Learning in Schools about Traditional Knowledge Systems in the Kumaon Himalayas

by Sameer Honwad

People in the Kumaon region of the Himalayas have used traditional knowledge and cultural practices to manage and conserve natural resources for generations. For example, rivers like Ganga and Yamuna are considered goddesses. By regarding sources of water as entities worthy of worship, locals have cared for these water bodies and protected them from pollution and overconsumption. Although people still consider water bodies and other natural resources as sacred, over the last several decades mismanagement of natural resources has reached alarming levels because of pressures from industrialization (Basant 2013). Likewise, education focused more on a Western value system is viewed as a vehicle that prepares youth to make a life outside their village community (Shiva 2000). This knowledge system based on Western values does not hold the traditional knowledge system in high regard. Western influxes have created a belief that traditional knowledge is unscientific and backward (Gupta 2007), and the system of transferring traditional knowledge from one generation to another has fallen apart.

Formal education has become more classroom-focused, and the gap between community-based knowledge and school-based knowledge is on the rise (Niraula 2007; Goonatilake 2001). As Pande points out, "In their haste to run away from the village, the young men and women do not seem to have the time to understand their own village and their own people, neither do they receive any orientation towards this in school" (2001, 48). For example, in Maichun village in the Kumaon region, *Palta* was a community activity that involved the entire village community coming together and making compost for their agricultural fields. The practice not only strengthened community bonds but also provided high-quality fertilizer for agriculture. Yet, Jackson observes,

> The young youth in the village do not see compost as a resource for sustainable agriculture. In fact, they are ashamed of working on the land: the girls for aesthetic reasons (*nail paint would be spoiled* and the *compost stinks*—were some instant remarks from girls) and the boys for livelihood (*what will we do in the village? We go to the city, earn money and live comfortably*—the boys say). Several families in the village now complain of declining agricultural yields, so much so that "food is not even enough for six months in a year. (2004, 96)

The example points out that since the traditional knowledge is not passed on to the next generation and the formal educational system does not focus on traditional knowledge practices, the sustainable livelihood in the village is affected. Pande adds, "These impacts were too small to be noticed in the village in the early stages and when they became apparent and obvious for everyone to notice them, it requires resources, the time, and knowledge to regenerate or improve them—a task that nobody in the village can do alone" (2001, 51). Thus there is an urgent need to bridge the gap between content provided by the school curriculum and community-based traditional knowledge.

To help bridge this gap, the Uttarakhand Seva Nidhi Paryavaran Shikshan Sanstha, a local nongovernmental organization (NGO) working in the Kumaon ranges of the Himalayas, introduced an environment education curriculum into the school system. *Our Land Our Life* (OLOL) focuses on local issues, and the embedded pedagogy within the curriculum tries to address the concerns of rural people in the Kumaon Himalayas. OLOL seeks to connect classrooms with actual environmental problems, identifying links between issues that reflect real-world situations and relating environmental education to the local community. The curriculum addresses not only environmental science but also environmental education for sustainability more generally. The curriculum was developed in a unique partnership with local villages and has a focus on traditional knowledge.

The course runs in all the state government schools (public schools) and is implemented from 6th grade to 10th grade. The curriculum tries to connect livelihood issues related to land, water, fodder, crops, trees, and other ecological elements to formal education in schools. The OLOL curriculum is the only course in the entire schooling system that focuses on local environmental issues and discusses these issues within the context of local empowerment. Thus, understanding the impact of this curriculum on students' lives is important. This article discusses how youth in rural communities of the middle Himalayas use traditional knowledge to support environmental decisions; examines how the youth negotiate a balance between traditional and Western/outside knowledge; and addresses how youth apply knowledge from the OLOL curriculum in decision-making processes.

