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Scientific perspective of Indian cultural practices

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Abstract
Indian traditions were earlier considered as superstitions but with the advent and advancement of science the Indian beliefs have gained substantial recognition. It is now proved that these traditions are linked to some scientific explanations and our ancestors were well aware of the benefits obtained from these cultural practices. Indians are mostly following these traditions due to their link with Gods and religion but now science has open new avenues of studies related to these cultural practices and their significance. In this paper authors have elaborated few Indian cultural practices and traditions along with their scientific explanation. This attempt can harbor interest of common people and students to explore more about the age old traditions and their significance.

Keywords: Cultural practices, health, environment, agriculture

Introduction
Science education has been an important component of society welfare and development; and imparting science knowledge to the students has immense value to shape the future of mankind. Despite the immense importance of science education in society, trends suggest decreasing student enrollment in science courses across the world. Some researchers have suggested that inclusion of cultural values and practices can improve the inculcation of scientific understanding and value among students (Brown *et al*. 2005) [4]; however, inclusion of cultural knowledge and practice remains challenging in science education.

One of the major challenges is the integration of science to the need of the student's traditional and cultural life, where current practice of science education fails. Modern Science education is knowledge centered and hence remains disconnected from the people involved in their world (Brown *et al.* 2005) [4]. Hence a policy on strengthening science education focusing on sociocultural perspective is very much needed.

Cultural practices refer to the traditions and customs practiced in a particular ethnic group. These practices could be associated with any aspect of the society, be it religion, administration, environment, agriculture, health or education. Culture has evolved as the assimilation of all the above aspects of the society. Education, being one of the primary factors affecting the society developments, has always been affected by culture; and science education is no exception. Strong link between culture and science can also be traced to the changes in the cultural practices of the society along with scientific developments; for example, industrial revolution and renaissance. Hence, it will not be wrong to say that culture and science are closely bonded.

In this paper we examine few examples to show how science and culture have always been closely associated with each other. Some examples supporting scientific understanding in cultural practices have been discussed, hence arguing that science education can significantly benefit from inclusion of cultural practices. This paper focuses finally on to suggest few steps which could help in teaching science in classrooms and favors a policy level discussion to assimilate culture in science education.

Scientific knowledge and cultural practices: Are both linked?
Since the inception of human race, it has endeavored to accumulate knowledge. Over the period of time the systematization of knowledge resulted in a more exquisite arena called Science, which is predominantly driven by practical observations and experiments. Few examples are discussed below:

Religious practices
Religious and spiritual beliefs have largely been discarded by the modern society to be random and non-scientific. However, detail inspection and observation of these practices suggest a logical and scientific reasoning to adopt them. Concept of deities is not random but they were associated with either with some natural phenomenon or emotional state of human being. For example Sun god has been accepted as the primary god in most religion and cultures, controlling life on the Earth, which is very logical from the fact that Sun is the source of biological productivity. *Gayatri* mantra of *Sanatan Dharma,* also praise the Sun God for blessings. Interpretation of same says- 'As you light up the Heavens and the Earth, O Radiant Sun, So light up my mind' (Sanyal 2012) [14]. The forest god has always formed core of the religious beliefs because of the forests role in livelihood and resource generation. *Shiva* – native tribal god in India is one of the most important god in Vedic beliefs, he symbolizes existence of mankind with nature. Even location of worshipping places also points out to the understanding of the scientific understanding of the geography and society. For Example, setting up of four monasteries by Adi

Shankaracharya is not random, these were carefully chosen possibly according to the understanding of surface and contours.

