

Infused Environmental Education concepts in the 10th Standard Text Books of Kerala

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Abstract

The policy lines of Kerala School Curriculum-2013 highlights the need for awareness about environment and the protection of natural resources which should permeate throughout the school curriculum. In this context it can be conceived that in Kerala also Environmental Education is not a separate subject on the already overburdened curriculum but environmental concepts are infused in all subjects from Science and Social science to Language, Mathematics, IT, Arts and Crafts. It is envisaged that through learning of various subjects will help students comprehend various environmental issues leading to the development of a more comprehensive understanding of Environmental education in their minds. Although the inclusion of Environmental education material in textbooks and curricula for several disciplines has been deemed successful to some level, evaluation studies have highlighted the drawbacks of this approach. The present study is taken up to map the infused environmental concepts in the 10th standard textbooks prepared by SCERT of Kerala (2016). The text books of various subjects were analyzed for locating the infused environmental concepts using a mixed method type of content analysis. Findings of the study revealed gaps in information related to the presence of environmental concepts in the current 10th standard textbooks of Kerala. The results thus is an eye opener to curriculum planners, textbook authors, teachers, teacher educators, and aspiring teachers at secondary level to determine the gap between the curriculum, textbook and the lessons on the implementation of the curriculum with infused environmental concepts.

Keywords: Environmental education, infused environmental concepts, textbooks

Context of the study

The main goal of EE is to create informed, environmentally conscious citizens who are eager to actively contribute to the management and sustainable usage of their environment. As a result, EE was included in the academic curriculum at all levels. The overarching goal is to give students in schools the knowledge and understanding of environmental concerns and challenges they need to actively participate in finding and implementing solutions to the issues they face in their surroundings. The National Curriculum Framework and the Supreme Court's approval affidavit (2010) on integrating environmental education into the school curriculum led to revisions of the central and state level school textbooks that incorporate messages of ecological conservation and sustainable progress as well as instil environmentally friendly attitudes, values, and behaviours. The State Council for Educational Research and Training of Kerala created secondary level textbooks as part of ongoing national initiatives by including environmental ideas into all disciplines in accordance with NCERT requirements. The Kerala Curriculum Framework (KCF 2007) also emphasises the significance of environmental protection and awareness as one of the main issues in the school curriculum. Environmental issues are one of the important social issues that should be covered by the school curriculum, according to the issue-based curriculum, one of the key outputs of the Kerala Curriculum Framework. It has been observed that syllabi

and textbooks place a lot of focus on using an infusion method to make teaching and learning more environment-oriented.

Rationale of the Study

The Kerala school curriculum-2013 policy lines stress the necessity for environmental awareness and the protection of natural resources which should currently permeate the whole school curriculum. In this context it may be assumed that Environmental education is not taught as a separate subject in Kerala's already overloaded curriculum but rather it is incorporated into all disciplines including language, maths, science and the arts and crafts .Therefore rather than as a separate subject Environmental education is promoted in secondary schools in Kerala using a cross-curricular approach. It is envisaged that through learning in various topics such practise will help students comprehend various environmental issues leading to the development of a more comprehensive understanding of Environmental education in their minds.

The fundamental teaching tool in schools is the textbook thus there is a huge opportunity and need to address the problems of incorporating environmental education themes into the teaching of many lessons. The interaction with participants and academic coordinators of textbook development at SCERT Kerala indicated that all secondary level textbooks are in line with NCERTs infusion strategy. Local environmental resources, experiences and activities were included as part of this infusion which is frequently referred to as greening of textbooks. It is envisaged that through learning in various topics such practice will help students comprehend various environmental issues leading to the development of a more comprehensive understanding of environmental education in their minds. Adding environmental viewpoint concepts, activities, graphics etc to textbooks is known as greening them CEE 1994. Although the inclusion of Environmental education material in textbooks and curricula for several disciplines has been deemed successful to some level, evaluation studies have highlighted the drawbacks of this approach. Earlier studies revealed that numerous essential Environmental education topics have been discovered to be missing from school curricula and textbooks of other states. Even the included content is not given the attention necessary to guarantee that the goals of Environmental education .The main issue is that textbook authors are reluctant to give the material of Environmental education the proper attention because doing so requires them to explore outside the confines of the traditional frameworks of the relevant fields. A startling conclusion of a two-year study by the Bharati Vidyapeeth institute for Environmental education and research 2003 in Pune was that Environmental education had not increased environmental awareness. There was a dearth of a holistic teaching approach and there had been very little infusion of information on sustainable lifestyles. An investigation of the NCERT model textbooks to determine the effect of infusion exercises on student learning the study found that the curriculums incoherence is being caused by the infused material and that efforts to fix it are only making matters worse it suggests that adjustments to the current syllabus may be necessary to solve this issue (Jackson)

True greening encompasses the written words, content and the ways in which it might be taught. Its success is up for debate though the textbooks for biology ,chemistry, physics geography, mathematics and languages all include material linked to Environmental education. Informal conversations with secondary school teachers revealed that they had difficulty in reconciling the expected results of the main subject with the perspective of the environment as a learning outcome. For at least a minority of students, the secondary school might be a terminal point of their exposure to the academic curriculum. So it is all the more important that a good exposure to Environmental concepts is necessary at the secondary level

itself. In light of this background and the need for the study, the investigator's opening queries are

- 1) Are there enough Environmental education concepts included in the current 10th standard textbooks of Kerala?
- 2) How is Environmental education concepts incorporated into the textbooks?
- 3) How do the different subjects differ in their infusion of Environmental education concepts in frequency?