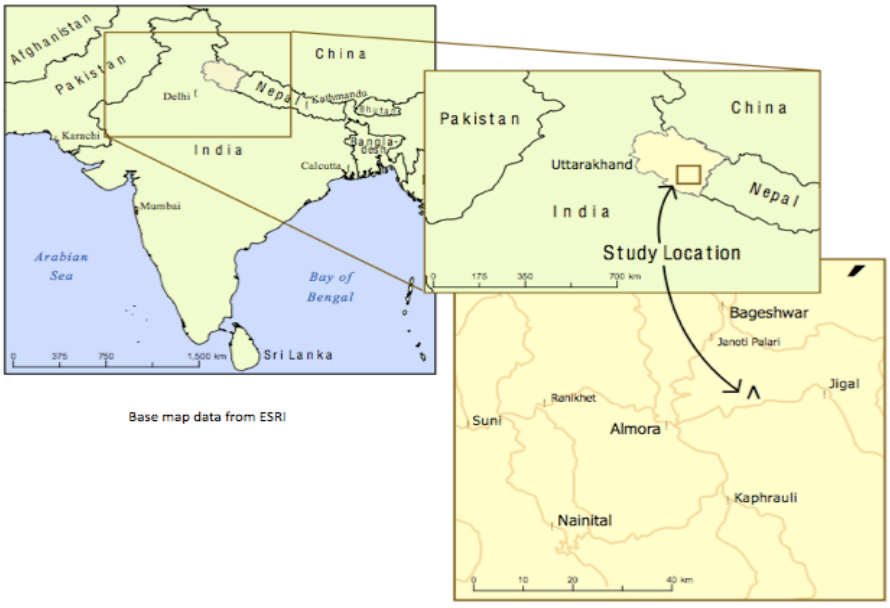

Figure 1. Map showing the location of the study area.

Our Land Our Life and the Educational Context in the Kumaon Himalayas

The Kumaon Himalayas is a region within the Himalayan mountain range that is bordered in the South by the plains formed by the river Ganga and by Tibet in the North. The population is rural, and people mostly live in small clustered villages spread across valleys and slopes. Farming is the main occupation that supports people's livelihood and is done along terraces made on the slopes of the mountain range (Figure 2).

Figure 2. OLOL students document Kumaon Himalayas terrace farming.

Regional schools provide an education geared to an urban lifestyle, not on preparing youth to lead a future in their villages. For example, textbooks illustrate computer concepts and instruct how to make PowerPoint presentations and use Word and Excel. Yet, when these books were introduced into the school system, most villages did not have electricity and the state-supplied generator was extremely noisy, therefore any computer use had to be conducted after regular school hours. Thus, computer education had very little application for village communities living in the Kumaon Himalayas. Since schools have mostly an urban-focused system, most youth (particularly boys) leave the villages and migrate to more urban areas. Thus, most villages these days consist of women who engage in agriculture and take care of homes.

OLOL takes steps in addressing some of these issues. The course focuses on the idea of the village as an ecosystem (Figure 3). The course not only discusses local problems such as land degradation and water scarcity, it also connects these problems to the broader issues of livelihood such as health and economics. For example, as a part of the course youth learn how the water supply system in their villages work and how the water system affects residents' health. The course was designed with community input. The local women's group was actively involved in the process and supplied examples that highlight environmental issues within the context of empowerment for women. The course includes case studies of how village women address and negotiate environmental issues along with issues related to empowerment. Finally, the course actively connects youth to their communities, requiring them to engage community members at various levels. In one unit, the youth work with community members to make a map of the village and its environmental resources. The main topics covered every year in the course are listed below (Table 1).

