Leveraging Indigenous Knowledge to Foster Developmental Entrepreneurship

Khanjan Mehta, Lead Faculty, Humanitarian Engineering and Social Entrepreneurship (HESE)
Ladi Semali, Associate Professor, College of Education
Aaron Fleishman, Project Engineer, HESE, College of Engineering
Audrey Maretzki, Emeritus Professor, College of Agricultural Sciences
Penn State University

ABSTRACT
Indigenous knowledge is about the ways of knowing, seeing, and thinking that are passed down orally from generation to generation, and which reflect thousands of years of experimentation and innovation in all aspects of life. Indigenous knowledge has value not only for the culture in which it develops, but also for scientists and entrepreneurs seeking solutions to community problems. Considering indigenous knowledge is essential when conceptualizing, validating, and implementing entrepreneurial ventures in developing communities. Penn State is producing a series of thirteen video clips of 6-8 minutes each capturing compelling stories about the importance of indigenous knowledge systems in developing and implementing entrepreneurial strategies to address global challenges and foster development. The video stories discuss how indigenous knowledge helped solve a significant problem, as well as the processes used to uncover indigenous knowledge, validate it, and apply and integrate it into community development projects in various parts of the world.

Introduction
Can we use stories to capture the importance of place-based indigenous knowledge and foster developmental entrepreneurship? That is the question this paper attempts to answer. Stories are the universal way of teaching. Stories can be used to build a rapport and personally connect with others. Stories transcend language, culture, and disciplines. When working with something as “foreign” as indigenous knowledge, stories provide a powerful tool to engage and educate, to ask provocative questions and illustrate valid answers. The use of stories by ethnographers as an educational tool, as well as a potent research paradigm for indigenous communities is well documented (Lekoko 2007). But the use of stories for uncovering indigenous knowledge, validating it, and applying or integrating it into teaching, research, and outreach activities in higher education is less common.

In this paper, we showcase video stories developed by our team to demonstrate compelling experiences captured in 6-8 minutes each. The interviewees and general topics of the video clips are provided in Table 1.
<table>
<thead>
<tr>
<th>Name and Affiliation</th>
<th>General Theme of Video</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ted Alter&lt;br&gt;Agricultural, Environmental and Regional Economics</td>
<td>Defining indigenous knowledge and discussing alternative epistemology. Also, other speakers discuss ICIK at Penn State and the objectives of the video series.</td>
</tr>
<tr>
<td>Khanjan Mehta&lt;br&gt;Humanitarian Engineering and Social Entrepreneurship</td>
<td>Telemedicine and the importance of traditional healers. Role of social capital and trust in developing appropriate business models for developing communities.</td>
</tr>
<tr>
<td>Audrey Maretzki&lt;br&gt;Food Science &amp; Nutrition</td>
<td>The story of Nutribusiness, a modern food product made from traditional Kenyan food crops.</td>
</tr>
<tr>
<td>Duarte Morais&lt;br&gt;Recreation, Parks &amp; Tourism Management</td>
<td>Self-determination and tourism development. Portrayal of indigenous peoples.</td>
</tr>
<tr>
<td>Fran Osseo-Asare&lt;br&gt;Entrepreneur - Betumi.com (Indigenous Foods of Africa)</td>
<td>The myth of African cuisine and how urbanization is hurting the image of agriculture.</td>
</tr>
<tr>
<td>Madhu Suri Prakash&lt;br&gt;College of Education</td>
<td>Slow Food Movement and the Happy Planet Index.</td>
</tr>
<tr>
<td>Mary Marete&lt;br&gt;Grad Student, Agricultural Economics</td>
<td>Stories related to agriculture from her childhood in Kenya.</td>
</tr>
<tr>
<td>Michael Jacobson&lt;br&gt;Forest Resources</td>
<td>Successful businesses based on traditional African flora: Baobab tree, Fordoun Spa, and Amarula.</td>
</tr>
<tr>
<td>Carolyn Sachs&lt;br&gt;Agricultural Economics &amp; Rural Sociology</td>
<td>Stories of women as keepers of agricultural knowledge in many developing countries.</td>
</tr>
<tr>
<td>Mary Chandy Vayaliparampil&lt;br&gt;Grad Student, Educational Theory and Policy and Comparative International Education</td>
<td>Traditional Indian education system (Guru-shishya parampara) and its relevance to modern education</td>
</tr>
<tr>
<td>Bruce Martin&lt;br&gt;College of Education</td>
<td>How the Ojibwe people connect language and culture, and other ways of knowing.</td>
</tr>
<tr>
<td>Clemente Abrokwa&lt;br&gt;African Studies &amp; Conflict Resolution</td>
<td>How music represents life and how it is used to resolve conflict in African villages.</td>
</tr>
</tbody>
</table>

Table 1. Themes of the Video Clips

These video stories highlight how indigenous knowledge helped solve a significant problem or provided valuable insight into a particular aspect of the problem. Each story has a theme and responds to a development question. The two overarching goals of this video project are to create an appreciation for the importance of indigenous knowledge in entrepreneurial engagement ventures and to illustrate effective ways of bringing alternative knowledge bases into the academy. Our underlying assumption is that stories can provide an antidote to the resistance of students and some faculty members to critically examine “dominant ideological assumptions” that owe their genesis to the privilege enjoyed by western epistemologies and models of thought. This effort responds to our unwavering quest: How can we ensure that learners are informed about the full history of ideas and events that have shaped and continue to shape human activities and their development? This information is critical in the design of solutions that target or affect the communities in question.

