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Global Narratives on Education and Sustainability

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Abstract

Education for Sustainable Development has increasingly taken on importance around the world. The Earthducation project has been examining intersections between education and sustainability in climate hotspots worldwide, with six field expeditions completed to six different continents to date. While in the field, the team is documenting culture, environmental issues, and educational practices, and collecting video narratives from individuals discussing the role of, and intersections between, education and sustainability. In addition, the general public has been contributing perspectives on these issues via self-posted videos within an online EnviroNetwork. The data gathered to date illustrate both how education can influence sustainability in different regions of the world, and the complexities that geographic location and culture bring to this topic.

Introduction

As global citizens of different natural environments and different cultures, we collectively and individually have different relationships with the natural environment. These complex relationships are embedded, and can be nurtured, within education. Education for sustainable development (ESD) can help facilitate a shared respect for the natural environment while recognizing the unique factors within individual cultures that affect the formation of environmental attitudes and behavior.

ESD has increasingly taken on importance around the world, in part due to the growing awareness of environmental concerns such as climate change, and in part due to a challenge set forth by the United Nations Decade of Education for Sustainable Development (2005-2014) to integrate the principles, values, and

practices of sustainable development into all aspects of education and learning. There is, as a result, a growing body of ESD literature (e.g., see Blum, Nazir, Breiting, Goh, & Pedretti, 2013; Chalkey, 2006; De Hann, Bormann, & Leicht, 2010; Eilam & Trop, 2011; Green & Somerville, 2014; Karatzoglou, 2013; Kemmis & Mutton, 2012; Reunamo & Pipere, 2011; Rieckmann, 2013; Walshe, 2008; Weaver, 2015), and many places in the developed world have begun to establish policies addressing ESD. The less-developed world is a different matter, however, and case studies on ESD have rarely been drawn from developing regions (Manteaw, 2012; Nomura, 2009).

At its core, sustainable development, or sustainability, is about living responsibly and within limits, allowing us to meet present needs without compromising the needs of future generations (World Commission on Environment and Development, 1987). Environmental, social, and economic demands all impact sustainability, which encourages harvesting from the earth using methods and tools that do not deplete or permanently damage a resource, species, or ecosystem; recognizes the need to ensure the continuation of a plurality of life and a healthy environment for people worldwide and for generations to come; and takes into consideration the importance of equitable distribution of resources and opportunities for all (see International Institute for Sustainable Development, http://www.iisd.org/sd).

Earthducation (Figure 1) is an adventure learning project that has been examining intersections between education and sustainability around the world. This project considers how education in its multiple interconnected forms might influence a healthier future for our planet, from the formal classroom with a designated teacher leading a group of students in learning activities, to the informal social networks and activities that make up our lives, and the passing along of traditional knowledge from elder to younger members of a community. The configuration and role of these varying sources of education look different for different communities around the world. What we know, how we acquire knowledge, and how we define knowledge is tied to place, to landscape, to culture (Roland, Margaret, & Semali, Ladi, 2010). It is influenced by accessibility and infrastructure, and it changes over time.

The Earthducation team has thus been traveling to climate hotspots on each continent, gathering data on local culture, education, and environmental issues, and collecting video narratives from individuals discussing beliefs about how these myriad forms of education impact sustainability in their personal lives and region of the world. Some of these data are being shared online while the team is in the field. They are housed in a website that includes background information about communities and issues being explored, along with associated educational resources and activities for teachers. At the same time, the general public is discussing these issues via self-posted videos in an online EnviroNetwork (Figure 2). Data gathered to date illustrate both how education can influence sustainability

in different regions of the world, and the complexities that geographical location and culture bring to this topic.

Previous studies have found that education can positively influence environmental attitudes and behaviors (Franzen & Vogl, 2013; Hamilton, Colocousis, & Duncan, 2010; Doering, 2006; Doering & Veletsianos, 2008; Doering et al., 2008; Doering & Henrickson, 2015; Henrickson & Doering, 2013; Marquart-Pyatt, 2012; Mayer, 2013; Miller et al., 2008; Tikka, Kuitunen, & Tynys, 2000). Those studies have typically focused on developed nations with high standards for, and broad accessibility to, formal education, and do not assess impact from additional factors such informal learning experiences or familial and cultural attitudes and behaviors. Some recent studies, however, emphasize the importance of community engagement and local culture in ESD in formal education settings. For example, Green and Somerville do so in their compelling examination of teacher integration of sustainability education in primary school classrooms in Australia (Green & Sommerville, 2014).

Other research has provided case studies examining impacts of informal education programs on environmental attitudes and behaviors, with varying outcomes depending on the program being examined. Many of these studies have looked at experiential-focused programs targeting teachers and/or youth, and indicate a positive relationship between first-hand exposure to and engagement with the natural environment and pro-environmental attitudes and behaviors (Bogo, 2003; Dresner & Moldenke, 2002; Irvin, 2007; Lieberman & Hoody, 1998; Riordan & Klein, 2010; Ruebush et al., 2009; Silverstein, Dubner, Miller, Glied, & Loike, 2009; Windschitl, 2003).

Traditional knowledge "encompasses not only empirical understandings and deductive thought, but also community know-how, practices and technology; social organization and institutions; and spirituality, rituals, rites and worldview" (Nakasima, et al., 2012, p. 30). The past decade has shown an increasing number of initiatives and studies exploring the role and impact of traditional knowledge on environmental sustainability (Alexander et al., 2011; Annahatak, 1994; Berger, 2009; McGregor, 2012; Pember, 2008). Traditional knowledge has long served as a means to educate and sustain life, language, and culture among Indigenous peoples worldwide (McGregor, 2010; Nakashima, Galloway McLean, Thulstrup, Ramos Castillo, & Rubis, 2012; Nunavut Tunngavik Incorporated, 2012; Roland & Semali, 2010).

