

The effects of educators' level of environmental literacy on their view of student environmental literacy and perceived barriers.

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Abstract: Formal and nonformal educators help develop the environmental literacy (EL) of K-12 students, but do so in very different contexts. This paper describes educators' views of their roles in developing student environmental literacy and barriers to that work. Educators with more advanced EL mentioned practices such as perspective taking and information evaluation. Many educators highlighted developing a connection – between students and the environment or between curriculum and students' lives – as key to their work. The barriers identified reflect previous research, with nonformal educators also identifying access to student and peoples' access to their sites as a major barrier.

Keywords: Sustainability education, environmental education, environmental literacy, educators, teachers, barriers

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Introduction

For many years, environmental literacy (EL) has been considered to be synonymous with the objectives of environmental education (EE) (e.g., Carter & Simmons, 2010; National Science Teachers Association, 2020; UNESCO, 1978). In short, EE should create citizens who are knowledgeable about the environment, care about it, and have the skills and motivation to address current issues and prevent new ones. Yet 45 years after the Tbilisi Declaration (UNESCO, 1978) we still face significant environmental issues, many of which are worsening (Saylan and Blumstein, 2011). Clearly EL is more than an accumulation of knowledge that leads to pro-environmental behavior. It involves dispositions such as valuing the environment (e.g. Tamar, et al., 2021), feeling connected to it (Schultz, 2002), and having self-efficacy towards environmental action (e.g. Huang, 2016). Identity appears to be key, especially in regards to systemic-level significant environmental behaviors such as voting and advocacy (Hunter & Jordan, 2020). So quality EE must attend to more than cognitive instruction and move to develop the whole person in order to move toward actions that sustain healthy environments and people.

To accomplish this, EE is a lifelong, lifewide, and lifedep endeavour (Banks, et al., 2007; Bell, et al., 2009), with people learning from educators and by themselves in a variety of settings that extend far beyond school walls. Though it often finds a home in schooling in science class, EE is both interdisciplinary and cross-disciplinary, found in multiple content areas and requiring collaboration across content areas (Gough, 2011; Tal, 2007; Vincent & Foch, 2011). Given the current intersecting crises of climate change, emerging pandemics, and social inequities, EE is needed more than ever. Yet how educators view EE varies (Ballantyne, 1999; Dobrinski, et al., 2008; Torquati, et al., 2013). The research here examines formal and informal educators' views of their role in student EL, how those relate to the educators' own EL, and perceived barriers to that work before making recommendations for teacher education help educators progress to higher levels of EL.

A Contextual Perspective of EL

This article is part of a larger study on the EL of educators who work with K-12 students (Hunter & Jordan, 2019, 2020). It uses a contextual perspective on EL that recognizes EL as composed of four components (dispositions, knowledge, behavior, and practices) situated in social-ecological systems (Figure 1). This situated nature suggests that one's EL is not portable, but rather describes how one engages with environmental issues in a given social-ecological system. However, the practices included in the framework (identifying what is an environmental issue, generating possible strategies to address it, and choosing the best possible option for that scenario) can help individuals to boundary-cross (Ackkerman & Bakker, 2011) between social-ecological systems by building capacity for knowledge building and investigation.

These practices also facilitate an individual's movement along a continuum of EL. This continuum of environmental literacy (Figure 2) expands on Stables' (1998) continuum, bringing in behavior that reflects knowledge construction at each point on the continuum and multiple types of knowledge (Table 1). It begins with a functional literacy that is primarily ecological knowledge based and progresses to a critical level that recognizes the entanglement of social and ecological components of environmental issues. This critical level

also interrogates current interactions and proposes action that will change those relationship and remedy or prevent issues.

Student and Educator Environmental Literacy

If the goal of EE is “ultimately... a democratic society in which environmentally literate citizens participate actively” (Carter & Simmons, 2010; p. 13), then students should learn about and develop the values, knowledge, behavior and practices in multiple settings. These settings include formal schooling, field trips, museums, parks, and EE centers, as well as in the community.

