



Science Curriculum for the Most Marginalized Children in India

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Abstract

Developing a curriculum for the most marginalized children in India-- The Tribal and underprivileged children--is a challenging task.

Providing a learning environment which is not threatening, so as to encourage learning process becomes imperative when we deal with children who are already lacking in courage and self esteem. Evolving a curriculum that liberates and embraces the spirit of independence is the first step to any learning to take place is for children in any school environment.

There are two aspects to the planning which is the academic and the aesthetics. It is imperative to give scope for the development of both these aspects –the logical and the artistic which are governed by the left and right side of the brain—to ensure a comprehensive growth of the personality. This approach opens up innumerable avenues to children to understand concepts in their own specific way and at their own pace.

An interdisciplinary approach to learning is best suited to ensure the learning outcomes. How do we approach this?

Selecting a theme from the science syllabus and approaching the same from different subject angles and viewing it from their perspectives gives a complete understanding of the concepts taught. Knowledge does not exist in isolated pockets but is seamlessly connected flowing blending into one another. This fact if understood enhances the understanding as a total picture. Fragmented learning leads to a lot of misunderstanding. Knowledge is a cohesive whole and exists as the web of life.

Working on this principle, the learning process becomes meaningful and complete. Complete because it is total comprehension. Complete because of the sense for art and aesthetics. Complete in the sense of a total being – being human.

Introduction

The world is going through a climate crisis but a second crisis is in the offing in the field of education. There is an urgency crisis of our natural resources and our human resources. This is because we make very poor use of our talents. People are displaced from their natural selves and their fore when they reach middle they begin to wonder why they lived their life as they did and feel sorry that they failed to follow their passion or develop their talents. Therefore a curriculum that recognizes the need to address the natural talents and gives scope for this expression is essential to the complete growth of the individual.

Learning process is not an industrial one. Schools are not factories producing products and at the end of the day are tested and declared either fit or discarded. People believe that if the data is fine tuned the process will hum along happily. We believe in linearity but life is not linear it is organic.

Education needs an agricultural model. Learning process cannot be hastened, it takes time to germinate, to grow and flower. What it needs is the suitable environment to grow. If there is a dearth of any one of the factors imperative to its growth, then the flowering does not happen or the plant is either stunted and dwarfed or suffers from various inadequacies.

Education is both an organic and a human system; it is about people. And there are conditions under which people thrive. Human beings are naturally different and diverse and prosper in a broad curriculum that celebrates their diversity and various talents. A curriculum that includes not just maths and science but also the arts will provide diverse learning. Arts speak to those parts of children that are otherwise untouched.

Math, science and technology are essential to education but not sufficient. One of the purposes of education is economic and this lead to the industrialization of education. Therefore the curriculum was geared to supply the



need of the industry and the over emphasis on maths and technology led to this lop sided view of education. We now have different set of parameters. The demands from the corporate world are adaptability and creativity of their members. Coupled with this is the cultural identity and values as a result a broader curriculum has become imperative.

A conviction that a curriculum of this nature has to be evolved to make learning meaningful to the tribal and under privileged children at Anaikatti compelled us to rethink on the methodology and innovate new systems so as to reach these children and also retain their interest in schooling. A curriculum that encompasses the head, heart and the hands had to be designed. A multi-age and multi-ability classroom provides challenges for both the teacher and the students. It also encourages other values like peer learning and caring. A fear free environment allows children to excel themselves in whichever area of study they choose. This self confidence building process and self learning ability is the primary focus in the early years of schooling, to develop a thinking skill and have the conviction to express what the student feels is the first step to learning. Learning is a continuous process and is never done in compartments. Subjects and class distinctions that we make do not necessarily make sense to the students. The ability to absorb, understand and further learning at each individual's capacity lays the foundation to consolidate what has been learnt and move ahead. Therefore the curriculum does not stop with academic excellence but extends its learning process into the fields of fine arts.

To make this process of studying through themes possible, it was decided to start from the immediate to the far away. So SOIL was selected as the theme. Children love to play with soil and the immediacy of it makes it a interesting subject to explore. It is a theme that lends itself to detailed study both from the scientific angle as well as from the social science, math, languages and arts angle.

Theme from the science curriculum is chosen as the core and developed through science and other subjects. The interdisciplinary approach to learning establishes the interconnection of various areas of learning and the understanding that no concept is in studied in isolation but derives its meaning from another discipline as well. The seamless connection gives the student a total perspective of the topic and not just a string of unconnected facts which seems to exist in isolation.

For example soil is science, soil is also intrinsic to social science so also to math, art and languages. This comprehensive view of a theme imbues a student with the capacity to view things in different ways.

A sample curriculum

It all began with THE POT.



Fig.1 A potter's wheel signifying creativity



Fig. 2 The Potter- a genius behind the creation

The idea of choosing THE POT for discussion is twofold 1. The topic has extensive coverage illustrating the interdisciplinary study. 2. The pot is a symbol of the elements. Thus a study of the elements can be extrapolated from this The idea of choosing THE POT for discussion is twofold 1. The topic has extensive coverage illustrating the interdisciplinary study. 2. The pot is a symbol of the elements. Thus a study of the elements can be extrapolated from this symbol as the next area of study

The earth is the soil of which the pot is made. The Pot is made with water and soil. The Pot is fired and so the fire is inherent. The Pot exists in space. In this way the five elements are represented in the pot.



Areas of study



Fig. 3 Areas of Study

The earth is the soil of which the pot is made. The Pot is made with water and soil. The Pot is fired and so fire. The Pot exists in space. In this way the five elements are represented in the pot.