In this paper, we share data and narratives from field expeditions conducted in Burkina Faso; northern Norway; Australia; Peru and Chile; Arctic Alaska and Canada; and Nepal. Based on these narratives, we propose assertions related to how education might influence sustainability, as well as what types of education appear to be influential in the different realms of sustainable development (sociocultural, economic, environmental). We conclude with suggestions for future study.
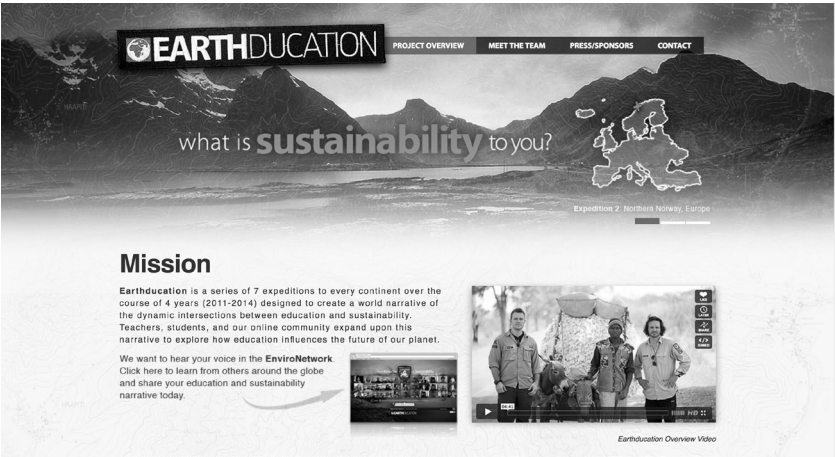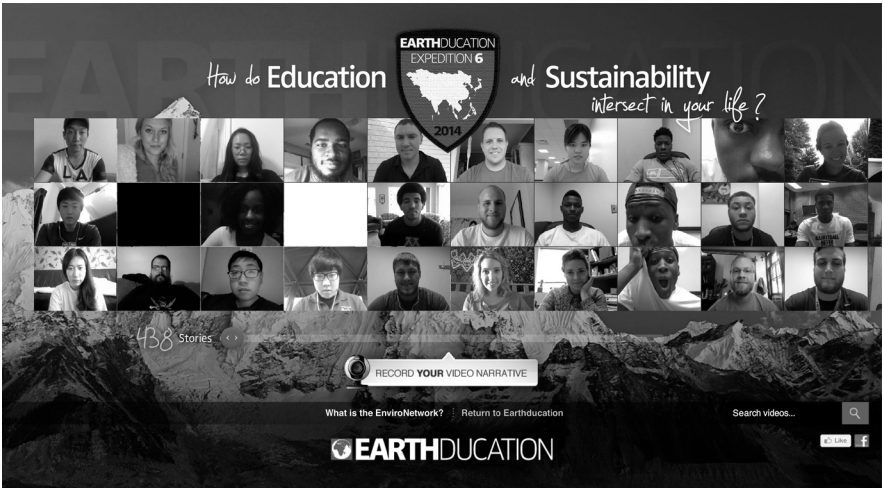
Figure 1. Earthducation main website.

Figure 2. The Environetwork.

Earthducation and Adventure Learning

The Earthducation project evolved from almost a decade of delivering adventure learning (AL) (Doering, 2006) projects to students and teachers around the globe. AL is a form of hybrid distance education that blends experiential (Dewey, 1938; Kolb, 1984) and inquiry-based (Bransford, Brown, & Cocking, 1999) approaches. Grounded in a strong curriculum and pedagogy, an adventure-based narrative, and place-based concepts of learning (Sobol, 2004), AL emphasizes real-world, authentic problem solving, and merges an online learning environment with teacher-led classroom activities. It has been shown to have a positive influence on student engagement, motivation, and learning outcomes, and to be a successful model for teaching and learning across the curriculum (Doering, 2009; Doering, 2015; Doering, 2013a; Doering, 2010; Moos & Honkomp, 2011; Doering, 2012; Veletsianos & Kleanthous, 2009).

Within an AL program, a team undertakes an expedition centered on a specific location and issue, for example, climate change in the Arctic. The team develops an inquiry-based curriculum tied to that issue and location, and then travels into the field to capture authentic data and narratives synched with that curriculum. The team's field experiences, data, and media assets are shared online in an environment where learners are able to interact and collaborate with field experts, the explorers, and their peers and teachers. Learners complete activities related to real-world events, engage in discussions around them, and present potential solutions to issues that are raised, all while following along with the field adventures of the explorers. These experiences allow learners to form connections between what is happening in the real world and their studies.

With its grounding in experiential and inquiry-based pedagogies, adventure learning is a framework that aligns well with environmental education (EE) standards, including the North American Association for Environmental Education (NAEE; www.naaee.org) guidelines for quality EE, and the EE awareness to action model. Adventure learning environments scaffold learners through a similar learning progression as the awareness to action model, guiding the learner from awareness about and sensitivity toward the natural environment, through knowledge-, attitude-, and skill-acquisition, with the ultimate goal of the learner actively participating in environmental stewardship, whether on an individual or larger group level.

Adventure learning also has close ties to place-based education (Sobol, 2004), with each AL project grounded in a specific location and issue. The power of using place-based learning and the natural environment as an integrating context to teach across the curriculum and as a means to help close achievement gaps in education has been well documented (Bogo, 2003; Dresner & Moldenke, 2002; Irvin, 2007; Lieberman & Hoody, 1998; Meichtry and Smith, 2007; Riordan & Klein, 2010; Silverstein, Dubner, Miller, Glied, & Loike, 2009).

As we embarked upon AL expeditions through such projects as Arctic Transect 2004 and the GoNorth! Adventure Learning Series, we collaborated with diverse cultures in locations ranging from the Arctic to South Africa. It became evident there were exhilarating narratives, large and small, that might benefit a worldwide audience and could serve as jumping-off points for critical discussions around ESD. To develop ESD requires insight into regional education in its myriad forms and an understanding of how differing educational traditions relate to the natural environment with respect to structure, content, pedagogy, and process – these are insights and understandings that Earthducation seeks to foster.

Methodology

Research Questions
The overarching guiding questions for the project are below.
- In what ways might education, in its myriad forms (formal, informal, traditional), support sustainable environmental practices?
- In what ways might education, in its myriad forms (formal, informal, traditional), support sustainable cultural practices?

Participants and Data
To date the Earthducation team has visited six continents: Alaska, USA, and Nunavut, Canada, in North America; Burkina Faso, Africa; Northern Norway in Europe; New South Wales, the Northern Territory, and Queensland in Australia; Peru and Chile in South America; and multiple locations in Nepal, Asia. We have collected just over 235 formal interviews, with an additional 438 self-posts in the EnviroNetwork.

Interview questions are translated into the native language of participants prior to travel, and an on-site translator (native speaker) has been used when interviewing participants not fluent in English. Some participants were identified prior to the beginning of each field expedition, and some were identified while the field expedition was underway. Identification of participants results from research conducted by the project team online; discussions with other researchers familiar with the communities to be visited; discussions with local and international leaders in the fields of education, environmental issues, and/or Indigenous studies; and referrals by other participants in the project. Potential participants have been contacted by email, by phone, or in person.

Prior to the team's departure, we work to identify regions strongly impacted by or vulnerable to a changing climate. The Earthducation team works for months contacting locals within these target regions, discussing issues that are most relevant to their lives and setting up the interviews, homestays, and site visits. Also before departure, the team designs and develops a new online learning

environment and EnviroNetwork specific to the continent, communities, and issues of that field expedition.

Formal interviews have been conducted with individuals from diverse backgrounds, ranging from farmers, factory workers, students, and teachers, to government officials, grassroots organizers, indigenous leaders, and much more. We strive to include a balanced perspective from individuals from different socioeconomic and cultural backgrounds in each location. While we also strive to include a balanced representation from both genders, we have found that in some cultures, women are more hesitant to speak on camera or to speak with male interviewers or translators if a female is not available to assist with the interview. Approximately two-thirds of the formal interviews are with men, and one-third with women. Ages of the participants range from 16 through 83. The full interviews span, on average, 30 minutes to an hour.

