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Challenges in measuring 'connectedness to nature' among indigenous children: Lessons from the Negev Bedouin

Introduction

Today, connectedness to nature is being increasingly emphasized by environmental researchers and educators, who believe that it plays an important role in fostering environmental concern and environmentally responsible behavior (Mayer and Frantz 2004). This emphasis is further supported by studies showing that connectedness to nature has a beneficial effect on human wellbeing, and that it plays a crucial role in the intellectual, emotional, social, spiritual and physiological development of children (Kahn and Kellert 2002). Most studies of nature connectedness, however, have been developed and conducted in 'Western', industrialized nations, based on the assumption that children in these countries are being isolated from their natural environment (Bruni et al. 2017). In this paper, we present a model for developing culturally adapted questionnaires with which to more accurately characterize the nature connectedness of children from indigenous communities, based on our own experience of creating such a questionnaire while working with children from the Bedouin community of the Negev desert in Israel.

Our questionnaire was developed in the context of a larger, long-term research project, which focused on a group of young Bedouin students (5^{th}-6^{th} grade) who live and study in highly rural, unrecognized villages near the contaminated Hebron Stream in the Negev. It sought, among other things, to examine these students' connectedness to nature, and how this was influenced by various factors, including their socio-cultural environment, relationship with nature, and political-economic conditions. In this paper, we highlight our experience of the challenges of designing a culturally adapted research tool for this purpose, but also the extensive rewards – and even the necessity – of doing so.

The Bedouin community in Israel's Negev Desert shares many similarities with other indigenous communities around the world that are currently undergoing a process of post-colonial modernization (Abu-Saad 2008). Like other such communities, it is a society in 'transition,' which retains many traditional elements from its own history, but draws heavily upon elements from the highly Westernized lifestyle of its neighbors, with whom it is in continual close contact (Authors 2014). Our approach acknowledges this duality by combining categories from Western tools for measuring nature connectedness, on the one hand, with elements that reflect the local culture of the indigenous population, on the other. To do this, we engaged members of the questionnaire's target population as active participants in its development, using multiple cycles of personal and group interviews with Bedouin students as a means of assessing and improving the questionnaire's relevance and effectiveness. Thus, drawing upon Homi Bhabha's theory (1994), we used the questionnaire development process itself as a 'Third Space' in which to engage in a 'negotiation' between the concepts and categories employed by Western tools for measuring nature connectedness and the experiences and worldview of *this* particular group of Bedouin students. The model presented here is based on the assumption that questionnaires used to determine nature connectedness in one population *cannot* necessarily be used effectively to do so in another. What this paper offers is therefore not an alternate questionnaire, but a description of a cultural adaptation *process* through which suitable questionnaires for learning about a specific population's relationship with its environment can be created.

Placing the study in context – the Negev Bedouin and the life of a Bedouin child

The indigenous desert-dwelling Bedouin are an integral – though culturally distinct – component of Arab society throughout the Middle East. The Bedouins' traditional lifestyle was semi-nomadic: structured around seasonal migration with herds, with women, children and elders left behind to tend a specific familial territory, and men returning to their designated homes periodically in accordance with the seasons (Al-Krenawi 2004). The Bedouins of the Negev Desert are indigenous Palestinian Arabs who remained on their lands after the 1948 conflict. They have inhabited the Negev desert for many generations, and have been subject, at various times, to Ottoman rule, the British Mandate government and, after 1948, the State of Israel (Amara, Abu-Saad and Yiftachel 2012). Today, the Bedouins of the Negev are one of several prominent ethnic minorities within the State of Israel, geographically and culturally distinct from other Israeli Arabs and Jews (Levinson and Abu-Saad 2004).

According to Abu-Saad (2008), for many indigenous peoples the connection to the land is suffused with social, economic and spiritual meaning, and is therefore central to their culture and their day-to-day lives. For much of their history, the Bedouins, like other indigenous communities around the world (Holt 2006), lived at low population densities with limited technology, relying directly on local natural resources for survival and using these resources in a sustainable manner. In addition to herding sheep and camels, the Negev Bedouins also relied on traditional seasonal agriculture (Abu-Rabia 1994). Their agricultural activities and lifestyle were adapted to the natural cycles and seasons of the desert, overcoming the limitations of scarce water by capturing and storing water flows in seasonal creeks and streams during winter through a system of stow dams and terraces of various sizes (Abu Rabia, Solowey and Leu 2008). They also developed a method of preserving grazing grounds, in which areas were grazed only at specific times to allow the plants to grow and spread their seeds (Abu-Rabia 2002). Even the spatial organization of Bedouin settlements is based in ancient traditions, many of which reflect a use and awareness of the settlement's natural environment (Manor-Rosner, Rofè and Abu-Rabia-Queder 2013).

Like other indigenous populations, however, Bedouin society has, over the past several decades, been undergoing a relatively rapid process of modernization. In the Negev Bedouins' case, this was brought about by their close proximity to other, sedentary populations with vastly different lifestyles, and further expedited by the sharp decrease in land left available for the Bedouins' use, as areas on which they had been accustomed to live were reallocated by the state for other uses. As a result of this decline in available land, an increasing proportion (approximately 50%) of the formerly migratory Negev Bedouins now live in state recognized townships, while the other half live in unrecognized villages or 'shantytowns' popularly known as 'the Bedouin Diaspora' (Rudnitzky and Ras 2012). Since the unrecognized villages lack official government recognition, they have no formal system of local government and pay no taxes. They also do not receive municipal funds, and lack basic municipal infrastructure like water, sewer access and organized waste disposal (Meallem, Garb and Cwikel 2010). Moreover, any domestic structures that are formally classified as illegal are under on-going risk of being torn down, so they tend to be temporary, composed of light substances such as fabric, tin or wood.

Whatever their legal status, Bedouin localities tend to be ranked lowest in socio-economic indices in Israel at large, while their unemployment rates and social welfare support are, correspondingly, among the highest (Rudnitzky and Ras 2012). One major source of the perpetuation of these difficulties is lack of infrastructure, and comparatively low levels of government investment and development in areas such as educational frameworks, infrastructure, local industry and commerce. The educational gap, for instance, which begins at elementary school, reaches its peak at the university level. This makes it extremely difficult for the Bedouin to break through the circles of higher education and employment, and their

absorption into Israeli society consequently remains marginal (Abu-Saad 2016; Knesset, Research and Information Center 2017).

Despite the recent fundamental shift away from the traditional Bedouin lifestyle, various elements of that lifestyle still remain. For example, raising sheep, though it is often no longer financially beneficial, is still common practice in the unrecognized Bedouin settlements (Marx and Meir 2016), both as a domestic source of meat and milk, and as a means of preserving a traditional Bedouin lifestyle (Degen 2007). Caring for and herding these sheep is generally a task reserved for women and children. From an early age, Bedouin children are expected to play an active role in maintaining their household, gradually taking on series of age-appropriate tasks designed to help support their family. They therefore play a central role in raising their family's sheep, and in various other tasks associated with domestic agriculture. This means that, even today, Bedouin children have much more direct, daily contact with their natural environment then urban children do (Ben-Zvi Assaraf, Eshach, Orion and Alamour 2012). In addition to helping with the various livestock on their family farms, they spend a great deal of time outdoors, herding sheep and playing in nearby fields (see Figure 1).

Insert Figure 1 here

Bedouin children in the Negev are also far more directly impacted by adverse environmental conditions. Many of them walk several kilometers to get to school, crossing streams on the way, which can become impassably blocked by flooding on rainy days. Since much of their home environment is unpaved, rain can also turn their immediate surroundings into an inconvenient, muddy quagmire. At the other extreme, life in the desert exposes these children to the dangers associated with extreme heat and dry weather, such as heat stroke and dehydration, as well as water-born infections due to the lack of proper plumbing and local hazards like scorpions and toxic plants (Elsana, Elbedour and Shalev 2014).

Finally, the children in our study live in an environment marked by extensive local pollution. The lack of municipal disposal services has led the community to dispose of its waste by various alternative means, including: backyard burning of household waste; dumping of household and agricultural wastes in unregulated dumps in and around the settlements; storage of bulky waste such as asbestos in backyards; and dumping of waste in steams and stream beds (Meallem et al. 2010; Authors 2014). It is worth noting that practices like incineration or leaving waste to biodegrade worked reasonably well in the days when Bedouin communities were smaller, nomadic, and generated waste that was almost entirely organic. Today, however, the waste generated by the Bedouin village whose children participated in our study is an amalgam of miscellaneous packaging materials, diapers, aerosol containers, paper and cardboard, glass, rope, barrels, buckets, tires etc., all of which also constitute part of the children's environment (Meallem, Garb and Cwikel 2010).

What is connectedness to nature and why is it considered important?

The questionnaire whose adaptation process we describe below incorporates components drawn from Western tools for assessing connectedness to nature. It is therefore worth taking a moment to consider what, according to these tools, connectedness to nature *is*, and why it should be measured. While the research literature has not produced a single clear and universal definition of 'connectedness to nature,' elements of it can be found in a variety of theoretical concepts (Braun and Dierkes 2017). Thomas Beery, for instance, lists a variety of "related yet distinct terminology," including "affinity," "biophilia," "ecological self," "environmental identity," "nature relatedness" and "place attachment" (2013, p.101). On the

whole, however, the study of connectedness to nature can be said to address the question of how people define and describe their relationship to the natural world.