Figure 1. A snapshot of an individual’s EL in two different social-ecological systems according to the contextual perspective. EL here is dynamic with multiple interactions within the individual and between the individual and the system they are in. In the new system (right) they have less knowledge, which may change how they engage with the system, and lead to lower levels of behavior or dispositions such as self-efficacy. In time practices have the potential to develop other parts of EL and lead to greater levels of engagement and behavior.

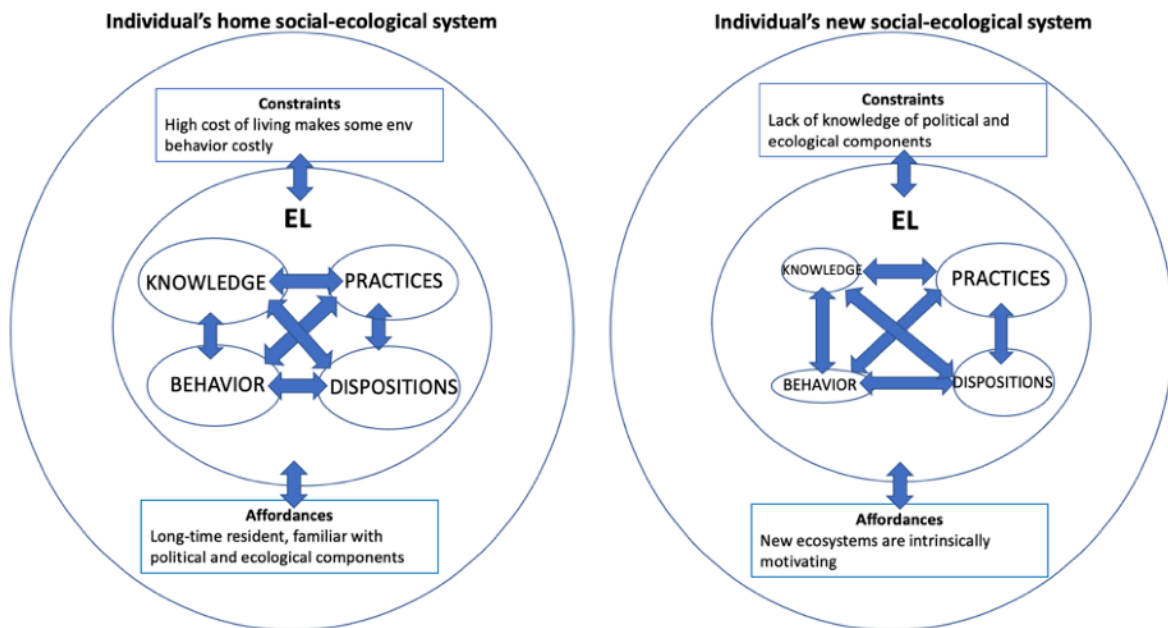


Figure 2. The levels of Stables' environmental literacy continuum (from Hunter and Jordan, 2020).

