and animals.

The final two games aim to measure children's environmental preferences and are played verbally; they both use the same board of photos depicting physical places that children play (i.e., a backyard or playground). The fifth game (game 3a) asks the participants about their favorite places to play and why, and game 3b asks the participants about their least favorite places to play and why. The total amount of time needed to perform the testing is an average of 15.25 minutes (MacKeen and Wright, 2020).

Table 1

*List of games and the concepts they intend to measure and game style used.*

Game	Concept Measured and Game Style
Game 1A	<ul style="list-style-type: none"> <li>• Children's environmental sensitivity</li> <li>• Sorting game</li> </ul>
Game 1B	<ul style="list-style-type: none"> <li>• Children's environmental sensitivity</li> <li>• Matching game using happy and sad faces</li> </ul>
Game 2A	<ul style="list-style-type: none"> <li>• Children's environmental awareness</li> <li>• Matching game of ecological services</li> </ul>
Game 2B	<ul style="list-style-type: none"> <li>• Children' environmental awareness</li> <li>• Verbal response and sorting game</li> </ul>
Game 3A and 3B	<ul style="list-style-type: none"> <li>• Children's environmental preferences</li> <li>• Participants choice of photo and verbal response</li> </ul>

### Data collection

Data for both face and content validity was obtained through a questionnaire and, when appropriate, follow-up interviews with a group of experts within the field of environmental psychology, early childhood environmental education, and connection to nature and bioaffinity. Recruitment of the expert panel (n=6) was carried out through a non-probabilistic and purposive sampling technique, focusing on a combination of stakeholder and criterion sampling that allowed the researchers to identify and interview significant stakeholders who are knowledgeable about CTN and the creation, use, and evaluation of psychological testing instruments. The chosen experts have participated in creating and evaluating psychological testing instruments designed to measure children's psychological attributes related to nature connection. Therefore, they possess an understanding of the theory and methods used to assess this particular type of instrument. Participants were invited via e-mail correspondence that included information about the study, tasks, and a consent form, as well as preemptive consent for a follow up interview and permission to digitally record the interview. When the specialists agreed to participate, the study's questionnaire was sent out for completion.

### Questionnaire construction

The purpose of the questionnaire was to formally explore the four criteria used to assess face (clarity, ease of use, and appropriateness) and content (relevancy) validity. The questionnaire posed a number of Likert-style questions to assess the four criteria for the instructions, pictures, and language used in the modified tool. For each of the three components of the modified tool, a five-point scale (i.e., 1 = very unclear, 2 = unclear, 3 = neutral/undecided, 4 = clear, 5 = very clear) was composed to assess the individual qualities (clarity, ease of use, appropriateness, and relevancy). Clarity was used to investigate the comprehensiveness of the intent and contents, ease of use and

appropriateness contributed to whether the content was considered culturally and/or developmentally suitable for Canadian preschoolers, and relevancy was used to establish if the items in the tool were representative of the targeted construct (the foundational concept the tool was built to measure – in this case, connection to nature) (Piredda *et al.*, 2017; Polit & Beck, 2009; Silva *et al.*, 2020). The scale provided an extensive amount of rich information concerning each section of the tool, including the information provided before starting the game's testing, each of the six games, and the debrief section.

#### Interviews

Once the questionnaires were complete, the face validity analysis determined whether semi-structured follow-up interviews were necessary to investigate poor results. Interviews were conducted through the online platform Zoom as it is considered the most popular video conferencing app and can provide password protection for the meeting, the ability to lock up the meeting (mitigating against unwanted users joining the meeting), and individual privacy controls (Singh & Awasthi, 2020). Of the six experts taking part in this validity testing of the modified tool, three were interviewed to gain further insight into the answers they provided in their questionnaires. The survey results indicated what areas of the tool were lacking in terms of validity but there was no space for the experts to provide reasoning. The scores for three of the experts highlighted that they were satisfied with the items in the tool and how they operate to measure the construct of the instrument. However, the scores for the other three experts specified that the instrument needed further modification. Interviews were chosen to explore their answers and gain insight for how to enhance the instrument and its ability to measure children's connection to nature. A rough interview guide was created to cater to each of the three interviews because of the differing questionnaire results. Therefore, each interview produced varying perceptions about the expert's concerns within the tool. These varying outlooks were then compiled to examine for emerging patterns and to determine the best way to modify specific segments in the instrument.

### Data Analysis

Just as there are various ways to evaluate the validity of a testing instrument, there are also a variety of methods used to analyze the data. Previous work on this subject suggests that the first three criteria (clarity, ease of use, and appropriateness) can be calculated together as they examine the intent and suitability of the items within the tool, which indicates if the face value of the tool is adequate (Piredda *et al.*, 2017; Silva *et al.*, 2020). In comparison, the criterion relevancy looks at whether the items are pertinent for measuring the instrument's construct. As a result, analyses differ with face validity utilizing interrater reliability correlation analysis and content validity using the item and scale content validity index calculations (Polit *et al.*, 2007; H. E. A. Tinsley & Weiss, 2000).

#### Face Validity

To assess the face validity criteria collected via the questionnaire, interrater agreement analysis and the intra-class correlation coefficient calculation was used. Interrater agreement indicates the degree to which the ranking amongst a group of raters is the same or, more specifically, determines the strength between two or more raters (Tinsley & Weiss, 2000). With a five-point scale, high interrater scores suggest that the experts value the features of the tool (i.e., pictures) with a consistent rating (Tinsley & Weiss, 2000). We chose the intra-class correlation coefficient (ICC) for this research due to its widespread use in social science literature and the number of expert raters ( $n=6$ ) recruited for this study (Bajpai *et al.*, 2015; Bartko, 1966). ICC results range on a spectrum between zero to one, with 0.70 being considered an acceptable level of agreement between the expert raters (Tinsley and Weiss, 2000).

Before calculations could commence, the expert scores gathered via the questionnaire were converted to a zero (expert ratings equaling to three or below) or a one (expert ratings equaling to four or five). Then, the ICC and other descriptive statistics (mean, variance, and 95% confidence intervals) were calculated individually for clarity, ease of use, and appropriateness via the statistical package SPSS. The confidence interval (CI) results are shared because they provide a deeper understanding of the relationship under scrutiny (Kallogjeri *et al.*, 2019). This data showcases the variability, which aids in getting a broader picture of insight about certain outcomes (Kallogjeri *et al.*, 2019).

## Content Validity

The item and scale-level content validity index (CVI) is used to quantify content validity for the multi-item modified scale based on expert ratings of relevance or their average of agreeance (Polit *et al.*, 2007). Calculating CVI is an essential step in validating the foundations of an instrument and ensuring high-quality content (Polit *et al.*, 2007; Shi *et al.*, 2012). All CVI calculations were conducted in Microsoft Excel.

Before calculating CVI, the scores from the Likert-style questions were converted to a zero (expert ratings equaling to three or below) or a one (expert ratings equaling to four or five) to conform to the range used to assess CVI. Once the scores were converted, the first calculation was the item-level content validity (I-CVI), which was used to determine the CVI for each individual component (i.e., game 1a, game 1b, etc.). Then, the I-CVI was used to compute the average I-CVI across the items, known as the scale-level content validity average (S-CVI) (Polit *et al.*, 2007). More specifically, the (S-CVI) looks at all of the components (i.e., all six games and the instructional sections in the tool) being assessed by the expert raters. The analysis includes the I-CVI and S-CVI average for the pictures, language, and instructions for each of the games within the modified tool. When evaluating new testing instruments, a typical limit of acceptability for the S-CVI average is a score of 0.80 or higher (Polit *et al.*, 2007; Shi *et al.*, 2012).

## Results

The following section showcases the results from the face and content validity analyses and utilizes the interview outcomes to help support and illustrate them. The four components of the instrument (instructions, recommendations, language, and pictures) that the experts analyzed are used to guide the results and discussion to follow. Finally, it is essential to note that the outcomes from the validity analysis facilitated modifications to the MacKeen and Wright 2020 instrument that resulted in a new version of the instrument dated 2022.

### Face Validity

The validation scores for the questionnaire's face (ability) assessment are categorized into four sections: recommendations, instructions, pictures, and language. Within these sections, readers will find explanations about each of the three-face validity criteria clarity, ease of use, and appropriateness. First, it is important to note the overall findings for these three criteria.

In Table 2, findings from all the components in the game-based testing instrument have been compiled into the total calculations for each of the three criteria, with the most important computation being the intra-class correlation coefficient (ICC). When examining the ICC for all three criteria, the outcomes for clarity are the most promising, with an ICC of 0.493. While promising, this finding still does not meet the minimum acceptable ICC level of 0.70 and is not consistent due to diverging confidence intervals for this criterion which echo the high variance result of 0.707 (Tinsley & Weiss, 2000). A lower CI of 0.109 and an upper CI of 0.748 further showcase this high variance amongst the expert ratings. The findings for the latter two factors (ease of use and appropriateness) indicate extremely high variance and low ICC scores. Interestingly, both criteria have negative ICC scores, where ease of use has an ICC of -0.444 and appropriateness an ICC of -0.489. These negative results could be occurring for several reasons, such as high variance, small sample size, negative bias or ICC underestimation (Wu *et al.*, 2012).

Additionally, a closer look into the individual averages amongst the raters demonstrate that two of the experts had very low mean scores throughout the three validity criteria. In contrast, the other experts had means close to the highest rating of five. For example, for the criterion appropriateness, these two experts had average scores of 1.480 and 2.039, and another expert had an average score of 4.88. These results supported the need to conduct follow-up interviews with these two experts. Further, the low ICC scores signal the need to investigate individual scores for the sections within the tool to determine what parts need attention and modification.