Data Analysis

Data analysis is ongoing and will continue through the end of the interview collection period in 2017. We used the constant comparative method (Glaser & Strauss, 1967) to analyze participants' interview responses, and took a case study approach to the research design (Merriam, 1998). Researchers engaged in open coding of the data where they independently read and analyzed the data to (a) note emerging patterns and (b) gain an understanding of participant experiences. The researchers then met five times to discuss results, compare notes, and collaboratively analyze data in search of common meanings. The patterns discovered were compiled and reanalyzed in order to confirm and disconfirm themes across and between participants. Analysis continued until no more patterns could be identified and researchers felt that the data had been saturated (i.e., when researchers felt the data had been completely represented by current codes/themes). Once these patterns were identified, they were grouped into the themes. The patterns discovered are continually being reanalyzed as new data is acquired, in order to confirm and disconfirm themes across and between participants.

Triangulation and rigor

Triangulation methods were used to examine the accuracy of the collected data and reduce the possibility of researcher bias in drawing conclusions from the data:

(1) Data were collected from multiple sources (field observations, historical documents, and interviews), and data sources informed each other.
(2) Researchers analyzed data independently and then met to compare and discuss their findings.

(3) One researcher examined the themes and the extent to which they were congruent with participants' experiences as revealed through publicly available artifacts shared in the online learning environment.

For the purpose of this study, we are sharing narratives that best illustrate some of the issues faced by, and views expressed by, participants in the communities the team has visited to date. Some emerging assertions follow these narrative illustrations.

Expedition Narratives
Expedition 1: Burkina Faso, Africa
In this small, landlocked nation where 80 percent of the population relies on subsistence agriculture, the community is facing tremendous impacts from climate change. Unpredictable rainfall and increasingly high temperatures have led to soil degradation, water shortages, and reduced crop yields. These factors combined with a fast-growing population, a weak communications and technology infrastructure, environmentally harmful practices such as deforestation and overgrazing, and an adult literacy rate of less than 30 percent present great challenges to the nation of Burkina Faso.

While Africa overall is facing many environmental, social, and economic challenges, Burkina Faso presents a particularly compelling opportunity to explore the relationship between education and sustainability. In this small, landlocked, and impoverished nation where 80 percent of the population relies on subsistence agriculture, the community is facing tremendous impacts from climate change. Unpredictable rainfall and increasingly high temperatures have led to soil degradation, water shortages, and reduced crop yields, among other impacts (Sawadogo, 2007). Such changes not only disrupt the lives and livelihoods of Burkinabe, but also have the potential to instigate political instability and regional conflict over such issues as water availability, food security, disease prevalence, and population distribution (Brown & Crawford, 2008). In northern Burkina Faso, one recent study has shown that the cultural values of several ethnic groups may be impeding their adaptation to the effects of climate change (Nielsen, D'haen, & Reenberg, 2012).

These factors combined with a fast-growing population, a weak communications and technology infrastructure, environmentally harmful practices such as deforestation and overgrazing, and an adult literacy rate of less than 30 percent present great challenges to the nation of Burkina Faso. Though formal schooling is mandatory through age 16, only about 80 percent of children attend primary school, and less than 42 percent of those who begin are able to complete it. That percentage drops in half yet again in terms of the number of children who continue on to secondary school.

During Earthducation Expedition 1, the team traveled over 1,000 miles within Burkina Faso, visiting 17 villages and towns throughout all regions of the country. The team captured over 35 interviews with individuals ranging from the minister of basic education and literacy, to kings, farmers, teachers, and schoolchildren. The online learning environment showcased both our journey and the interviews we captured, which revealed that some of the key education and sustainability challenges throughout Burkina Faso are access to freshwater, quality education, and food production (agriculture) in a resource-poor and rapidly changing environment. Schools are overcrowded (70-80 students per classroom with one teacher, often not well trained or adequately supported) and ill-supplied with basic tools and books. Students often lack access to freshwater, sufficient food, and sanitary facilities.

Reflections from interview participant Benao, an elder from Zao, captured challenges that many residents in Burkina Faso are facing. He shared that farming and access to freshwater have changed dramatically over the past decades. Many farmers used to plow with hoes, but because the ground is now so dry, they cannot plow by hand. They are instead in need of oxen, but there is not enough water both to grow food for the oxen as well as provide water for both the animals and the people. Also, although in his community there are boreholes for the water, many of those holes are running dry and are not potable. Benao shared, "Living on the land is becoming more and more challenging. We had good rain in the past, which made the ground fertile, allowing us to have a good harvest to support our family. Nowadays, rains are rare. As a result, the young plants die before maturing because of the drought. Freshwater is a challenge for us."

Expedition 2: Northern Norway, Europe
Though Norway is a wealthy country with a high standard of living, a sparse population, abundant natural resources, and a public commitment to living sustainably, the country is facing some tough decisions. Does it continue to expand its oil drilling and mining operations that supply much of its wealth, and risk harming the natural environment, the wildlife and marine populations, and the culture and livelihood of some of its citizens in the north? And what stand should it take on such issues as land and water rights for the indigenous Sami population, aquaculture (fish farming), whaling, and the future of small, rural schools?(Carrington, 2011)

Earthducation: Expedition 2 took the team to Northern Norway, where the water-saturated landscape and abundant natural resources starkly opposed what the team had found in Burkina Faso. This sparsely populated, mountainous region of Norway comprises three counties (Nordland, Troms, and Finnmark) and sits almost entirely north of the Arctic Circle. Within this region, the Earthducation team found a mix of remote villages and small cities; several

distinct cultures and languages; and a number of diverse ecosystems. These factors have led to some unique educational and environmental challenges, along with some creative commitments to sustainability.

Norway has been a global leader in the green movement, with aggressive goals for cutting carbon emissions, a commitment to renewable energy development, and a fishing industry that has been said to be a model for sustainability. It also has a 100 percent literacy rate among its citizens, and a detailed plan for incorporating education for sustainable development into its national curriculum.

Within Norway, the team traveled almost 1,000 miles to 10 communities, capturing more than 30 interviews. Ranging from the tiny community of Digermulen with a school that serves only 12 students, to the isolated island community of Røst and the bustling city of Tromsø, each community faced unique challenges. For example, the island of Røst (population circa 600) is a major producer of Norway's stockfish (dried cod), the longest sustained export in the region. The fishing industry serves as the primary source of economic revenue in Røst. Were the cod to disappear from its waters, the community would be hard-pressed to find an alternate source of income and would likely simply become a ghost town. As interview participant Olaf Jr. from Røst succinctly stated, "If we don't have sustainable catches of cod . . . it means the end of the community, because we are 100% dependent on the cod."

On the mainland in northern Norway, in the Sami community of Drag, the team met with Lars, a Lule Sami leader, who talked about how language and culture influence environmental sustainability. Lars described a recent struggle that occurred in his region, where the Norwegian government was attempting to establish a national park inside a fjord that is a traditional homeland to the local Sami. Lars shared one of the reasons the Sami are opposed to the establishment of a park there.

> A lot of culture [is] embedded in the landscape. When we go into the fjord, we are going home. . . . If the state makes a national park, in itself it could be a good idea. The problem is then we are going into a national park, not home anymore. Those subtle nuances like what a name is is extremely important because it's all about identity, it's all about feeling rooted, connected with the landscape. If you lose the rights to make a definition of the landscape, you also lose yourself somehow through that process. For us, that's a kind of environmentalism, not to lose the connection to the land.

Lars also talks about how the spoken Sami language first began to disappear when the Sami moved from their traditional homeland in the fjord to nearby towns, where they tried to assimilate into the dominant Norwegian culture.