The video stories initiative is part of our commitment to integrate indigenous knowledge into new approaches to health, nutrition, agriculture, and conservation of the environment. The generally accepted assumption behind these initiatives is that new approaches should not replace indigenous knowledge, but rather should make use of the knowledge that has been produced by generations of practice by families, traditional healers, shamans, and farmers to address local concerns.

Many indigenous cultures use stories to convey events in words, images, and sounds. Stories or narratives have long been shared in every culture as a means of entertainment, education, cultural preservation, and often to instill moral values that are specific to a particular community. However, few examples exist where stories are used to overcome persistent intellectual barriers that have historically served to devalue knowledge generated outside the bastions of academia or the corporate world. The individuals featured in these video stories are convinced that indigenous knowledge has immense value not only for the conceptualization, validation, and implementation of en
trepreneurial ventures, but also in our quest for solutions to problems facing humanity on a global scale. We urge social scientists to take the lead in discovering and validating this knowledge and to work with others such as engineers, educators, health care professionals, agriculturalists, and entrepreneurs to consider this knowledge in the design process.

Humanitarian Engineering and Social Entrepreneurship

The Humanitarian Engineering and Social Entrepreneurship (HESE) initiative is housed in the College of Engineering at Penn State. The basic philosophy of HESE is the convergence of concepts, disciplines, cultures, and countries towards a freer, fairer, friendlier, and more sustainable world. HESE brings together students and faculty from various disciplines to develop innovative and practical technology-based solutions to address the most compelling challenges facing marginalized communities in the developing world. The initiative seeks solutions that meet the four hallmarks of sustainability: technologically appropriate, environmentally benign, socially acceptable, and economically sustainable. HESE also seeks the convergence of the tripartite university missions of teaching, research, and outreach to educate globally-engaged social problem solvers and to create sustainable value for developing communities, while generating and disseminating knowledge and lessons learned. Forming long-term relationships with multi-sectoral partners and leveraging indigenous knowledge to foster developmental entrepreneurship create the foundation for all our initiatives. HESE works closely with the Interinstitutional Consortium for Indigenous Knowledge (ICIK) at Penn State on various teaching, research, and outreach initiatives.

Interinstitutional Consortium for Indigenous Knowledge (ICIK)

The Interinstitutional Consortium for Indigenous Knowledge was established at Penn State in 1995 with the goal of linking faculty, students, and community residents from across the Commonwealth of Pennsylvania and beyond its borders. Individuals who become part of the consortium are those who value the many kinds of knowledge that exist outside the academy while also valuing the contributions of western science. Local/traditional/indigenous knowledge is, at present, often devalued within academic classrooms, research laboratories, and outreach centers where its presence could foster useful insights. Penn State’s ICIK is the only global indigenous knowledge center in the US. Its primary function is to facilitate the creation of interdisciplinary teams that are synergistic in their efforts to bring indigenous knowledge into the academy. We believe indigenous knowledge exists in a reciprocal relationship to the academic outreach programs through which universities transfer knowledge and technologies generated within the academy. Through its relationship with HESE, ICIK has helped to foster successful outreach/inreach partnerships that are gaining support within the academy.

Indigenous Knowledge and Development

Our current concern with local communities and their uniqueness reflects emerging concerns of western society about the way it confronts other cultures. In recent years, some scholars and practitioners have sought ways to harness indigenous/local knowledge for community development (Semali et al. 2007). They have challenged the “externally” imposed knowledge and policies developed by experts and have sought ways to create collaborative forms of knowledge that underpin more appropriate and sustainable programs that value indigenous ways of knowing, thinking, and managing a community’s local environment (Semali et al. 2007). Yanow defines local knowledge as: “the very mundane, but still expert, understanding of, and practical reasoning about, local conditions derived from lived experience” (2003). Lack of attention to such knowledge has led to negative consequences. For example, Visvanathan identifies a number of disasters resulting from scientifically-driven development in India that failed to recognize and take note of local knowledge (2005). On the other hand, indigenous knowledge is gradually being re-evaluated and considered as an inspiring source of strategies for sustainable development (Fernando 2003).