Table 2

*Combined findings for the criteria clarity, ease of use, and appropriateness including the mean, variance, ICC, and confidence intervals.*

	<b>Clarity</b>	<b>Ease of Use</b>	<b>Appropriateness</b>
<b>Mean</b>	3.887	4.025	3.480
<b>Variance</b>	0.707	1.341	2.204
<b>Intraclass Correlation</b>	0.493	-0.444	-0.489
<b>Lower 95% CI</b>	0.109	-1.615	-1.619
<b>Upper 95% CI</b>	0.748	0.300	0.259

### Recommendations

Throughout the tool, recommendations are provided to specify how the delivery of the instrument and game design should be fulfilled, such as enlarging, printing, and laminating pictures from a designated list and shuffling the cut-out pictures before testing another participant. As seen in Table 3, this aspect of the modified tool received the highest mean scores for clarity, ease of use, and appropriateness. As a result, much of the recommendations stayed the same.

Table 3

*Mean expert scores for the three criteria of face validity relating to the four components assessed within the modified instrument.*

	<b>Recommendations</b>	<b>Instructions</b>	<b>Language</b>	<b>Pictures</b>
<b>Clarity</b>	4.41	3.48	3.83	3.36
<b>Ease of Use</b>	3.83	3.75	3.61	3.61
<b>Appropriateness</b>	3.73	3.61	3.44	3.33

### Instructions

The second component in the device is the instructions that provide step-by-step guidelines for how to conduct the games, including the associated question prompts and order of operation. Results showcase varied expert ratings due to the means ranging between three and four (Table 3). A three in relation to the five-point scale is a neutral/undecided rating. However, individual experts scores highly fluctuated, such as for the appropriateness of the instructions for game 2b, scores went as low as a one (not clear, not easy to use, and not appropriate) and as high as a five (very clear, very easy to use, and very appropriate).

During an interview with Expert One, it was suggested that the game design and associated instructions for game 2b be revised to include some new elements. In this game, the children are asked if certain pollutants (water pollution, air pollution and ground pollution) can hurt animals, cars, or people. This expert indicated that this game could be taken one step further to include deforestation in the set of impacting factors and the element of “you” and forest in the options for the affected. They reasoned that by including these additional factors there is more substance to analyse, which could then incorporate a discussion about how the children’s answers differ between living versus non-living items getting hurt, and whether they have different emotions and knowledge about things related to the biosphere other than just the three pollutants. For example, a child could believe that deforestation and clear-cutting of trees can hurt the forest, but they may not think water pollution can hurt the forest. This suggestion led to the modification of the tool to include these three new concepts and, therefore, creates an opportunity to highlight further the children’s varying connection to and knowledge of nature.

## Language

Another component assessed in relation to the three criteria of face validity is the language used throughout the instrument used to describe the pictures and prompts. While all three criteria received a mean between three and four, not many alterations were suggested by the experts relating to the language used for the pictures and prompts (Table 3). Further, MacKeen and Wright (2020) indicate that the modifications they made, including changes to the language, have enhanced children's understanding of the games testing. However, there were some minor changes made to the phrasing, such as "cut down trees" (MacKeen and Wright, 2020) being altered to "cutting down trees" (latest 2022 version of the tool), since the photo had also been changed from a clear-cut forest to a person standing in a clear cut and cutting down one of the remaining trees. It is important to note that there was a more extensive discussion about the use of language used to create the foundations and construct of the tool, which is later discussed in the results for content validity.

## Pictures

The final aspect of the instrument inspected was the photos used to illustrate the concepts. Based on the averages, lack of clarity and appropriateness had the lowest mean scores (Table 3). As later revealed in the results for content validity, certain games were flagged (i.e., game 1b) and then further discussed during the expert interviews. For example, Expert One suggested that in game 1b, the "cleaning up" picture might not have anything to do with environmental relations. This picture was initially modified to a child cleaning the floor with a vacuum indoors (MacKeen and Wright, 2020). The expert proposed that it be related to cleaning up the environment since that is more related to the instrument's construct. Therefore, the photo was changed to children cleaning up garbage outdoors at a beach. Another example in game 1b pertains to the photo of "plastic on the ground," which lacked a clear indication that the plastic is on the ground because it is a zoomed-in picture of a bundle of plastic bottles and cans. As a result, the image now portrays a person with plastic litter on the ground around them.

## Content Validity

The results for the scale-level CVI suggest that there are components in the game-based testing instrument that are not adequate for measuring preschool children's affinity with nature. As exhibited in Table 4, the three elements within each game had averages of 0.622 for the instructions, 0.583 for the language, and 0.527 for the pictures. These outcomes are all below the acceptable S-CVI average of 0.80 (Polit *et al.*, 2007). However, these results reiterate issues found in the face validity analysis and indicate that these components have room for improvement that are further identified in the individual CVI scores.

Table 4

*Results of the scale-level content validity index averages for the tool components instructions, language, and pictures.*

	S-CVI Average
Instructions	0.622
Language	0.583
Pictures	0.527

## Instructions

The instructions are included in the instrument to provide researchers with an understanding of how to administer each of the games within the tool. Here is a quote from the instructions for game 1a in the first section of the tool environmental sensitivity:

*Begin by explaining the exercise to the child:*

*Example: "In this first game, I will hand you a picture and ask if the thing in the picture can feel an owie or get hurt, and then you will sort them into the yes or no bins (demonstrate while explaining)".*

These explanations are designed to be straightforward for someone else looking to repeat the games. While the instructions received the highest S-CVI average (see Table 4) meaning that the experts felt the instructions were somewhat adequate, the I-CVI provides more information for each of the individual games. As seen in Table 5, the items "before starting the games testing" and "game 1b" meet the acceptable CVI level of 0.80. Game 1a received the next highest score, and games 2a, 2b, 3a, and 3b all received a divisive I-CVI of 0.500, split equally between the experts. These outcomes do not indicate that the instructions are in dire need of further modification. Instead, they suggest they need a second look and a few minor corrections.

Table 5

*Outcomes of the interpreted expert ratings and individual content validity index scores for the tool component instructions.*

	Expert 1	Expert 2	Expert 3	Expert 4	Expert 5	Expert 6	I-CVI
<b>Before Starting the Games Testing</b>	0	1	0	0	1	1	0.857
<b>Game 1A</b>	0	1	0	1	1	1	0.667
<b>Game 1B</b>	1	1	0	1	1	1	0.833
<b>Game 2A</b>	0	1	0	0	1	1	0.500
<b>Game 2B</b>	0	1	0	0	1	1	0.500
<b>Game 3A</b>	0	1	0	0	1	1	0.500
<b>Debrief</b>	0	1	0	0	1	1	0.500

## Language

The variable "language" encompasses all the language used in the tool, including the recommendations, instructions, words used to describe the pictures and the foundational concepts used to outline the instrument. Our analyses indicate that three out of the six games received a split in opinions from the experts, including games 1b, 2a, and 2b, whereas games 1a, 3a, and 3b got a higher score of 0.667 (Table 5). None of these outcomes meet the acceptable CVI level of 0.80 and suggest more attention is required for games 1b, 2a, and 2b regarding the language choices. However, during interviews with Experts Two and Three it was revealed there was a deeper concern with the language being used to define the construct the instrument intends to measure: bioaffinity.

Table 6

*Outcomes of the interpreted expert ratings and individual content validity index scores for the tool component language.*

	Expert 1	Expert 2	Expert 3	Expert 4	Expert 5	Expert 6	I-CVI
<b>Game 1A</b>	0	1	0	1	1	1	0.667
<b>Game 1B</b>	0	1	0	1	1	0	0.500



<b>Game 2A</b>	0	1	0	0	1	1	0.500
<b>Game 2B</b>	0	1	0	0	1	1	0.500
<b>Game 3A</b>	0	1	1	0	1	1	0.667
<b>Game 3B</b>	0	1	1	0	1	1	0.667

One of the key questions asked during the questionnaire is why the experts feel that the games they flag are not relevant for measuring emotional, cognitive, and attitudinal affinity with nature (bioaffinity). Throughout the interview with Expert Three, they continuously came back to whether the games genuinely measure bioaffinity and that the operational definition of bioaffinity is absent. More specifically, for game 1b regarding the photo of water pollution (the photo on the left in Figure 1 below), the expert made the point that “somebody could be very disconnected with nature, but I think they would still find a bird covered in oil sad” and whether it is getting at empathy instead of a child’s connection to nature. Another example is given for game 2a, the matching game, and how this showcases the children’s knowledge rather than explicitly measuring their bioaffinity. In the same vein, the expert noted that bioaffinity is vague and that these games could measure things that are essential to children’s affinity with nature, but it is not clear.

During the final interview session, it was made clear that a thorough review of the domains of bioaffinity was required to ensure that the operationalization of the term includes the items that the tool intends to measure, which are emotional, cognitive, and attitudinal affinity with the biosphere. The final expert profoundly reiterated a lack of congruency between what the title and terminology used in the tool intend to measure and what the games may actually be measuring. For example, game 1b is titled “concern and sensitivity instructions”, but the expert indicated that the terms concern and sensitivity are dissimilar and very different from affinity.

Further, they questioned how relevant the terms are for measuring bioaffinity, and it may be that concern and sensitivity foster or lead to affinity or connection, but this assumption should not be inherent and needs additional exploration. In the section for cognitive affinity, the expert highlighted that asking children about ecosystem services is strictly probing their knowledge on the topic as opposed to examining their affinity or connection with nature. It was discussed that assessing their cognition determines the extent of the functions and skills the children possess, such as the ability to memorize a set of words or successfully participate in a sorting task (Sternberg, 1981). As a result of the conversations about the construct with experts three and four, the title of the tool and section headings have been modified (Table 6).