He feels language is crucial to sustaining a strong cultural identity. He and others have established a Lule Sami cultural center that offers language and culture classes, both in-house and via distance education technologies, to help young people in particular learn their native tongue and re-instill a sense of their cultural identity. Lars also works with the local school, which offers a unique curriculum that blends Sami and Norwegian language and culture in all its teaching and learning. About half the school's students are from Sami homes, and half from Norwegian homes.

Expedition 3: Australia
Australia's biodiversity is at risk from even moderate climate change and already under stress, for example from habitat degradation, changed fire regimes and invasive species. (Steffen et al., 2009)

Australia is one of the most biologically diverse countries on Earth. It is home to a rich array of plants and animals, including about one million different native species, as well as the world's largest coral reef system. Unfortunately, Australia also has one of the largest documented declines in biodiversity of any continent over the past 200 years. In addition, it is typically cited as being one of the countries most at risk from climate change.

Earthducation: Expedition 3 was a vast 4,000+ mile expedition across the continent of Australia. Traveling from Sydney to the small Northwest Territory island community of Galiwin'ku to the ranches of Queensland and the Great Barrier Reef, the team observed many close connections between education and sustainability. These observations included how Aboriginal Australians' lives are changing and how their educational system is trying to adapt to bridge two cultures and changing environment. The team also observed how "bringing farmers … on board for conservation is a key step in halting biodiversity decline and an important way to link fragmented habitats" (Pickrell, 2011, np). Sustainable ranching is not about how many acres you own, as we learned from interview participant Roger, a third-generation rancher in Queensland, it's about how you manage your grasslands and grazing.

In addition to pressing environmental issues, Australia, like many countries, is facing concerns about the loss of its traditional cultures and languages. Aboriginal Australians have a long history of and connection to caring for the land, and are the keepers of a wealth of invaluable traditional knowledge related not only to the environment, but also to the arts, culture, and history here.

The indigenous people of Australia have the oldest living cultural history in the world, going back at least 50,000 to 65,000 years, with some of the longest surviving artistic, musical, and spiritual traditions known on Earth. Prior to 1788, when the first Europeans began populating the continent, there were approximately 700 languages and 750,000 indigenous people living in Australia.

Today, there are approximately 410,000 Aboriginal people and Torres Strait Islanders, comprising about 2% of the overall Australian population. Fewer than 200 of the original languages remain in use, and all but 20 are considered endangered. As language embodies cultural, traditional, and ecological knowledge unique to its speakers, the loss of language also embodies the loss of unique place-based knowledge in communities throughout Australia. This connection of language to place, to ecology, is a sentiment echoed above in our interview with Lars, a Sami leader in Northern Norway.

On the island of Galiwin'ku in the Northwest Territory, the Aboriginal population is striving to put their lost culture back into the education system. This has taken the form of introducing more experiential learning opportunities to students outside the school walls, as well as establishing community cultural liaisons and Elders who work with the school and the students, and serve as a community voice within the schools.

Maratja, a respected elder on the island, described how the culture and environment has changed on the island. When asked about how education is impacting environmental sustainability, Maratja replied, "I think we need to do much more work and look at the issue from a holistic view of connecting with the land and knowing where you are coming from in order to make ends meet. In order for us to survive, this issue is really important."

Expedition 4: Peru and Chile, South America
Unprecedented demand for the world's remaining resources, combined with new technologies to extract previously inaccessible resources in the remotest regions, are putting even the most isolated minorities and indigenous peoples under increasing threat from governments and private companies wanting to profit from the resources found on or under their lands. (Walker, 2012)

South America is a continent rich in natural resources, including timber, freshwater, fish, rubber, agricultural products such as fruits, nuts, and quinoa, and minerals and metals such as gold, copper, lithium, and silver. As a result, the countries that inhabit this continent are highly reliant on natural resources to drive their economies and provide a livelihood to their citizens.

Overdependence on these natural resources, however, is neither good for the economy nor the environment. Deforestation, mercury contamination, soil degradation, desertification, and air pollution are only a few of the environmental ills that are resulting from such activities as mining and other natural resource extraction, including the clearing of land for agriculture and the harvesting of trees for commercial purposes. Deforestation in the Amazon basin is a serious concern, in particular, though several countries are beginning to work to slow the rate of clear cutting. Brazil, specifically, has had much recent success in beginning to slow deforestation in the Amazon basin.

Throughout South America there is a growing tension between "global demands for resources and local demands for respect and the safety of their citizens" (Sabatini, 2012), particularly impacting indigenous populations in remote regions of the Amazon and elsewhere. Recent clashes (some deadly) between natural resource extraction firms, such as mining and petroleum companies, and local communities have highlighted this tension and brought this issue to the forefront of discussion in countries such as Peru and Chile.

Earthducation: Expedition 4 visited some of these impacted communities within the Amazon, as well as traveling to two other major environmental hotspots: the Atacama Desert and Chilean Patagonia. Traveling to 16 villages and cities and recording over 50 interviews, we attempted to capture a small glimpse of some of the intersections between education and sustainability found on this continent of extremes.

We first traveled through Villa El Salvador to Villa Maria Del Triunfo, an impoverished community that sits atop a large hill south of Lima. As we made the drive from Lima, we passed many small homes built into the sides of the hills. About 20 years ago, large numbers of people moved to this area from regions across Peru, seeking refuge from terrorism that was occurring throughout the country at that time. The effects of this massive migration continue to be felt, as Lima struggles to provide employment, electricity, freshwater, and sewer services to both the city and the surrounding regions.

At Villa Maria Del Triunfo, we met with Artemio, vice president of the local agriculture association, along with several members of the association who work on a fog harvesting project. The Villa Maria Del Triunfo fog harvesting project was sponsored by USAID, a non-governmental organization (NGO). With an annual precipitation of less than half an inch, rain rarely falls within these regions on the outskirts of Lima, but dense fog is a common occurrence here during the winter months, from June through about November. Tall fish-net-looking screens are thus placed on top of the hills to literally "catch" the fog. The dew of the fog drips down the net into a half-pipe that flows into a canister.

Although fog harvesting cannot be relied on for water year-round, we witnessed firsthand the benefits it provides to communities such as Villa Maria Del Triunfo. Only five years ago the region was nothing more than dry desert. Now, the area is lush green with aloe vera plants growing from irrigation provided by the water collected from the fog. Although there is a filter on each collector, the water is not yet fit for drinking. It is hoped that in the future, the community will be able to derive drinking water from the fog as well.

Artemio shared that education is needed for sustainability in this region where job opportunities are scarce. He stated, "Education is the most important part of our future. Education is needed as it allows us to accomplish projects such as [the fog harvesting]. Without education, we will not move forward in a direction of [sustainability]."

Great strides have been made in education in South America over the past decade. Some of the primary issues still facing many countries there, however, are inequity, affordability, and access, particularly in rural, remote, and indigenous communities. These issues were highlighted worldwide by the 2010–2012 Chilean student protests, in which demonstrators demanded a new framework for education in the country, including more direct state participation in secondary education and an end to the existence of profit in higher education. Currently, only 45% of Chilean high school students study in traditional public schools, and most universities are also private. No new public universities have been built since the end of the Pinochet era (1990), even though the number of university students has swelled. Protests included massive nonviolent marches, but there has also been some violence on the part of select protestors as well as riot police.