The concepts associated with nature connectedness often refer to various forms of affective connection. Mayer and Frantz (2004), for instance, defined connectedness to nature as "an individual's affective, experiential connection to nature" (p. 504). Other researchers have referred to this connection using terms like "emotional affinity," which, according to Kals, Schumacher and Montada (1999), motivates people to seek "contact and sensual experiences with nature" (p. 182). Louise Chawla employed the term "environmental sensitivity" to describe an individual's "predisposition to take an interest in learning about the environment," and their tendency, "on the basis of formative experiences," to "[feel] concern for it" and to take action "to conserve it" (1998, p.19). The interest in identifying and assessing such affective connections is thus based on the assumption that feelings of interest, affection and concern will translate into pro-environmental behavior.

Some researchers have associated nature connectedness with the integration of nature into the individual's perception of their 'self.' P. Wesley Schultz, for instance, in his overview of the psychology of the human–nature relationship, identified 'connectedness' as "the extent to which an individual includes nature within his/her cognitive representation of self" (2002, p.67). Susan Clayton (2003) associated connectedness with the concept of 'Environmental Identity' (EID), which Sets and Biga (2003) define as "the meanings that one attributes to the self as they relate to the environment" (p. 405). These researchers claim a connection between "connectedness, caring and commitment" as "three core components" of "inclusion with nature," arguing that nature connectedness, in this sense, is important because viewing ourselves as an integral part of the natural world contributes to our motivation to protect it (Schultz 2002, p. 67).

Other researchers have associated individuals' connectedness to nature with their connection to a particular place, identifying nature connectedness as a component in individuals' 'sense of place' (see e.g., Kudryavtsev et al. 2012). Sense-of-place research explores how people connect with places and how those connections influence individual and community engagement with the environment. A number of scholars have suggested that sense of place fosters pro-environmental behavior, and related emotions, attitudes, and behavioral intentions – that it is a prominent influence on individuals' relationship with their environment, which encourages them to be more emotionally involved in their environment's wellbeing and more inclined to take action to preserve it (Rollero and De Piccoli 2010).

Measuring connectedness to nature – the existing tools and their limitations

Based on the perceptions of connectedness to nature outlined above, researchers have developed a variety of 'scales' for its assessment. Upon review, however, we found that these existing tools were not entirely suited to our purposes. The first constraint that limited the usefulness of the existing connectedness-measuring tools for our needs was the fact that most studies that measure the nature connectedness of children (and adults) have done so by means of *quantitative* questionnaires (e.g. Cheng and Monroe 2012; Larson, Green and Castleberry 2011). In the past decade or so, however, environmental education researchers have increasingly noted the advantages of using a mixed-method approach instead (Ernst and Theimer 2011). This reflects the understanding that qualitative approaches can help provide a more comprehensive view of children's attitudes and sensibilities toward nature (Chawla 2006).

A second, more minor, concern that we encountered when reviewing existing tools for measuring nature connectedness was that, to date, most of these tools have been designed for adults. In comparison, tools for measuring the connectedness of children are at a relatively preliminary developmental stage, and many of them are adapted from established tools for

measuring nature connectedness in adults, based on the assumption that tools for children, in addition to being "reliable and valid," must also be "simple enough for young people to read and understand" (Cheng and Monroe 2012, p. 32). For example, Cheng and Monroe's (2012) Connection to Nature Index (CNI), which was used to assess fourth grade students who participated in a long-term environmental education program in Florida, was adapted from Mayer and Franz's (2004) Connectedness to Nature Scale (CNS), which had been effective in measuring nature connectedness and predicting environmental behavior in adults.

This concern was echoed by a more prominent one regarding the tools' suitability for our target population – namely that studies of nature connectedness have hitherto been conducted almost exclusively with children from developed, Western countries. Some studies, like that of Larson, Green and Castlebury (2011), which was conducted in Hall County, Georgia, addressed the potential differences that may exist between children from different ethnic groups (in this case, African American, Hispanic and White) in these Western countries. Larson, Green and Castlebury found that younger children (aged 6-9 years), and especially those from minority ethnic groups, had difficulty understanding concepts like 'environment' and 'environmental resources.' They therefore adapted Manoli, Johnson and Dunlap's (2007) NEPC (New Ecological Paradigm Scale for Children) scale, because they felt that children might struggle with its more complex statements. The result was the CEPS (Children's Environmental Perceptions Scale), which included fewer statements, simpler language, and was less time-consuming to complete than other scales. While the scale, which was designed to measure children's 'eco-affinity' and 'eco-awareness,' measures both the cognitive and the affective domain of children's connectedness to nature, its cultural 'adaptation' was limited primarily to the simplification of its vocabulary.

Other studies have designed comparative tools to examine the influence of the environment in which children live and their daily interactions on their perceptions of nature. Collado et al. (2016) compared the nature experiences of Spanish children in three different environments (urban, rural mountain range, and rural agricultural). To this end, they developed the FCN (Frequency of Contact with Nature) scale for assessing children's daily experiences in nature. Similarly, Zhang, Goodale and Chen (2014) developed the 'Children's Contact with Nature' scale, which was composed of statements describing 15 experiences and activities that take place in the natural environment, including contact with common wild animals and plants.

The few studies that have addressed the nature connectedness of so-called 'indigenous' communities have done so as part of a cross-cultural comparison. The studies conducted by Van Petegem and Blieck (2006) and Boeve-de Pauw and Van Petegem (2012), for instance, examined indigenous 13-15-year olds from Zimbabwe, using Manoli et al.'s (2005) NEP scale to compare these children's perceptions of the environment to those of other children. In a later study (Boeve-de Pauw and Van Petegem 2013), these researchers used culturally adapted versions of the MEV-2 scale to compare the environmental values (EV) and environmental behavior (EB) of 10-13-year-olds from three different cultures, in Flanders, Vietnam and Guatemala. While they did note in this study that Guatemalan and Vietnamese society was very socially and ethnically diverse, that both places were characterized by areas with very different levels of urbanization, and that 55% of Guatemala's population consisted of indigenous people, the population for their study was chosen randomly, and no distinction was made in the study between indigenous and non-indigenous children.

Though they did not focus exclusively on indigenous populations, these comparative studies did show that culture has a clear and significant impact on children's perceptions of nature, and that the perceptions of children from indigenous populations are different from those of children who lead urbanized, Western lives. These potentially extreme differences in the experiences of children from different cultures in different places raise the very real possibility that tools and studies developed for children in one place will be based on

assumptions about these children's everyday lives that are wholly inapplicable to the lives of children elsewhere. In the following section, we review some of these assumptions, and present several relevant critiques of these assumptions which highlight the alternative possibilities that our research tool needed to be able to explore.

Rethinking assumptions regarding the universality of children's relationship to nature

Many studies of connectedness to nature in children that have been conducted in Western, industrialized nations are based on the assumption that children in these countries are becoming increasingly isolated from their natural environment (Bruni et al. 2017). The rapid urbanization of these countries, it has been argued, has reduced the amount of natural space available for children's play, and opportunities for direct and spontaneous contact with nature have become increasingly rare (Louv 2005). Since studies of children have reported that their connection to nature arises from spending time in a natural environment and interacting with it (e.g. Collado et al. 2013), these researchers argue that the loss of such interaction, known as the 'extinction of nature experience,' is a threat to nature conservation and species variation, because people are in danger of losing their sense of connection to the natural world (Zhang, Goodale and Chen 2014, p. 113). The last decade in environmental education has therefore witnessed the creation of a range of programs designed to strengthen children's connection with nature by providing them with direct exposure to 'natural' spaces (e.g. Cheng and Monroe 2012; Liefländer, Fröhlich, Bogner and Schultz 2013). As Duhn et al. (2017) point out, "It is hoped that if a young child experiences nature, then a future adult who feels deeply connected to the natural world and is less likely to exploit it, should be the result" (p. 1358). However, even as this approach to defining both the problem and the solution has gained widespread support, it has also drawn criticism from researchers who claim that it is based on a number of problematic assumptions.

One central critique focuses on the basic assumption that the "child-nature disconnect" is "new," and that "past generations of children had a closer and more intimate relation with the planet," which must now be reinstated (Duhn et al. 2017, p. 1365). Dickinson (2013) argues that the problem with this "assumption that past generations were closer to nature" is that it "can deemphasize a long history of environmental degradation and disconnectedness" (p. 321). She notes that though adults may nostalgically "position their youth as ideal and safer, where nature was more accessible and wild with more freedom and less fear," this was not necessarily true, since "the eras that adults promote were marked by their own forms of degradation and fear" as well (ibid). Indeed, critics of this "emphasis on romanticising the lives of previous generations of children" cite "significant evidence" showing "that poverty, disadvantage and environmental degradation have had a long lasting and sinister impact over many generations on children's natured lives" (Duhn et al. 2017 p. 1365). Some have gone so far as to claim that "the Golden Age of childhood is nothing more than a wistful adult fantasy for a time and place that never actually existed" (Taylor 2011, p. 421).