The title and the section headings in the tool specify the concept that is trying to be measured. As such, it is important that the terms used to describe the tool and the games within it reflect the foundational construct the tool aims to measure. The insights gained from the expert interviews led to modifying the original terms to broader concepts that would best embody the intent of the instrument, which is to gauge children’s various connections to nature and their environmental knowledge. Consequently, the original title of the tool was revised to “Measuring Environmental Knowledge and Connection to Nature; A Games Testing Tool for Preschoolers (3-5-year-olds)” (see Table 6).

Table 6  
*Construct related terminology modifications.*

<b>Element in the Tool</b>	<b>Original</b>	<b>Modification</b>
Title of the tool	Modified Research Instrument (Games Testing for Emotional, Cognitive and Attitudinal Affinity with the Biosphere, Giusti <i>et al.</i> , 2014)	Measuring Environmental Knowledge and Connection to Nature; A Games Testing Tool for Preschoolers (3-5-year-olds)
Title of Game 1A	Emphatic Behavior Instructions	Environmental Sensitivity

Title of Game 1B	Concern & Sensitivity Instructions	
Title of Game 2A	Provision of Ecosystem Services Instructions	Environmental Awareness
Title of Game 2B	Pollution Awareness Instructions	
Title of Game 3A	Favorite Environmental Quality Instructions	Environmental Preferences
Title of Game 3B	Disfavored Environmental Quality Instructions	

Additionally, the section headings and titles of the games have been changed from the MacKeen and Wright (2020) version of the tool. Initially there were three sections as identified in the original title: emotional affinity, cognitive affinity, and attitudinal affinity. As seen in Table 6, each game had their own names and were placed within each of the three segments. These findings highlighted the confusion between headings and the names of the games, such as game 1a, emphatic behaviour instructions, being placed in what was originally the emotional affinity sector. The term emphatic is defined in multiple variations, for example “uttered with or marked by emphasis”, “tending to express oneself in forceful speech or to take decisive action”, and “attracting special attention” (Merriam-Webster, 2022c). This confusion amongst terminology is evident for other language that was used to build the instrument. The following discussion will further explore the terminology and the foundational constructs of the tool.

### Pictures

The final component pictures include responses about the images used to depict various items used to measure the children’s connection to nature, such as a photo of water pollution. This category received the lowest overall S-CVI average of 0.527 (see Table 3). Taking a closer look, it is apparent that game 2a has the lowest I-CVI of 0.333 (Table 7). Game 2a is a matching game where children are asked to match items to where they come from, hoping they will pair the items with the environmental option (i.e., matching blueberries with a garden). With four out of the six experts rating this a three or below on the Likert scale, it is clear that further modification is necessary for the photos within this game. Games 1a, 1b, and 2b had split scores from the experts of 0.500 and games 3a, and 3b received the highest I-CVI for this criteria (see Table 7).

Table 7

*Outcomes of the interpreted expert ratings and individual content validity index scores for the tool component pictures.*

	Expert 1	Expert 2	Expert 3	Expert 4	Expert 5	Expert 6	I-CVI
<b>Game 1A</b>	0	1	0	1	1	0	0.500
<b>Game 1B</b>	0	1	0	0	1	1	0.500
<b>Game 2A</b>	0	1	0	0	1	0	0.333
<b>Game 2B</b>	0	1	0	0	1	1	0.500
<b>Game 3A</b>	0	1	1	0	1	1	0.667
<b>Game 3B</b>	0	1	1	0	1	1	0.667

These three criteria echo the findings from face validity and suggest that the contents of the instrument are not adequate for measuring affinity with nature, which was further supported during the interviews with the three experts. Expert Three made some crucial points about how it could be difficult for the children to understand what is happening in such complex photos relating to environmental degradation. For example, as seen in Figure 1, the picture on the left with a bird being pulled from an oil spill portrays water pollution. However, it is understandable

that this picture may not be developmentally appropriate for such a young age group, primarily because of the assumption that the children can understand the antecedence leading to the result of a bird being covered in oil. More specifically, it is unwarranted to assume all of the 3-5-year-old children can connect this to a human-caused oil spill. This led to the revision of the picture to include a person physically putting litter into a waterway to make the photo more digestible for the target audience (see Figure 1).

Another concern for this expert is the picture initially used to depict air pollution. This picture had been modified in 2019 to a photo of a person wearing a mask with smoke in the background, but the photo has not aged well with the ongoing COVID-19 pandemic. It was discussed that masks would now be commonly associated with the virus rather than protection from air pollution or any form of smoke. As a result, the photo has been exchanged for a photo of cars driving along a roadway with a cloud of smog in the air, in hopes that this illustration could be better associated with how automobiles contribute to air pollution.



Figure 1. Original (MacKeen and Wright, 2020) and modified (2022) pictures that illustrate water pollution.

Overall, the face and content validity findings and support from the interviews suggested there were cosmetic and foundational issues throughout the instrument. The following section will further explore the theoretical concepts and construct of the device and the problem with disguising and manipulating definitions to better suit individual research.

## Discussion

Within any individual scholarly discipline, a researcher can expect to find concepts, methodologies, theories, topics, and terms engineered explicitly for use within that specific school of thought (Stock & Burton, 2011). However, these characteristics can become blurred, masked, and absent when they are not fully understood or explained (Stock & Burton, 2011). In the case of developing psychological instruments, strong definitions and explanations of concepts are critical to establishing a solid construct (Stone-Romero *et al.*, 2009). The foundations of the instrument we have been using and which was subject to validity testing in this study were first conceptualized in a 2012 manuscript titled: Reconnecting to the Biosphere; Children's Socio-ecological Emotions for Nature (Giusti, 2012). Inner workings of the framework used to build the foundation consisted of exploring how different socio-ecological environments influence the development of environmental consciousness in children. Environmental consciousness in the context of this study was defined as "a set of psychological traits held by an individual which specifically represent the individual emotional connection with the biosphere" (Giusti, pg. 12, 2012). It was said that environmental consciousness consisted of four characteristics, including environmental sensitivity, awareness, attitude, and ethics.

Environmental sensitivity is described as a “conjunction of empathy and concern, as caring for a person implies also being concerned about his or her health” (Giusti, pg. 24, 2012). Environmental awareness is said to include a cognitive, knowledge-based component and an affective, perception-based component that is not limited to the impacts of human behaviour on the environment but also knowledge about essential ecosystem services and nature (Giusti, 2012). Environmental attitude in this manuscript is defined as “a durable positive or negative feeling towards the biosphere, regardless of the deriving behaviour” (Giusti, pg. 25, 2012). Finally, environmental ethics is described as personal values and beliefs about the environment that influence environmental behaviours (Giusti, 2012). Results from Giusti’s study indicated that children with higher exposure to wild and rural environments also have higher empathy and concern for nature and led to the creation of the instrument (Games Testing for Emotional, Cognitive and Attitudinal Affinity with the Biosphere, Giusti *et al.*, 2014) to further explore these findings.

However, during the composition of the Giusti *et al.* (2014) tool, these fundamental terms and ideas were restated and potentially lost in translation. As previously noted, the tool is divided into three sections, including emotional affinity, cognitive affinity, and attitudinal affinity. Emotional affinity with the biosphere is assembled to quantify the children’s emotional perspective-taking and empathetic concern for nature (Giusti *et al.*, 2014). Cognitive affinity with the biosphere targets measuring the children’s basic awareness of ecological resources, and attitudinal affinity explores their appreciation of nature and environmental awareness (Giusti *et al.*, 2014). It is clear that there is a mixing and perplexing misuse of specific terms, such as using environmental awareness with attitudinal affinity and even the simplicity of using the term affinity instead of connection. These terms have different meanings and definitions, and while researchers can manipulate and define them for their studies, the question remains: should we? This highlights how elements of theories become misconstrued and replaced by surrogates. This can in turn lead to weak construct validity in the foundation of the research due to imprecise theoretical components (Stone-Romero *et al.*, 2009).

The method of circular restatement is known to avoid theories and concepts by restating phenomena in different words, causing tautology (Gigerenzer, 2010). When researchers restate and provide one-word explanations of the construct, the foundation of the device and its intentions come into question (Gigerenzer, 2010). Further, using elaborate and decorative terms over simple ones impacts how the research connects to the broader community for the targeted discipline, and other validity tests (i.e., face and content validity) rely on a sound construct to properly assess the tool’s functions (Cronbach & Meehl, 1955). Therefore, comprehensive theoretical components used to establish psychological behavioural assessments are necessary for evaluating the device’s psychometrics (i.e., validity and reliability).

Giusti *et al.*, (2014) wanted to “analyze the extinction of nature experiences in the surrounding of urban preschools in Stockholm and relates it to the degree of affinity with the biosphere that 5-year-old children have developed” (pg. 18). As such, the premise of the Giusti *et al.* (2014) tool is to measure children’s affinity with nature, but the question remains: what is affinity? Affinity can be broadly defined as “a spontaneous or natural liking or sympathy for someone or something” and “a similarity of characteristics suggesting a relationship” (Oxford Languages, 2022a). This is a loose term that can be spontaneous and merely suggest a relationship, implying that it may not identify the degree of affinity because the meaning of the word is not static. Affinity is also not a very common term in environmental psychology. The Giusti *et al.* (2014) tool is inspired by other assessments, including the Connectedness to Nature Scale (Mayer & Frantz, 2004), the Nature Relatedness Scale (Nisbet *et al.*, 2009), and the Connection to Nature index (Cheng & Monroe, 2012). However, the terminology has strayed from common terms used in this line of research, such as connection and relations with nature. In comparison to affinity, a connection is defined as “a relationship in which a person, thing, or idea is linked or associated with something else” (Oxford Languages, 2022b). While affinity suggests a relationship, connection links a person with something, indicating a direct relationship. These differences may cause the objective and intent of the construct to get blurred and restated to something not originally envisioned.