Expedition 5: North America
For thousands of years, education was centered on traditional Indigenous knowledge which included not only spirituality, culture, and language, but also focused on local environmental conditions, physics, geology, geography, math, astronomy and other sciences, as well as medicines and medical knowledge. Knowledge about family, community, national and political relations were intertwined with knowledge about our relations with the earth, water, sun, moon, sky, birds, animals, fish and plants. (Chiefs of Ontario, 2012)

Throughout the world, remote communities face similar educational challenges related to formal schooling. These challenges include recruiting and retaining qualified teachers and administrators (Sharplin, O'Neill, & Chapman, 2011), conflicting interests between local culture and national curriculums and educational directives (McClean, 1995; Nunavut Tunngavik Incorporated, 2012; Redwing Saunders & Hill, 2007), and limited access to the infrastructure, technologies, and resources found in many urban and suburban communities (Irvin, Hannum, de la Varre, Farmer, & Keane, 2012). Due to climate and terrain, remote communities may be extremely isolated from the outside world, accessible only by plane or boat, for example. They also may be home to indigenous populations on whom mandated, government-sponsored schooling has been forced, with little to no input from the local community.

The circumpolar Arctic is home to many such remote, indigenous communities. It is also a region that is receiving increasing global attention due to climate change debates and the opening of new possibilities for natural resource extraction and global transportation routes. This increased attention brings its own set of unique challenges, including new threats to local culture, language, and traditional knowledge bases.

For Expedition 5: North America, the Earthducation team visited

communities in Alaska and Canada, including Kotzebue, Noatak, and Kodiak Island in Alaska, and Qikiqtarjuaq and Pangnirtung on Baffin Island in Nunavut, Canada. There were similar themes expressed within these remote, largely indigenous communities, with relation to education and sustainability, and some similar struggles, particularly related to education. As shared in the Canadian Arctic example earlier in this paper, absenteeism in the schools, particularly in the spring months, is a serious concern, as students become engaged in land-based activities with their families. The changing climate is also having an impact in many Arctic communities, on everything from the possibility of the need to relocate entire communities (such as for Kivalina, in the Northwest Arctic Borough) to changing animal migration patterns and its effect on a family's ability to feed itself through subsistence hunting and fishing.

Other challenges expressed by interview participants include basic infrastructure (including everything from water and sewage to internet connection speeds) and housing in these communities; recruiting and retaining skilled teachers and administrators; sustaining and revitalizing cultures and languages fragmented by decades of oppression; creating new job opportunities; adapting bureaucracies to align with local traditions, seasons, and rhythms; and better engaging youth in learning opportunities.

Billy, an Elder in Qikiqtarjuaq, Canada, shared that he was born in a camp outside Pangnirtung before he was forced to move into the community to go to school. He said, "It was a time that the government was just setting up a federal residential school system. At the same time the federal government slaughtered all the dogs across the Arctic so our people, our parents, had no form of transportation for survival. That's why they were forced as well to move to the same location." Billy also spoke about the changing climate, noting, "There's a big change in the climate, it's much warmer in the summer and the season is getting earlier and earlier and here. It was normal that the ice was gone late August, and now last year we were [word unclear] June 22."

Raymond, who works with the schools in the Northwest Arctic Borough in Alaska, emphasized the importance of better engaging students in learning to improve attendance. He talked about the value of experiential learning programs and how critical it is to make learning more culturally relevant to specific communities. Willie, an Elder in Kotzebue, Alaska, talked about how the forced location of the Inupiaq people into communities and into a cash-based economy and a Western school calendar had devastating effects on their traditional culture and language as well as subsistence hunting activities and even the ability of youth to learn basic survival skills critical to understand when one lives in a remote community with such an extreme climate as is found in this area of Alaska. And Sven, the executive director of the Alutiiq Museum on Kodiak Island, detailed the challenges the island is facing in reviving a near-lost language and cultural practices, trying to help reinstate traditional knowledge in a living context.

Expedition 6: Nepal, Asia
Nepal is currently one of the least developed countries on Earth, with the lowest per capita energy consumption. However, with a largely rural population that relies heavily on natural resources and a press toward modernization, Nepal is facing numerous environmental challenges, including air pollution in its urban centers, deforestation, erosion, watershed disruption, pesticide use, and indoor air pollution related to the burning of wood for fuel. Global warming, meanwhile, is instigating rapid melting of critical glacial ice, increasing extreme climate-related events, and threatening the livelihoods of millions of already impoverished communities. Inadequate infrastructure, lack of institutional capacity, and a high dependence on natural resources constrain climate change resilience and are a major challenge for the people of Nepal.

The Earthducation team visited urban and rural communities within Nepal and found some incredibly inspirational implementations of education for sustainability in the remote mountain village of Nangi. At 7,380 feet, Nangi is nestled in the southern flank of the Annapurna and Dhaulagiri ranges of the Himalayas, surrounded by terraced farming and flanked by the high Himalayas in the north, including Dhaulagiri and Annapurna, the seventh and tenth highest peaks in the world. There are fewer than 500 people that live in Nangi, and the trek to reach this small village from the nearest city of Pokhara takes nearly nine hours by jeep, including a harrowing ride up a steep, unpaved road along a route that only opened to motorized vehicles in 2010.

Due largely to the work of local resident Dr. Mahabir Pun and his Himanchal Education Foundation and Nepal Wireless Networking Project, Nangi offers a stunning example of a community that has worked to retain their cultural values and traditions while bringing running water, electricity, and cutting-edge technology into its village and school. From solar panels to water pumps, Internet and computers in the local school, sustainable farming practices, and electricity, the local community and volunteers from around the world have made this village a model of sustainability. Projects the community has undertaken to advance both environmental and economic sustainability include jam making, yak breeding, paper making, and an impressive reforestation project, through which villagers are planting multiple varieties of trees to be transplanted to the forest when the trees are mature enough.

Dr. Mahabir Pun has to date built a network connecting 175 villages to free wireless Internet services through his Nepal Wireless Networking Project. For this pioneering work bringing Internet to rural schools and communities, promoting digital literacy, and helping improve the quality of education, he was just this year inducted into the Internet Hall of Fame in Hong Kong. In our interview with Dr. Pun, he shared his story and his vision for the future with us. His vision includes: (1) a focus on establishing a community-based eco-tourism

program to keep tourism income in the villages, and (2) a focus on establishing an innovation center for the economic development of Nepal using its human resources. Mahabir also described his desire to advance hydropower in Nepal to assist in supporting villages and villagers. With Nepal being second only to Brazil in hydropower, he outlined a vision that would allow plants to sell electricity back to the electric company, providing funds to support people throughout rural Nepal.

Our team observed sustainability innovations in urban settings within Nepal, as well as in rural villages like Nangi. In Pokhara, we interviewed a young farmer, Govinda, who has started an organic farm as an education and training center for locals. On his small farm he is growing more than 30 species of diverse plants, with a commitment to sustainability and pesticide-free food production. His commitment to a sustainable lifestyle extends to his home life as well, where a biogas system fed by cow dung generates cooking gas for the stove. Most homes in Nepal use wood fuel for cooking, which, in addition to contributing to health issues from the smoke generated, is not a sustainable source of fuel without proactive measures to replenish the trees being consumed in the process.