The argument presented in this paper is that, to remove stories from the academy or from development endeavors, particularly stories that represent indigenous people and their knowledge, is to silence indigenous voices by depriving them from using a mode consistent with their culture and their ways of understanding, knowing, and learning in the world they live in. It is difficult to imagine implementing the United Nations Millennium Development Goals (MDGs), which aim to significantly reduce world poverty, without valuing local knowledge and the contributions of the keepers of such knowledge. Whether to implement change or diffuse new innovations, it is important to engage participants to identify, validate, and develop safe, effective, and affordable local solutions. Some examples of situations amenable to the application of indigenous knowledge include finding remedies for infectious diseases; resolving issues related to child and maternal health; promoting collaboration between professional researchers and indigenous practitioners; supporting intergenerational transfer of indigenous knowledge and cultural heritage; and designing appropriate educational materials to encourage practices that enhance individual and community well-being, while empowering women and other marginalized groups.

Engaging in participatory dialogue and collaboration between local scholars and residents of communities provides opportunities for moving the academy toward community engagement. Within this framework, a Community Driven Development (CDD) approach that celebrates the stories of rural people and their institutions as partners and assets for a common goal provides the necessary bridge to sustainable solutions as defined by the MDGs. CDD is increasingly seen as a nexus between bottom-up and top-down approaches to improved governance and service provision (World Bank 2000; Dasgupta and Beard 2007).

In producing visual narratives that illustrate the power of stories, we saw an opportunity to engage in a deliberative dialogue about recognizing and documenting indigenous knowledge. To carry out this goal, we are generating video stories that are compelling enough to
transform the academy in a variety of ways, including modifying its institutions into a marketplace of multiple ways of knowing; internationalizing its curriculum; expanding its research methods beyond positivistic approaches; and diversifying its pedagogical approaches to embrace both non-western as well as western educational knowledge and ways of knowing. It is difficult to promote the merits of this valuable tool and the dynamics of telling stories to facilitate learning within the highly structured environment of higher education, which is resistant to new ideas and particularly to ideas that have not originated from the academy itself (Semali and Maretzki 2004).

Supporting this argument are discussions and examples focusing on aspects such as the nature and structure of stories, the social meaning of stories, potential benefits of using stories in development and in entrepreneurial ventures, and the accompanying challenges of using new technologies such as photo-voice and video-voice in participatory action research (McTaggart 1997), participatory video (Lunch and Lunch 2006), or video-cued multi-vocal ethnography. Using stories in classrooms is a way of averting the use of mainstream theories that do not respect indigenous identity, culture, experiences, and ways of knowing, and counteracting the resistance of individuals to go against the established mainstream ideology or belief system.

**Barriers to the Inclusion of Indigenous Knowledge Concepts in Academia**

In 2004, a web survey was conducted in which all Penn State faculty employed at the main University Park campus, as well as county-based Cooperative Extension agents and faculty located at 22 Commonwealth Campuses, provided information on perceived barriers to the incorporation of indigenous/traditional/local knowledge into their teaching, research, and outreach activities. This survey revealed that place of employment, discipline, and academic rank, as well as peer support, were all predictors of a faculty member’s reported use of knowledge generated outside the university system (Semali, Grim, and Maretzki 2006).

Individuals housed on the main campus were significantly less likely than those working in other locations to report using indigenous/traditional/local knowledge in their teaching, research, and outreach activities. Faculty in the “hard” sciences were significantly less likely to employ indigenous/traditional/local knowledge concepts than their peers in the social sciences and humanities. Additionally, faculty with higher academic ranks were less likely than those at lower ranks to use such knowledge.

These findings are, in general, quite intuitive. It comes as no surprise that chemists, physicists, and others who rely upon empirical data that can be quantified and subjected to rigid hypothesis-testing would not place a high value on scientific knowledge generated through observation and experimentation. This is true in spite of the success of the gradual “trial and success” process that led to crop varieties well adapted to agro-ecologically challenging locations, water harvesting and storage techniques in arid locations, and housing structures appropriate for severely cold climates.

Finally, it seems quite reasonable, upon reflection, that senior faculty, who have succeeded in an environment where peer review of competitive grant proposals and scholarly manuscripts by their disciplinary colleagues is the institutional norm, would be unlikely to embrace knowledge systems that are not fully recognized as acceptable in their discipline. It is senior faculty who evaluate junior faculty, but it is junior faculty who profess a greater interest in using indigenous/traditional/local knowledge. However, they are likely to receive little support within the academy for doing so.

These barriers bring us to peer support, the single factor from our survey that enhanced faculty use of indigenous/traditional/local knowledge in their teaching, research, and outreach. Peer support serves as the justification for documenting “compelling stories” of individuals who have overcome those intellectual barriers that have historically served to devalue knowledge generated outside the academy. Peer support of younger academics for the admission of locally-generated knowledge into their classrooms, research laboratories, and outreach settings should be undertaken by successful and enthusiastic mentors working in their respective disciplinary departments. Given today’s academic climate, however, this type of peer support is unlikely to be spontaneously generated.