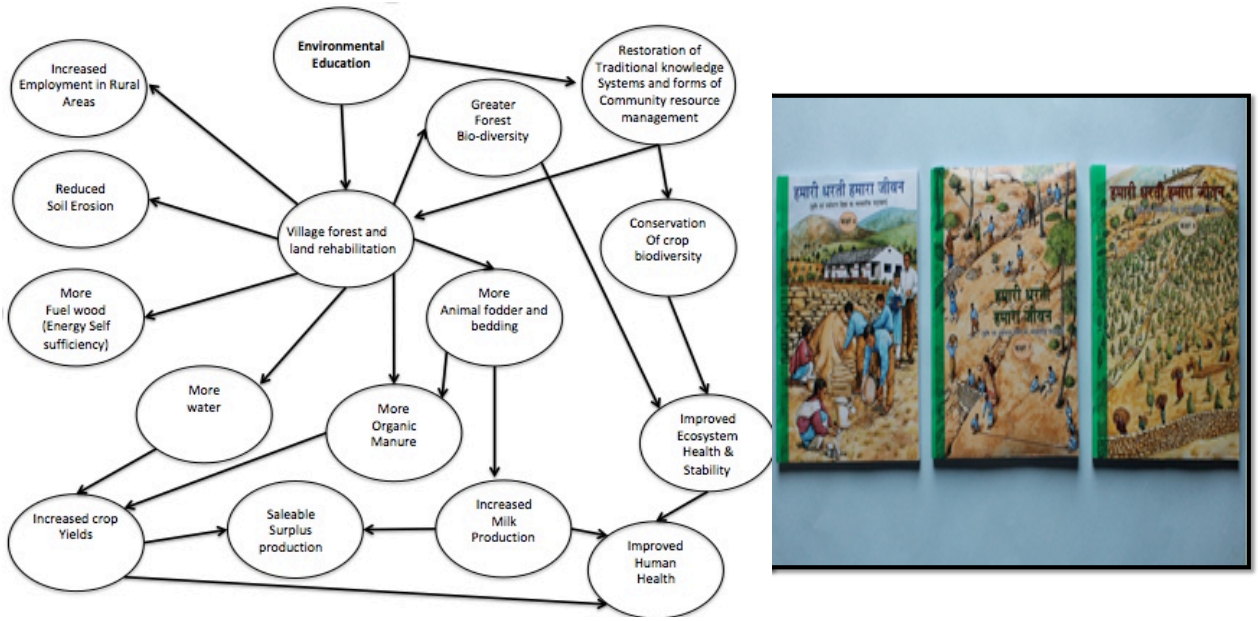

Figure 3. Our Land Our Life design (Jackson 2008).

Table 1. Overview of OLOL Course Design (Jackson 2008)

Grade	Topics Covered
6	Construction of study village map. Measurement techniques and mathematics involved. Introduction to plant-soil-water relationships. Introduction to principles of good land management. Growing tree seedlings. The natural vegetation of Uttaranchal. Learning the history of study village and traditional management practices for land and animals.
7	Study village support area rehabilitation project, including tree seedling production, begins. Geology of Uttaranchal. Soil formation and erosion. Rainwater runoff and infiltration. Measuring spring flow and domestic water consumption. Support area land classification. Measurement of rainfall and analysis of data.
8	Support area rehabilitation project continues. Measuring crop yields, compost application rate, use of animal bedding, and fuelwood consumption. Measuring land area. Concept of slope. Population dynamics. Introduction to ecological concepts. How to build fuel-efficient *chulhas* (stoves) and sanitary latrines.
9	Support area rehabilitation project continues. Enumerating human and animal populations of study village. Measuring fodder consumption and wood production. Further ecological concepts. Introduction to national and global environmental problems. Formulation of draft plans for study of village support area rehabilitation and water use. How to build a water storage tank.
10	Support area rehabilitation project continues. Estimating future productivity of study village and future carrying capacity. Population stabilization. Discussion and finalization of draft plans in village meetings.

Prevailing Traditional Knowledge Systems and OLOL

The issue of identifying knowledge types—Indigenous Knowledge (IK), traditional ecological knowledge (TEK), or exogenous—is a complex process. There is rarely a single instance that can be one knowledge type or another. In most instances there is an overlap. Semali and Kincheloe (1999) address this complexity by pointing out that "Indigenous knowledge is an ambiguous topic that immediately places analysts on a dangerous terrain. Not only are scholars unsure what we're talking about but many analysts are uncertain who should be talking about it." Thus, it is important that community members get to define what is traditional knowledge and how they use it in their everyday life.