After examining the disconnect between the 2012 and 2014 Giusti texts and conferring with the experts, it is important to peel back the layers of the instrument and redefine the foundational construct and concepts. The premise for all versions of the tool seek to explore children’s connection to nature and how their exposure to outdoor environments and environmental knowledge affect such a relationship. This resulted in the adoption of the term

connection in place of affinity. However, many of the games are also a measure of the children's knowledge because, without comprehending the material, there would be no way to analyze their relationship with nature successfully. Thus, the core construct of the tool is now measuring children's connection to and knowledge of nature and its processes, which leads to the title of the newly improved tool being: Measuring Environmental Knowledge and Connection to Nature; A Games Testing Tool for Preschoolers (3-5-year-olds). Now that the central theory of the tool has changed, the subsections need to adhere to this change.

Another element at play in these revisions was the Giusti (2012) manuscript that outlines the four characteristics of environmental consciousness as mentioned above. The basis of these features (sensitivity, awareness, attitudes, and ethics) are topics that are frequently investigated in psychological research. Children's sensitivity is explored in correlation to facial expressions (Gao & Maurer, 2009), musical styles (Gardner, 1973), and word use (Markman & Hutchinson, 1984) as few examples. Their awareness is measured relating to matters such as awareness of inconsistent information (Markman, 1979), fatal illnesses (Waechter, 1971), and internet safety (Ktoridou *et al.*, 2012). Many studies measure various aspects of children's attitudes, including their attitudes towards reading (McKenna *et al.*, 1995), pets (Kidd & Kidd, 1985), peers (Coplan *et al.*, 2007), healthy eating (Bebetsos *et al.*, 2015) and much more. Finally, children's ethics or moral development is also a topic of interest in various studies (Berkowitz & Grych, 1998; Eisenberg & Valiente, 1995; Kurdek, 1978; Turiel, 2015). However, in 2014 when Giusti *et al.* established the tool, these topics were disregarded and replaced with emotional affinity, cognitive affinity, and attitudinal affinity with nature. While on the surface these terms seem to encompass some of the other features, such as sensitivity being associated with emotions, not all of these categories and expressions are commonly explored and used in environmental psychology.

Additionally, the games within these categories claim to measure different things than what is suggested by the overarching section. For example, in game 1b, the concern and sensitivity instructions include two terms where concern can be defined as "to relate to" or "to have an influence on", and sensitive as being "delicately aware of the attitudes and feelings of others" (Merriam-Webster, 2022a, 2022b). While these two concepts are explored in environmental psychology research, they are most commonly addressed separately; it is far more common to find studies that utilize environmental sensitivity in conjunction with research that includes children (Cheng & Wu, 2015; Chu *et al.*, 2007; Erdogan & Marcinkowski, 2015; Lionetti *et al.*, 2019; Nocentini *et al.*, 2018). Another example is game 3a, labeled as favourite environmental quality instructions, in section three under attitudinal affinity. The name of the game was previously disconnected from the concept (attitude) that is to be measured for this segment of the instrument. The word favourite may be a sentiment that drives the child's attitude towards the environment, but the word quality distracts from the principal idea. As a result of these disputes, the titles for each of the six games have been removed, and the overarching sections have been changed to reflect the initial concepts used to inspire the makeup of the instrument (Table 6).

Environmental sensitivity, awareness, and preferences are fundamental beliefs that foster one's connection to nature and environmental knowledge. It is important to note that environmental ethics has been omitted from the tool due to the targeted audience and their limited developmental capacity for moral sentiments. It is essential that as psychological instruments emerge in specialized disciplines, the theories and terms used to describe that concept are clearly defined and are suitable for the target audience and the greater field of research. By modifying the foundational aspects, it will allow the device to become more widespread in its universal applicability and placement in environmental psychology. Finally, now that the construct of the tool has been revealed, the instrument can undergo further psychometric evaluation and produce trustworthy outcomes.

## Conclusions and Future Implications

Establishing the validity of the modified instrument for measuring preschool children's connection to nature and environmental knowledge is a critical step towards a psychometrically sound and trustworthy device. This study sought to explore the face and content validity of the revised (2020) version of this device and determine whether the individual and overall components aid in quantifying the construct of the tool. The results revealed low face and content scores, which led to three follow-up expert interviews and further modification of the instrument. Interviews

with the experts exposed a disconnect between what the tool intends to measure and the characteristics used to outline the features relied upon to measure the core concept(s). Therefore, the foundations and underlying inspirations of the instrument were investigated and led to a discussion about the importance of utilizing well-defined terminology to frame a psychological device. As such, the construct of the tool has been revised to measure children's connection to nature and environmental knowledge, with the internal sections reflecting the new title by changing them to environmental sensitivity, awareness and preferences. Alterations to the pictures, language and instructions also took place to enhance the clarity, ease of use, appropriateness and relevancy for measuring children's connection to nature and environmental knowledge.

However, it is important to note that the face validity outcomes are no longer applicable due to the tool undergoing further revisions. This limitation implies that face validity would need to be re-evaluated for the new 2022 version of the modified instrument, and/or other facets of validity testing (for example, criterion validity) need to take place before the tool is used in a larger format study. Despite this, we suggest that future studies that seek to use this instrument use the newly modified 2022 version as it is now the most relevant for measuring preschoolers connection to nature and environmental knowledge (please note that a full copy of the instrument is available by contacting the authors or by visiting this [link](#)).

Moreover, the hope for this instrument is for more research to explore how various forms of nature exposure impact preschoolers' CTN and environmental knowledge, such as a comparison of CTN between children who attend nature-based (i.e., Reggio-Emilia inspired) versus non-nature based schools. More research concerning the biological and developmental growth of 3-5-year-olds and cultural and geographical influences is imperative as the tool is used in various locations worldwide. Finally, this modified instrument creates a lasting impact in the field of environmental psychology as it should be considered a living tool that is manipulated to suit different geographic, cultural, and young developmental stages. By establishing such a tool, scholars can use this chain of research as a guide for how to develop, modify, and psychometrically evaluate game-based testing instruments.

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It is declared that there are no conflicts of interest relating to the research, authorship, and publication of this article.

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## Revisiting “Unless”: When Should We Expect *The Lorax*?

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### ABSTRACT

During the 1960s a flurry of provocative publications sparked broader awareness and concern for the environment. In 1971, Dr. Seuss published *The Lorax* to communicate environmental concerns to young children. The book engages complex themes with rhythmic language and colorful artwork. For decades, the book has served as an early introduction to the tradeoffs between consumption and the environment inherent in market-based economics. Over time, the environmental movement has evolved. For many, technological innovation insures a sustainable future; while for others, technological innovation exacerbates challenges facing society and the environment. Although written for children one-half century ago, *The Lorax* represents a compelling expression of the complexity of environmental concerns and controversies.

**Keywords:** Dr. Seuss, environmental education, sustainability

Theodor Geisel (1971) writing under the *nom de plume*, Dr. Seuss, wrote *The Lorax* as a cautionary tale to inspire young readers to embrace the nascent environmental protection movement of the 1960s and early 1970s (Wolfe, 2008; Witter, 2020). While the moral of the story is not subtle, Seuss’s prescription mirrors the ambiguity of the mysterious “Unless” left behind by the titular character. The moral is undeniable, but the underlying problem remains omitted from the discourse. This essay reviews an established dichotomy to explore Geisel’s prescription in the context of the environment movement fifty years after publication of *The Lorax*.

A primary purpose of this essay is to collect and share insights regarding the depth of the presentation by Dr. Seuss, so teachers may employ the text with greater confidence and effectiveness to help children realize their agency in the well-being of the environment. Geisel quite literally places the future of the environment in the hand of young child. The normative language of the title of this essay is intended to evoke the familiar ethics mantra, ought implies can, to suggest that the promise of the story is realized through the understanding and action of children.<sup>1</sup>

*The Lorax*, as a franchise, takes multiple forms including a television adaptation and an animated feature film presented in theaters. The 1972 television program and the 2012 film modify the story to accommodate the respective medium. This essay refers primarily to the Seuss illustrated text with a singular exception that is clearly noted. Given the various forms of *The Lorax*, it is prudent to provide a summary of the original text and a cursory review of the historical context in which Geisel conceived and executed his vision. Commentary on the text as an educational resource and as tool to promote concern for the environment contextualize the discussion pertaining to the competing perspectives informing the environmental movement of the past half century.

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<sup>1</sup> The statement is often attributed to Kant, but there is considerable debate who originated the formula.

## Characters and Plot

*The Lorax* is Geisel's favorite book (MacDonald, 1988; Witter 2020) and was reportedly difficult to craft until Geisel vacationed in Africa where Patas monkeys are believed to have influenced the physical attributes of the titular character, and the Thorned Acacia inspired the image of the Truffula trees (Dominy, Winters, Pease, & Higham 2018). The narrator of the story is a young boy who makes his way through a lifeless setting to the dilapidated home of the Once-ler, who, for a fee, tells the boy how the dreary condition of the landscape came to be. Prior to the arrival of the Once-ler, the landscape was alive with color and sound from Swomee-Swans, Humming-Fish, and Brown Bar-ba-loots, yet it was the delicate tuft of the Truffula Trees that inspired the opportunistic Once-ler to end his search and to erect a shop in which he intended to produce the ironically branded Thneed.

