

Craft Based Pedagogy in Science Education: A Solution through Nai Talim for Sustainable Development

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ABSTRACT

Nai Talim is being revisited by the educationists particularly science educators to seek out a solution for sustainable development. It has an inbuilt strategy of craft based pedagogy which can be employed as a prelude for science teaching and learning to foster required knowledge, skills and values in the students to become aware and sensitive towards the problems related to sustainability of life. Craft based pedagogy enables them to prepare models and charts made up of waste materials or natural resources utilizing indigenous knowledge of various occupations including agriculture, gardening, spinning, metal work, wood work etc. as well as indigenous strategies of wild life conservation for learning various science concepts. They get directly or indirectly engaged in protection of the environment, promotion of the indigenous occupations encouraging sustained economic growth and maintenance of harmony in their physical and social life. Thus, they develop as responsible citizens having awareness and sensitivity towards natural resources, indigenous culture and knowledge, waste management and wild life. This paper illustrates craft based pedagogy as an essential part of Nai Talim and explicates its features and phenomena in science teaching and learning. It draws attention to the ways the students can be engaged in the activities for sustainable development through craft based pedagogy for learning science concepts.

Keywords: Nai Talim, Craft Based Pedagogy, Sustainable Development

Nai Talim and Craft Based Pedagogy

Nai Talim proposes manual activity as a teaching element that sits side by side with all other disciplines, that is, a solid structure for growing every object of knowing. The practical skill of crafts serves as the centre and foundation of an individual's spiritual, cultural, and social development and in which skills such as literacy and mathematics are learned in context with and in service to the crafts (<http://mettacenter.org/definitions/nai-talim/>). All aspects of the individual's development—intellectual, physical, social, and spiritual—are cultivated in a curriculum that integrates learning with hands on work that prepares young people for their life in the world. "Craft, art, health and education should all be integrated into one scheme. Nai Talim is a beautiful blend of all the four and covers the whole education of the individual..." Nature and hands-on activities are tools in this approach (Menon, 2016).

Nai Talim is based on the premise that education should connect knowledge to action. It imparts education through some productive work or craft which prepares the learners for life in the real world. It cultivates the practical skills of different vocations prevailing in the community by integrating learning of different subjects like Science, Social Science, Maths and Language with Hands-on work. Thus, craft is the medium of instruction to impart education of any of the academic subjects. It connects all the academic subjects and places them in the context of the community and thus learning of these subjects become practically meaningful. Education is not merely to know certain facts about different subjects but is to apply these facts to choose some vocation of the community as a means of livelihood with dignity, improves the vocation with learned academic and technological inputs and also generates new vocational skills and

techniques for its advancement. It thus preserves and strengthens the culture of the community and makes its individuals economically self-sustained. As the sustainability of crafts depends upon the availability of natural resources, the individuals also become sensitive towards protection of nature and thus, the movement of environmental sustainability is strengthened. Development of one craft supports that of another craft or vocation, hence social harmony is established among people's thoughts and practices in the community.

In this approach to schooling, academic subjects are taught in an interdisciplinary way and never separated from their practical application in the world. It seems to be a boon to the teaching-learning of science where practical understanding of physical phenomena is essentially required to apply these facts in resolution of day to day life problems. Learning of science integrated with crafts, connecting together various academic subjects, help science teachers and learners develop working models or improvised apparatus for demonstration of various science concepts. Construction of these models and apparatus cultivate in the learners the value of self-sustainability, sensitivity towards environmental conservation and social harmony (Gray & Camino, 2016).

Poularisation of Science through Productive work

As Prasad (2001) underlines- "Popularisation of science, according to Gandhi, was not a linear transfer of knowledge from the expert to the lay person but had to be a collaborative effort. It was only thus that science too could benefit from the process: "It is clear that in Gandhi's Nai Talim, science education was not to proceed by pursuing islands of excellence in a sea of mediocrity. Work was to be done on the base of education so that no hierarchies of knowledge were created between the scientists as experts and the people. He wanted a proliferation of scientists and engineers in the villages, an increase in India's scientific manpower that would not be measured by the number of university degrees in science, but in creating scientists who would be true servants of the nation".

Science is not meant only for the individuals who will pursue science as a discipline in their later carrier but it also belongs to the common man those

who are working in the farmlands, craftsmen doing spinning, wood work, metal work, paper work or leather work; tailors, cooks and so on. Science does not only happen in the sophisticated science laboratories of higher education institutions but also in the natural fields of farmers, craftsmen, tailors, cooks and so on. Science should not only lead to formulation of new theories to explain complex scientific phenomena in a comprehensive way but also to provide practical skills to the individuals to support their local community and develop understanding of the cultural history of the community and nation at large. Science is culturally oriented and has the roots penetrating deep into the culture.

Now, it is the duty of the scientists as well as the common man to trace into these roots and find out certain unique interactions between animate and inanimate as well as humane and non-humane which may foster harmony within the nature and society as well as between them. Science is now to be considered as a creative process intermingling ecology with culture to produce indigenous knowledge in the form of improvised apparatus and crafts to deal with the problems of environmental, economic as well as social sustainability or sustainability as a whole.