Even in the urban heart of Kathmandu, we find farmers committed to sustainable practices. Our team interviewed members of a local cooperative that has as its mission to help farmers buy land, fertilizer, and seeds, and provide training on new farming technologies and techniques, encouraging reduced pesticide use and more organic farming methods. We were given a tour of plots of land on the city's outskirts where many cooperative members farm, growing vegetables and other crops that are sold within the city of Kathmandu. However, with the rapid growth of Kathmandu, there is worry that these plots will soon disappear, giving way to new buildings and city infrastructure that today literally stretches right to the border of the fields.

One of the least developed countries in the world with one of the highest poverty rates, Nepal is transforming itself from the ground up. The most impressive transformations we observed are springing from small, community-based initiatives, which we found everywhere we went, from the cities of Kathmandu and Pokhara to remote villages like Nangi. We witnessed a host of innovative, inspirational sustainability projects, and found even in areas of great poverty there was an optimistic outlook for the future of Nepal.

Several common themes that appear in the Nepal interviews include:

- A desire to provide enhanced education and employment opportunities for rural communities especially, so villagers do not need to leave their homes to earn a decent living.
- A focus on sustainable farming and providing opportunities for people to grow their own food.
- A concern for the environment and the impact that climate change is having on freshwater access, mountain glaciers, farming, and tourism.

Emerging Themes and Assertions

Some of the themes that have emerged from the more than 235 formal interviews conducted on six continents to date are noted below.

Cultural identity is closely tied to language and the natural environment, and can influence sustainability within that environment.

When culture and language are disrupted through such means as forced removal of a people from their traditional lands, forced relocation of people into permanent settlements and schools where they are required to speak a language different from their native tongue, and/or implementing a school calendar that goes against traditional seasons and cultural activities, it can adversely influence sustainable development in a region. We have seen this evidenced powerfully in communities in the Arctic as well as in Aboriginal communities in Australia.

As noted earlier, Lars, a Sami leader in Norway, expressed how the Sami identity in his community is tied to the fjord where they live, to the landscape. "For us, that's a kind of environmentalism," he said, "not to the lose the connection to the land." He also discussed how crucial language is to maintaining a strong cultural identity, a sentiment that was echoed by interview participants in Alaska, Canada, and Australia.

Willie and Raymond, two Inupiaq Elders in Kotzebue, Alaska, noted that their community was facing degraded social networks, a loss of connection to and understanding of the land, alienation between generations, and loss of culture and language. Factors they felt contributed to these issues included the forced location of the Inupiaq people into settled communities, a cash-based economy, and a Western school calendar at odds with local traditions. All these factors, they said, had devastating effects on traditional culture and language as well as subsistence hunting and fishing activities and opportunities for youth to learn about the land, including basic survival skills critical to understand in an extreme climate as is found in Arctic Alaska. Willie noted, "In order for the next generation to survive, they need an education and jobs… But it's also very important that [this change in lifestyle from a subsistence focus] doesn't destroy our culture, and that's why we're making such efforts to revitalize our language because every culture's dependent on its language. The language dies, our culture dies."

In Arctic Canada, Billy, an Elder in Qikiqtarjuaq, shared a similar story of the shift from a subsistence lifestyle to a lifestyle dependent on a cash-based economy. He discussed the widespread slaughter of sled dogs by the Canadian government in his community and elsewhere in Arctic Canada in the 1950s through the 1970s. Having lost their means of transportation and subsistence travel on the land to be able to hunt and fish, this event forced Inuit people into settled communities and dependence on cash-based economies and store-bought food. In Qikiqtarjuaq and throughout Nunavut in Canada, however, knowledge of

the Inuktitut language has remained strong and is still spoken in many homes, unlike many of the Native languages in Alaska.

On the island of Galiwin'ku in the Northwest Territory, native languages are also still spoken in many homes. The school, however, has only in recent years converted to a bilingual approach, and the Aboriginal population is striving to put lost culture back into the education system there. This has taken the form of introducing more experiential learning opportunities to students outside the school walls, as well as establishing community cultural liaisons and Elders who work with the school and the students, and serve as a community voice within the schools.

Maratja, a respected elder on the island of Galiwin'ku in the Northwest Territory of Australia, described how culture and environment has changed on the island. When asked about how education is impacting environmental sustainability, Maratja replied, "I think we need to do much more work and look at the issue from a holistic view of connecting with the land and knowing where you are coming from in order to make ends meet. In order for us to survive, this issue is really important."

Providing experiential learning opportunities to youth and establishing relationships between community Elders and knowledge keepers and schools is an important component in helping youth engage with the environment and local issues of sustainability.

As noted above, on the island of Galiwin'ku in Australia, we observed programs that were successfully pairing knowledge keepers and Elders from the local communities with the schools, to help the students learn traditional skills, knowledge, and language, all of which are rooted in a deep connection to the land and to principles of sustainability. "I believe mainstream education as we know it doesn't fit remote communities," said Bryan, principal of the local K-12 school on the island. "We're very proud to be a bilingual school…. The first thing our young children have to learn is about themselves, who they are, where they come from, and what their culture is."

Programs designed to connect Elders with students in order to build language skills, cultural identity, and pride, and re-instill traditional knowledge and understanding of the environment are also being put into play in the Northwest Arctic Borough and on Kodiak Island in Alaska. On Kodiak, Sven is the director of the Alutiiq Museum and himself a Native Alaskan. The museum is unique in its push as a museum to not only share traditional knowledge through exhibits and education programs but also in its push to help reinstate traditional knowledge, skills, and language in a living context. The museum is accomplishing this through partnerships with Elders, Native villages, and schools on the island. Sven noted, however, that "most of our fluent speakers in Alutiiq and most of the people who grew up in these traditional ways are 70 and up. Their timeline is

shrinking." He explained the importance of moving quickly to capture existing knowledge before this generation disappears.

Raymond, an Inupiaq Elder who works with schools in the Northwest Arctic Borough in Alaska, shared some powerful examples of engaging youth in experiential, land-based activities outside the classroom walls. He uses such opportunities as an incentive for students to improve their school attendance (students must meet specified attendance requirements in order to participate), while concurrently teaching traditional skills, language, and ecological knowledge through such activities.

Raymond said: "Our place, our lifestyle here in this region above the Arctic Circle, is about survival. You're talking about cold weather, you're talking about gathering food… You've got to have experience on it, you've got to know how to do it. When I teach our language, I include our culture. And we do a lot of hands-on training with our kids using our language and telling stories. Telling stories is important and they learn about [their cultural identity] through our stories."

Raymond emphasized the importance of making learning meaningful and culturally relevant to the communities with which he works. We had the opportunity to participate in a school program with William while visiting Kotzebue in February 2013, traveling out by snow machine with a small group of students, teachers, and elders from Kotzebue High School. The temperature that day was -20F, and we traveled over 70 miles across the ice, collecting ice and snow and water depth samples to be used both in science class as well as by the local authorities in town to help them communicate the safest routes across the ice. All told, the students spent 7.5 hours outdoors, learning not only important science concepts, but also critical winter survival skills, while also contributing important civic knowledge that would aid the safety of the community as a whole as residents traveled out across the traditional routes about which the students had just gathered important ice data.