Another, not unrelated, critique addresses the "tendency for universalizing childhood in child-nature research," despite the fact that "how a child engages with spaces … differs enormously" according to the "environments where one's childhood is located" (Duhn 2017, p. 1365). Basing one's assumptions regarding children's relationship with nature on the experiences and opportunities available to "White, middle class Americans," these critics argue, renders "the vast array of experiences of childhood in less developed nations" – or in other "disadvantaged communities" – "essentially invisible" (Malone 2016, p. 44). These critics point out that "the vast majority of the world's children … live in a diversity of 'childhoods'," and that "that not all childhood encounters with the 'natural world' are [necessarily] restorative, healthy or spiritually uplifting" (ibid).

This leads to a third important critique that, to some extent, incorporates the previous two within it. This critique challenges the 'connectedness with nature' (CWN) approach's basic assumptions regarding what 'nature' actually *is* and how humans are positioned in relation to it. Proponents of this argument point out that the rationale underlying the very idea of 'connectedness to nature' is predicated on the basic assumption that humans are *not* nature, and that "it is possible for some species, namely humans, to be more or less nature, connected or disconnected from nature, and superior to or dominant over nature" (Duhn et al. 2017, p. 1363). Critics who disagree with this assumption challenge it from a number of different angles. Of these, one of the most relevant to our topic is Fletcher's (2017) claim that "the idea that one could be disconnected from 'nature'" is grounded in a "culturally specific … conceptual dichotomy between opposing realms of 'nature' and 'culture'" which is "characteristic of a Western worldview in the modern era," and that "the CWN perspective tends to confuse" it with "the human condition in general" (pp. 228-9). In other words, the idea that humans *can* be disconnected from nature – or indeed, that they themselves are *not* nature – is based in a particular Western point of view that cannot be assumed to be universally constant.

Another highly pertinent angle to this critique is McPhie and Clarke's argument (2018) that nature is *not* "a destination to be visited, experienced and connected to," but is, rather, "a concept" that can and has meant different things in different places and times (p. 2). In their article, "Nature matters: diffracting a keystone concept of environmental education research – just for kicks" (2018) they describe a number of these possible "conceptions of nature," as well as what they "do" and how they "perform" in the world (p. 6). This list of "natures" includes "utopian nature," which is their name for the "romantically idealized nature" that "people who say 'we must re-connect to nature' generally seem to mean" (p. 7). However, it also includes very different "natures," like "scary nature" – a place that is "scary, useless and dangerous, inhabited only by wild animals" (ibid). This conception of nature, they point out, "still scares people today," citing Milligan and Bingley's (2007) finding that while some young people found the experience of being in woodland "restorative," others "felt fearful or were repelled by it" (ibid). Similar findings have been reported by other studies as well, like Aaron and Witt's (2011) study of the perceptions of nature by urban children living in Houston, Texas. They noted that many children expressed unenthusiasm or even fear when asked about nature, in the form of statements like "I'm not sure what is out there"; "I could get lost or hurt"; "animals could kill me"; "My phone won't work, I wouldn't have cell service" (p. 154).

A third type of nature noted by McPhie and Clarke is "scarier nature," in which they include things like "dog shit, slime mold, adrenal cancer, earthquakes, strychnine poison, sulphur dioxide, methane, piss, tsunamis, scorpions, rotting cabbage, snot, bile, viruses, the Black Death, phlegm, malaria, weeds, sharks, breast cancer, floods, a flower that smells of rotting meat, rotting meat, puke, forest fires, etc." (p. 8). This is a concept of nature for which our research tool would certainly need to account, since, as we noted above, many items like those cited in this list are part of our target population's everyday environment. Previous studies have already noted that the natural environments experienced by children from indigenous communities can often be characterized by the types of pollution and safety hazards associated with lower socioeconomic status (e.g. Adams and Savahl 2015), though "growing up next to high polluting industries, busy highways and degraded landscapes" is by no means an experience limited to indigenous peoples (Duhn et al. 2017, p. 1365).

As the critiques reviewed above suggest, there are types of childhood, and types of nature, that standard tools for measuring nature connectedness are not necessarily prepared to deal with. Nevertheless, we concluded that, despite their various practical and theoretical limitations, these tools could still be a useful *starting* point from which to build our

questionnaire. To use them productively, however, we must ask ourselves: How can we make the students' experiences 'communicate' productively with the theoretical concepts defined in the literature?

An alternative theoretical approach – Negotiating a solution via the Third Space

Our approach to the new questionnaire's development drew upon Homi Bhabha's notion of the Third Space (1994), which serves as a theoretical framework for researchers interested in understanding and (re)negotiating the relationships between the dominant and "so-called 'universal' Western perceptions and the culture of individual, non-Western communities (Glosson 2010, p.129). This theory seeks to explain and address the tensions and conflicts that can arise when several different cultural identities come into contact. It has been applied in a wide variety of disciplines, including architecture, ethnology, cultural studies, linguistics and education (Cook 2005), including specific applications in research into science and environmental education (e.g. Lowan 2012; Wallace 2004). As Glosson et al. explain:

> The local indigenous culture provides meaning and identity to community members in the first space, while Western ideas (e.g. Eurocentric science) provide a second space for learning in schools, often in European languages. However, students and community members must function in a third space to negotiate meanings and understandings for the intersections of knowledge, practices, and languages from merging cultures. (2010, p.128).

This process of negotiation generates change, creating hybrid interpretations of science and the environment. The Third sSpace generates a shared foundation between the indigenous and Western perspective, a place in which to engage in dialog, where "multiple discourses may be woven together without sacrificing or dismissing the importance of their speakers' experiences and ways of knowing the world" (Wallace 2004, p. 908).

In the field of science and environmental education, Third Space theory has been applied in various ways. Cook (2005) describes a model for creating "an actual 'third space' in primary classrooms," in which "outside school experiences are recreated [and] home-type learning is encouraged" (p. 85). Wallace (2004) uses Third Space as part of a theoretical model for understanding students' science literacy and language use in class. Specifically, she envisions the Third Space as "an abstraction of a space/time location" that exists *between* speakers (for example, the teacher and the student), "in which neither the speaker's meaning nor the listener's meaning is the 'correct' meaning, but in which the meaning of the utterance is hopeful for either co-construction of interpretation or new hybrid meanings" (p. 907).

As Wallace (2004) points out, the implication of communication via the Third Space is that "neither the teacher's meaning, nor the student's meaning for an utterance is the correct meaning." This means that "learning will involve the negotiation (here in the sense of cooperation or compromise) of meaning until either there is mutuality of meaning, or a new hybrid meaning is constructed" (p. 908). In the case of our study, the process of developing the new questionnaire can be defined as a Third Space. In this space, we literally *negotiated* with a group of students from our target population over the form and content of the questionnaire until, after a series of individual and group interviews and several cycles of feedback and revision, we produced a version that was comprehensible to the students and reflective of their experience. The remainder of this article is devoted to describing, in detail, how the questionnaire was developed, providing examples of the type of information it produced, and offering suggestions for how similar questionnaires should be developed in future.

Participants in the questionnaire negotiating process

The questionnaire's development relied on input from two separate groups of participants. The first group consisted of a total of 58 fifth grade students (28 boys and 30 girls) who live in unrecognized villages in Israel's Negev Desert, and who took part in various stages of the development process (see findings section below for details).. In their daily lives, these students speak an Arabic dialect specific to the Bedouins that live in this region. This dialect differs markedly from Modern Standard Arabic (AMS) the formal, literary Arabic in which they, along with students throughout the Arabic-speaking world, are taught to write in school. Because most of these Bedouin students were unfamiliar with written Arabic before encountering it at school, they are far less fluent in it than they are in their native spoken dialect. As a result, they find written expression and reading comprehension significantly more difficult than oral communication. This had a number of implications for the questionnaire's development, as we will see below.

The second group consisted of four professionals from the fields of education and environmental education who work with students in the Bedouin community: the coordinator of environmental education in the Bedouin community from the Society for the Protection of Nature in Israel, an educational psychologist and two Bedouin teachers.

Ethics

Participants were accessed via five elementary schools located in the participating community. Ethical clearance was obtained from the ethics committee of Kreitman School at Ben-Gurion University and the Chief Scientist of the Ministry of Education. Permission was obtained from the principal of each school prior to the research being conducted. With the assistance of the deputy principal and class teachers, letters were sent to the children's homes and consent forms were signed by one parent or guardian and sent back to the school.

Data collection

The data for various stages of the questionnaire's development and validation was collected by means of two different types of interviews:

1. Personal, semi-structured interviews

The topics of the interviews were defined in advance, marking primary focal points about which the researcher wishes to learn (Qu and Dumay 2011). Interviews of this sort allow researchers to gather detailed information about the research topic, while maintaining the freedom and flexibility to raise new issues or respond to new issues raised by the interviewee (Patton 2002). All interviews were audio-recorded and transcribed.

These interviews were conducted with:

a) Ten randomly chosen Bedouin 5th grade students (5 boys and 5 girls). These 30-40 minute interviews were conducted in the students' schools. They were held in a quiet and secluded room to encourage an atmosphere of calm and comfort. The purpose of these interviews was to gather preliminary data about the students' everyday experiences in their natural environment in preparation for generating the first version of the questionnaire (see results, stage 1 for more details). Questions on topics such as students' enjoyment of and interest in nature, going to the pasture, playing in the field, experiences with animals etc. were prepared in advance as headlines, and were used as a basis for conversation between the students and the interviewer. The questions were devised by the primary author, a (non-Bedouin) Arab Muslim who has been working as a teacher in Bedouin schools for the past ten years, during which time she has gained extensive firsthand knowledge of her students' daily lives. The interviews were

conducted in the local spoken Arabic dialect, to allow the interviewees to express themselves fully without any language barrier.

b) Four professionals with extensive experience of working with children in the Bedouin community. These interviews were held after the first version of the questionnaire had been tested, but prior to its first major revision (see stage 3 in the results section). They were conducted individually, and each lasted between 60 and 90 minutes. The questions in the interview focused on two primary elements: the interviewees' pertinent knowledge and views regarding the cultural characteristics of the Bedouin children, and the interviewees' direct response to a perusal of the first version of our questionnaire. In addition, the interviewer shared the results of the first round of testing (see results, stage 2) with the interviewees to encourage discussion of the factors that may have led the students to respond to the questionnaire as they did.