Kumaon Himalayas villagers define traditional knowledge as knowledge that their ancestors pass on to them and that evolves over time. It is knowledge that is attached to a certain place. This knowledge is also embedded in the practices that have been conducted over several generations.[1] Understanding IK in traditional communities is fundamental to the design of any learning environment in the Kumaon region of the Himalayas (IIRR1996). The importance of out-of-school learning becomes clear when one examines the relatively small amount of time spent in school compared to other settings. Activities in homes, community centers, and after-school clubs can have important effects on students' academic achievement (Bell et al. 2006; Bransford 2001). In the Kumaon region, learning also takes place when youth work on family farms, take cattle out for grazing, and do landscape-related work. Thus, effective instruction begins with taking into account what learners bring to the setting; this includes cultural practices and beliefs as well as knowledge of academic content. There are many studies that have shown that what people learn and how people learn is context-dependent (Mertl et al. 2007). Therefore, a learning environment that takes into consideration the context should help learners link ideas from ecology and formal science to their own lives (Burford et al. 2005). Finally, an educational initiative on sustainability that embraces IK would help learners negotiate different worldviews and value systems about development and livelihood (Palmer 1998).

To understand indigenous knowledge/traditional ecological knowledge that would be used in the classroom for water and land management better, we used the Delphi technique. The purpose of the Delphi technique is to facilitate information, opinions, and judgments from a panel of community experts to gain consensus on an issue (Dunham 1996). The usual objectives for a Delphi assignment are as follows:

1. To understand the process of delivering judgment on an issue that may need deliberation,
2. To look at commonalities between different opinions to generate a consensus among the respondents,
3. To synthesize information about a topic that spans multiple disciplines, and
4. To inform respondents about the various different facets of the topic (Turoff 1970).

This Delphi focused on what type of IK is used for water and land management related to agriculture, forestry, and soil.[2] By focusing on the types of knowledge people use to manage land and water, we were able to make suggestions toward designing better environmental education programs for helping communities in the region better their quality of life.

Some practices for addressing environmental issues that the community members identify as based in traditional knowledge using the Delphi process follow.[3]

- Water is the basic necessity for life.
- A community traditionally manages water through *naulas* (groundwater springs). There is traditional knowledge associated with how to build a naula. The structure is very important because it helps groundwater come to the surface and then stay above the surface.
- To keep water sources clean, often they are designated religious and thus people must go into them barefoot, which helps keep the source clean.
- Collecting rainwater is another way to manage water traditionally.
- People plant native species (oak and deodhar cedar) to ensure maximum seepage of water into the soil. Planting these trees helps hold soil together, leading to more seepage and increasing the groundwater table.
- Digging trenches (*khals*) is another way to manage the water.
- People also build small dams (*choys*) to stop flowing water
- To keep soil together and help stop water runoff, people build depressions (*guls*) around their farms.
- There are traditional devices (earthen pots) to store water and keep it clean.
- There is encouragement to use running water rather than stored water because running water has a natural filtration system.
- Using organic compost is important.
- Seed saving is traditionally considered good land management practice.
- Mixed farming and crop rotation practices keep land healthy.
- Healthy forests keep farms healthy by providing more organic litter for decomposition to make good compost.
- Not cutting an entire tree for fodder, cutting only lower branches, for example, preserves the tree—the healthier the trees, the healthier the soil and thus higher yields from the land.
- Sharing labor for agriculture is a good land management practice because there is community participation, ensuring everyone keeps their piece of land healthy and bad practices do not spread.
- Organic pesticides and insecticides such as walnut leaves and neem leaves are better for the land and water than industrial chemicals.

Figure 4. Youth studying the water system as a part of their course.

These traditional practices are embedded in the OLOL curriculum. For example, some schools in the region studied existing water systems and then designed and built their own rainwater harvesting facilities using local materials (Figure 4). Thus, the course not only involves the use of the traditional knowledge systems used by the local communities but also blends it with current best practices to facilitate the evolution of the knowledge system and optimize benefits for local communities. Our research discussed below describes the effectiveness of this curriculum on decision making.

Preparing Youth for Environmental Decision Making: Study Design

Study participants were recruited from two villages east of the city of Almora, Chanoli and Maichun. The youth were recruited from two schools, Panvanaula High School and Inter College and Garudabanj High School and Inter College. (In India, high school runs through 10th grade, while inter college includes grades 11 and 12). Both schools are run by the state government. Participation was voluntary.