**Academia and Developmental Entrepreneurship**

Globalization has increased the interconnectedness between nations and people of the world. It has also put increased pressure on educational institutions to prepare students for life in an increasingly connected and borderless world. In response to this “flattening” of the world, there is a growing trend towards internationalizing the curriculum at universities. Universities are challenged with how to expand these educational experiences from a select few to the vast majority. They are also trying to find innovative ways to provide both travel and non-travel based experiences that will expose students to international issues. Integrating socially and globally relevant perspectives and issues into classes is one such strategy, and this video series provides a nucleus for rich discussions and further exploration.

The engineering profession is currently one of the most global professions, with international design teams developing technologies for international markets. The university’s strategic focus on experiential, cross-disciplinary, international education with an entrepreneurial flavor is being harnessed by academic programs to develop technology products that help disadvantaged people in developing and underdeveloped countries. Many universities have local chapters of organizations like Engineers without Borders and Engineers for a Sustainable World that engage in service learning and development projects around the world.
In order for these solutions to be successful and sustainable, they must be designed with the intimate involvement of all stakeholders so that the designs meet their needs and use preferences and contribute to a self-determined improvement of livelihoods and agency. History is filled with costly, unsustainable, and ineffective development projects designed by international experts. There is no data available on the importance placed on indigenous perspectives and knowledge by the multitudes of students who travel to remote communities to “help” them with their pre-conceived projects and solutions. For whose benefit are we engaging in these projects? If it is for the community’s benefit, how can we ignore the vast knowledge that they have accumulated over time?

The next section of the paper presents numerous stories narrated by the interviewees in the video series. The video series is a way of showcasing the stories of individuals who, regardless of their discipline, research interest, or experiential background, are known as persons who consciously and respectfully employ indigenous knowledge in their academic activities. It is especially challenging for young academics to bring indigenous knowledge into their classrooms and laboratories, because they may fear ridicule or condemnation from peers. This video series can be seen as an academically acceptable way to introduce indigenous knowledge concepts into settings where the source of the knowledge can be objectively considered, the ways of knowing in indigenous and western cultures can be compared and contrasted, and the value as well as the validation of both research-based and indigenous knowledge can be discussed. Our team is currently developing the video series into learning modules, where each video will form the nucleus of a rich discussion in a typical 50-minute class.

**Indigenous Knowledge: Is it Really There?**

Carolyn Sachs was working in Swaziland, advising farmers on how to obtain a higher maize yield. Her team was advising people on how to use a certain kind of fertilizer. One of their observations was that women weren’t weeding the maize in a timely fashion, thus reducing its yield. The team assumed that women were not weeding because they were time-constrained due to household chores and child care. Several years later, a student was studying the nutrition of these families and discovered two plants that the people were eating with every meal. The researchers discovered that those two crops were what the scientists had identified as “weeds” in the maize fields. Women were letting them flourish, not because they were lazy or didn’t have enough time, but because those “weeds” were known to be healthy. Indeed, they are an important source of vitamin A in the family diets.

Mary Marete grew up on a small farm in Kenya and worked as an agricultural extension agent. One of her stories is about how farmers are supposed to respect their farm’s boundaries by not planting crops close to their neighbor’s farm. One farmer, however, grew gravelia at the boundary with a neighbor. The neighbor decided to avenge his neighbor’s unacceptable behavior by planting a tree on his own boundary that consumes a lot of water. The angry farmer did not actually know how the tree worked, he just knew that once he planted his tree it was going to kill the gravelia. He planted the tree and the gravelia died within a week! The neighbors were fighting with each other using their knowledge of plants and trees.

Bruce Martin grew up living with the Ojibwe people. He tells the story of going on the lake fishing with an Ojibwe friend and saying to him “the sky is as clear as crystal,” to which his friend responded “we need to get off the lake” or “we need to get behind those islets. There’s a storm coming.” There was nothing on the horizon, but an hour later there was a huge storm. How does an Ojibwe know that? It’s not “the sky is as clear as crystal,” but “you can see the signs” which he knew how to read. How does an Ojibwe know that? It’s not just by physically seeing because it’s not on the horizon. There’s a very complex sort of process that goes on and it can only happen with people who’ve known this lake for years, who know how to read those signs, know how to feel the signs of that land, and those lakes. There’s no other way to explain it... but it happens all the time. Is that not knowledge?