2. Interviews conducted with small groups of students as they orally completed the questionnaire

To test the compatibility of various versions of the questionnaire with the target population, interviews were conducted with small groups of students, in which they completed the questionnaire, asking questions and making comments as they did so (see results, stage 2 and 5 for details). The students were chosen randomly, regardless of their academic achievement. Both rounds of testing were conducted with the same group of 48 students, divided into groups of four, for a total of twelve group interviews per round.

The interviews were conducted in the students' schools over a period of 90 minutes. During these interviews, the statements in the questionnaire were read aloud one by one. For each, the students were asked to note if the statement was clear, what, if anything, they did not understand about it, whether they agreed or disagreed with it and why. (In the second testing round, after the addition of the illustrations, the students were also asked to comment upon these.) The group setting helped the students' feel more comfortable asking and commenting about things they found unclear, and we documented their various questions, comments and explanations in writing.

Data analysis

The data from the semi-structured interviews underwent thematic analysis, according to the five stages suggested by Braun and Clarke (2006). To analyze the group interviews, we gathered everything that was said by the students and documented by the primary author, including the questions, comments and explanations associated with each statement in the questionnaire. These responses were then divided into categories based on the aspect of the questionnaire that the student had commented upon, such as the language of the statement, its accompanying illustration, the connection between the statement and the students' experience of their environment, or additional pertinent cultural and social factors.

The categorization process was validated by four experts in the field of science and environmental education (a professor, a doctor, and two doctoral students). In addition to reviewing the students' reactions to the questionnaire, these experts also participated in the validation of the questionnaire itself, commenting on existing statements and suggesting potential changes (see also stage 3 in the results section). These researchers were given access to the various versions of the questionnaire, and to the students' responses to them. Their input was a continuous part of the questionnaire's development process, until a final version was agreed upon by all. For a full description of categories produced by this analysis, see Appendix 1.

Results

The results section is divided into two parts. In the first, we present the seven stages through which we developed the nature connectedness questionnaire, adapting it to the culture of the Bedouin students who live in the Negev's unrecognized settlements. The stages are summarized in Figure 2, and then elaborated in greater detail below. In the second part of the results section, we present selected examples of the data produced by the implementation of the questionnaire's final version. The samples presented here are merely designed to illustrate the importance of the adjustments that were made during the development process, and the pertinence of the information that such specific adaptations can yield.

Part 1 – The seven-stage development of the culturally adapted nature-connectedness questionnaire

Figure 2: Stages of connectedness to nature questionnaire development and adaptation to the Bedouin students' culture.

Insert Figure 2 here

Stage 1 – Creating a bank of statements. In the first stage of the development process, we created a bank of statements, which were gathered from two sources – previous questionnaires from the research literature, and interviews with the Bedouin students.

a) Statements taken from the literature

After an extensive review of the literature on research tools associated with nature connectedness in children, we found that they addressed nature connectedness in the context of at least one of three dimensions: cognitive, affective and behavioral. While some of these tools were unidimensional (addressing only one of the three), others were multidimensional (addressing more than one). One such multidimensional tool that was also adapted for children was Cheng and Monroe's (2012) CNI (connection to nature index). We therefore drew statements for our questionnaire primarily from that scale.

The CNI consists of four components: (a) enjoyment of nature, (b) empathy for creatures, (c) sense of oneness, and (d) sense of responsibility. Their instrument was composed of 16 statements, and established by the researchers to be reliable. Bragg et al. (2013), who examined a number of different nature connectedness questionnaires, concluded that this index provides a useful tool for measuring nature connectedness in children.

Additional statements were collected from questionnaires that had been used to assess nature connectedness in adults. Thus, for instance, because the CNI was influenced by the index for adults developed by Mayer and Franz (2004), comparison was conducted between the two tools and gathered statements from their original questionnaire as well. Statements were also gathered from the EAN (Emotional Affinity toward Nature) scale (Müller et al. 2009) and the DCN (Disposition to Connect with Nature) scale (Brügger et al. 2011).

b) Statements drawn from interviews with students

We conducted semi-structured interviews with 10 students in order to gather information about their experiences and their interest in the nearby natural environment, intended to help us adapt the questionnaire to this particular study population. The interviews included questions like: "Tell me, what natural places near you do you like?", "What places do you not like and why?", "What animals do you raise?", "What animals do you like?", "Do you go herding at the pasture?", "What do you do at the pasture?", "How do you feel when you are in the natural environment near you?" and "What bothers you when you are in the natural environment?"

Based on the students' responses to the interview, we created new statements that used simple, local language and drew upon the students' own experiences.

At the end of this stage, we had gathered a total of 46 statements, which were written in Modern Standard Arabic and divided according to the four categories of nature connectedness suggested by Cheng and Monroe (2012), namely: enjoyment of nature, empathy for living creatures, sense of oneness, and sense of responsibility. To these, we also added an additional category: experience of nature in my immediate environment. The statements in this category focused on experiences that were specific to the Bedouin students, as described in their interviews.

Stage 2 – Preliminary testing of the students' understanding of the statements. Preliminary testing of the 46 statements gathered in stage 1 was conducted with 12 groups of students, taken from two separate villages. Each group consisted of four randomly chosen students, who participated in two consecutive group interviews, each of which covered 23 of the 46 statements. During these interviews, the students were asked to complete the questionnaire, and to ask questions and point out any elements that were unclear to them. As they completed the questionnaire, the primary author documented their responses, their questions and their ability to undertake the task.

The preliminary group interviews revealed several obstacles. One of these was that many of the students had difficulty understanding some of Cheng and Monroe's statements, such as "I am part of the natural world," "My actions will change the natural world" and "People don't have the right to change the natural environment." Postma and Forest (2016) pointed out that, despite the fact that the index is designed to test students' affective responses to nature, these statements also require a cognitive component. Moreover, they are quite abstract and the students in our study showed difficulty understanding concepts that are unconnected to tangible reality.

The students were similarly confused by general statements like "I like to hear the different sounds in nature." They asked, "What are sounds in nature?", "What sounds are there?" and "What sounds do you mean?" The statements' lack of focus was frustrating for both the students and researchers. We had difficulty answering the students' questions, because we wished to avoid leading them in a particular direction and influencing their answers.

Other statements, such as "I enjoy gathering rocks and shells," were simply irrelevant to the students' lives. These students live in a desert environment, and they have no contact with shells. Though we removed the reference to shells from the statement, the students viewed gathering rocks as a dangerous activity that could be harmful to others ("the rock might hit someone and hurt him"). Another example of a statement that our students found irrelevant was "I would always prefer spending time with my friends to spending time alone in nature," taken from Brügger et al. (2011). This is a reverse statement designed to test respondents' sense of identification with nature. However, the students' responses indicated that they play with their friends outdoors, *in nature* – that their nearby natural environment is where they play, and that spending time with their friends is therefore inseparable from spending time in nature.

Another obstacle revealed by the interviews is that some of the statements contain two components, such as "I enjoy contact with animals and plants," and the children sometimes had different opinions regarding these different components of the same statement. In response to this statement, some children claimed that they enjoy contact with animals, but that they do not touch plants, because they like their smell but not their feel. They further noted that some plants are covered with sharp thorns, that are not nice to touch.

Finally, the preliminary test revealed a linguistic obstacle, since the everyday Arabic spoken by the students is very different from written Arabic, and this made it difficult for the students to read and understand the translated statements. Moreover, the original questionnaire was designed to be marked on a Likert scale, with answers rated on a scale of 1-5. The students had

never used such a scale; they had difficulty rating the extent of their agreement between "not at all" and "very much," and were particularly confused and frustrated by the "not sure" option.

Stage 3 – Consultation with experts. Following the preliminary testing of the original questionnaire, we consulted a variety of experts, asking for their feedback on the questionnaire, and on the students' responses to the initial testing. These experts were divided into two types: (a) experts in environmental education and science education, and (b) educational and environmental professionals who work in daily contact with the Negev Bedouin population.

The experts in the fields of science education and environmental education were part of the questionnaire's validation process (see data analysis section for details). They were given the original questionnaire, as well as access to the results of stage 2, and asked to make suggestions for revision. The experts' recommendations referred primarily to the need to include negative statements, and to make the statements less abstract (i.e. more concrete and specific).