To understand how youth used traditional knowledge in their decision-making processes, we conducted interviews and focus groups. The youth also participated in a role-play activity that revolved around youth assuming the role of stakeholders involved in environmental decision making and acting out case studies of community-based environmental problems. A total of 29 interviews and seven focus groups were conducted with youth from both schools. Transcription of the interviews and focus groups helped identify youths' use of traditional knowledge.[4]

Results and Conclusion

When asked how they would go about solving water-related problems in their community, almost all the youth said that planting native tree species is the most important step.[5] Their explanation was that the trees would hold the soil, which in turn would stop water runoff and increase groundwater tables so that springs and rivers have more water. This explanation corresponds to that given in their OLOL environmental education curriculum. The youth also mentioned using naulas, harvesting rainwater, using proper water storage, and keeping water sources clean as other ways to resolve water-related issues.

In terms of land-related issues, most youth thought that not cutting trees in their entirety was the number-one solution.[6] The explanation was that cutting trees would lead to deforestation, which would cause soil runoff and be harmful to the land. A few youth mentioned mixed farming, crop rotation, organic insecticide, and seed saving as solutions for resolving land-related problems in their community. Thus, most youth indicated that currently they would use practices based on traditional knowledge to resolve some of the water- and land-related issues in their community.[7]

It also appears that they are aware of and recommend certain practices based on traditional knowledge that they learned in school. Based on their answers it appears that the OLOL curriculum is a major source of this knowledge; 72.4 percent of youth mentioned that they learned most of these practices in school, and 13.8 percent indicated that they learned some practices at home and some at school.[8] However, the findings also indicate that although they mention that most practices they would use are traditional, it is not guaranteed that they would use them to resolve these issues in reality. This observation is supported by the data that indicate that when asked whether they prefer tap water or water from the naula, 95 percent said that they would prefer tap water. Thus, it may be possible that OLOL presents them with solutions that do not fit their reality. It is also possible that youth gave the answers they learned in school since the interviews were conducted in the school.

Therefore, a question arises about how well the environmental education curriculum fits the changing nature of the communities. The demographic of the village community has changed over time. Men often go to urban centers to seek better economic opportunities (Pande 2001). There is a need within these communities to urbanize, since that is recognized as being developed (Agrawal 2005). Thus, traditional knowledge practices are often adapted to the needs of development and urbanization. However, in the school, youth are learning about traditional knowledge systems and how these knowledge systems are sustainable because they fit the context. So on one hand, at home, there is a push toward being more urbanized, while on the other hand, at school, there is a push toward traditional practices. This struggle shows in the data as the youth are not voicing the actual changes experienced within their communities.

Thus, the OLOL school curriculum needs to fit the changing face of knowledge. The curriculum needs to recognize that people move through time and space and knowledge itself will evolve over a period of time. If the curriculum hopes to revive traditional knowledge systems among the youth without acknowledging the evolution of the knowledge base, then we think there is a fair chance of it being rejected, especially since teachers (who come from an urban area) think of this curriculum as not up to date (field observations 2005, 2006, 2007, 2008). By not recognizing the changing landscape of the traditional knowledge systems, any curriculum focused only on traditional knowledge could be seen as working against intergenerational knowledge transfer, especially since the knowledge the adults are bringing into the village from the urban centers is new and different than the traditional knowledge. Thus, even when the youth read about traditional knowledge in OLOL they continue to get a different message at home than the knowledge they are learning in school.

Tradition and Innovation When Teaching IK and TEK

Along with changing communities, knowledge also changes. With immigration and emigration of knowledge, the complexity surrounding what knowledge is traditional for a particular generation remains a question yet to be answered. Although the study does not directly ask these questions, they become more pressing as communities move in time and space. For example, men in the village are often employed in the urban areas and interact with urban resources such as water taps. When they come back to the village, they seek these urban conveniences and try to adapt these conveniences to their context and culture. Thus, in the process they add to the existing traditional knowledge systems. These adaptations are not always sustainable, but once in a while an adaptation such as a water tap next to a house becomes a sustainable practice. So, when should we identify the water tap as traditional? This is a complex question beyond the scope of this study, but like a restoration ecologist struggles with how far back in time one should go to restore the ecosystem to its "native" state, similarly there is a struggle here as to how far back in time we should go to identify a knowledge practice as traditional. The way traditional knowledge evolves, and what constitutes traditional knowledge, is a complex study that will require a different set of probes. But as we acknowledge the complexity of this issue, we would also like to state that we have tried to address the complexity of what is traditional knowledge by gaining consensus from local experts. The Delphi panel does not address every single complexity of how these knowledge systems are constructed but provides a starting point and good insight into the traditional knowledge systems.