Having chopped down a tree to access the tuft needed to produce the first Thneed, the Once-ler is visited by an unfamiliar creature, who introduces himself as *The Lorax*, an advocate for the trees. While confronting the Once-ler, *The Lorax* is distracted by the appearance of the Thneed, for which there is no apparent use nor aesthetic appeal. The conflict escalates when a faceless consumer purchases the Thneed, thereby validating the Once-ler's suspicion of the commercial viability of the product. Illustrations reveal expansion of the physical plant, and, in time, deployment of the Super-Axe-Hacker to chop four trees at a time to meet consumer demand.

As the Super-Axe-Hacker accelerates deforestation, the *The Lorax* revisits the Once-ler to inform him that the Brown Bar-ba-loots must seek food elsewhere because there is an insufficient supply of fruit from the remaining Truffula trees. Undeterred, the Once-ler continues to expand production to exploit the lucrative market opportunity. The *The Lorax* visits a second time to inform the Once-ler that the Swomee-Swans can no longer sing due to the smog and will seek clean air elsewhere. As the Swomee-Swans fly away, *The Lorax* escorts the Once-ler to witness the Humming-Fish abandoning their home as byproducts, Gluppity-Glupp and Schloppity-Schopp, from the factory pollute the water habitat. Despite evidence of the undesirable environmental consequences of producing Thneeds, the Once-ler continues production to satisfy the market demand until the last of the Truffula trees falls. With the once idyllic paradise now devoid of flora and fauna, *The Lorax* exits through an opening in the smog. Where he stood, he leaves behind a message "UNLESS" that the Once-ler does not initially understand. As the Once-ler finishes telling his story, he determines that the message means that the environment will not recover "UNLESS" someone cares, more specifically, the environment will not recover "UNLESS" someone makes the effort to nurture and to protect its revival. Seuss's story concludes when the Once-ler delivers the last seed of a Truffula tree to the narrator and encourages the boy to tend to the tree so one day *The Lorax* will return.

## Context for *The Lorax*

Informed by Thoreau's *Walden* (1854), *Progress and Poverty* (George, 1879), teachings of John Muir, the conservation effort of Theodore Roosevelt, and Leopold's *Sands County Almanac* (1949), environmental consciousness accelerated in the United States during the 1960s largely due to the publication of *Silent Spring* by Rachel Carson in 1962 and *Operating Manual for Spaceship Earth* by Buckminster Fuller (1968). Catapulted into the public consciousness by images of a burning Cuyahoga River in 1969, government established the Environmental Protection Agency and augmented the Clean Air Act in 1970. Publication of *The Population Bomb* (Ehrlich, 1968) elevated public concerns arguing that population growth is the principle threat to the environment. Geisel writes in the midst of a swirl of distinguishable albeit interconnected concerns. His story presents deforestation and the destruction of habitat as he simultaneously accuses and convicts the unexamined commitment to economic growth and excessive consumerism as causes of environmental degradation, which simplifies the complexity of the relationship between people and the planet and, more importantly, accommodates production of a comprehensible children's story.

## Commentary on Text

The symbolism of the ashamed adult relinquishing the remaining seed to a child is unmistakable. The adult abdicates responsibility of the environment essential to the survival of future generations and chooses to entrust the remaining seed to a child, innocent of his ancestors' malfeasance, with hope that the child will serve as a better steward of the

seed to revive the lost beauty and bounty. Implicit in the timing of this concession is the self-awareness of the Once-ler that, despite surviving in the devastation that he caused, he, nonetheless, failed to act despite possessing the final seed. Might Geisel be suggesting that adult readers possess the potential to repair environmental damage, yet are unable to act?

The symbolic references to American values are similarly undeniable. We observe a young Once-ler arriving in a prairie sooner, suggestive of the iconic pioneers who were willing to endure extreme hardship for an opportunity to derive an existence from the bountiful land. The Once-ler possesses numerous qualities generally celebrated in capitalist economic systems. He is creative, enthusiastic, inventive, and ambitious. Moreover, he exhibits a strong work ethic, albeit in the production of a good with an undetermined purpose and no discernible aesthetic appeal. Meanwhile, faceless consumers buy the product, unconcerned with its unstipulated utility and disinterested in the unobserved environmental consequence of its production.

Central to the story is the absence of interaction between the Once-ler and buyers of the Thneed. Disassociation from the environmental impact of Thneed production parallels the estrangement between producers and consumers. Mauss (2000/1925) suggests that exchange was not always transactional. Geisel's visual illustrates commodity exchange inherent in market-based economies. The two-page spread portrays two independent actors engaging in a quantitative relationship involving the immediate exchange of alienable goods. The obscured faces exemplify exchange based on the transfer of one object, a Thneed, for another object, money. The Once-ler defines success when he receives \$3.98. Alienated from the buyer and uninterested in utility and beauty, the Once-ler is oblivious to the consequences of his narrowly defined success.

Similar to nature itself, *The Lorax* lacks power to defend flora and fauna from the primacy assigned to production growth, *biggering*, inherent in market economies. *The Lorax* apparently possesses some unsourced authority but cannot halt the actions of the Once-ler. Moreover, nature lacks an inalienable right to exist, which contrasts with the apparent right of the Once-ler to exhaust the natural environment to profit by satisfying the demand for a superfluous product. All *The Lorax* can do is verbally assail the Once-ler. With each reprimand, *The Lorax*, society's *superego*, is increasingly disappointed and angry, yet the Once-ler, society's *ego*, soldiers on in pursuit of profit, albeit rationalized as serving a previously unmet need, a need that did not exist prior to creation of the Thneed. Interestingly, the Once-ler retains a single seed, ultimately to entrust to someone able to obey one's conscience. Empathetic readers might be tempted to cast the Once-ler as a tragic hero, whose fatal flaw of greed led to his demise, but it is difficult to assign substance to his temporary fortune due to the absurdity of the Thneed and the extensive destruction imposed on the environment.

Shortly after the last *Truffula* tree falls, production ceases, the abandoned landscape is dark and devoid of the vibrant life so enchanting at the beginning of the tale. The Once-ler retreats into his residence isolated and alone surrounded by the unpleasant consequences of his actions. Notably, the Once-ler experiences no socially imposed consequence for transforming the landscape and disrupting the ecosystem. The self-imprisonment and unwillingness to permit the narrator to view his face imply a sense of shame and, thus, a hint of self-awareness that may motivate his protecting the single seed.

With the depletion of the natural environment, the labor of his family is no longer needed. The faceless, perhaps soulless, workers speed off in search of their next purposeless employment. It is tempting to consider that Seuss is alluding to Heidegger's central concern expounded in his essay, *The Question Concerning Technology*; however, although published in German in 1954, the essay was not translated into English until 1977. Nonetheless, the imagery illustrates Heidegger's concept of *enframing* nature and his concern that even human beings would be relegated to mere resources. However, Mancuse (1964) publishes *One-dimensional Man* in English.<sup>2</sup> His thesis emphasizes the irrationality of consumers whose search for social connection, in an increasingly disconnected world, explains

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<sup>2</sup> Mancuse and Heidegger studied under Husserl. In 1932, Mancuse published Hegel's *Ontology and the The Theory of Historicity*, which is believed to be heavily influenced by Heidegger. Mancuse emigrated to the US in 1934 but would likely be aware of and able to read Heidegger's book in the original German.

consumption of new products with no concern of the negative effects on the environment or themselves. The insidious consequence of the misplaced freedom, according to Mancuse, is the indifference supported by affluence that sustains the social order and thwarts any desire for change. From this perspective, one might speculate that the absence of consequences for environmental destruction compensates perpetrators who unwittingly support the status quo.

*The Lorax* is not an allegory; similarly, there is no nuance nor subtlety. Seuss condemns modern capitalism that relies on consumerism and disregard for consequences to the environment and, perhaps, the human beings entrapped by the ethos. Albeit, not as commercially successful as his other books (MacDonald, 1988), *The Lorax* has inspired many applications and considerable commentary. The industry that emerged from this single work of children's fiction ranges from advocates who embrace the cautionary tale as an instructive teaching tool to challengers who question the literary value and ideological idealism.

### Applications and Challenges

Dr. Seuss and *The Lorax* garner academic interest from scholars across a breadth of disciplinary interests. Miller and Watts (2011) offers insight into the magnitude of interest reporting that the ERIC database returned seventy items for Seuss and seven items when searching *Lorax*. A decade later, searches for *Seuss* and *Lorax* return ninety-four and sixteen items, respectively, revealing the enduring interest in both the author and *The Lorax* as vehicles for teaching and scholarly pursuits.

The scope of applications of *The Lorax* reflects the appealing story and illustration of the book as well as the significance of the topics. *The Lorax* has been applied to a breadth of academic disciplines ranging from reading (Rule & Atkinson, 1994; Marshall, 1996; Dymock, 2007), mathematics (Kurz & Bartholomew, 2012), and education (Rodgers, Hawthorne, & Wheeler, 2007; Johansson, 2011; Plankis, Ramsey, Ociepka, & Martin, 2016) to business (Greenwood, 2000; Feger & Thomas, 2011;), science (Teorey, 2014), philosophy (Johansson, 2011), and economics (Hammock, Mixon, & Parono, 2000; VanFossen, 2003; Rodgers, Hawthorne, & Wheeler, 2007; Miller & Watts, 2011).

Interest in *The Lorax* extends beyond classroom applications. Rankin-Gouthro (2011) evokes the conflict between the Once-ler and *The Lorax* to illustrate how planners and policy makers can benefit from scenario building to find a shared vision needed to reduce the inherent uncertainty affecting environmental projects. Legal scholars contextualize analysis of Supreme Court decisions (Kurz, 2007; Wenstock, 2009), argue that lawyers have a moral obligation to advise environmental advocates like *The Lorax* (Rizzardi, 2012), and illustrate how a defense attorney's strategic *voir dire* can contribute to seating a fair jury for an unsympathetic client like the Once-ler (Mitchel, Hofstetter, & McLaughlin, 2012). Most commonly, *The Lorax* serves as a vehicle to address environmental responsibility (Rule & Atkinson, 1994; Maniates 2001; Pleasants, 2006; Lowell, 2008; Schnoor, 2008; Wolfe, 2008; Sloane, 2010; Miller and Watts 2011; Rankin-Gouthro, 2011; Kopnina, 2012; Teorey, 2014).