**Sticky Information and Indigenous Knowledge**

The primary challenges of technology-based social ventures are often not on the engineering side, but with the cultural, social, and socioeconomic aspects. In product development parlance, we need to effectively uncover the “sticky information” related to the societal context of the problem (von Hippel 1994). This sticky information helps identify key stakeholders, constraints, and resources to be considered in the design process leading to sustainable solutions (Mehta et al. 2009). The sticky information needs to be uncovered and embedded in the project from the conceptualization stage. There are various ethnography-based approaches for identifying and embedding sticky information into the design process. IDEO, considered one of the most innovative design companies in the world, has developed and shared numerous methodologies for human-centered design (2010). Some of these methodologies can help uncover and leverage sticky information and indigenous knowledge in the design process. A related body of knowledge is “systems thinking” and in previous work, we have developed and shared practical methodologies of integrating systems thinking into the design process in an academic setting (Stepler et al. 2009). For social entrepreneurial ventures, it is critical that the strategy for the implementation/rollout is devised with societal context in mind. The indigenous knowledge that resides in the community is the richest source of sticky information and can be crucial to develop appropriate and sustainable solutions to foster self-determined development.

Duarte Morais tells the story of Lan Yue, a tiny windswept island on the eastern side of Taiwan. The government tried to do top-down improvement and arrived with a Japanese colonial perspective to build housing for tourists. The government did not realize and acknowledge that housing had cultural meaning. They built many identical houses with ocean views because outsiders felt it was desirable. However, the island is wind-swept by typhoons every year. Traditional houses were buried down into the ground and the number of doors...
corresponded to the status of the family. The new houses are eyesores, and they compromise the aesthetics of the island. The houses are not occupied; they hurt touristic appeal and result in a significant loss of potential revenue for the tourism industry. Future tourism development is encumbered by this previous mistake. Though Lan Yue is a place where we can study the effects of failure to value local knowledge, mistakes are still occurring. An airport is being built in a windy area, against the advice of the locals. Tourists don’t like to be there at most times of the year because they are frightened by the winds. Despite repeated evidence of how things shouldn’t be done, government-backed developers continue to ignore the locals.

Indigenous people know what their problems are, how their system works, and what improvements can be made. However, they may not have the capacity to make those improvisations and develop those innovations, which provides collaboration opportunities for programs like HESE at Penn State. This inability to solve their problems by themselves might be due to a lack of knowledge or funding, or it might be power structures that don’t allow them to make a change everywhere. University-based programs work collaboratively with a range of stakeholders to effect change, and ideally create a system where everybody wins. It is essential not to destabilize the power structures just to create another set of winners and losers.

When you are starting a business in the African context, you must look beyond traditional forms of equity. Khanjan Mehta tells the story of trying to get validation for the Mashavu healthcare system in East Africa. The Mashavu team set up a kiosk where people could get their weight or blood pressure for a small amount of money. The team made ten dollars in four hours, providing excellent validation for the preliminary business model. An interesting scenario occurred, however, when an elderly woman approached the kiosk and wanted to know her blood pressure, but did not have any money. When the team dug deeper, they realized that a lot of economic transactions in that community happened without cash. It was very typical for elderly people (especially women) not to have access to any funds. Nevertheless, they did participate in the local informal economy (e.g., looking after children in exchange for food). How do we integrate these people into the business model? How do we develop business models that integrate these alternate ways of economic transactions?

The Mashavu team also discovered that people go to traditional healers before they go to western doctors. Even if the western doctors were close by and accessible, people preferred consulting traditional healers because they are part of their social networks and will provide medicines on credit. The traditional healers are an important part of the healthcare system, and integrating them into the Mashavu system was critical to its success. On the other hand, western doctors often use traditional medicines in their clinic (e.g., honey is commonly used as an antiseptic) and prescribe herbal medicines because they are easily and inexpensively available locally. A key challenge is to get western doctors and traditional healers to respect and work with each other so that people get better access to healthcare. The development of business models for developing communities cannot overlook the critical role that trust plays in all economic and social relationships.

**Businesses Based on Indigenous Knowledge**

The appetite suppressant Hoodia owes its genesis to the San people of Namibia. The San are often called “bushmen,” a cultural representation that is addressed in a different video segment. The periwinkle flower from Madagascar is used to make chemotherapy drugs for leukemia. Besides these highly publicized stories, there are numerous other ventures, small and large, which are based on indigenous knowledge.

Michael Jacobson tells the story of the Fordun Spa. A traditional healer, encouraged by the growing interest from tourists, partnered with a hotel owner in Durban to start a spa. The entrepreneur wanted to go beyond the traditional Zulu market and leverage his knowledge and natural resources to scale up his business. He formed a partnership where he would treat customers at the spa and provide them with products. Now he has his own product line and has hired personnel to increase production. Fordun Spa provides jobs to a number of people and safeguards and promotes indigenous knowledge at the same time.