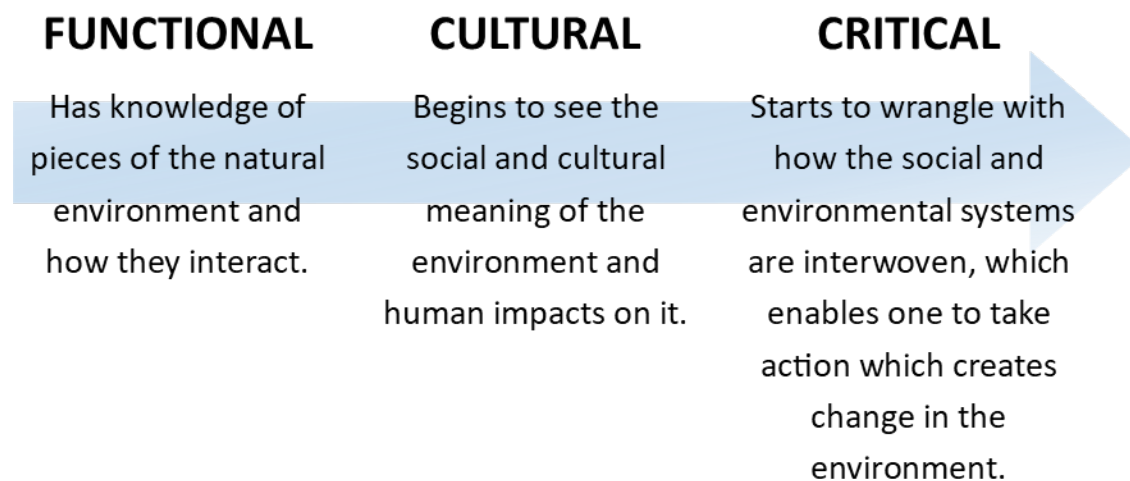


Table 1. A continuum of environmental literacy and the levels of knowledge found at different points of the continuum.

	Functional	Cultural	Critical
Conceptual Knowledge	Low to moderate	Low to high	Moderate to high
Issue Knowledge	Low to moderate	Moderate to high	High
Socio-political Knowledge	Low	Low	Moderate to high
Behavior	Low to moderate (personal level behaviors)	Moderate (includes some consumer and persuasion)	High (includes system-level behaviors)
Environmental Justice	Low	Low to moderate	Moderate to high
Systems Thinking	Low	Moderate to high	Moderate to high
INS	Low	Moderate	High

While there has been research on middle and high school students' EL (for example, McBeth, Hungerford, Marcinkowski, Volk, & Meyers, 2011; Negev et al., 2008; Stevenson et al., 2013), teacher EL has not been as well studied. Stevenson and colleagues (2013) found that teacher experience has a complicated relationship to student EL. Students with a teacher holding a Masters or in the field for 3-5 years scored higher on cognitive measures, but the effect disappears for teachers in the field longer than five. The mechanism for this is not clear and little research has been done with educators, and chiefly with formal educators directly (e.g. Amirshokohi, 2010; Cheng & So, 2015; Cutter-Mackenzie & Smith, 2001; Dada, Eames, & Calder, 2017; Ernst, 2007; S.-J. Hsu & Roth, 1998; Liu et al., 2015; Swanepoel et al., 2002). In recent research with informal and formal educators, Hunter & Jordan (2019) found that informal educators had relatively higher levels of knowledge, behavior, environmental identity and issue identification than formal educators, but neither group engaged in high levels of system-level behavior (Hunter & Jordan, 2020).

Barriers to Environmental Education

Regardless of their level of engagement, knowledge, values and participation, educators can encounter barriers within the contexts that they teach. These barriers can be within the school system, the classroom, or themselves as educators. Borg, Gericke, Höglund, & Bergman (2012) examined barriers reported by teachers in Sweden, where sustainable development is a required topic. They found that teachers lacked inspiring examples, expertise on sustainable development, time to implement changes, and administrative support. They also felt sustainable development was not relevant to their subject. Teachers' educational practices, including pedagogy, were often discipline-based, and inclusion of environmental topics was greater when their disciplinary practices overlapped with the tenets of sustainable development, such as including multiple perspectives and avenues. Other researchers (Corney, 2006; Cutter-Mackenzie & Smith, 2001; Hanna, 1992; Summers, Corney, & Childs, 2003) identified similar themes of lack of knowledge, administrative support, and time. Ernst (2007), studying teachers in the U.S., also reported the emphasis on state standards and testing as a barrier to use environment-based education in their classrooms. With this study, we seek to understand how educators in and out of classrooms view their role in student EL in terms of not just barriers, but also opportunities.