Rivers have been worshipped in most cultures and religion because of their role in soil fertility and irrigation. Examination of *hymns* in Vedas (Sacred book describing the life and knowledge of Vedic people), reveal how society understood and, integrated the knowledge of geography and natural resources in the culture. Rig Vedas praise for mighty river *Saraswati* and its association with wisdom is unavoidable. Vedas are believed to have originated from the banks of *Saraswati* – hence it became known as the Goddess of Wisdom (Sanyal, 2012) [14]. Nile and Ganges have been worshipped as "*iterw* – God of River" and Goddess *Ganga* respectively. Ganges has been believed to have medicinal properties and cured many diseases besides increasing the fertility of the land. Sacred Groves have been considered holy and it's forbidden to hunt inside these areas. Locally preserved habitats, as Sacred Groves, have been considered as recruitment areas, e.g., for seed dispersing birds and bats, and these are considered critical for renewal of associated ecosystems (Gadgil *et al.* 1993) [6].

Medicine and Health

India's rich cultural diversity gets reflected in various practices, which have direct or indirect; short or long-term impacts on the individuals, society and the populations' health. Many of such practices have already received the modern scientific experimental basis and many others have kept the scientific communities glued in the process. This however also must be received with many other traditional practices being scientifically proven to be retrogressive and harmful as well. Some of the rational practices are discussed here.

Ayurveda, which means 'the knowledge for long life', is a form of alternative medicine which originated in India thousands of years ago and is a time-tested health-care science. The *Sushruta Samhita* and *Charaka Samhita* are considered as the encyclopaedias of medicine and are regarded as the foundation works of Ayurveda.

Ayurveda and medicinal plants are considered to be synonymous. In rural India, a large percentage of the population still prefer to use traditional health practices or Ayurveda. Many medicinal herbs and spices have been in use in Indian kitchen for cooking, like onion, garlic, ginger, turmeric, clove, cardamom, cinnamon, cumin, coriander, fenugreek, fennel, ajwain, anise, bay leaf, asafoetida black pepper etc. these medicinal plants and spices are used as an ingredient in ayurvedic medicine.

Meditation as a practice of attention focus finds mention in ancient Vedas running possibly as old as 5000 years. The practice that also forms a part of other cultures like Confucianism, Taoism, Buddhism has been proven to offer immense benefits to human health (Alain, 2001) [1]. Long-standing studies have proven the positive impact of meditation in alleviating stress (Altieri and Nicholls, 2004) [2]. Mindful meditation has been proven to have a large-scale positive impact on overall mental and physical health even bettering the cognitive performance (Altieri and Nicholls, 2004) [2]. The findings have been suitably supported by the neuroimaging techniques highlighting the areas in brain that get activated during the process (Altieri and Nicholls, 2004) [2]. In another study conducted at Harvard, a group of volunteers after eight weeks of meditation training registered a significant increase of control over the alpha wave rhythm in cortex in comparison to the control. This would have a large influence on the learning efficiency of the students due to the enhanced focus and the distractions' minimization (Berkes *et al*., 2000) [3]. Telomeres, which represent the end segment of the chromosomes, are associated with the process of ageing (Brown *et al*., 2005) [4]. Telomere shortening is also associated with the psychological stress which in a speculative study the team from University of California propose can be slowed down by meditation practice (Jordens *et al*., 2012) [5]. Meditation practice also reduces the risks of cardiovascular diseases (Gadgil *et al*., 1993) [6]. In another very common practice of fasting in our culture lies immense wisdom as is being unearthed gradually. The Nobel Prize for 2016 physiology was awarded to Mr. Yoshunuri Oshumi for is seminal work on Autophagy. Although a normal process in the eukaryotic cells it has been reported to be upregulated in the cases of starvation (Gilbert, 2008b) [20]. This increased autophagy not only ensures the cell survival during starvation through selective killing of components but is also associated with delayed onset of cancer and also slowing down the process of aging. This happens due to the faster turnover of the diseased and worn-out components/organelles that typically is associated with the youthfulness of the cells and the organisms (Jantur, 2013) [7]. Moreover, the cancer protection nature is attributed to the reduction in Insulin like growth factor 1(IGF-1) in the mammalian cells during the starvation (Jodha 1998; Mister, 1983) [9]. Interestingly short term fasting protects the normal cells from the harms of chemotherapy (Mister, 1983) [9]. However, at the same time the weight reduction effect of fasting is well known too and may attract the physique conscious youth to try out. This practice however is associated with a lot of health risks which may range from immunity impairment, to stress and headache. Moreover, the whole strategy may prove to be counterproductive as the individuals who skip breakfast tend to develop liking for high calorie food, promoting obesity rather than fighting the same (Smith, 1979) [10]. Similarly the health benefit of another age old practice of drinking water in copper vessels can now be scientifically validated. Copper is known to possess antimicrobial property and hence increases the potability of water, apart from acting as a part of various proteins and metalloenzymes. Copper is also associated with an active immune system (Palsson, 1998) [11]. However, at the same time a proper science education would ensure the learning that its overdosage is equally harmful and is associated with diseases like Wilson's disorder (Reichel-Dolmatoff, 1976) [12]. Many other cultural practices of the land have evolved in adjustment to the climate and vegetation of the region and hence offer a lot of health wisdom. Moreover, some aberrations that hot prolonged too need to be debunked using the proper scientific training. The list may include the cultural pious status of river Ganga emanating from its self purificatory property due to certain microbicidal bacteriophages that are present in the water (Sankhala, 1993) [13], medicinal properties of certain local climate spices and them being the part of daily food habits and some cultural ceremonial practices (Sanyal, 2012; Sofia *et al*., 2006) [14, 15]. At the same time many cultural vices can be proven irrational on scientific grounds. Many discriminatory and illogical practices during menstruation for example have been existing for years in India and many other places which have no present scientific basis (Shumba 1995) [16]. There are