Science		
<ul style="list-style-type: none"> ▣ Types of soil ▣ Garden soil, ▣ Construction soil ▣ Soil weathering ▣ Soil profile – color and composition ▣ Types of soil, from a physical point of view ▣ Properties of soil ▣ Percolation rate ▣ Fossils and minerals ▣ Where does food come from ▣ Uses of soil ▣ Land forms – desert, mountains, marsh lands, dry lands, wet lands 	<ul style="list-style-type: none"> ▣ Alluvial soil – plant life ▣ Agriculture ▣ Soil erosion ▣ Vermicomposting ▣ Nitrogen fixation ▣ Microorganisms – friend and foe ▣ Coal and petroleum ▣ Purification – Moisture and air in soil ▣ Soil pollution ▣ Deforestation and its causes ▣ Consequences of deforestation 	<ul style="list-style-type: none"> ▣ Afforestation ▣ Living soil – methods of protecting soil ▣ Unhealthy practices which kill soil ▣ Healthy soil ▣ Causes of land degradation and soil regeneration ▣ Impact of barren lands on farming, animals, productivity ▣ How to reclaim soil ▣ crude oil to petrol ▣ Conservation of forest plants and animals

Social Science		
<ul style="list-style-type: none"> ▣ Parts of the earth – lithosphere, hydrosphere, atmosphere, biosphere ▣ Continents, oceans ▣ Early man ▣ Major land forms – mountains, plateaus, plains ▣ People and land forms ▣ Climate, vegetation and wildlife ▣ Bird poaching ▣ National parks ▣ Bioreserves ▣ The need for forests ▣ Wildlife – Important animals 	<ul style="list-style-type: none"> ▣ Volcanoes ▣ Floods ▣ Tsunamis ▣ Cyclone ▣ Tornado ▣ Avalanches ▣ Landslides ▣ Soil pollution – Plastics, colors ▣ Sand sculptures ▣ Stone painting ▣ Stone carving ▣ Rangolis from natural soil ▣ chemical fertilizers, burying radioactive 	<ul style="list-style-type: none"> ▣ Seasons, monsoons and winds ▣ Tropical rainforests ▣ Thorny bushes ▣ Mountain vegetation ▣ Mangrove forests ▣ The need for forests ▣ Wildlife – Important animals ▣ Tribal songs relating to the importance of soil and changes in their forms ▣ Songs for cultivation ▣ Folk dances



<ul style="list-style-type: none"> ▣ Migratory fields ▣ Bird poaching ▣ National parks ▣ Bioreserves ▣ Nature and human beings ▣ Physical components– land, air, water ▣ Biological components – plants, animals, decomposers ▣ Aquatic and terrestrial ecosystems ▣ Conservation – Chipko Andolan, Save the Western Ghats movement, The Nilgiri Biosphere reserve ▣ Global Warming Earthquakes ▣ Mud painting ▣ Clay modeling ▣ Murals ▣ Natural colors from rocks 	<ul style="list-style-type: none"> substances ▣ Pollution of water because of insensible substitute of POP in the place of soil in a certain Hindu festival ▣ Soil and climate ▣ Natural manures and fertilizers ▣ Horticultures ▣ Subsistence farming – Intensive, primitive, shifting, nomadic herding ▣ Commercial farming in India – Mixed farms, plantations, major crops, cash crops ▣ Songs for cultivation ▣ Folk dances ▣ Mud painting ▣ Clay modeling ▣ Murals ▣ Natural colors from rocks 	<ul style="list-style-type: none"> ▣ Migratory fields ▣ Life of a farmer in Tamil Nadu (Rice growing area – Thanjavur) ▣ Villupaattu by the students ▣ Excavation – Mohenjodaro, Harappa ▣ River valley civilizations – Indus valley, Nile Egyptian civilization ▣ Discovery of fire ▣ Paintings and cave paintings ▣ Use of stone utensils ▣ Fired utensils (pots) ▣ Stone weapons ▣ Tribal songs relating to the importance of soil and changes in their forms
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Math		
<ul style="list-style-type: none"> ▣ Whole and part ▣ Equal and unequal parts ▣ Fractions ▣ Measurement ▣ Shapes out of mud, length of the sides and edges 	<ul style="list-style-type: none"> ▣ Shapes that fit specific measurements ▣ Names of shapes ▣ Area and perimeter of rectangles, squares, circles etc. ▣ Different shapes from same volumes 	<ul style="list-style-type: none"> ▣ Volume and weight relationship ▣ Agricultural measurement ▣ Comparison between old and new ways of measurement

Languages		
<ul style="list-style-type: none"> ▣ Poetry related to creatures in the soil or the d'oil itself ▣ Soil related Thirukural ▣ Soil related proverbs ▣ Nomenclature of villages and mountains 	<ul style="list-style-type: none"> ▣ Riddles ▣ Stories related to soil ▣ Divisions of soil according to Tamil literature ▣ Study of Tamil literature which gives an idea of the characteristic traits of people of the area. Studied both in Tamil and English 	<ul style="list-style-type: none"> ▣ Study of culture and literature of Gypsies in the Western Ghats ▣ Creative writing and other language building activities with respect to soil



The need of the hour is to look for in education not standardization and conformity but celebrating curiosity and individuality. The focus is to see how children are learning. They have a voracious appetite for learning which stops when they enter school. Science flourishes in this curiosity and to retain this vibrant communication with the student is the aim of every teacher. An interdisciplinary approach to teaching gives scope to this interaction and learning. A good teacher is a creative one and this curriculum challenges that creativity.

Reform in education is like putting together broken pieces, and that is no use. Education has to innovate fundamentally challenging the earlier understanding and creating a revolutionary thought.

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