Methods

Participants

As part of a larger study on educator EL, interviews were conducted with 46 educators in the U.S. who worked with K-12 students in formal (n=27) and informal (n=19) contexts. Forty educators were from the state of New Jersey, the remaining were from New York, Pennsylvania, Maine, and Arizona. The focus on New Jersey, New York City, and southeastern Pennsylvania educators was consistent with the contextual view of EL – they were situated in the same or similar social-ecological systems to where the study was conducted in New Jersey. The additional participants were part of an effort to increase the response numbers for the survey. Participants were recruited using a combination of convenience and snowball sampling – we reached out to education colleagues and educator groups such as the New Jersey EE affiliate (ANJEE) and science teachers association personally and through social media, and they referred others they knew. The semi-structured interviews were 45 – 60 minutes long, and chiefly related to responses to an online EL

assessment participants had completed, the Teacher Environmental Literacy Assessment (TELA; Hunter & Jordan, 2019). EL level was determined using participant scores on the TELA to assign them to functional, cultural, or critical levels of EL, based on the criteria in Table 1. Educators' instructional context and level of EL are noted in interview excerpts below.

Analysis

The interview question we focus on in this paper is "How do you see your role in developing student EL?" Interview transcripts were initially coded using four facets of EL – knowledge, dispositions, practices, and behavior. A second round of analysis yielded a fifth theme – connection. This included connection to nature and connecting their lives to the environment. Barriers were open coded, and then grouped into parent codes.

Results

Few educators saw developing student environmental behavior as part of their role, and many said it was not their role to preach or tell them what to do. Dispositions (primarily awareness, but also empathy, love, and identity) were the most frequently described roles, followed by knowledge, practices, and connection.

Dispositions

There were some noticeable differences between educators at different levels of EL. In general, those at a functional level gave answers with much less elaboration, and were focused more on awareness and knowledge. Ethan (functional EL), a public high school educator:

Just making them aware. I mean, I'm not ... I guess, I don't have to be an environmental class to kind of just point out ... point out things like the recycling and the ... if they're at a lab station, make sure the water's off if they're not using it, just things that, like, everything's ... everyday things that they actually could do in their daily lives, or their daily routines.

Caleb (cultural EL), a private high school educator, talked about awareness of issues:

Well, I try to tie it into the French curriculum, which isn't always easy. But when we have these decisions coming from France, the French speaking about what they're doing to protect the environment. And then I'll usually bring in an article in French, for them to translate, and we'll talk about it. Just to make them aware of what's going on, not to try and change their opinion.

While Sophia (critical EL), a public middle school educator, framed awareness of the environment like this:

So just to raise awareness through everyday practices is so easy to do. And it could be the weather, or it could be here in the park, like I started the year with a jar of ticks, and just asking them, how many of you got bit by a tick this year? How many of you noticed there's more ticks? You know, that kind of thing. When do you notice, like we planted bulbs. We did a bulb project, and like when do they come up, and do you see that there's a difference of when plants are budding? There's just so many things that they just pay attention, are right there, and then they just all have different interests. Some are more interested in

animals, or their travel, or just like the weather because they're outside exercising.

Educators identified dispositions beyond awareness, but the distinction between EL levels can still be seen. Contrast how Elizabeth (functional EL), an elementary educator, describes love of nature:

Since I work with children that are so young, I feel like my role is just to teach them to love the environment, to love the earth, to love the animals, to love plants, to learn about these things and to know that they're all essential and necessary for the survival of people for our planet to continue to thrive... If kids find the value in our planet and find the value in our environment, then hopefully they can make a difference and they can continue to move us, push us in the direction that matters.

With how Nisha (cultural EL), a nonformal educator that works with elementary students, frames empathy:

And I think for environmental ed, empathy is really important because what I think humans [do] is saying, "That's an animal, I'm a person." But when you start to see, "I am a being and that is a being" you can start to empathize. I think my role is developing those character traits that make them feel more of a community. I mean community with salamanders, community with spiders, community with trees. Not necessarily community with humans, because I think that's easy.