Schools need to do a better job of adapting to local culture, seasons, and rhythms, to improve school attendance and community engagement.

As noted earlier, we need to start adapting school calendars and hours to local needs, to help improve student attendance and community engagement. This concept is perhaps illustrated most powerfully through experiences in North America in the Arctic. In Alaska, Willie perhaps spoke most strongly to this point when he noted:

> *The white people figured out a way to lock us in, they built the schools, kept us from learning what we needed to learn about survival…. When I was a kid we couldn't wait to move to camp. Then we were free to live with the elements, to welcome the animals that were coming back in the springtime…. I miss that,*

I miss that because now, unless my grandkids have a certain number of days in school, they will not graduate, they will not move up in the next grade… So we've got to adapt to that and we've done that.

Basic needs must be met, and teachers well educated and trained, before being able to successfully speak to sustainability education in a meaningful way.

In Burkina Faso, Africa, it is difficult to speak about education for sustainability in formal education when the classrooms are overcrowded and so many basic needs of the students and teachers are not being met, including access to freshwater, food, and medical care. Approximately 80 percent of Burkinabe live in one of the thousands of rural villages scattered around the country. There is great disparity between its urban and rural areas concerning revenue, health, education, and general infrastructure. The communications and technology infrastructure nationwide is weak. Radio is the country's most popular medium. As of 2008, less than 20 percent of Burkinabe had telephone access, and less than 1 percent had Internet access.

Luc, who is employed with the Ministry of Secondary/Higher Education and Scientific Research in Burkina Faso, shared that, though there are restrictions on classroom sizes in Burkina, they are difficult to enforce. Class sizes in some schools reach up to 130 students with one teacher. He also noted that teachers are sometimes very young, barely older than the oldest students, and that classroom management is challenging for them. Romaric, a Burkinabe who is working with his community to reforest a large plot of land and establish better soil health there, stated that many teachers receive inadequate training and are unprepared to handle the day to day demands of teaching. In addition to poor training and overcrowded classrooms, teachers face lack of access to basic school supplies and resources such as books, paper, and pencils.

Some small villages in Burkina do not even have access to schools. Outside Cassou, the team met with a village Elder and a small group of community members. When the conversation moved into a discussion of education, one community member shared, "We have no school, but sitting here [the Elder] teaches us what he knows. For example, speaking of medicinal plants, when he goes to the bush to look for ingredients such as roots, he has the kids come along. He explains the types of diseases that are cured with these roots. Often he is tired and asks the children to dig for him."

Many people we spoke with in Burkina explained the critical importance of freshwater to communities, and how water impacted every aspect of life there, including education. Lassane, who is heading up a community farm in Sabou, commented, "It is because we have a reliable water source that we can provide an educational forum in which students can learn."

The community farm that Lassane oversees is employing reforestation and water conservation efforts to help improve soil health and grow food sustainably for the local community. It was one of several community-based programs we encountered in Burkina using informal education to advance sustainability. Another example was a shea butter factory that we visited that employed widowed women to help the women pay for their children's education.

Traditional education and knowledge are necessary components to establishing environmental sustainability.

Traditional knowledge is rooted in many years of collaborative, communal knowledge. Modern science and technology certainly can help with some environmental and educational practices, but newer is not always better. There are numerous studies that have emerged over the past decade in particular that speak to the benefits of traditional ecological knowledge and practices.

In many remote communities we have visited throughout the world, a strong connection to the land and to principles of sustainability have been part of the culture for many thousands of years. Ironically, interruptions to those connections and to sustainability seem to begin to occur when cash-based economies and formal education are forced upon communities and when communities are pushed to adapt to non-native languages and lifestyles.

As an Elder in Cassou, Burkina Faso, so eloquently shared, "Being born in this community, our main knowledge is traditional. That is, we know the land, the plants, the animals, and how to live here. We had our traditions before the arrival of westerners."

Willie, an Elder in the Northwest Arctic Borough of Alaska, noted:
Right now, I'm very concerned about my grandkids and I see the change in my life is not going to be the same as theirs, so I'm preparing them to be prepared in any kind of an emergency. I teach them how to hunt, I teach them how to fish, I teach them the land, I teach them the elements, but at the same time I encourage them to go to school. That's the way it is now. Take advantage of what there is today with the jobs and the educational opportunities but still remember your culture. You're an Inupiaq. I teach them that. And these are the things that we eat. Things are the things that we hunt. These are the things that make us Inupiaq. That survived the elements for thousands of years.

Traditional education is not just found in or just important to indigenous communities, however. In northern Norway, on the remote island of Røst, which is almost 100 percent reliant on fishing to sustain its economy. We interviewed

an Elder on Røst, Olaf Sr., who voiced community concerns regarding oil exploration in the seas surrounding the island. Locals are worried that such exploration might alter the annual cod migration, and could destroy the livelihood of island residents. Olaf doesn't believe the Norwegian government understands much about fish or the fishing industry, or that they trust that locals have unique knowledge that is valuable to the debates about sustainable seas. Fishing has been a sustainable endeavor for more than 1,000 years here, and Olaf believes locals should be given more voice in determining how to sustainably manage the industry.

He notes that though it's critical for fishermen today to learn how to use sophisticated computers and navigation equipment, traditional learning plays equal importance in learning this craft. He says: "Fishermen have to know quite a lot about how the sea behaves. You need to know because the machine doesn't tell you it's too bad weather to go in that direction today. I think most fishermen they combine computer and brain, they're good at it."

When asked about sustainability of the sea and the role locals play in that, Olaf notes, "We have to also to take care of stability in the sea and follow all the rules. In years with less fish, we have to be very exact, measuring and having the right numbers, the right figures, everything." The interviewer responds: "Do you think that helps with the sustainability of the fish compared to back when there were no rules like that?" Olaf replies: "We don't know. There is everything in nature goes in cycles. We've had some years of poor little fish . . . and suddenly this year it's exploding, there's fish everywhere. So, we don't know. I think the cycle is more than the strict rules and regulations because I think nature regulates itself to a certain degree. Of course we have to help sometimes, but I think there is more to it than a lot of people think."

Formal education has increased in perceived importance in many rural/remote communities today due in part to the role technology and bureaucracy have come to play in many working environments today.

Formal education has increased in perceived importance in many rural/remote communities today due in part to the role technology and bureaucracy (legal rules and regulations) have come to play in many working environments today, including land-based endeavors such as fishing and farming, which used to be much less regulated and to rely heavily on informal or traditional education via the passing along of knowledge from elder to younger, or master to apprentice. We saw this evidenced in northern Norway in particular, where fishing figures heavily into the economy of many communities. In communities around the world we've visited, however, interviewees have spoken to the importance of formal education in securing a well-paying job.

A cotton farmer in Burkina Faso, Bouliou, shared: "Education is very important to me. With the land degradation it is difficult to be a farmer so I am

forced to learn other jobs to be able to get by. I cannot cultivate during the dry season due to lack of water so I am forced to take other small jobs to get by. … I see the value of education today. I'm not happy for not being able to pursue my schooling. I would like to go back to school."