Although OLOL is a powerful curriculum that focuses on local traditional practices, it needs to take into consideration the evolving nature of traditional knowledge and the applicability of this knowledge. For example, newer ecological problems have arisen during the past 20 years. With problems such as climate change looming over Himalayan communities, the curriculum needs to focus on adaptability rather than only traditional knowledge. It is important to answer how the people in the Himalayas will adapt to the changing climate and how they can collaborate with the global community in order to address newer environmental problems. Collaboration is particularly important because climate change is a global problem and actions conducted by non-local populations (urban areas in India, China, and the U.S. are the highest emitters of CO2) are affecting the local level environmental processes. The curriculum may outline a pathway toward local and global engagement of environmental problems.

In summary, the data and observations suggest that the youth are aware of traditional practices and some scientific reasons behind these practices, but they are less likely to use them in reality. There is evidence that youth are learning about different practices at the school and at home, but at this time they are unable to build bridges to integrate carefully the knowledge that they gain in these different settings. They seem to be thinking that the knowledge from home is not useful in school, and that in school they should only discuss things that they learn in the school curriculum.

It is important to bridge the gap between formal and informal learning as learners are constantly making sense of their environment in formal as well as informal environments (Bransford et al. 2006). Thus, if youth do not connect in-school (formal) learning to what they learn at home (informal), then youth are going to find it difficult to construct scientifically sound and meaningful knowledge (Hewson 1992). The youths' underdeveloped conceptual ecology with respect to environmental problem solving is certainly going to hamper their decision making. Thus, to close the gap between formal and informal learning and empower youth to make environmentally sound decisions about their local environment in the future, OLOL curriculum designers need to realign some of the content in the curriculum with the current environmental situation of the Kumaon Himalayas. This can be achieved by the following:

- Evaluate the current environmental situation in the villages. This has to be done, as problems such as climate change are starting to create severe water problems in the Himalayas, and these new environmental problems need new strategies of adaptation and survival drawn from traditional and emergent knowledge.
- Restructure some of the content in the curriculum *Our Land, Our Life* based on the environmental evaluation.
- Conduct long-term ethnographic research with youth to assess long-term learning and application of knowledge.
- Prepare iterations of the curriculum based on these long-term studies.
- Connect the curriculum to other subjects and make it a truly interdisciplinary curriculum. This would also involve organizing teacher trainings to have subject teachers collaborate with each other.

As the climate changes, water and land resources in the Himalayas are changing at a rapid rate. There need to be strategies in place to help people in the Kumaon region cope with these changing times. The recommendations above are just a start, and there is plenty of more research and action

needed to help the mountain environment and the communities that reside in the Kumaon Himalayas cope and adapt to the changing ecology of the Himalayas.

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About the photos: All photos courtesy of research personnel associated with the mountain project.

Endnotes

1. This definition of Indigenous Knowledge came directly from the Delphi procedure described in Endnote 2.
2. Thirteen participants/experts were identified and invited to participate in this consensus-building exercise. Participation was voluntary, and no compensation was offered. The participants/experts were chosen by consulting with the officials of the Uttarakhand Seva Nidhi Paryavaran Shikshan Sanstha (Uttarkhand Environment Education Center–UEEC). The criteria for selection were that the individuals have experience working with the local communities on social, agricultural, economic, and related environmental issues. The Delphi procedure was carried out in three rounds. In the first round the participants were asked three sets of questions. These questions were asked in interview format in Hindi and in English and were recorded on video. The questions were as follows:
   1. What is your definition of indigenous knowledge?
   2. What are some practices that use indigenous knowledge for water management? What is the specific indigenous knowledge used within these practices?
   3. What are some practices that use indigenous knowledge for land management (as related mostly to forests and agriculture)? What is the specific indigenous knowledge used within these practices?

   Participants were free to answer in Hindi or English: All were fluent in at least one of these languages (although the local language is Kumaoni, all schooling is conducted in Hindi and/or English and almost all local media are in Hindi or English).