many in the list that needs to be removed from the practice, tossing of the baby from heights for health, etc.

Engineering and Architecture

Hindu temples are the place where a person can concentrate, meditate and can obtain spiritual energies. The architecture or layout plan of ancient Hindu temples is so intricate that it can fulfill above-mentioned needs (Meister 1983) [9]. These temples are placed at a place where earth magnetic and electrical energies are at the maximum. The deity is placed in the center, where it has the maximum amount of magnetic power. Mostly the Hindu temples are closed from three sides to increase the power of energies in the centre. The person revolving around the deity (pradikshina) therefore, gains the beamed magnetic waves, which help him in meditation (Smith 1979) [10]. Walking bare foot in the temples has also great significance. The magnetic and electrical waves are absorbed bare foot in the temple. The ringing bells are also an important part of Hindu temples. They are made of combination of different metals to create a unique sound to touch the seven healing centers (chakras) of body (Denielou 2001) [1].

Environmental and Agricultural practices

Recent developments in scientific understanding highlight the benefits of cultural practices in overcoming the challenges of sustainability (Tengo *et al.* 2017) [18]. These can be useful in adapting and developing sustainable methods to insure food security, genepool preservation, biosafety and control of epidemics. Construction of traditional ponds has been a necessity in villages to ensure water sustainability. These concepts are now being utilized in water scarce area of India and other countries. *Waterman of India* – as Rajendra Singh of *Tarun Bharat Sangh* is rejuvenating traditional ponds "*johad*" in Rajasthan to overcome water scarcity. Another well-known person Anupam Mishra (1948-2016) promoted traditional water harvesting techniques in rural India.

Traditional Ecological knowledge can be considered complementary to scientific ecology in its understanding and application (Berkes *et al*. 2000) [3]. Traditional Ecological Knowledge can contribute to the biodiversity conservation, protection of natural habitats, maintenance of ecological functionality, and to sustainability of natural resources. Temporal control on hunting is a well-known practice all across the globe for fish and wildlife management. For example, shamans of Tukano people of Colombia assess species population by random scheduling of hunting visits, hence identifying species for conservation and hunting (Reichel-Dolmantoff 1976) [12]. Icelandic fishers monitor fish population (Palsson 1998) [11] and coastal communities of Maine assess clam abundance to improve long-term harvesting (Susan 2000). In India many species of wetland birds are only hunted outside their breeding habitat ensuring sustainable population (Gadgil *et al* 1993) [6]. In Hindu-Kush Himalayas there were temporal restrictions on gathering from common resources of a village (Jodha 1998) [8].