Despite enduring popularity, *The Lorax* is criticized on its merits and used to challenge the matured environmental movement (Hammock, Mixon, & Parono, 2000; Pleasants, 2006; Boggs, Wilson, Ackland, Danna, & Grant, 2016). On its merits, Hammock, Mixon, and Parono (2000) contends that the scenario presented in the parable is unlikely. The authors note that the premise ignores basic economic principles and that incentives present in a market-based economy would intervene to prevent the environmental destruction depicted in the text. In a market-based economy comprised of self-interested actors, the Once-ler would likely raise the price, given the demand, to maximize profit. The higher price would ration the known reserve of Truffula trees. This criticism can be challenged.<sup>3</sup> To begin, the authors ignore economic history. Whaling in the Atlantic Ocean, westward migration of cotton farmers and the Dust Bowl of the 1930s are familiar examples of human beings exhausting the environment to their economic detriment. More notably, the authors ignore the scholarship addressing the well-established idea of the

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<sup>3</sup> A related challenge centers on market failure. The concept of market failure, notably negative externalities, was well established by the 1960s. Buchanan and Tullock (1962) addressed the persistence of government failure to offer explanations for government inability to internalize (social) costs of the externality.

tragedy of the commons first identified by William Foster Lloyd (1833).<sup>4</sup> H. Scott Gordon (1954) rigorously applied the concept to fisheries prior to Garrett Hardin (1968) popularizing the concept shortly before publication of *The Lorax*.

Pleasants (2006) argues that *The Lorax* reflects a North American bias and recommends alternative texts for young readers in Australia, while Boggs, Wilson, Ackland, Danna, and Grant (2016) contends that *The Lorax* fails to present to children the complexity of environmental concerns. To address the shortcoming, these authors offer criteria including the depth of scientific thinking to evaluate children's texts. These challenges do not diminish the efficacy of the text, but rather illustrate the global reach of the text over time and its value as an educational tool to advance a message and to encourage debate.

### Competing Perspectives: Shallow vs. Deep Ecology

Scholars use *The Lorax* to frame discussions of environmental movements and environmental education (Lubduska, 1994; Marshall, 1996; Maniates, 2001; Wolfe, 2008; King, Segerson, & Shogrenm, 2010; Kopnina, 2012). Unmistakable in *The Lorax* is an irreconcilable ontological distinction between the biocentric defense of nature represented by *The Lorax* and the anthropocentric land ethic represented by the Once-ler (Lebduska, 1994; Marshall, 1996). The biocentric land ethic contends that nature has as much right to exist as humans (Leopald, 1949). In contrast, an anthropocentric land ethic elevates human beings above all other life. The distinction embodied by *The Lorax* exemplifies "deep ecology" perspective (Naess, 1973; Kopnina, 2012).

Naess (1973) disparages "shallow ecology" that lacks a systematic approach toward the environment. "Shallow ecology" advocates uncoordinated policies like pollution abatement, CAFE standards, energy efficient windows and appliance along with acknowledging natural resource depletion and promoting recycling. Naess, in contrast, favors "deep ecology" which stresses the interdependence of the environment and all aspects of human life. Thus, he laments the entrenchment of "shallow ecology" and argues that "shallow ecology" is evidence of disproportionate power ascribed to economic actors that benefit from the perspective espousing technological solutions to ecological challenges (Anker, 2008). In contrast, "deep ecology" requires evaluating a broad array of social, political and economic issues ranging from consumption behavior, tax policy, trade relations, and immigration policy to access to birth control and political influence of firms. *The Lorax* does not reference "shallow ecology" or "deep ecology" directly, but *The Lorax* visits the Once-ler repeatedly to report the inevitable departure of each species, which implies an interdependency consistent with a "deep ecology" perspective. More blatantly, the indeterminable utility of the Thneed implicates irrational consumerism as a necessary condition for excessive depletion of natural resources, the subsequent pollution, and the *enframing* of workers, even when the workers are relatives. In short, Geisel demonstrates the systematic interdependency of humanity and the environment appropriate for children's fiction.

It is not surprising, therefore, that *The Lorax* exemplifies three of the four laws of ecology introduced by Commoner (1971). First, Geisel infuses *The Lorax* with a *systemic perspective* of the environment, which explains his appearance moments after the demise of the first Truffula tree. Second, the dialogue and the illustration show the reader that *waste persists* as smog, Gluppity-Glupp and Schloppity-Schlopp, rather than disappears. Third, eventually the *exploitation of nature transforms resources from useful to useless* forms as seen when the harvesting of the tufts of the Truffula trees forces the beleaguered fauna to depart. The story omits the law contending that technology intended to improve upon nature ultimately harms nature, which implies *nature knows best*, although one may argue that *The Lorax*, in speaking for the trees, embodies the essence of the fourth law.

Geisel's theme, text and illustrations reveal preference for "deep ecology" associated with a biocentric land ethic. Yet, one-half century later, the anthropocentric land ethic dominates public policy with nature sacrificed for economic wealth (Lebduska, 1994). Modern property rights originate from the Lockean contention that ownership

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<sup>4</sup> Oxford University published the original lectures; however, *Population and Development Review* published the lectures in 1980. See: Archive (1980). W. F. Lloyd on the checks to population, *Population and Development Review*, 6(3), 473-496.

is derived from the application of human labor to natural resources (Locke, 1948[1693]). Locke's assertion underpins the Once-ler's *natural* right to appropriate the Tuffala trees and to sell Thneeds. Often omitted when revisiting Locke's basis for property rights is the rider that individuals are not to extract more than needed from nature to ensure sufficient natural resources availability for all. The intertemporal component of this rider serves to distinguish shallow and deep ecology perspectives. The concern that nature will be unable to sate human needs is not a recent development.

The Malthusian Trap asserts that "geometric" population growth would overwhelm "arithmetic" food production growth and, thus, doom humans to a subsistence existence (Malthus, 1970/1798). Malthus's analysis and proposed solutions led Thomas Carlyle to label economics the "dismal science" (Beggs, 2020). Kling, Segerson, & Shogren (2010) contrast Malthus and Seuss by contending that Malthus was concerned with how to harness nature, whereas Seuss confronted the challenges resulting from human mastery of the environment. Writing at the end of the eighteenth-century Malthus was concerned with population growth in relation to discoveries of arable land. More than a century later, Geisel was concerned with the actions of technology-empowered human beings. As science contributes to knowledge, the application of scientific knowledge (e.g. nuclear weapons and "Super-Axe-Hacker") is not necessarily progress as the innovation may impose substantial cost on the environment just as not all work, creativity, and inventiveness is necessarily beneficial.

Industrialized societies enlist science and technology to alleviate the adverse consequences of progress (Heidegger, 1977; Kelley and Knowles, 2016). Malthus could not imagine the technological innovation that would permit the planet to support a far greater population. While Malthusian concerns are often dismissed in the twenty-first century, reformulating the argument in terms of ecological sustainability transforms Malthus's jeremiad from a premature premonition to foreshadowing the boundless demands humans impose on the environment.

Malthusian concerns regained prominence in the late 1960s with the publication of *The Population Bomb* by Paul R. Ehrlich (1968). Ehrlich captured the attention of the general population and the media with predictions of massive starvation and death resulting from unabated population growth. Increasing affluence exacerbated concerns regarding exhausting the environment (Ehrlich & Holdren, 1971). Opponents argued that the prescriptions of the "deep ecology" perspective were unnecessarily disruptive because technological innovation offsets demands imposed by population growth (Boserup, 1965; Simon, 1980; Friedman, 2005). Indeed, in the past half century, the global population more than doubled without realizing the apocalyptic predictions; however, food production increased at a cost to the environment.<sup>5</sup> Fifty years later, the "deep ecology" perspective of *The Lorax* remains marginalized relative to the "shallow ecology" perspective dominating politics and perpetuated through education policy and business practice. Political power is, in part, maintained through ideology, and government perpetuates the status quo to serve those that benefit (Buchanan & Tullock, 1962; Althusser, 1971/1969). It is, therefore, instructive to consider how federal and local government normalize the "shallow ecology" perspective.

### **Institutionalized Anthropocentrism – Role of Government**

Education policy normalizes ideals and perspectives. Compliance with federal policy initiatives impacts education funding for states. To offer an example, the U.S. federal government promotes STEM education in response to global competition and environmental challenges (Kelley & Knowles, 2016). Education policy and funding priorities that emphasize science, technology, engineering, and mathematics (STEM) education reflect and reinforce the anthropocentric land ethic.