Another interesting case is the baobab tree. The baobab, the most iconic representation of an African landscape, is found throughout the savannah woodlands. The primary significance of the baobab has been cultural; communities used it for initiations, births, and other ceremonies. Penn State scientists are now interested in its huge fruit, which has seeds that can be used for food. The pulp in the fruit has potential as fruit juice, wine, and other products. Penn State and local universities are trying to get communities to separate the fruit’s usable components, manufacture various baobab products, and market them. Women entrepreneurs are collecting baobab seeds to extract oil, which is exported to Europe where it is used in perfumes.

**Uncovering and Validating Indigenous Knowledge**

Indigenous knowledge is not “uncovered” but is “revealed” or “concealed” by the owner of the knowledge in the context of the relationship that exists between the seeker and the person possessing the knowledge being sought. It was explained by Oscar Kuwagley, an Inuit elder, that each culture has a specific House of Knowledge which a non-member of that culture must approach with proper respect. An improper approach to this House of Knowledge will produce closed, and possibly barred doors and windows. A properly respectful approach may result in being invited into the public rooms of that culture’s House of Knowledge, but for an outsider there will almost always
be parts of the House that are off limits. The better one comes to understand the culture, the more doors of the House of Knowledge are likely to be opened to the seeker of that knowledge.

Much indigenous knowledge cannot reasonably be “validated” using accepted academic procedures such as double-blind clinical trials, controlled laboratory experiments, rigorous field trials, and other techniques that are acceptable to peer-reviewed scientific journals. It is the validation question that often plagues western-trained academics whose “way of knowing” does not embrace the validity of careful observation of natural phenomena in a defined environment, but requires controlled experimentation by multiple researchers to determine with statistical confidence that the result was not a “chance” occurrence. The rational validation of knowledge generated locally is the collaborative involvement of those who are “at home” in that place and academics who are “at home” in their laboratories. Unfortunately, such collaboration seldom occurs, but when it does the results can be exciting.

Clemente Abrokwa explains that the power of indigenous knowledge is that it is expressed knowledge. It is not written down, it is within the person, and over the years it becomes accumulated knowledge. If it’s not passed down and preserved, then the knowledge will be lost. However, over many years, indigenous practices and traditions have been retained. Many indigenous peoples, like the Ojibwe in Minnesota, have preserved some of their religious stories word-by-word over generations. Abrokwa explains that, over time, you become the knowledge, and the knowledge becomes you. Indigenous people don’t have science laboratories; their lab is their environment. They know what works for them. It’s traditional to them. It’s indigenous in the way that they are one with it. If the solution works, it is knowledge, otherwise it is discarded. This knowledge is place-based and is not generalizable to a larger area, but in its place, it has withstood the test of time.

Audrey Maretzki has established a nutri-business cooperative to develop and market nutritious, shelf-stable infant-weaning porridges with women of the Kikuyu and Kipsigis tribes. She recounts her first personal encounter with indigenous knowledge in Kenya when working with the women to identify and categorize indigenous foods based on their nutritional values. The challenge was to identify all of the common edible plants grown in the area. Audrey developed charts that showed the nutritional values graphically using bar charts, and then had the women decide what they wanted to use in creating their weaning product. An elderly lady, who grew maize and finger millet (wimbi) in the area, contended that if you have two little boys and one was fed on wimbi and the other on maize, the one fed on maize would be big and fat, and the one fed on wimbi would be thinner and more wiry. If they fought, the wiry little boy would knock over the maize-fed boy. When you look at the nutritional values, wimbi is the more nutritious grain, and they were able to see that data gathered from the graphs and the story made sense.

The woman’s story about the boys’ fighting was used to convey knowledge about nutrition and this was a major “A-Ha!” moment for the researchers. They realized that they didn’t have to teach the women about nutrition, they already understood it. However, maize is cheaper and easier to cultivate and process, so people are adjusting their traditional food practices. So, gradually, maize replaces the more nutritious grains like wimbi. This trend is prevalent not only in Kenya, but also in many other parts of the world. American corn, provided as food aid to developing countries, further complicates the problem of indigenous crops being wiped out.

**Representation of Indigenous People**

Ladi Semali brings up some compelling examples of the one-sided representation of Africa in the media. Africa, Semali contends, has been framed to show what the American audience wants to hear. The representation of Africa’s poverty and hopelessness is tailored for rich potential donors. What is the indigenous representation of poverty? Poverty is a relative term; indigenous people and their native historians do not talk in terms of poverty. How do the people of Africa themselves think about poverty and hopelessness, and how might their perspective be communicated?

For example, in the well-known film, The Gods Must Be Crazy, a Coca-Cola bottle was the center of gravity of the men living in the “bush.” These San did not call themselves bushmen. If we really want to understand indigenous ways of thinking and knowing, we should embrace what they call themselves, and that’s how we should represent them, rather than a prejudiced name that has been assigned to them that does not describe them, but rather describes their habitat in a derogatory way. Compared to city life, they are primitive…and they are considered to be “hopeless.”