In approaching experts who worked closely with the Bedouin community, our goal was to harness their knowledge and experience with Bedouin children to improve our understanding of such children's social and cultural characteristics. We therefore conducted extensive semi-structured interviews with the National Society for the Protection of Nature's environmental education supervisor for the Bedouin community, with a Muslim Arab senior educational psychologist who works with the Bedouin community, and with two Bedouin teachers (for more details, see 'participants' section above). We met with each of the experts separately, describing our experience of introducing the questionnaire to the test groups and the challenges we encountered in doing so. The experts commented on our findings and expressed their opinions regarding the reasons underlying the students' response to the various statements. They were also asked specific questions, such as, "Tell me about the lives of children in the Bedouin community; how does a day in the life of these children look at school, in the village and at home?", "How are beliefs, values and norms reflected in these children's education, especially their environmental education?", and "What sort of difficulties or challenges have you come across in your work with children from the Bedouin community?"

The interviewees raised a variety of issues in response to our data and our questions. The environmental education supervisor, for example, raised the issue of the Bedouin students' relationship with nature. For example, she noted that the statement "My actions will change the natural world" is problematic, because Bedouin children see themselves as part of nature, and are therefore unclear about what it means to "change nature." She also addressed the practical impact of the environmental conflicts faced by the Bedouin community, and of their lack of resources. She explained that, "environmental education in the Bedouin community is peripheral … the students live in a polluted environment … that lacks waste disposal and infrastructure, which makes it difficult for them to apply the things they learn in the educational activities in their homes." The circumstances in which they live, she pointed out, make it difficult for these children to be agents of change and engage in environmental activism. She therefore recommended that all of the statements referencing environmental behavior be rephrased as 'willingness' to act and protect the environment, rather than as a statement of the act itself. Thus, for instance, a statement like "I protect the nature around me" would be replaced by "I am willing to protect the nature around me."

The psychologist addressed the implications of the students' socioeconomic situation. For example, she noted the conflicting emotions involved in a statement like "I enjoy playing with toys I found in the trash." In her opinion, the students' attitudes towards finding toys in the trash are conflicted – on the one hand, toys are a rare luxury, while on the other, they are ashamed to report that they play with toys found in trash heaps, since this is an indication of their poverty. Another aspect of this situation that she noted is the scarcity of Bedouin children's "emotional vocabulary." She explained that "the parents are not attentive to the children's emotional needs. Their primary concern is fulfilling the children's most minimal

material needs – food, bread … I bring questionnaires about feelings to classrooms and I see that they have trouble expressing their feelings." She recommended using pictures in the questionnaire, since, in her opinion, questionnaires give students the sense that they are being tested, and adding pictures would make them seem safer and less threatening.

The two Bedouin teachers addressed the students' experiences in their close environment, as well as their relationship with that environment and their language. For example, they emphasized the importance of the local Bedouin dialect and the concepts used by the students in their daily lives, which differ significantly from concepts in the literary Arabic in which the questionnaire was written. This gap, they pointed out, made it difficult for the students to understand the statements. They therefore suggested adding words from the local spoken language to the questionnaire (e.g., using the local word for "pasture" instead of the literary one, and incorporating a local term that refers specifically to "hills surrounding the olive trees").

Stage 4 – Revision of statements based on results of stages 2 and 3. After analyzing the results of the first test round and consulting with the various experts (stages 2 and 3), we revised the questionnaire – rephrasing the statements that had confused the students and adding more statements based on the experts' suggestions. Furthermore, in light of the students' frustration with the five-point Likert scale, we decided to the reduce the number of options to two (agree/disagree).

The student interviews and the expert feedback led to significant changes and amendments to the statements in the questionnaire. Many of the original statements were substantially altered, or removed completely and replaced with new statements (see Table 1). The revised questionnaire consisted of 35 statements, divided into three parts: 10 statements from previous questionnaires from the research literature, 15 statements derived from the students' interviews, and 10 statements suggested by the science education and environmental education experts we consulted. Between them, the statements incorporated the four components of nature attachment set out by Cheng and Monroe (2012), as well as an additional aspect, "experience in my immediate environment," which focused on the specific experiences of students in Bedouin society. After the statements were finalized, each was also given a visual illustration that reflects its content. This was designed to help overcome language barriers and increase the students' interest and motivation.

Stage 5 – Testing the revised questionnaire. When the revised questionnaire was complete, we tested the new version using the same method we had employed in stage 2, with the same groups of students. This round of testing revealed that some of the pictures did not fit the statements to which they were assigned, or were not representative of the children's culture, so the questionnaire underwent another round of adaptation.

Stage 6 – Readjustment of illustrations and statements. After testing the original illustrations, we made adjustments to make sure each picture represented the content of the statement. we also made sure to provide pictures of both boys and girls, wearing colors and clothing appropriate to the students' culture (see item A in Figure 3 below). The pictures were also designed to be relevant to the students' everyday lives (see item B in Figure 3). In other words, they were specifically adapted to the students' gender, culture, and lifestyle (see Appendix 2).

Insert Figure 3 here

Figure 3 shows how the colors and styles of the children's skin tone and clothing were adapted to make them more similar to the students themselves. For example, the girl in item A is dressed according to the style worn by Bedouin girls. Item B also shows how the image was adapted

to the Bedouins' everyday lives, with the boy catching butterflies with his hands, rather than using a butterfly net.

Stage 7 – Adding a formal 'explanations' section to the questionnaire. The experts with whom we had consulted suggested that, in addition to broader cultural adaptations, the questionnaire should also provide the flexibility for each of the respondents to express their own personal perceptions and experience. The students had already been doing this informally during the first two testing stages, as a byproduct of the fact that the questionnaire was being answered orally in a group interview setting. The students' questions and comments about the statements during the testing sessions, which were documented by the researcher, had provided a great deal of additional information.

We therefore decided to add a new and separate section to the questionnaire, in which the students were invited to provide open-ended explanations for their responses to specific statements. In this section, the students were first asked to choose six statements from the first part of the questionnaire – specifically the three that represented their opinion most accurately and the three that represented it least accurately. They were then asked to explain their choices. These explanations helped us understand the considerations that motivated the students' choice of statements that reflected their opinions. Next, the students were asked to choose eight statements that they found interesting and would like to explain – four with which they agreed and four with which they disagreed. They were asked to write down the reasons that led them to agree or disagree with each statement. Because some of the students were reluctant to write, we told them that we would help them with the writing. we approached the students who needed help; the students told them their answers and they wrote them down.

The students' explanations in this new section provided a great deal of qualitative data about their relationship with nature. Answers to the closed questionnaire alone would not have allowed us to fully understand the reasons underlying the students' choices. The use of qualitative tools, like interviews and open-ended questions on questionnaires, can help fill in missing information (Creswell and Tashakkori 2007). Altogether, completing this revised and extended final version of the questionnaire took children a total of about 90 minutes.

Part 2 – Examples of incompatibilities with standard nature connectedness questionnaires that are revealed and compensated for by the culturally adapted questionnaire

The students' responses to the questionnaire's statements, and their explanations of their responses, provided us with a great deal of information about how they approached each statement in the questionnaire, and how this approach was shaped by their day-to-day experiences in their environment, by the physical conditions, by their culture, and by the proximity to nature in which they live their lives. This was especially clear for those parts of the questionnaire where the students provided explanations that were unexpected – and not congruent with the categories usually defined by literature on the topic of nature connectedness.

The students' responses and explanations, as expressed in the newly added second section of the questionnaire, could not be clearly divided according to the aspects of nature connectedness defined by the literature. In other words, some explanations were reflective of more than one aspect from the literature, while others did not reflect any such aspects at all. Moreover, the students' explanations of their responses to the statements often indicated that they assigned those statements meanings other than those that had been intended. As a result, statements designed to provide data about a specific aspect of nature connectedness could instead provide data relevant to a different category, or to another issue not raised in the preexisting categories from the literature at all. All of this calls attention to the fact that the Bedouin children, who are members of a specific indigenous community, and who still live in very close proximity to their natural environment, draw a variety of different meanings from

nature that Western children do not see, and that standard questionnaires are not designed to anticipate.

Below are several key examples that illustrate this point. The first of these relates to the nature connectedness category 'enjoyment of nature.' We found that this category, the statements in which are generally designed to elicit an aesthetic response from Western children who associate nature with recreation, was perceived quite differently by the Bedouin students. For example, the students agreed with the statement, "when I'm in nature I feel happy," but then provided explanations that were not always aesthetic or recreational, but related to nature's functional, everyday usefulness in their lives. One student said, for instance, "I like being in nature because it has flowers and grasses, and the sheep eat them … if there was no nature the sheep would die." Another said, more broadly, "Nature is part of life and it's the most important thing to people. It makes food and drink." In this case, it seems that some of the students who responded to this statement associate nature with happiness because it provides for their economic and physical needs.

Another example connected to the 'enjoyment of nature' category is the statement, "I like to see wildflowers." Though the students' responses show that some of them disagreed with this statement, the reasons cited in their explanations are not aesthetic, but rather associated with their everyday experiences in nature. This is reflected in answers like, "I don't like picking the flowers, because they have worms in them," and "because the flowers have thorns and they hurt."

As these responses show, these children's extensive, unmediated contact with their natural environment allows them access to various elements – like worms and thorns – that lead them to associate nature with negative experiences too. This was further indicated in the statements that we added to specifically reflect the students' daily lives, such as "I like to play in the sand." The students' explanations of their answers to this statement raised the issue of pollution in their environment. Some of the students disagreed with the statement, explaining that they disliked the sand because it was dirty, and because they wished to avoid being injured by buried shards of broken glass.