   In the second round, results of the first round were transcribed and translated into English. Then both the Hindi and the English versions of all interviews were given to the participants. Thus, each participant got to see 13 answers along with his/her own. They were then requested to review their answers and change/modify them if they felt necessary.

   The modified transcripts were collected, and participants' changes were incorporated into new transcripts. Since two participants dropped out of the protocol in the last round, only 11 answers were circulated for round 3. Participants were asked to choose the five best answers. They were then asked to rank those answers from 1 to 5 with 1 being the one they liked most and 5 being the one they liked least.
3. It is important to note shortcomings of the Delphi panel. Although the Delphi panel identified indigenous knowledge and practices, we do not believe that they have identified all the practices that are indigenous to the region. An example is the practice of community discussions to resolve issues faced by the community as a whole. The Delphi panel has not identified this practice as indigenous, but village communities are often known to get together to resolve an issue faced by their community. The Government of India, in an attempt to restore traditional practices in village communities, encourages *Panchayat Raj,* a form of local government that involves community discussions and resolving issues at community level (Amstrong and Mangal-Joshi 2004). While this specific form of community discussion forum (Panchayat Raj) may not exist in the Kumaon region, other forms of community discussion forums may exist. The issue is thus nuanced and complex. The practice of using formal community discussions to resolve issues may have existed in the past (before British rule). It is documented that community discussion forums or *village sabhas* were part of society until 600 BC (Mathew 2000). After this, the subcontinent was broken up, and different rulers/kings governed different parts (Mathew 2000). During the British rule (which lasted about 150 years) all forms of local problem-solving mechanisms were dismantled (Mathew 2000). It was only after India regained independence that local village governing systems were put back into practice. Thus, the local community discussion forums exist in a different form than those that existed in pre British India, which brings up the issue of how indigenous practices evolve over time.

For the purposes of this study, we have identified complex practices such as community discussions as non-indigenous practices, not only because the Delphi panel did not identify them as indigenous knowledge or practice but also because the practices themselves do not exist in their original forms. There is documentation (Shiva 2000) about how the caste system has hijacked the practice of community discussion forums, where upper caste members have an upper hand in decision-making processes. Thus, since they do not exist in their true indigenous forms, I have identified them as nonindigenous practices.

Also, some practices that the panel has identified as indigenous can also be identified as a part of the modern conservation movement that has been based on Western ecosystem science. One prominent example is the practice of planting trees. The Delphi panel identified planting trees as an indigenous practice. This practice can be seen in the modern conservation movement and stems from excessive deforestation that took place for developmental purposes. As industrialization took priority, deforestation took place at a rate that was unsustainable and thus it gave rise to the need of tree planting (Govinda and Diwan 2003). However, this is also an indigenous practice and is suggested to be a part of the sacred grove concept, where communities planted trees to appease the gods (Bhagwat 2005). Thus, for the purposes of this study, we have identified this particular practice of planting trees as indigenous knowledge.

We recognize that the issue of "what is indigenous and what is not" is far more complicated than the scope of this particular study, but the Delphi panel does provide a means to construct a reasonable list of indigenous practices within the region.

4. Once all the interviews and focus groups were transcribed, every utterance was coded for the use of indigenous knowledge as identified by the Delphi.

Table 1. Coding for Subcategories for Interviews and Focus Groups

The participant is aware and thinks that the particular solution is viable.	1
The participant is aware but does not think of the particular solution as viable—for example will prefer tap water	2
The participant supplements No IK with IK. For example, will take initiative to use naula*s* along with tap water and not just use the naulas when tap water runs out.	3
Did not mention at all.	4
Interview failed due to equipment problem.	0

Thus, the following is an example of the complete coding system with main and subcategories:
Participant: If the tap water runs out we go to the village leaders or government official and get them to fix the problem and in the meantime use the water from the naulas.