Nisha expresses more of a sense of interconnectedness that characterizes later levels of EL – rather than emphasizing loving something because it is important for human survival, instead she frames the human and the ecological as equals, and part of the same system.

Connection

The threads of connection that are woven into the disposition responses above extended through the responses of many cultural and critical level educators, but was limited in functional level educators. Connection for these educators is multifaceted, from the other community members Nisha talks about, and the love and care for nature and animals Elizabeth seeks, to connecting the environmental science topics to students' lives as Sophia does. Bella (cultural EL), a nonformal educator working with elementary students in a major urban center, works to bridge the two:

... You can't remove yourself from nature. It is everywhere, even in the biggest, busiest, bustling city where all you see is pavement. It's still there. So I try really hard to have them see that, and that they are connected to nature. Because I think before you have that ... how can they care? How could they ever take any other steps? How could they ever care about any environmental issues, vote the way that I would hope they would vote, anything. Participate in a cleanup, get a job in a field that helps the environment. Like none of that happens if they feel like nature's over there for other people and not something that's for them. ... And also realizing that there are problems and kind of connecting those actual problems that are in their community that they can see and want to do something about. I think yeah, you can't really do anything. You can't just be like, you know what's really a problem? Plastics in the ocean. And they're like, okay, but I didn't have dinner last night, and I haven't had new shoes in four years. Like that's not a

relevant issue. Connecting to relevant local issues, and before that, really just noticing, realizing that nature is in their community.

Henry (critical EL), a public high school educator, goes further to connect environmental issues with students' current and future lives:

Well, I think my main role is in getting them to care and to see why environmental issues are important to their lives. We'll talk about energy and I'll say, "Well, you're all going to own a home someday. Are you going to want to spend \$200 a month on electricity or \$8 a month? You could do that if you switched out from incandescents to LEDs." That gets into the discussion of short-term and long-term costs and benefits. How much does this LED cost versus this?

These both demonstrate an understanding of the social aspect of environmental issues beyond the ecological knowledge aspect of the functional level. The critical level goes further by connecting social and economic impacts, at multiple time scales.

Practices

The last theme for educators' view of their role in student EL is that of developing practices. Practices here are the socially constructed ways of participating that develop knowledge and are mutually influenced by knowledge (Lave & Wenger, 1998; Wenger 1999). Practices are key to the contextual perspective, as they help one progress across levels in the continuum. Educators with a functional level of EL did not mention practices in their responses. Audrey (cultural EL), a public elementary teacher, talks about the importance of perspective taking:

So I feel like it's really important to show the kids both sides of an environmental issue and let them kind of come to their own conclusions about. And really think about things from multiple different perspectives. Which is like the whole Flint, Michigan issue. I had the kids, okay if you were a doctor, what's the problem here? How are you gonna solve that problem? All right, what if you're a teacher? What's the problem? If you're a nurse, if you're a soccer player, if you're ... you know, so like I feel like it's really important to make sure that you give the kids the tools to be able to critically think rather than just tell them what to think.

While Rose (cultural EL), a nonformal educator who works with students K-12, emphasizes the intersection of knowledge, investigative practices, and communication practices:

Whether it's why does this work? How does this work? What happens when X and Y meet? So that they learn how to think critically on their own and how to formulate questions that, in such a way that they're going to be respectful and they're going to be able to ask them of anyone... So basically, we want to create kids that have a sound understanding of basic scientific concepts and have an understanding of how to go online and find good answers to environmental questions they have. Because nobody can know everything about all the environmental topics there are.

Ruby (critical EL), a nonformal educator who works with elementary students in a major urban center sees the importance of systems, a marker of critical EL, and the goal of using these practices in multiple settings:

Also then to hopefully build some of the skills to think, if we can think critically about systems and about food webs, and things that we observe in this part of our ecosystem when hopefully then when they're considering the impacts of other

contemporary issues they're able to translate some of that analysis, some of that ability to critically think about these things to bigger issues, to different issues.