Another aspect of nature connectedness that elicited unexpected responses was "empathy towards animals." From a Western perspective, empathy towards living creatures is perceived as part of nature connectedness, as reflected in the statement, "I feel sad when wild animals are hurt." Indeed, some of the students who agreed with this statement provided explanations that reflected empathy towards animals. Others, however, explained their agreement in more practical terms, such as "I don't want them to be hurt and sick, so they don't die and make the area smell bad."

Yet another group of students *disagreed* with this statement, providing explanations that were also not necessarily indicative of empathy. Some, for instance, cited superstitions or traditional 'cultural beliefs' that influenced their attitudes toward specific animals, leading them to despise particular species (such as ravens or owls) that are considered 'bad luck.' Other students disagreed with this statement because they see wild animals, like birds, as competitors that are vying with them for resources and damaging their property. For example, "I'm not sorry if a bird gets hurt, because birds eat our seeds and our fruit."

In the third aspect of nature connectedness, "oneness with nature," the students' explanations reflect their tendency to interpret the statements in this section of the questionnaire in highly concrete and pragmatic ways, which address the functional roles of nature in providing for their basic needs. In this context it is worth noting that Bedouin society has long been directly dependent on natural resources for its subsistence. Despite the recent changes to their lifestyle, Bedouins still rely on seasonal agriculture and sheep herding, and Bedouin children are active participants in herding sheep and caring for additional livestock.

Their personal experience with nature as a source of food is evident in their agreement with statements like "I can't live without plants," with the explanation that this is "because plants give us food." Some of the students' explanations for this statement also addressed the fact that plants provide oxygen for breathing, noting that "plants give us the oxygen we breathe and take the carbon dioxide." This indicates that the students' perceptions are shaped not only by their personal experiences, but also by their exposure to Western knowledge about plants' roles in the ecosystem in school.

At the same time, however, some of the students did *not* agree with this statement, and their explanations are once again grounded in their personal experience. As desert dwellers, the students live in an environment in which much of the vegetation is dry (and therefore seemingly useless) for part of the year. They therefore conclude that plants are not necessary for existence: "because plants are dry in the summer. I can live without plants."

Another aspect that yielded unexpected explanations was "sense of responsibility for the environment." While some of the students who agreed with this statement explained their agreement using knowledge of how waste negatively impacts the environment, others cited religious reasons for their choice: "because the Prophet (Mohammad) said that 'cleanliness comes from faith'."

Other students, however, disagreed with this statement, citing practical circumstances, like the fact that "there are no trash cans to throw trash into." It is important to note in this context that the students live in unrecognized villages that are severely lacking in infrastructure (running water, waste disposal, electricity). The students' explanations therefore reflect the impact not just of cultural/religious factors, but also of economic-political factors, on their nature connectedness.

In conclusion, the students' explanations show that their attitudes and sense of connectedness to nature can be informed by factors and interpretations other than those assumed and described in the research literature, and that these influences are intimately connected to the students' actual day-to-day experiences in nature. The cultural differences between these children and children who were not raised in a natural environment arise clearly from the differences in their perceptions of that environment. Unlike Western children, whose daily lives are typically lived at some remove from the natural environment, these Bedouin children spend a great deal of their daily routine in nature (whether playing outside, or helping to sustain their family). As a result, their responses to the questionnaire reflect an awareness of various aspects of nature – like its functional, economic and political value – that does not generally characterize children from more urban, Western backgrounds.

Insert Table 1 here

Discussion

The study presented here offers a model for developing a culturally adapted questionnaire to characterize the nature connectedness of children from indigenous communities. Adapting research tools for this purpose is important because attitudes and perceptions toward nature cannot be universalized. The results of previous studies, and of our own study, show that students' relationship with nature is influenced by a wide range of factors, like their experience in their home environment (Collado et al. 2016), safety concerns (Adams and Savahl 2015), and a variety of other socio-cultural factors (Linzmayer and Halpenny 2014). Therefore, based on the understanding that the specific items used to measure nature connectedness will never be universally applicable, and that changes must be made to accommodate different population types, we made the changes that were necessary in order to understand the nature connectedness of the children in our chosen population.

Studies have shown that culture plays a prominent role in shaping how people perceive and relate to nature (see e.g., Blatt 2013). Our study was conducted using a questionnaire that, over a series of stages, was continually reshaped and adapted according to the culture and experiences of Bedouin elementary school students living in the unrecognized villages of the Negev desert. Its development required extensive testing and examination from a variety of different viewpoints (e.g., consultation with experts who work with the Bedouin community in various capacities, obtaining the students' responses at various points in the development process). In addition to adjusting for considerations of culture, gender and language, our adjustments also accounted for the relevant characteristics of the natural environment with which these students have firsthand experience. The research literature contains previous examples of studies in environmental education that made changes to the statements of the original questionnaires by simplifying language (Larson et al. 2011), or by adjusting content to accommodate specific geographical characteristics or political/cultural relationships (Schneller, Johnson and Bogner 2015). However, these studies made changes to only one or two elements, while the changes proposed in our study are far more extensive.

The process of adapting the tool functioned as a 'Third Space,' in which the everyday discourse of the students and the Western discourse from which the questionnaire originated merged together to create a new and fuller understanding. Our findings point to the immense importance of generating such a Third Space in which to negotiate the meanings that are assigned to nature, since individuals' cultures, experiences and worldviews are crucial to the determination of their attitudes towards their natural environment. The information derived from this study allowed us to expand our knowledge of nature connectedness beyond the perspectives determined by Western research literature, promoting the notion of a dialog between different points of view, and leading to new insights regarding the potential impact of culture and place.

It is important to note that adapting the questionnaire was a long and complex process, which included a great deal of negotiation with the students over the meaning of the statements. The students' responses to the questionnaire in the various testing stages helped us identify statements that were potentially problematic (too abstract, irrelevant to the students' lives, difficult to understand or misleading), and gave us an indication of how they should be rephrased. This was important, for example, in the case of statements that were not concrete or relevant enough for the students to relate them clearly to their lives, which obstructed their understanding of the statements and thus impeded our own understanding of their perception of nature. Our efforts to overcome these obstacles promoted the formation of the questionnaire as a dialog between different approaches and perspectives, which refrained from any attempt at homogenization. As such, they reflected Carol Brandt's call for combining "Eurocentric sciences" and "Indigenous knowledge" in a manner that does not require one "to relinquish either position," but rather to "simultaneously embrace" elements of both (2007, p.306).

The group interview settings in which we negotiated with the students over the form and content of the questionnaire can be viewed as an example of what Brandt (2008) calls 'discursive spaces.' Using examples from the experiences of indigenous American Indian students studying science in a university setting, Brandt defines a discursive space as "a setting (physical or virtual) in which people could meet to engage in conversation," adding that its parameters were not "determined solely by the physical nature of a place, but rather … by its relational, interpersonal nature" (p. 713). More specifically, discursive places were a "comfort zone" and "a location of safety," in which participants "valued each other's presence, life experience, and expertise" (ibid). This sense of being seen and valued, Brandt claims, helped students to be more comfortable expressing their opinions and concerns in these spaces than they did in the university at large. As a result, they functioned as "locations of possibility," in

which students were able "to develop an expansive dynamic relationship with science that more closely aligns with their sense of who they are" (p. 708).

The process of adapting the questionnaire shed light on the unique perspectives of these Bedouin students and on their personal experiences in their natural environment, providing information that is crucial to the development of any culturally relevant environmental curriculum. Based on our experience of this process, we offer the following series of recommendations for developing culturally adapted research tools:

First, the process should include the use of existing scales and tools from the research literature, but these must be piloted repeatedly with the target population in order to adjust the contents to its needs. Second, written statements should be supplemented with visual and representations and oral explanations that are specific to the local spoken language and culture, especially in cases where the target population is made up of children. In this context, the questionnaire should also be read aloud to avoid the possibility that subjects will misunderstand what is written, or have difficulty expressing their responses in writing. This is especially important in instances like the Bedouin case, where oral and written languages differ sharply from one another, and subjects may not be equally fluent in both. 'Diglossia' – a term used to describe "a situation in which in a given society there is more than one language variety in complementary functional use" (i.e. a local 'low,' colloquial, spoken language and a more universal 'high,' written language), is by no means unique to the Bedouin case (Saiegh-Haddad and Henkin-Roitfarb 2014, p. 19). It is typical of multiple Arabic speaking societies (as Saiegh-Haddad and Henkin-Roitfarb note, Arabic is "a prototypical case" of diglossia), but it also recurs in a variety of other languages and societies around the world.

Another particularly significant point to consider is the indigenous population's interpretation of the statements provided by the research tool. In developing and adapting the tool, researchers must take into account that Western terms and concepts that have been employed successfully in other studies may not be relevant or meaningful in some indigenous communities. As we showed above in the results section, this was true of several common nature connectedness categories we employed in our research (e.g., empathy, utility). We found that the students' personal experiences with their natural environment and with animals led them to interpret statements that had been designed with a certain set of responses in mind in different and unexpected ways. Based on our observation of the Bedouin children's responses, we suggest that any tool for measuring nature connectedness in indigenous communities should account for the factors that separate them from more Westernized, urbanized societies.