Semali gives us a glimpse into indigenous perspectives on happiness, “If you ask indigenous people if they are happy, they will tell you: Yes!” “In my classes,” he explains, “I ask students, what is progress, what is development, what is change? Paint that for me, either graphically as a picture, or give me an example from your community.” The majority of students are confused because of their western education. The material things are what counts for happiness, for progress, for wealth. But when you begin to look very closely, it’s all gadgetry that they don’t use, gadgetry that they don’t need. Then he asks them what is happiness, how do they spend their time, who is wealthy? Happiness is when they are with their community for celebrations. In the west we call it “happy hour.” There are many, many happy hours in African cultures, and these happy hours are not just at the end of the workday. They are spontaneous. People may have very little food, but they will sacrifice it for you to have a good time with them. So happiness and hopelessness may co-exist and stories about both “states of being” need to be independently told to express the real meaning of poverty.
Duarte Morais contends that tourism development imposed from the outside does not result in long-term empowerment. It may result in increased economic development, but not an increase in well-being. Duarte studied the Yami people in Taiwan, a culture that is proud of its heritage. The Yami were very proud of their hunting skills and of having developed one of the earliest forms of fish farming. During colonial times, the Yami were hired to hunt deer because of their hunting skills. They did not want to talk about their deer-hunting past with tourists, even though it was a very important part of their economy for centuries. They were not proud of this aspect of their history, but were pleased to depict themselves as innovative fish-farmers.

The Taiwanese government is actively involved in tourism and in developing an identity different from that of mainland China. They hired an anthropologist to conduct research on the indigenous cultures and portray it in a scientific way. The anthropologist discovered that the Yami people described their ancestors as fishermen, but seldom as hunters. The tourism agents, however, were more interested in showcasing the Yami people as savage hunters, in order to provide a more “exotic” and “authentic” experience for their customers. Outsiders may do a supposedly “unbiased” survey of a culture without regard for which aspects are sources of pride for the community. However, a community should have the right to represent itself, formulate its own identity, and decide what aspects of its culture are showcased to the outside world.

Indigenous Knowledge and the Educational System

Mary Chandy Vayaliparampil discusses the traditional Indian “Gurukul” system of education, which was in practice until the British rule. The Gurukul system employed the pedagogies of problem-based learning and service learning to prepare students for life. The objective was to educate students in languages, math, and science, and also to prepare them for life in terms of relationships, not just in the immediate family, but also in society at large. It was a means toward an end. Under British rule, the education system focused on educating Indian elites (and not the Indian masses) to prepare them for office, clerical, and accounting jobs. A century of colonialism and six decades of development resulted in an education system that was based on chalk and talk and rote learning to develop conformists who fit into set jobs. The centralized system favored by the British is very gradually giving way to decentralized local centers within the community where students get a more holistic education. A few elite schools based on the principles of the Gurukul system (Auroville in Pondicherry, for example) are leading the way in providing students with a more holistic education.

However, for the vast majority of schooling systems, there is a disconnect between what students learn in school, particularly in science classrooms, and what they do at home in terms of the application of that science. Ladi Semali tells the story of how, when his grandmother was alive, there was always food in the house. There would be foods dried in the sun, or roots, tubers, or potatoes that were stored underground to preserve them. African schools do not teach about the preservation of food, which is critical to food security. Current estimates are that 40% to 60% of the food harvested in sub-saharan Africa is wasted, because there is no way to preserve it in a shelf-stable form. One would expect that in Africa, the science of food storage by drying, canning, or pickling would have been given priority. Preservation of milk through indigenous methods like smoking the containers, or by converting it to yoghurt, do not appear in African science textbooks and is not taught in school. Integrating indigenous knowledge into the science curriculum and employing pedagogies like service learning can have a significant positive impact on an entire educational system. It is critical that the system be redesigned so that students learn science concepts and also learn how to apply them immediately, not when they have left the school system.

Mainstreaming Indigenous Knowledge

The video series includes several clips that illustrate the interface between information technology and indigenous knowledge. In a global economy dominated by multinational corporations for whom the concept of place has little relevance and native languages are disappearing more rapidly than endangered species, it is pleasant to note that social media, the cellphone, and selected websites can provide ways to document indigenous knowledge and connect persons with common interests in ways that build trust and provide economic opportunities to women, rural residents, and others who lack the power to change their lives.

In one of the video clips, Fran Osseo-Asare discusses her website Betumi.com. Betumi is a space “to discover, document, and share information on the vast and fascinating culinary heritage of Africa.” Betumi has African recipes, book reviews, relevant articles, reviews of cookbooks, ingredient research, and interviews with people who operate African restaurants. Interestingly, Fran uses Facebook, Twitter, and other social media to promote Betumi—an excellent example of how modern technology can actually be leveraged to create more awareness about indigenous knowledge.