Government policy and proponents of STEM education initiatives emphasize attractive employment opportunities (McDonald, 2016), which is odd given that in a market economy, workers will pursue educational opportunities and employment in response to a combination of individual preferences, compensation, working conditions, and

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<sup>5</sup> Beginning in the 1950s and 1960s, the Green Revolution contributed to greater food production. At present, carbon dioxide emissions from tillage, fertilizer run-off and toxic algae blooms, water use for irrigation, and excessive methane emissions from feedlot cattle are recognized environmental challenges.



benefits, compared to an alternative. For government to disregard the allocative efficiency of the labor market reveals that policy makers are unaware of the efficacy of the price mechanism, which is unlikely, or that initiatives serve special interests. For example, consider how increasing the supply of STEM graduates serves the interests of producers seeking lower labor cost.<sup>6</sup> Lower production cost resulting from less expensive labor necessarily increases production intended for mass consumption, which imposes upon environmental sustainability.<sup>7</sup>

In the US, the STEM Education Strategic Plan identifies STEM literacy, diversity, and workforce development as primary goals. The initiative's vision is for the US to achieve global leadership in STEM employment (Committee on STEM Education, 2018). Remarkably, three of the 174 (1.7 percent) spending initiatives representing 0.001793 percent of the \$3.7 billion initiative relate directly to environmental sustainability (Office of Science and Technology Policy, 2020). The emphasis on employment and the minimal funding allocated toward environmental sustainability reveals the disconnection between the policy and the biocentric land ethos.

At the local level, schools reinforce the anthropocentric ethos by assiduously addressing state government standards. State-imposed learning standards emphasize use of the environment to serve the population and identification of technology and engineering solutions to address subsequent challenges (Ohio Department of Education, 2010 & 2011). Environmental education featuring "othering" of nature to accommodate market-based economic systems perpetuates the anthropocentric paradigm (Wilson, 1992; Ronda, 1992). The standards normalize the "shallow ecology" perspective.

Maniates (2001) asserts that *The Lorax* embodies the well-informed and polite proponent of environmental sustainability. The imposition on children likely resonates with readers who embrace Continental Enlightenment ideals of intergenerational improvement and human perfectibility postulated by Rousseau (2004/1754). If funding priorities and learning standards normalize a biocentric land ethic, the next generation of polite proponents of environmental sustainability may be unprepared to act individually or collectively. Transitioning to a "deep ecology" perspective faces formidable barriers, most notably the political influence of commercial enterprises that benefit from the prevailing "shallow ecology" perspective.

### **Institutionalized Anthropocentrism – Role of Commercial Enterprise**

*The Lorax* reflects the prevailing American response to environmental concerns by emphasizing individual behavior to reverse environmental degradation and to support environmental sustainability. "Individualization" describes the responsibility of environmental sustainability imposed upon individual actors, specifically, consumers, who are encouraged to make "smart" decisions in the marketplace (Maniates, 2001). Education policy and state standards require schools to present this perspective to schoolchildren. Advocates of a biocentric land ethic will argue that environmental sustainability requires a collective effort inconsistent with "smart" individual consumption decisions. Commercial interests that benefit from the anthropocentric ethos advance the perspective through marketing and advertising practices. By 1990, marketers spent \$500 million targeting children (Durning 1993). According to the American Psychological Association (2004) marketing expenditures targeting children are estimated to be \$12 billion annually. By 2019, advertising expenditures specifically targeting children reach \$4.2 billion (Marketing Charts, 2019). Children may not earn income, but children influence household consumption decisions.

The 2012 theatrical adaptation of *The Lorax* deviates from the original text and features a youthful Once-ler with guitar in hand traveling to town to promote the Thneed. The song lyrics begin, "Everybody needs a Thneed, A fine thing that all people need, the Thneed is good, the Thneed is great..." (Powell & Paul, 2012). Subsequent stanzas offer more than a dozen potential uses for an extensive, albeit vague, array of potential buyers. Inclusion of the song in the film emphasizes the role of advertising in promoting consumption of superfluous goods and further condemns

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<sup>6</sup> More insidious, government promotion of STEM education may misallocate labor, which suggests that the policy places the well-being of special interests above the well-being of the individual.

<sup>7</sup> In addition to lower labor cost, theory predicts that an increase in STEM graduates improves production efficiency further reducing production costs to increase profit.

irresponsible producers and irrational consumers.<sup>8</sup> Advertising can be informative; however, advertising is also utilized to create needs that do not otherwise exist (Galbraith, 1952).

Beginning in the 1960s, corporations embraced “green marketing” to appeal to consumer preferences for environmentally friendly practices (Meyer, 2010). Reliable aggregate marketing and advertising expenditure data specific to “green marketing” are unknown, however surveys report that approximately sixty percent of consumers are willing to buy “green” products on the condition that the goods are less expensive or offer savings for buyers (Mondalek, 2016). In contrast, a sixty-country Nielsen poll of 30,000 consumers found that seventy-three percent of millennials acknowledge a willingness to pay more for products identified as sustainable (Curtin, 2018). Despite the absence of data to provide magnitude of the phenomenon, Westerveld (1986) reports that “green marketing” inspires “green washing,” which involves fraudulent claims of sustainable practices.

The Sustainable Apparel Coalition (SAC), composed of 150 of the largest fashion brands, introduced the Higg Index (HI) in 2011 to measure the environmental impact of the participating brands and to reduce water and harmful chemical usage. The SAC does not make available the HI algorithm, but the coalition reports incorporating independent studies and consulting experts. Based on the HI algorithm, synthetic materials like “pleather” (plastic leather) are rebranded as environmentally responsible (Tabuchi, 2022). Another opportunistic practice is observed in the hospitality industry. Upon entry into a room, a placard informs customers that daily linen and towel service is no longer the norm. The notice justifies the new standard in terms of conserving water and energy. It is also the case that less frequent housekeeping eases the demand for labor and decreases related expenses for detergent and cleaning materials in addition to reducing water and energy costs. In short, the new practice contributes to profits.

More insidious to the “deep ecology” and biocentric ethos is the appropriation of environmental concerns by commercial interests to promote self-interest at the expense of the environment. Consider the small paper or plastic bag in which the dental hygienist inserts floss, toothpaste and a toothbrush. Many bags feature the logos of the products deposited in the bag along with a message linking healthier smiles with a healthier planet when we recycle the sack. The packaging of the floss, toothbrush, and toothpaste also depict the logo and brand of each product. While perhaps a convenience for a small proportion of departing customers, the sack is superfluous. Its greater purpose is to promote the brands as customers parade through the waiting room toward the exit. The importance of oral health maintenance is not in question; however, the provision of the small bag violates “deep ecology” perspective.

### **Environmental Education: Supplementing *The Lorax***

Education standards present competition between the environment and consumption (Lubduska, 1994). Environmental education featuring “othering” of nature to accommodate market-based economic systems perpetuates the anthropocentric paradigm (Wilson, 1992; Ronda, 1992). *The Lorax* illustrates the trade-off as deforestation is presented initially as the acceptable consequence of meeting the consumption demands of consumers. *The Lorax* appears to satisfy Griener’s (1983) definition of meaningful ecology-fiction because the story connects actions of people and prevailing attitudes. Criticism of *The Lorax* as an effective tool to communicate with young children hinges on both the message itself and the delivery. For many critics Seuss does not go far enough. Rule and Atkinson (1994) provide an annotated list of children’s books with an ecological theme to supplement *The Lorax*.

Environmental education does not depend solely on books. Games, table top and computer, at all levels of education, offer opportunities to engage students and to facilitate discussion that connects complex issues (McClough, 2021). Mostowi, Koleini, and Khorramar (2016) provide evidence of how role playing games improve

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<sup>8</sup> Advertising is unlikely solely responsible for consumption of superfluous products. Say’s Law (Say, 1964/1803) observed that supply creates its own demand. Veblen (1979/1899) contended that conspicuous consumption and conspicuous waste afforded status to consumers.

management of natural resources, and Rodela, Ligtenberg and Bosma (2019) argue that serious games can affect positive changes in resource management.

Feature films address environmental themes. Animated films, while targeting children, often address provocative themes. The 2008 Pixar release, *Wall-E*, portrays an uninhabitable earth. Humans evacuated the planet, leaving behind solar-powered robots to clean-up the mess and symbolically rebuild the former “great” cities using bricks of compressed garbage. Humans return to earth when a single seedling emerges as evidence that the planet can again support life. The financial success of *Wall-E* may have motivated the 2012 release by Universal Pictures of a substantially embellished version of *The Lorax*. In the animated feature, a new character, Mr. O’Hare, serves as the foil to the narrator whose interest in growing trees threatens O’Hare’s commercial interest to sell air. The onscreen competition perpetuates the belief in a trade-off between the environment and commercial interests. In addition, the inclusion of a self-interested monopolist suggests that property rights may not necessarily be the solution to avoiding environmental devastation, as critics of *The Lorax* contend (Hammock, Mixon, & Patrono; 2000). To justify a feature film, the original book required additional story lines, but Mr. O’Hare and, especially the pointless love interest add little substance to the original story. In both films, environmental devastation results from human activity and the future hinges on the survival of a single seed. This message likely resonates with young viewers.

### Conclusion

One-half century after publication of *The Lorax*, it is appropriate to assess the environmental movement. The United Nations’ Kyoto Protocol was adopted in 1997 and entered into force in 2005; and the Paris Agreement was adopted by 196 parties in 2015 and entered into force in late 2016. These international treaties contain no enforcement mechanism but rather reflect commitments to principles intended to limit greenhouse gas emissions (Maizland, 2022). The most significant contribution of the treaty may be the acknowledgement that the environment is a global public good requiring international cooperation rather than uncoordinated smart consumption decisions. Signatories accept specified emissions reduction targets. The compliance with reduction targets represents a collective action challenge as no party to the treaty has an incentive to act in the absence of action by others. The challenge remains to galvanize domestic political support for climate change initiatives.

In western democracies, domestic political support follows the preferences of the electorate. In the US, the environment is not a leading priority. Prior to the 2022 midterm elections, registered voters ranked climate change last of seven topics.<sup>9</sup> Incidentally, eighty-five percent of respondents identified the economy as extremely important or very important. In contrast, forty-five percent of registered voters identified climate change as extremely important or very important (Saad, 2022). Economic well-being is important; however, environmental sustainability is a necessary condition for economic security.