For example, the tool must take into account the intimate, often utilitarian, relationship that indigenous communities have with their natural environment. The natural environment is an important component in the lifestyle of indigenous populations, incorporating a variety of economic, social and cultural values. In our study, the students' sense of oneness with nature was expressed through their community's direct use of natural resources. This direct use also influenced the students' sense of empathy, which they did not express for creatures (e.g. pigeons) that served a direct nutritional or economic purpose in their community, nor for creatures that compete with them for the same natural resources. Our results correspond with those of other studies of the perceptions of indigenous peoples. For example, studies of children living in rural areas of Zimbabwe who rely directly on natural resources also revealed this utilitarian ecological perspective (see Boeve-de Pauw and Van Petegem 2013; Van Petegem and Blieck 2006).

Another issue associated with the community's utilitarian relationship with its natural environment concerns the importance of distinguishing between domesticated and wild animals. One of the drawbacks of our study is that it did not make enough of this distinction, though our qualitative results suggest that it would be worth incorporating such a differentiation into future questionnaires. The students' attitudes to the two were different,

since domesticated animals had sentimental and practical/economic value, while wild animals were often perceived as competitors, irritants or threats. The importance of this distinction is also implied in Johnson-Pynn et al.'s study of the perceptions of young people in Uganda, where they point out that "unlike Westerners who romanticize the human-wildlife relationship, most indigenous Africans do not consider wild animals as national treasures," viewing them instead as "predators of people and livestock and pests who raid and destroy crops" (2014, p.312).

As all of the examples above show, it is important, when researching the views of a given community, to understand how its members make use of their natural environment, because these uses affect their perceptions in various important ways. Research tools must be designed to reflect such uses, taking into account that they may be subject to change as indigenous communities are influenced by processes of modernization.

A second factor that culturally adapted tools should take into account is the religious beliefs of the indigenous community. Religious beliefs and superstitions can carry a great deal of weight. They are an integral part of individuals' cultural background, and can directly affect their attitudes. For example, the children in our study were encouraged to preserve the environment by their belief in the Prophet Mohammad's claim that "cleanliness comes from faith." The researchers Gregory Hitzhusen (2006) and Lyn Parker (2017) support the idea of integrating religion into environmental education, suggesting that this has the potential to promote the development of a religious environmentalism. As Hitzhusen explains: "Adding religious teachings to the environmental education mix greatly broadens the base of values available to support environmental citizenship—not by attempting to convert students to a new environmental belief system, but by empowering students to develop their environmental values within whatever pre-existing value system they already occupy" (2006, p.13).

It is important to clarify here that Hitzhusen is not advocating that religious figures be brought into schools to 'teach religion,' but that teachers should learn to identify and to leverage the environmental potential that may be present in the religious beliefs their students *already have.* He notes that "educators can describe" they ways in which scientific and religious approaches to environmental issues overlap "without advancing particular religious or ethical teachings" (p. 12). Hitzhusen offers multiple examples of such points of "potential complementarity," like tapping into "religious themes of value, respect, and reverence" for creation as a means of "justifying the intrinsic value of nature" (p. 16). He notes that informing religious students "that their faith tradition promotes environmental action and concern" can increase their "ownership of environmental issues," and that religious faith can even be harnessed as an aide to perseverance and "a hopeful antidote to pessimism" in the face of "complex environmental issues" that "may take generations to solve" (pp. 17-8). In light of the potential relevance of such aspects of religious faith, research tools should also aspire to include an expression of culturally specific religious and superstitious beliefs, and explore how these beliefs may influence respondents' perceptions.

Third, when developing a research tool for a specific indigenous community, that tool must be adapted to that community's particular, concrete physical environment. The local physical environment can be very significant. Every location has its own particular characteristics, which set it apart from other places, through which individuals experience the world in their own particular ways (Van Eijck and Roth 2010). Questionnaires should therefore include statements that specifically characterize the place in which respondents experience their daily lives. Understanding the local experiences that shape students' lives provides an opportunity for place-based learning, which "helps students develop stronger ties to their community, enhances students' appreciation for the natural world, and creates a heightened commitment to serving as active, contributing citizens" (Sobel, 2004, p. 7).

A fourth factor that should be taken into account when developing new tools is the possible comprehension gaps that could be generated by the use of a language that does not correspond to the local dialect. Language can strongly influence indigenous children's ability to cope with a questionnaire. Our questionnaire made use of the students' local spoken dialect, based in part on the assumption that the students' language is more than a mere tool used to name objects, but rather an inherent part of their worldview (McKinley 2005). Studies of indigenous communities should strive to make use of the local language and dialect, since this could greatly increase the subjects' ability to understand the questionnaire, and then express themselves fully and fluently in response.

Finally, we recommend that any future tool make use of pictures or other visual representation to help the students more fully understand and connect to the statements. Studies have shown that many children find traditional research tools (like questionnaires) intimidating (since they require high literacy levels), unsuitable (since they often lack any meaningful context) or boring (since they are not enjoyable to complete) (Barker and Weller 2003). In our study, we added pictures to every statement, thus offering a visual representation of its context. This helped the students overcome linguistic obstacles and understand the questionnaire better, increasing the students' interest and motivation and encouraging them to respond. In this context, it is important to note that choosing and matching the right pictures to the statements is very important, since different students may see pictures in different ways. We found that it was important that our research tool contain pictures that were suited both to the content of the statements and the students' culture.

In light of the points emphasized above, additional research is required to integrate these recommendations into research tools for indigenous communities and assess their efficacy in accurately and usefully representing these communities' relationship with their natural environment. Addressing these challenges in the development of future questionnaires could aid in the development of effective, place-based education, which relies on data gathered by reliable tools that are sensitive to the unique perspectives and environment of each particular community.

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Table 1: Details of the Connection to Nature Questionnaire's Development

Category	Statements	Source
Nature enjoyment	When I'm in nature I feel happy.	Cheng & Monroe (2012)
	I like to see wild plants.	Cheng & Monroe (2012)
	There's nothing to see in the nature around me. It's just dirty. *	Suggested by experts in the field
	I like hearing the sound of the birds in nature.	Suggested by experts in the field
	I like touching plants and animals.	Cheng & Monroe (2012)
	I like seeing nature clean.	Student interviews
Experience of nature in my near environment	I like to play in the water of the stream.	Student interviews
	I have fun playing in the sand.	Student interviews
	I like going to the pasture.	Student interviews
	I like running and sliding on the dunes.	Student interviews
	The heat in summer bothers me a lot. *	Student interviews
	The rain bothers me and makes it difficult to walk. *	Student interviews
	I like to milk the goats.	Student interviews
	I like to ride on animals (donkey, horse, camel).	Student interviews
	In nature, animal droppings bother me. *	Student interviews
Empathy for living creatures	I like collecting butterflies. *	Student interviews
	I like collecting eggs and chicks. *	Student interviews
	Sometimes I find animals in nature disgusting. *	Suggested by experts in the field
	I like to feed the birds.	Student interviews
	I don't like seeing wild animals living in an unclean environment.	Suggested by experts in the field
	I like hunting pigeons.	Student interviews
	I feel sad when wild animals are hurt.	Cheng & Monroe (2012)
Sense of oneness	There are no animals in nature that interest me. *	Suggested by experts in the field.
	I can't live without plants.	Cheng & Monroe (2012).
	I can't live without animals.	Cheng & Monroe (2012).
	I feel that I am more important than the plants and the birds. *	Similar to Mayer & Frantz (2004)
	I would prefer to live in the city. *	Similar to Brügger et al. (2011)
	I like to pick wildflowers. *	Student interviews

Sense of responsibility	I am willing to protect the animals in my environment.	Suggested by experts in the field
	I don't care if other children run over the plants. *	Suggested by experts in the field
	I am willing to say something to a friend who harms an animal.	Suggested by experts in the field
	I am willing to protect the nature around me.	Similar to Müller, Kals & Pansa (2009)
	When I see a pile of burning trash, I think that's good, because the trash is not scattered around	Similar to Müller, Kals & Pansa (2009)
	I can't help the stream in my environment. *	Suggested by experts in the field
	I am willing to say something to a friend who throws trash on the ground.	Suggested by experts in the field

* Reverse statement

Table 1 Details of the Connection to Nature Questionnaire's Development.

Figure 1 Bedouin children herding sheep in their natural environment.