Benao, an Elder from Zao in Burkina Faso, noted: "Education is important to us because without it we are blind…. [but] we need help in order to educate our children. Living on the land is becoming more and more challenging. We had good rain in the past, which made the ground fertile, allowing us to have a good harvest to support our family. Nowadays, rains are rare. As a result, the young plants die before maturing because of drought. Fresh water is a challenge for us."

Willie and Raymond, Elders in the Northwest Arctic Borough in Alaska, both spoke about the importance of formal education today in securing a job. Raymond commented: "We had a great big change like urban lifestyles now… We've got better machines… better technology, better houses, but it costs money. In order to live that new urban lifestyle you have to have a good job to pay for that urban lifestyle. Fifty years ago it wasn't like that. Fifty years ago there was no running water here, there was hardly any electricity, people were packing their own water, they were hauling their own wood to heat the houses, and go out and hunt off the land to bring food on the table."

Olaf Sr., an Elder on the remote island of Røst in northern Norway, also noted how crucial formal education is for young people today: "It's extremely important because we see that the companies that are growing, they have people with good education, very good education, for economy, for hand treating fish, and all that. Some years ago, you could do anything, but now you have a million rules to follow and if you're not good with computers, you've got no chance." Olaf explains that the computers are used not just on the business side of fishing, but on the boats as well, which have become highly sophisticated equipment-wise.

He says, "I see in companies now the young people who go away five, six, seven, eight years, they come back and get to work in their family companies and they have a lot to give back to their companies because of their education. I think education for running fish industry is absolutely necessary, but that's necessary for almost any industry you want to join.

"The young men who want to go into fishery, before they just started on the boat and worked and got on and buy a new boat for their own, and bigger boat and bigger boat. But now the people who want to be fishermen, they go to the school to learn navigation, economics, everything . . . because the fishing boat is like a computer, everything is done with that, you just look at the map and you plot in the route and the boat almost goes by itself (laughing)."

Broader Implications

When taken as a whole, these assertions and others from the interviews to date lend themselves to the formation of broader assertions about how different types of learning might influence sustainability. We caution, however, that though there are similarities facing some of the communities we have visited, there are also unique sociocultural, geographic, and economic factors influencing each community that must be taken into account and that mediate making too broad of comparisons. For example, a country like Burkina Faso in Africa faces so many stark environmental, political, and economic hurdles compared to a country like Norway that addressing what form education for sustainability might take in each region must be examined completely independently of the other. On the other hand, the Aboriginal communities in Arctic North America and those in Australia face some similar historical and political struggles (e.g., forced settlement in government-designated communities and forced residential schooling, to name a few) as well as similar cultural connections to the land, such that ESD in these communities might share certain characteristics (e.g., experiential learning opportunities and partnerships between schools and community Elders). Such are some of the complexities that geographical location and culture bring to the topic of ESD.

Educational initiatives that appear to be producing the most engagement and pro-environmental influence from a community level toward achieving sustainability in countries including Norway, Nepal, Australia, the United States, and Canada, are ones that actively invite community members to participate in formal schooling, and that integrate traditional knowledge and experiential learning activities into the curriculum. For example, in a community such as Pangnirtung on Baffin Island in the Canadian Arctic, students are brought out on the land for a three-week spring camp to learn by working with Elders and family members – the traditional Inuit way (e.g., see Davies, 2009). This finding aligns with previous studies focused on both community engagement and experiential education noted earlier in this paper's introduction.

The Earthducation narratives illustrate the type of challenges formal education faces when inherited human relationships to the natural environment are not paralleled within educational settings. For example, in regions where subsistence-based hunting and fishing activities are critical to sustain life and culture, schools would be advised to adapt their calendars to accommodate those activities – or to offer alternative opportunities to students to complete schoolwork during those times. School attendance typically falls dramatically during late spring in the Arctic, for example, as families travel out of the community to camp on the land for extended periods.

Bonds between culture and climate continue to change across the planet as events such as climate change, technological globalization, and resource

extraction reach the remotest regions of the Earth. These changes need to be addressed in education in all its guises.

Online and mobile technologies offer great opportunities to rural and remote communities, in particular, to extend learning opportunities in all realms, and to capture and preserve traditional knowledge that is being lost as Elders pass away and native languages are eroded by encroaching social changes. Unreliable and unaffordable Internet service and slow broadband speeds are issues plaguing many remote communities currently, however. Broadband access in Burkina Faso, for example, is among the most expensive in the world, with fees reported at about $1,300 per month (Smith, 2009). Internet use in Africa lags significantly behind the rest of the world. In 2010, Internet user penetration in Africa was estimated at 9.6%, compared with a world average of 30%, and a developing country average of 21% (International Telecommunications Union, 2010). Radio is Burkina Faso's most popular medium. As of 2008, less than 20 percent of Burkinabe had telephone access, and less than 1 percent had Internet access. Mobile phones, however, outnumber landlines by a 15 to 1 margin, with approximately 2.6 million mobile phone subscribers as of 2008. Mobile phone use predominating over landline use is a trend found throughout Africa, which has seen mobile phone use increase by 550% over a five-year period. Mobile technologies thus offer some exciting educational possibilities there.

Teacher education and training is also an important ongoing factor that is impacting the integration of sustainability education, not just in developing countries but worldwide. We observed some of the strongest teacher education around sustainability issues in Norway and Australia, and encourage other nations to work toward.

Conclusion

Education in all its forms has the power not only to influence the methods and tools we use to conduct our lives and the decisions we make, it also broadens accessibility to additional sources of knowledge, empowers individuals and communities, and can shift attitudes and behaviors in ways that benefit not only those directly involved but the world at large. At its heart, education is about forming individual as well as collective wisdom in order to develop understanding, better lives, and protect the diversity and spirit of human communities and natural environments worldwide.

The Earthducation team has traveled to six continents to date, learning about and documenting local culture, environmental issues, and educational practices, and collecting video narratives from a broad array of individuals discussing their beliefs about the role of and intersections between education and sustainability. The formal interviews gathered and shared during each expedition are beginning to form a picture of how education can influence sustainability, as

well as illustrating the complexities that geographical location and culture bring to this topic.

Understanding the connection between education and the natural environment on local scales may enable and empower change in education on a global scale, as it provides structure for modeling new approaches to education for sustainable development. A key outcome of this project upon its conclusion will therefore be the creation of a global dialogue of collective beliefs on education and the environment that can serve as a foundation for embedding sustainability in learning at all levels in all cultures. At that time, we hope to be able to posit answers to such questions as:

- How do views of education and sustainable development differ and converge from community to community, and culture to culture, around the world?
- In what ways do our educational experiences and local landscapes influence the creation of our individual and collective ecological identities?
- Can knowledge of different regional approaches to education aid us in developing a global approach to education that facilitates the emergence of a universal ideology of nature or a common cultural model about the environment?
- How does education culturally inherent to a region's natural environment serve the process of learning for sustainable development?

These are just a few of the societal and scientific impacts we foresee could result from this research. We expect, however, that as the base of data and experience grows with each subsequent expedition, this project could have additional impacts on both a local and global scale, and we encourage other researchers to engage in their own examinations of the questions above.

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