Multiple educators referred to critical thinking, such as Lilly (critical EL), a nonformal educator working with grades K-12. She sees this as a trait everyone should have and be able to use when they are presented with new issues.

I think my role is to help them to become critical thinkers. To help them to be consumers of information that they don't believe everything they read, that they could go back and look where it came from and is this real or not. I think teaching them to look at things critically and to evaluate where it comes from and is it real or not and to have at least, I mean not everyone is going to become a scientist and that's okay because we need artists and everyone else in the world too. They need to have at least a basic understanding so they can critically read it or something like that and say, "Well, okay at least I trust Pinelands Preservation, that these people are going to do the right thing."

In the contextual perspective (and most views of EL), knowledge and dispositions are necessary, but not sufficient to foster necessary behavior. Practices, and participation with more expert individuals, is what supports students engaging in those practice and behaviors themselves. This means that those educators at the functional level are not fully supporting their students' EL.

Barriers to EL

Educators identified seven types of barriers to developing student EL – structural/societal, schooling, instructional, attitudes, access, students, and parents (Table 2). These reflect findings from previous research (Borg, et al., 2012; Corney, 2006; Hanna, 1992). There were no differences in barriers identified by educators of different levels of EL, however nonformal educators identified access to program sites and students (poor transportation option, middle and high school students with other commitments) as a barrier which formal educators did not. For example, Bella (critical EL) a nonformal educator who works with elementary students, recognized how access is tied to socioeconomic factors:

And a lot of the kids aren't ... they don't have the right clothing, the right shoes, if they want to explore an area besides their direct community, there's no transportation. How are you gonna get to a cool larger park where you can take a real hike? How are you gonna get there? You can't. There's no bus there. There's no train there. The parents don't necessarily have a car. So I think there's that kind of socioeconomic and structural kind of stuff that are barriers.

Katie (critical EL) who works in a more affluent area, described losing access to middle and high schoolers:

But then we lose that middle age range. We really don't get very many high schoolers either, for whatever reason... So that would probably be a societal thing because they're so involved with school and sports and academic things after school and extracurricular things that they just don't come to the nature center when they're not little anymore.

Table 2. Types of Barriers to Student Environmental Literacy Identified by Educators.

Type of barrier	Examples
Structural Societal level factors	<ul style="list-style-type: none"> ● Poverty ● Children's overscheduled lives ● Social tendencies to live in bubbles, be technology dependent, or lack system thinking.
Schooling Structural factors specifically related to the educational system	<ul style="list-style-type: none"> ● Lack of administrative support ● Curriculum that doesn't focus on the environment ● Focus on high-stakes testing
Instructional Factors related to individual teachers and instruction	<ul style="list-style-type: none"> ● Time they have with students ● Lack of access to high quality data and information ● They don't teach science ● Teachers have to really want to do it
Attitudes Prevalent attitudes	<ul style="list-style-type: none"> ● Biophobia ● Apathy towards the environment
Access * Lack of access to students or lack of student access to nature	<ul style="list-style-type: none"> ● Loss of middle school and high school students for both field trips and out of school programming ● Transportation
Student Factors related to students	<ul style="list-style-type: none"> ● Student developmental level ● Generational differences ● Students can't think quantitatively
Parents Factors related to parents	<ul style="list-style-type: none"> ● Parent attitudes or behavior are not supportive ● Lack of parental supervision/guidance ● Too many parent restrictions

* This type of barrier was found only in nonformal educators.