Green manuring is an age-old practice prevalent since ancient times, where leguminous crops like Dhaincha (*Sesbania cannabina.*), moong, sun hemp etc. can be sown just before the onset of monsoons. The crop is allowed to grow fully then is cut down and mixed into the soil at the same place. Green manuring not only increases the organic content of the soil but additionally it fixes nitrogen. It is found to improve the texture and water holding capacity of the soil. Cover cropping is another age old practice in India, which is carried out with nitrogen fixing crops that grow fast. The cover crops suppress the weeds, prevents soil erosion at the same time adding nitrogen to soil while giving returns in terms of fodder. Indian farmers have been following various farming practices since ages like crop rotation, multi-cropping, intercropping etc. These practices avoid monoculture, increase biodiversity, control the damage by pests etc. Now traditional multi-cropping system is being promoted to overcome the challenges, which arose because of monoculture agricultural practices in during the green revolution. Multiple species approach results in improved soil fertility and crop protection through assimilation of animals, crops and trees (Altieri and Nicholls 1994) [2]. For example, Bishnois of Thar Desert in India have traditionally utilized *Prosopis cineraria* (a leguminous tree) to improve soil fertility through enrichment of nitrogen content of soil (Sankhala 1993) [13]. Traditionally farmers have been using the natural inputs and making the compost at the field and nowadays whole world is emphasizing these practices as these natural resources are tested and validated for the holistic farming. Our students need to be enlightened about all these aspects which has scientific basis.

In Indian agricultural ecosystems, use of parasites and predators always showed good results if they are not disturbed. Dilute cow urine and vermiwash are still used as pesticides. Our farmers have been preparing and using natural bio-pesticides, by taking extracts from a number of plants like neem, ginger, chilli, custard apple, karanj, asafoetida, turmeric, garlic, tobacco, sweet flag, tulsi etc (Yadav 2010) [19]. These plant extracts have been tested to control pest and therefore is a very strong component of plant protection measures. Some of the studies conducted to test nutrition level, have shown slightly enhanced levels of certain micronutrients. Vitamin C content has been found to be higher in organic foods in comparison to the foods grown conventionally besides being this organic produce pesticide residue free. Organic farming is also about the environment, agricultural traditions, traditional seeds, animal welfare, farming communities, sensible energy use, soil and water conservation etc. which are an integral part of overall development (Sofia *et al* 2006) [15].

It is the need of the hour that present students know our rich and glorious culture and traditions. They should imbibe the vision of our ancient scientists and other contributors who could achieve highly with available resources.

Other practices

The Indian *Gotra* system is an excellent example to explain several concepts of classical genetics. The *Gotra* of a person tells about the origin of its lineage. For instance, if a person says he belongs to Vasistha Gotra, then it can be said that he belongs to the lineage of Guru Vasistha (who is supposed to be the ultimate ancestor). This brief introduction of Gotra system can be very useful to explain the concept of Ancestor, Lineage and Progeny.

Indian *Gotra* system also emphasizes that marriages should not take place between same *Gotra*. Now going into more details, the identity of the persons belonging to the same gotra/lineage at molecular level (more specifically DNA) is relatively similar.

In marriages between persons of the same *Gotra* will lead to generation of same kind of characters or inheritance of

recessive genes. In the same manner marriages between different *Gotras* will lead to the generation of new and/or improved characters. Improved characters are the basis of species evolution. This conditional marriage concept of Hindu Gotra system can beautifully explain the terms of homozygosity, heterozygosity, hybrid vigor and evolutionary lineages.

Indian system advocates that the meals should be taken at specific times, amount and manner. For instance, it is said that morning meal should be like king's meal including a variety of nutrients. As the level of glucose has been lowered due to the gap of last meal (dinner) therefore one should not skip breakfast and should include adequate food. Simultaneously, in the night meal one should consume lesser quantity of food in order to help the digestive system work optimally. Indian system also states that one should start the meal with spice and end with sweet. This is in accordance with the functioning of our digestive system. Intake of spicy things stimulates secretion of digestive enzymes, which are required for the metabolism of food in stomach. On the other hand sweets functions as suppressor of secretion of digestive juices thereby slowing down the digestive process.