Learning of science must involve the community based practices where the learners engage themselves with the scientific processes of various vocations like agriculture, gardening, spinning, wood work, metal work and so on involving cultural peculiarities of the community with the help of craftsmanship. It removes the myth that craftsmanship is deviated from research and scholarship. Experiential engagement with crafts to understand the scientific phenomena involved in the community practices will lead to development of indigenous knowledge that will develop scientific temper of the learners, improve the community practices as well as support the economic and social transformation for sustainability. This process of engagement will integrate various subjects reflecting the interdisciplinary nature of science, individual potentialities of various learners and also the element of co-operation among the learners.

Goodwin Brown, one of the prominent scientists who suggested that a reductionist view of nature will fail to explain complex features, explained that:

"[...] the university concept will have to be radically rethought in terms of an education process that provides people with the practical skills needed to support their local community as well as an understanding of the cultural history that has brought us to the present moment of transition. [...] there will be a diversity of learning possibilities within this system, appropriate to different individual interests, but they will all be grounded in a common understanding of ecological and cultural principles as expressions of a creative process in which everything is engaged, human and non-human, animate and inanimate".

"[...] Learning will be based on the acquisition of practical skills through experiential engagement with craft and place, combined with research and scholarship that guide the processes of innovation and social transformation. The acquisition of skills will have a significant cooperative dimension, with an emphasis on developing practices relevant to the community while encouraging individual creativity and appropriate innovation" (Goodwin, 2007, p. 337).

Integration of crafts with Science Education Promoting sustainable Development

Crafts bring greater benefits in democratising science. Crafts are a means to connect science with arts, culture as well as various vocations of the community. As learners explore and experiment with crafts, they establish deeper understanding of scientific principles (https://www.youtube.com/watch?v=-Fu-P1n_NsY). It makes learning of science joyful and concrete in nature. Science no more remains limited to scientists and its sophisticated labs but also reaches the farmlands of the farmers, the workshops of the craftsmen and so on (Gray, L.C. & Camino, E. 2016). The scientific principles/phenomena involved in various community practices may be included as the inputs of science syllabus. On the other hand, the crafts like toys, game articles made out of wood, paper or plastic work may help the young individuals to earn their living in later stages. The crafts are used to develop charts, models and improvised apparatus to demonstrate various scientific phenomena. Using waste or natural materials related to various

vocations like bits of paper, plastic bags or bottles, rubber tubes, electrical wires, batteries, wood and leather pieces, plant leaves and twigs, bark of the tree etc. to develop low cost disposable improvised apparatus for simple experiments or demonstration by the learners, develops in the learners the sense of responsibility towards management of wastes- how can the wastes be recycled or reused? How should the wastes be segregated and disposed to minimise the environmental pollution? How can the wastes be converted to less toxic or harmful substances? and conservation of natural resources as well as to compare cost efficiency of the apparatus constructed using the low cost locally available materials with standard factory produced ones (Yitbarek, 2012). Thus, waste management, environmental conservation, economic self-sustainability becomes a part of their routine activity.

Craft based pedagogy or learning through productive work is so closely related to rest of the process of learning that it is almost inseparable from other pedagogies of learning (Dasgupta, 2015). In science, crafts designed with mapping of the science concepts help the child learn the science concepts with its practical application in the real world (Prasad, 2001). It engages child in experiential learning of the science concepts through crafts. As crafts are closely related to the community life, the learners also explore the scientific principles involved in the community practices or the processes of various vocations. They seek to find out why and wherefore of these processes (Dasgupta, 2015). The young individuals, when they become practitioners of these vocations in later stages, may design different crafts involving various science concepts and develop indigenous strategies to deal with the problems of the particular vocation and fulfil the requirements of their personal and community life. For example: They may design agricultural tools for better ploughing or harvesting; means of production of organic fertilizers; toys made up of waste materials; natural means of food preservation, natural air cooler, natural vacuum cleaner, natural ways of rain water harvesting, low cost but effective means of waste management, indigenous strategies of conservation of wild life etc.

The skills and qualities that can be fostered in the learners through all types of productive works are-procedural understanding, cause and effect

relationship, sense of proportion, measurement and alignment, cost effectiveness, conservation of nature, spirit of inquiry, human qualities such as compassion, brotherhood, team work etc. These skills and qualities help the young individuals to understand the situations around them better than those belong to mainstream education system (Dasgupta, 2015). The development of crafts using science concepts guide the learners to develop equipments contributing to conservation of natural resources like natural air cooler, vacuum cleaner made up of plastic bottle or vacuum cup, utilization of locally available natural resources and waste materials for developing low cost articles for various vocations encouraging swadeshi practices leading to self sustained economy consistent with conservation of nature. While working in groups with crafts, the learners develop the qualities of tolerance, togetherness and empathy which consecutively support social transformation for sustainability where every individual's culture, vocation and ideas are paid equal respect.

CONCLUSION

Integration of crafts with science education facilitates learners to develop deep insight into the science concepts with its practical application in the real world through construction of models and charts as well as low cost improvised apparatus using waste materials and locally available natural resources. This consecutively leads to development of sense of conservation of environment, protection of nature, waste management and cleanliness in them. They also learn to develop cost effective articles involving scientific principles for various vocations of the community using waste or natural materials leading to self sustained economy consistent with conservation of environment.

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