Discussion

When asked about their role in student EL, it became clear that critical and cultural educators had thought about their role more than functional level educators – their responses were longer and more nuanced. In addition, they included practices such as perspective taking, issue investigation, information evaluation, and critical thinking that they hoped their students would be able to use in multiple contexts – boundary crossing in a situated view (Lave & Wenger, 1998). Critical educators included dispositions like functional educators, but also included other facets of student EL, such as knowledge and practices. While some educators are reluctant to promote particular behaviors because they feel it crosses the line between education and advocacy (Hunter & Jordan, 2020), critical educators saw practices as a way to build student agency and equip them for life outside the classroom. Educators at the cultural and critical levels, with greater incidence of system level behaviors themselves, perhaps see the efficacy of these practices from their own experiences and want to nurture that in their own students. Further, it aligns with the “teach children how to think, not what to think” mantra of many environmental educators. In addition there was an emergent theme of connection – connection to nature and connection of content to student lives, including issues in their own communities. This represents the growing understanding of the integration of social and ecological components of social ecological systems that comes with advancing EL.

The only difference in the view of barriers was between nonformal and formal educators. Perhaps this is because schooling and nonformal settings each has their own set of constraints and affordances. Nonformal educators work in a non-compulsory setting and rely on people prioritizing their sites, so they worry more about access, both people’s access to nature, especially those educators in urban settings, and their own access to students. In our experience with nonformal EE providers, supported by this study, school bookings drop precipitously at the middle school transition because of more complex schedules, transportation woes, and curriculum alignment issues. At the same time, tweens and teens move away from out-of-school programming at these sites because of increasing demands on their own schedule as well as developmental and social changes (Olsson & Gericke, 2016). This issue of access has been exacerbated by the global coronavirus pandemic, with many sites facing a tenuous existence with sharp decreases in both school and public programming (Collins, et al., 2020).

What does this mean for practice?

This research demonstrates that an educator’s own EL influences their beliefs about working with students, which could in turn influence students’ EL. This suggests that more attention should be paid to professional development for educators that focuses on moving educators to cultural and critical levels of EL. To do that, professional development opportunities must move beyond content, and include the socio-political aspects of environmental issues and opportunities for meaningful system-level behavior. Some educators are not comfortable with such actions (Hunter & Jordan, 2020), with some seeing that type of practice as in opposition to their identities, so careful attention must be made to how this is framed. Recent public discussion of racial bias in society broadly, and education and nature more specifically, provides a foundation upon which to build such work. This research will help inform further study on what educators in all settings see as their role in student EL. A study with a broader reach and in a greater geographic range is needed.

While this work has been done with formal educators (e.g. Borg, Gericke, Höglund, & Bergman, 2012; Ernst, 2007), the inclusion of nonformal educators can help identify commonalities and opportunities for collaboration, to more effectively deliver high quality EE programming.

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Author thumbnails

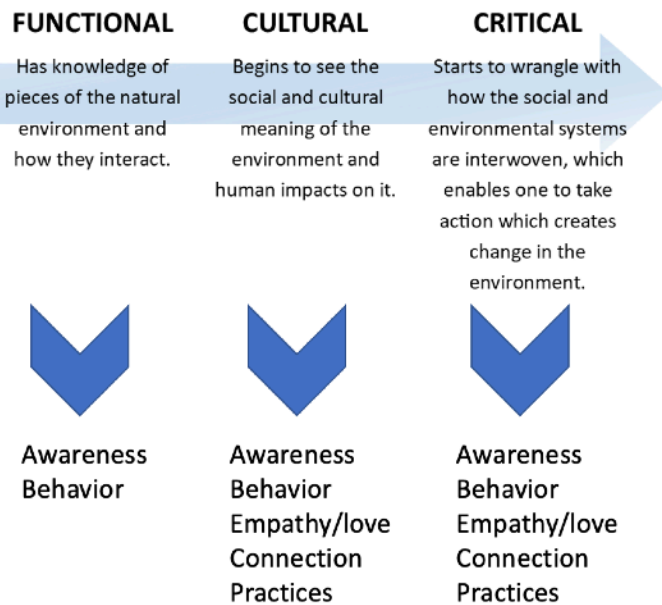
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Paper thumbnail

Educator Environmental Literacy



Role in Student Environmental Literacy