This utterance was coded for the main traditional knowledge category as **Use of naulas** and the utterance was further coded as **aware but do not think of as a viable solution to resolve the problem – 2.** The reason this utterance was coded as **2** is because although the participant is using the naula, he/she feels like the solution to resolving their problem is that the government should fix the tap. A category **1 Aware and think of as a viable solution** utterance is "*We should use the naula water and take care of the naula"* and a category **3** utterance is *"We use the naula and the tap water as the tap water is convenient but we cannot use it for drinking, we prefer the naula water for drinking.*

After coding for traditional/indigenous knowledge use, the data was coded for other solutions. These solutions were called exogenous or nontraditional solutions. The youth offered several with the main categories as follows:

1 Educate community members.
2 Sit together for a meeting and collectively solve the problem.
3 Since youth study these issues in school, adults need to listen to them.
4 Manage cattle grazing.
5 Petition the government/village chief to resolve the water issues.
6 Stop corruption.
7 Build hand pumps and wells.
8 Maintain and repair existing pipelines.
9 Distribute/ration water.

Since all participants who mentioned these solutions thought of them as viable, the utterances were sub-coded as **1-Aware and think of as viable solution** or **4-Did not mention at all.**

There were not many nontraditional solutions presented by participants to resolve some of the land management issues. Some were:

1 Stop pollution.
2 Control human population.
3 Stop migration toward the city.

5. Focus groups: N= 7.

Table 2. Indigenous Solutions Presented by Youth during Focus Groups to Resolve Some Issues Related to Water

IK	Aware and think is viable solution (n)	Aware but does not think of as a viable solution (n)	Participant use both IK and non IK (n)	Did not mention at all (n)
Use of naulas	2	3	0	2
Keep water resource clean	4	0	0	3
Rainwater harvesting	3	0	0	4
Planting trees	7	0	0	0
Proper water storage methods	2	0	0	5
Trenches	1	0	0	6
Use of running water	0	0	0	7
Guls	0	0	0	7
Choys	0	0	0	7

Interviews: N = 29

Table 3. Indigenous Solutions Presented by Youth during Interviews to Resolve Some Issues Related to Water

IK	Aware and think is viable solution (n)	Aware but does not think of as a viable solution (n)	Participant use both IK and non IK (n)	Did not mention at all (n)
Use of naulas	1	14	2	11
Keep water resource clean	1	0	0	27
Rainwater harvesting	4	0	0	24
Planting trees	24	0	0	4
Proper water storage methods	3	0	0	25
Trenches	0	0	0	28
Use of running water	0	0	0	28
Guls	0	0	0	28
Choys	2	0	0	26

* One interview was not recorded due to equipment failure.

6. Focus groups: N=7

Table 4. Indigenous Solutions Presented by Youth during Focus Groups to Resolve Some Issues Related to Land

IK	Aware and think is viable solution (n)	Aware but does not think of as a viable solution (n)	Participant use both IK and non IK (n)	Did not mention at all (n)
Using organic compost	1	0	0	6
Seed saving	1	0	0	6
Mixed farming	1	0	0	6
Healthy forest leads to healthy farms	1	0	0	6
Not cutting entire trees for firewood	6	0	0	1
Sharing labor for agriculture	0	0	0	7
Organic pesticides	0	0	1	6

Table 5. Indigenous Solutions Presented by Youth during Interviews to Resolve Some Issues Related to Land

IK	Aware and think is viable solution (n)	Aware but does not think of as a viable solution (n)	Participant use both IK and non IK (n)	Did not mention at all (n)
Using organic compost	1	0	0	27
Seed saving	0	0	0	28
Mixed farming	2	0	0	26
Healthy forest leads to healthy farms	1	0	0	27
Not cutting entire trees for firewood	24	0	0	4
Sharing labor for agriculture	0	0	0	28
Organic pesticides	1	0	0	27

* One interview was not recorded due to equipment failure.

7. The other relevant observation is that the youth were much more confident in presenting solutions to resolve water problems. When it came to answering questions related to land issues, most youth seemed like they did not know as much and thus used the information from their OLOL curriculum to answer the question. This could be because most of the youth who go to school do not go into the fields with their parents (or their parents are not farmers). However, they use water daily and are much more aware of water-related issues than land-related issues.

8. **Table 6. Where Youth Get Their Information**

Where youth get their information	(%)
School	72.4
Home	13.8
School and Home	3.4

Works Cited

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