Simultaneously, Indian traditional culture also advocates that one should observe fasting for spiritual gains. Scientifically, fasting helps in boosting the digestive system by reducing the work pressure along with cleansing the system from various toxic materials. Research suggests there are major health benefits of fasting like reduced risks of cancer, cardiovascular diseases, diabetes, immune disorders etc.

In the ancient India the umbilical cord of newborn baby was buried in a copper capsule under the tree using certain preserving chemicals. Now it has been well established the umbilical cord is the best source of stem cells. These stem cells can be employed to treat the various genetic diseases as well as malignant abnormalities. This leads to the preservation of umbilical cord using "stem cell banking" where the cord is preserved in deep freezers and can be employed later (Jordens *et al*. 2012) [5]. The ancient text "Mānavadharmaāstra" explains the tradition of umbilical cord preservation in ancient times and depicts the importance of stem cell banking.

Integration of Cultural knowledge in Science Education: the Way Forward.

For sustainable development the need of making greater use of science and technology in one hand and the traditional knowledge on the other is stressed. Culturally based education includes curricula based on native culture that incorporates histories, fundamental beliefs and values of the communities. Culturally based education is the full incorporation of the specific cultural ways of thinking and learning in educational practices. Culturally based education should focus on making the teachers skilled in cultural practices that recognizes and affirms the cultural based strengths in problem solving and learning (Gilbert 2008) [20].

In order to ensure that the native cultural science knowledge is incorporated in the elementary school science education, curriculum developers must work with the local community members to acquire the native science cultural knowledge. The cultural knowledge can be gathered from the elders, community leaders and educators, local cultural experts and grassroots people. The full and effective participation of traditional knowledge holders with the scientific community must be ensured. The curriculum developers must keep in mind that the individual scientists are influenced by their respective cultures in which they learn, work and research, thus to ensure the incorporation of the different cultural knowledge in the curriculum, the curriculum developing team should be comprised of different scientists from different cultural backgrounds. The cultural knowledge is stored in traditions, customs, folk songs, folk stories, folk dramas, legends etc. Use of these resources in school education will help students to relate with their common day experiences.

Science is a systematic study of natural phenomena and technology is knowledge put to practical use in solving man's problems. Various fields of science talked about day-to-day applications of life, use of machines and tools, animals and agriculture, but slowly these sciences grew out of useful social occupations and human activities. The need of the hour is to develop scientifically equipped citizens who can rationally manipulate their environment to take advantage of their abundant natural resources. Klopper (1969) [21] suggested relation of science to culture as an important component of scientific literacy. This would be important in understanding the relation of science and related technology on our society. Shumba (1995) [16] observed that all learners in a society have rich sources of prior knowledge accumulated through various experiences that they get while interacting with their environment. He therefore opined that such experiences and cultural values should be used in teaching since it is believed that they influence science learning.

Scientific principles should be related to local occupations and the traditional practices used by them (Jantur, 2013) [7]. Class discussions and demonstrations which relate principles and processes to the local activities which the students are familiar with will not only help to maintain interest in the subject but will also create a scientific awareness in them. Visits should be organised by the teachers to agricultural fields to discuss about the traditional practices used by the people and how modern science is based on that. They should interact with the grassroots people to know more about the soil quality, climate, water etc. of their locality. Students should start with their local area and then gradually move to the knowledge about regional, national and global environments. The emphasis should be laid on how we are turning back to organic farming in the interest of the environment. Similar visits should be carried out to local industries like dyeing, fermentation and preservation etc. to discuss the scientific principles behind these traditional practices.