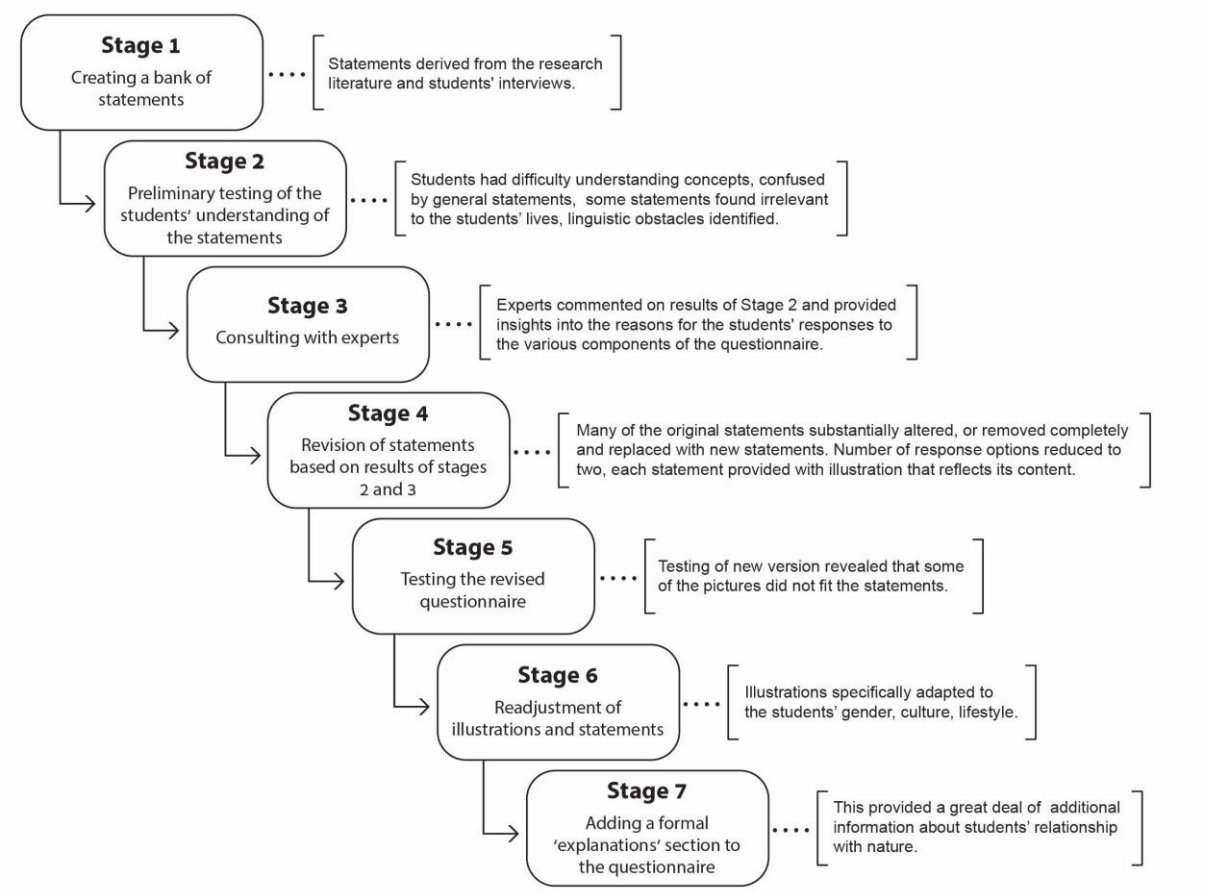

Figure 2 Seven-stage development process of the culturally adapted nature-connectedness questionnaire.

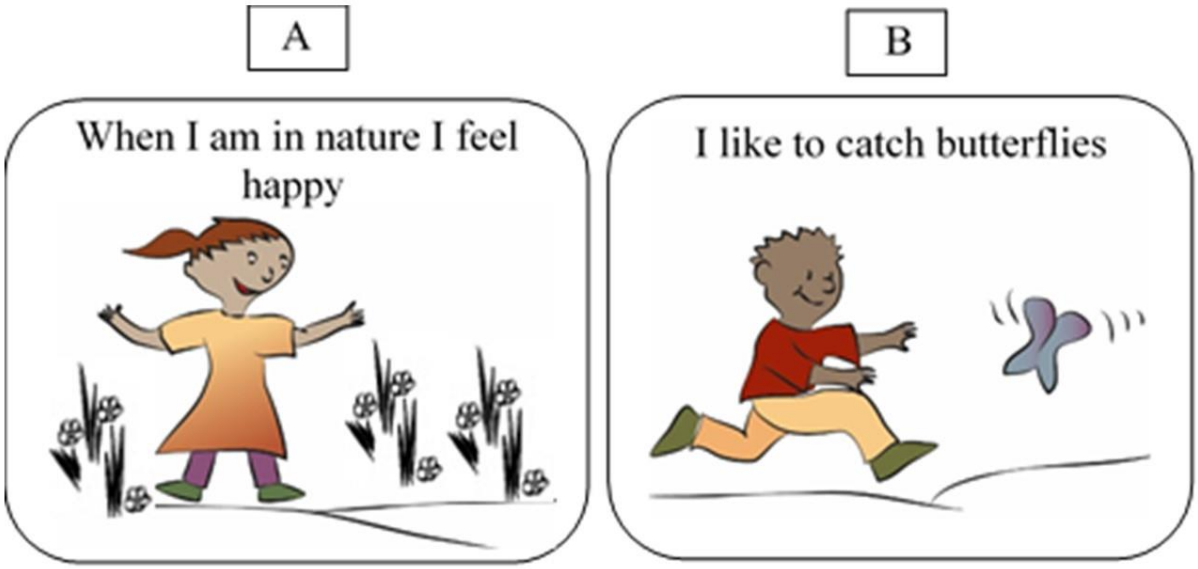

Figure 3 Examples of culturally adapted images in the questionnaire.

Appendix 1: Coding table – list of categories derived from interviews

The table below presents the categories that were constructed based on the semi-structured interviews with the students and the professional who work with the Bedouin community.

Thematic analysis			
Categories that were constructed based on the semi-structured interviews with the students			
Thematic coding		**Description**	**Example**
Experiences in nearby environment	Enjoyable experiences	Positive experiences arising from physical contact with the natural environment	"We play in the weeds, play hide and seek … we also make toys and play with them … like swings, make houses out of wood." "I like the green trees, the pasture, the flowers that grow, I like to play in the flowers."
	Disappointing experiences	Negative experiences arising from physical contact with the natural environment	"I don't like to go to the stream bed, because they always throw trash in it and dead animals." "I don't like playing in the dunes, because the sand makes me dirty." "When it's hot outside, we go out to pasture with our animals for a little while and then go home because it's very hot."
Experiences with living creatures (plants/animals)	Enjoyable experiences	Positive experiences arising from contact with plants/animals	"We have lots of animals … we ride the horses, sometimes ride the donkeys, I herd the sheep, I have dogs and puppies that are always chasing me. I sometimes take the camels to the hill where there are olives to feed them." "I like herding the goats, it's my nature. I feel happy."
	Disappointing experiences	Negative experiences arising from contact with plants/animals	"I like playing in the field, but now when we play in the weeds, we choke on the smell of dead animals and animal poop." "I don't like herding the sheep. It makes me tired."
Experiences connected to feelings of concern and responsibility towards the environment	Experiences connected to positive feelings of concern and responsibility towards the environment	Expressions of concern and responsibility for the environment in the course of their everyday lives	"Some birds have nests in the olive trees. The children hunt pigeons, I tell them 'don't', and my father takes their slingshots." "I like everything, but the garbage I don't like because it makes the place dirty, and the smoke I don't like because it makes me throw up, people burning the garbage."
	Experiences connected to lack of concern and responsibility towards the environment	Expressions of lack of concern and responsibility for the environment in the course of	"Sometimes I pick flowers and put them in a vase." "I like to hunt. The village children make traps for birds … and there's also a wild pigeon. I take the eggs. I know of five trees that have pigeons."

		their everyday lives	
Categories that were constructed based on the semi-structured interviews with the professionals who work with the Bedouin community.			
Cultural characteristics of Bedouin children		Cultural characteristics of students in the Bedouin community	"The child lives in a family with many children and that's a problem. The parents need to care for their kids, but they go to work in the morning, come back in the evening and it's hard for them to educate them. There's been some improvement but it's not enough." (teacher) "The parents are not attentive to the child emotionally. They're concerned with providing for their children's most basic material needs – food, bread … as a psychologist, I also conduct interviews and use questionnaires about feelings, and I see that they have trouble expressing emotions." (psychologist) "The children play in the wilderness … the mother is not concerned about it because there are no roads outside and they're not afraid of strangers. 'Outside' is safe, there's nothing to worry about. I see mothers talking amongst themselves and cooking and not going to check on their kids. The village is perceived as a safe place. In the Bedouin community, in the family's space, all the adults know all the children, they're all responsible and anyone can lay down boundaries for the kids." (psychologist)
Bedouins students' connection to nature		The Bedouin students' connection to nature in their daily lives	"The children are connected to the land … they hear their parents' conversations about protecting the land. Their education at home is to protect the land, to plow and care for it, as private property that needs to be protected." (teacher) "The children have a connection with animals … it's part of the Bedouin society's mentality. They raise and care for animals." (teacher)
Challenges of working with children from the Bedouin community		The difficulties arising in the course of the professionals' work with the Bedouin community	"Environmental education is a low priority in the Bedouin community … the students live in a polluted environment … there's no organized waste disposal and infrastructure, which makes it difficult for them to apply the things they learn in the educational activities." (SPNI coordinator) "The students are very strongly connected to sheep and camels and donkeys. This positive connection comes at the expense of other things. Takes away from their study time. They don't do their homework, a lot of them have trouble in school, they're not connected to technology. My son is four years old and he uses the computer. Here we have 7th graders in school who don't know how to use a mouse." (teacher)

Recommendations for improving the culturally adapted questionnaire	The professionals' recommendations for improving the design and contents of the questionnaire	"I recommend using pictures in the questionnaire … the children feel that the questionnaire is a kind of test, and pictures would make it feel more fun and less threatening." (psychologist) "I would prefer that the statements about environmental behavior be phrased as 'willingness' to act and protect the environment rather than actual behavior … It's hard for Bedouin student to take actual action. Their environment doesn't allow it." (SPNI coordinator). "The children won't understand the word 'field'. They don't use it. You can write the word 'bura' in parenthesis." (teacher)

Appendix 2 Connection to Nature Questionnaire.