There are 4.1 billion cell phone subscribers in the world. It is estimated that 97% of the people in Tanzania have access to a cellphone (Hancock 2005). The cell phone has gone from being a rare, expensive item used by the business elite to a pervasive, low-cost personal item that is the world’s leading telecommunications technology, with a profound impact on the social connectedness of users. Cell phones provide an unprecedented medium to democratize information-sharing and the community-building process, and bring knowledge from indigenous people into the mainstream. Khanjan Mehta describes WishVast, a cell phone-based social networking platform that harnesses the pervasiveness of cell phones in African countries to build trust, optimize resource utilization and supply chains, connect people, and expand their social networks, facilitate peer-to-peer trade, and help people emerge from poverty. A particular objective of
Indigenous Knowledge and Sustainability

Madhu Suri Prakash takes us to Cuba, which stopped receiving Soviet aid the day the Cold War ended. Cuba couldn’t continue to run its Soviet-style farms: mega farms that required tractors, fertilizers, and pesticides. The country, having been dependent on subsidized food and agriculture, literally starving for ten years while they returned to human and animal power. They also recovered their indigenous knowledge and, turning to their elders, Cuba learned to become self-sufficient. Havana is one of the greenest cities in the world, with 80% of its food grown in and around the city. This is in stark contrast with the 1500 miles that the average American mouthful travels. Cuba has one of the best primary healthcare systems in the world, with 1 doctor for every 170 people, compared with one doctor for every 390 people in the United States and one doctor for every 50,000 people in parts of East Africa. The Happy Planet Index, which measures the well-being of people in the nations of the world while taking into account their environmental impact, ranks Cuba #7, while the #1 spot is held by Costa Rica. Prakash argues that if we want to learn about sustainability and having a sustainable footprint, we can't turn to the United States and to other developed countries. We have to turn to countries that are currently referred to as developing or underdeveloped.

Bruce Martin reminds us that there is a strong connection between language and culture. The English language has borrowed from so many languages and cultures that it’s not rooted in a single place anymore. English is a language of nouns. We tend to make objects of everything. On the contrary, the Ojibwe language is a language of verbs; it’s a language that’s animated and reflects a philosophy and worldview. For the Ojibwe people, the world is alive in ways that most Americans don’t even imagine. Rocks are alive, and they have spirit, and in the Ojibwe worldview, you can have a relationship with anything that has a spirit. This animated worldview changes the sense of belonging and sense of place in the world. For most people living in western countries, that kind of relationship with the world around them does not exist. The implications of this different worldview are very significant, one example being respect for nature and all its constituents because they are as alive and as real as we are.

Africans make music from the cradle to the grave; it's an intricate part of themselves. Clemente Abrokwaa explains how music is strongly associated with the African way of life. The rhythm is very important and considered a part of nature. Africans believe that life is a rhythm, a circle that keeps revolving. When that rhythm is impeded, then everything else suffers. In Ghanaian culture, music was traditionally used to resolve conflict and create peace. African music is based on poly rhythms that are metaphors for the conflict in life. Rhythms might oppose each other, but they create one music. Music that has the power to move you. It’s not creating separateness or division, but it’s creating unity. Music is used to preserve nature, as well as to preserve community and bring communities together. While the music is playing, the community leaders will announce that two parties have a specific problem and now they have agreed to dance together. This would signify that they have agreed to put aside their differences. They come into the dancing ring, shake hands and dance. The dancing ring signifies the circle of life and is the melting pot of all disputes. The singer will then sing a song that indicates that conflict is not good for the community and everyone will join in. The songs, dances, and rhythms are all designed to help people come together. How can we use music to resolve the conflicts around us?

Conclusion

Duarte Morais reminds us that almost every indigenous community has a golden period in its history, a time when they thrived without damaging or compromising the natural environment. The challenges have changed, but we can learn from how they overcame those challenges to address new challenges, rather than bringing in solutions from outside. We live in a globally interconnected world, and we can learn from many indigenous people with different epistemologies and philosophies of life.

Indigenous knowledge has been subjected to 500 years of colonialism and then six decades of development initiatives. After six centuries of the desecration of indigenous knowledge as irrelevant, primitive, backward, and something to be obliterated from the earth so we can travel the highway of progress, we are learning that it has survived in many parts of the world and is being used to solve relevant local problems. Indigenous knowledge is not a panacea for challenges facing developing communities and the world at large. Indigenous knowledge is not static, it flows and adapts and evolves. Going overboard trying to protect indigenous knowledge can actually lead to it being museum-ified. As problem-solvers, engineers, and entrepreneurs, we can learn from indigenous knowledge and mold it with our formal western knowledge to develop appropriate solutions that foster self-determined development. Whether a cure for leukemia, a double-shot of Amarula, fractal patterns in African architecture, or a sexual position from the Kama Sutra, we have inherited vast knowledge that we should respect and harness to build a freer, fairer, friendlier, and more sustainable planet.
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References