Communication with students in the form of questions or statements is the most important mean to allow students to fully explore the role of cultural perceptions in learning. Discussions not only enable students to better understand the phenomenon but also make them express their perspectives which may be unique and different from others due to different cultural backgrounds. Students must be encouraged to share their cultural traditions and the modern scientific reasons behind each tradition.

References

1. Alain Daniélou. The Hindu Temple: Deification of Eroticism, Translated from French to English by Ken Hurry, ISBN 0-89281-854-9, 2001, 101-127.
2. Altieri M, Nicholls C. Biodiversity and pest management in agroecosystems. CRC Press, 2004.

3. Berkes F, Colding J, Folke C. Rediscovery of traditional ecological knowledge as adaptive management. Ecological applications, 2000; 10(5):1251-1262.
4. Brown BA, Reveles JM, Kelly GJ. Scientific literacy and discursive identity: A theoretical framework for understanding science learning. Science Education, 2005; 89(5):779-802.
5. Jordens C, O'Connor M, Kerridge I, Steward C, Cameron A, Keown D *et al*. Religious perspectives on umbilical cord blood banking, 2012.
6. Gadgil M, Berkes F, Folke C. Indigenous knowledge for biodiversity conservation. Ambio, 1993, 151-156.
7. Jantur PM. Traditional Practices in Plateau State that Promote the Learning and teaching of Senior Secondary School Chemistry, Mediterranean Journal of Social Sciences. 2013; 4(12):134-137.
8. Jodha NS. Reviving the social system-ecosystem links in the Himalayas. Linking social and ecological systems: Management practices and social mechanisms for building resilience, 1998, 285-310.
9. Meister MW. Geometry and measure in Indian temple plans: rectangular temples. Artibus Asiae, 1983; 44(4):266-296.
10. Smith JD. The Hindu Temple. An Introduction to its Meaning and Forms. By George Michell. Paul Elek: London, 1977. Pp. 192, 106 illustrations. Modern Asian Studies, 1979; 13(02):350-352.
11. Palsson G. Learning by fishing: practical engagement and environmental concerns. Cambridge, Cambridge University Press, 1998, 48-66.
12. Reichel-Dolmatoff G. Cosmology as Ecological Analysis: A View from the Rain Forest. Man, new series, 1976; 11(3):307-318.
13. Sankhala K. Prospering from the desert. Indigenous peoples and protected areas. Earthscan, London, UK, 1993, 18-23.
14. Sanyal S. Land of the Seven Rivers: A Brief History of India's Geography. Viking, Penguin India, 2012.
15. Sofia PK, Prasad R, Vijay VK. Organic farming-Tradition reinvented, 2006.
16. Shumba O. Science Teachers Assessment of the Interaction of Indigenous African Culture with Science Education in Zimbabwe, Zimbabwe Journal of Educational Research. 1995; 9(3).
17. Susan SH. Managing for human and ecological context in the Maine soft shell clam fishery. Linking social and ecological systems: Management practices and social mechanisms for building resilience, 2000, 190.
18. Tengö M, Hill R, Malmer P, Raymond CM, Spierenburg M, Danielsen F *et al*. Weaving knowledge systems in IPBES, CBD and beyond—lessons learned for sustainability. Current Opinion in Environmental Sustainability, 2017; 26:17-25.
19. Yadav AK. Organic Agriculture (Concept, Scenario, Principals and Practices). Director National Centre of Organic Farming, Ghaziabad National Centre of Organic Farming Department of Agriculture and Cooperation, Ministry of Agriculture, Govt of India, Uttar Pradesh, 2010.
20. Gilbert WS. Impact of culturally based teaching on student academic and social development. Campaign for High School Equity (CHSE) Congres¬sional Briefing: Culturally Based Teaching: A Model for Student Success, 2008b. Alliance for Excellent Education. Retrieved, 3, 2009 at http://www.highschoolequity.org/events/congressional-briefings/
21. Klopfer LE. The teaching of science and the history of science. J. Res. Sci. Teach., 1969; 6:87-95. doi:10.1002/tea.3660060116.