Challenging the prevailing anthropocentrism and reversing the *enframing* of resources identified by Heidegger involves establishing the dependency of the economy on the environment. Challenging convention that subordinates natural resources to humans can take place outside the classroom, but learning in the classroom is communal and reaches more children, who may adopt a biocentric land ethic with an appreciation that the economy is not separate from the environment.

For decades, the spirit of the environmental movement emphasized messages appealing to individual behavior. Individuals are encouraged to curb certain behaviors and to conserve resources. Commercial interests advertise consumption of particular products to meet these objectives. In addition, staging events raises awareness of environmental challenges and raises money to fund environmental initiatives, but the message of Maniates (2001) resonates: uncoordinated individual effort cannot aspire to achieve the level of collective action needed to alter the prevailing environmental ethos. Not until an ethos that accounts for the environment is embraced can meaningful change occur.

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<sup>9</sup> The environmental movement and climate change are not identical. Climate change is frequently the term used in polls to refer to the trace remnants of the environmental movement.

Advocating isolated individual acts portends nefarious unintended consequences, as individuals believe themselves to be making a difference when they are not. Duped by this misperception, individuals will be less inclined to support large-scale initiatives needed to curtail environmental decline. Emphasis on individual actions appeals to a sense of duty indicative of a deontological ethic; however, progress requires an alternative paradigm that replaces the prevailing utilitarian ethic that justifies market-based economics with a fuller understanding of the costs associated with mass production and consumption. Had the Once-ler included the full cost associated with sustaining the ecosystem, the Thneed would have been more expensive. At a higher price, faceless consumers would buy fewer Thneeds and the impact on the environment would be reduced. Internalizing external costs requires government involvement, which requires broad political support.

Geisel wanted to promote the environmental movement, and he has. *The Lorax* remains a powerful story that influences readers with a message that resonates five decades later. The proliferation of children's books and the emergence of new communication technology extends the possibility to inform and inspire. In 1972, the television adaptation required substantial modification to avoid angering the sponsors. In contrast, explicit dialog and catchy songs pervade the 2012 film. Communication technology now exists to institutionalize an environmental ethos to affect meaningful change. It may be that there is a place for *biggering* and more *biggering* after all.

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## CHILDREN'S BOOKS AND RESOURCES REVIEW

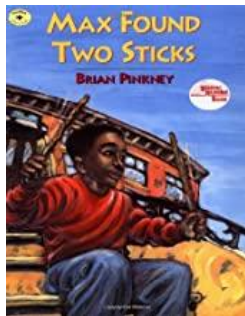
Carla Gull  
*University of Phoenix, USA*  
Book and Resource Review Editor

### Sticks, Lots of Sticks!

When my youngest was 2 and 3, he wanted “sticks, lots of sticks” for all of his presents! Sticks are still one of our favorite playthings in an outdoor context—there are so many opportunities! Find a variety of children’s read aloud books related to sticks, stick art inspiration, and stick support for educators below. How are sticks used in your setting?



***A Stick Until . . .*** by Constance Anderson explores how various animals use sticks as a tool—a flyswatter for an elephant, a lure for an alligator, a spoon for a chimpanzee, and even a game of fetch for a dog and boy. There are two lines of text, one simpler and another with more details about how the many animals use sticks in their daily lives.

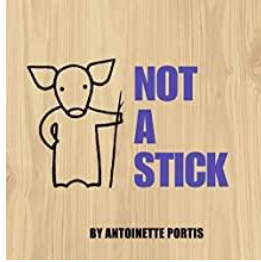


***Max Found Two Sticks*** by Brian Pinkney is set in a more urban area as Max sits on his porch finding two twigs fall down from a nearby tree. He picks them up and starts exploring sound all around his neighborhood, tapping the sounds of pigeons flying, subways passing by, rain on the windows, and the church bells. A marching band passes by, sharing special sticks with Max. Nice rhythmic text!

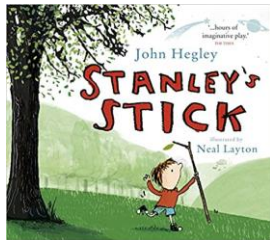


***Sticks*** by Diane Alber follows a popsicle that melted on a hot summer day, leaving behind just the stick. A twig in a nearby tree reaches out. They find Pencil and Brush and see the many things they can do. The stained popsicle stick feels like he doesn’t belong, until Twig shows Stick a popsicle stick bird feeder. Stick creates art in a bird feeder in the tree and feels that sense of belonging.





**Not a Stick** by Antoinette Portis cleverly illustrates the many ways a stick can be a part of child's play. From slaying a dragon to conducting music, sticks have unlimited potential. Simple line drawings allow the imagination to soar.



**Stanley's Stick** by John Hegley follows Stanley as his imagination uses a stick for sticky games, visiting the moon and stars, creating dinosaur skeletons, writing in the sand, stirring, and fishing. He releases his stick for others to play and finds a new, curvy stick the next day, which becomes a horn, mast, and telescope. It is "fantastick"!



**Stick Man** by Julia Donaldson showcases Stick Man with a stick family. Stick Man is chased by a dog, used in a nest, raced for a pooh stick, and becomes close to being part of a fire! He only wants to go home to his family tree for the holidays, not becoming a pen, flag mast, snowman arm, or bat. Santa helps him reunite with his family for Christmas.



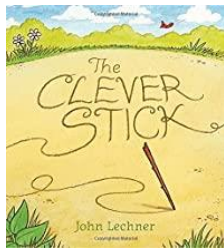
**The Stick** by Clay Rice is a great alternative to Not a Stick or The Giving Tree. A boy with no toys finds a stick in the park, which transforms him into a pirate, baseball player, or fisherman. Words inscribed on the stick promise that imagination lives in him and he can be anything he wants to be. Growing up, the stick is a constant companion until he shares it with a young girl with no toys near where he found it in the beginning. The silhouette illustrations are stunning.



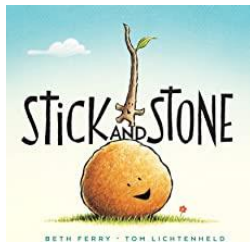
**Stick** by Irene Dickson follows a boy and a dog with a stick. In this simple book, the boy uses the stick for walking, throwing, tapping, balancing, swishing, drawing, stirring, waving a flag, dropping, floating, and building!



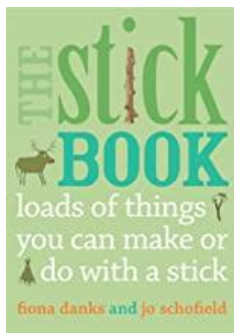
**6 Sticks** by Molly Coxé shows how two mice use six craft sticks to make flags, whiskers, swings, letters, snowflakes, skis, tents, and other imaginative creations! The book includes many math connections in the simple wording and illustrations.



**The Clever Stick** by John Lechner finds his “voice” as he realizes he can make marks in the ground. Previously only able to appreciate the beauty in nature around and unable to communicate, the Clever Stick is able to make a masterpiece on the ground that attracts all the nearby animals. Even when the rain comes and washes away his art, he knows he is a very clever stick. Lots of social/emotional connections!

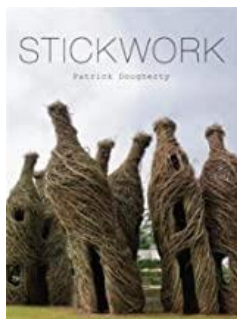


**Stick and Stone** by Beth Ferry explores friendship as Stick and Stone unite, go on adventures, get lost in a storm, and reunite as the number 10. While each are different, both contribute to the friendship. The book contains many social/emotional applications.



**The Stick Book: Loads of Things You Can Make or Do with a Stick** by Fiona Danks and Jo Schofield contains 70 projects or ideas focused on sticks! This is for ages 8-11 or as inspiration for projects that might be done in class, such as musical instruments, den making, stick weaving, bird feeder, and wild weaving!

### Additional Resources



**Stickwork** by Patrick Dougherty highlights stick sculptures throughout the world. These whimsical ephemeral works of art typically last around 2 years, made with locally grown materials, volunteers, and his stick expertise. I’ve been able to work on one of his projects—so fun and delightful to see community come together to make and play with the sculptures!



The Toy Hall of Fame inducted the stick into the museum in 2008, claiming it may well be the world's oldest toy. It helps children get outside and provides opportunities for creative play! <https://www.museumofplay.org/toys/stick/>



**Stick Play** Podcast Episode by Loose Parts Nature Play explores stick safety, procuring sticks, storing sticks, and playing with sticks in the outdoor classroom. <https://loosepartsnatureplay.libsyn.com/stick-play>



**Chelsea Forest School Risk Assessment** shows how one school looks at benefits, risk, and safety with stick play.

<http://www.chelseaforestschool.ca/index.php/en/risk-assessments/>



#### Tinkergarten Stick Activities:

- Follow the Arrows: <https://tinkergarten.com/activities/follow-arrows>
- Bundle of Sticks: <https://tinkergarten.com/activities/pick-up-sticks>
- Pickup Sticks: <https://tinkergarten.com/activities/pick-up-sticks>
- Build a Dam: <https://tinkergarten.com/activities/build-a-dam>
- Build a Wall: <https://tinkergarten.com/activities/great-wall>
- Go Fish: <https://tinkergarten.com/activities/go-fish>

If you have ideas or would like to contribute book or resource reviews, please contact Dr. Gull at [Carla.Gull@phoenix.edu](mailto:Carla.Gull@phoenix.edu).

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Thoughtful information may manifest through book reviews, description of educational approaches and programs, research investigations, and development or interpretation of theoretical perspectives. Associations among and between the following will be emphasized:

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- Environmental activities, education, or experiences
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