Methodology

The method for the study is determined by the research questions and the nature of the data required. The study is located closest to the interpretive paradigm because it seeks to explore the presence of environmental education concepts in the existing 10th standard textbooks of Kerala. The manifest and latent content both are analysed through quantitative and qualitative methods is a realistic and well-formed approach to analysis of the textbooks, so a mixed-method content analysis was used in this study to plot the infused environmental concepts in the secondary school textbooks . A methodical analysis of a text known as content analysis is used to determine the frequency, degree, or existence of a particular characteristic. The detailed content of instructional matter becomes more clear when one also “reads between the lines” or takes a look “behind the scenes”. Because the objective here is to present the status of infusion of environmental concepts in the textbooks, description is unavoidably dominant. Results are nonetheless commented upon in a critical manner. Content analysis can be both quantitative and qualitative in nature. Quantitative analysis focuses on the frequency of specific words or themes to describe phenomena (Babbie, 2012). Qualitative analysis is the “subjective interpretation of the content of text data” (Hsieh & Shannon, 2005). A mixed-methods approach makes wider the reach of this study as it increases the reliability of the findings. The text books at secondary level was analyzed for locating the infused environmental concepts. The examples, information, data, questions, exercises, case studies, activities and action links related to environment in the text books were coded and identified as specific concepts and they were categorised under specific categories. A separate coding sheet served the purpose. Once the data have been coded and categorized it can be counted, the frequency of each code and the number of words in each category. The mapping of concepts on environment clearly demonstrates the gaps in information that should be filled in.

Analysis and Interpretation

Infused environmental concepts in English text book (STD: X)

There are five main units in the Kerala English Reader. The lesson "The snake and the mirror" from the first unit, "Hues of Life," tells the tale of a doctor who leads a lonely life until he meets a snake, an unpleasant visitor. Robert Frost included the poem "A Girl's Garden" in the first unit. The poem explores how her father's guidance during her formative years had a lasting impact on her. The poem beautifully illustrates the various stages of farming and village life. One of the finest filmmakers, Satyajit Ray, describes how he was able to shoot the scenes for a movie that featured a tiger in his essay "The Project Tiger" in the second unit of the course, "The Frames of Mind." The lecture mentions the Prevention of Cruelty to Animals Act. That is, certain guidelines outlined in the Act should be followed when using an animal for amusement. The fourth exercise, which is provided at the conclusion of the course, asks students to pretend that Ray is writing a letter to the head of the Animal Welfare Board of India, outlining the specifics of the shot and assuring him that the regulations will be properly followed. The poem "The Blowin' in the wind" has references to various natural phenomena, including the mountain range, wind, sea, and sky. In the fable

"Aodlf," a small rabbit escapes from its humanized confinement and enters the unrestricted wildness of the woods. Debating whether it is appropriate to keep wild animals at home for entertainment is one of the activities provided at the conclusion. Additionally creating a poster on animal preservation is given. A youngster is obliged to go to school while nature calls him with all of its splendour in the poem "School Boy" found under unit five of "Down Memory Lane." The final lesson, "My Childhood Days," is a chapter from Rabindranath Tagore's autobiography about his youth, which includes references to the environment and rural life style.

Infused environmental concepts in Malayalam text book (STD: X)

The Adisthana padavali Malayalam text book of standard X consists of three major units with three chapters each. The major theme of the three lessons under the unit 'Jeevitham Padarthuna Verukal' is that all difficulties can be overcome through love and by maintaining healthy relationships. These lessons make few environmental references in the form of description of nature only. The chapter 'Kochu chakarachi' under the unit 'Nilavu peyuna nattu vazhikal' strongly portrays the relationship between man and nature. It silently conveys the message of the need for environmental protection and there by nature protect us. The poem 'Onamuttathu' depicts the richness and culture of Kerala with the seasonal changes during the festival of Onam. All lines of the poem with elements of nature depicting the aesthetic beauty of nature and there by conveying the message of unity. The Kerala Padavali Malayalam textbook of Standard X again consists of five major units. The presence of Environmental Education concepts in those units is limited to the description of nature and its components. The environmental references are included in chapters like 'Lakshmana Swanthanam', 'Kalidasan', 'Vishwaroopam', 'Priyadarsanam', 'Kadaltheerathu', 'Ashwamedham' mostly as the appreciation of the beauty of nature

Infused environmental concepts in Hindi text book (STD: X)

The Hindi textbook of standard X consists of five major units. The first lesson 'Beer bahooti' is a story under the unit one. It is a story with several environmental references like sky, forest, cloud, wind, trees, paddy field, grains, leaves, water, rain drops, greenery, earth, etc. with respect to environment and its components. In the novel 'Bandi' also terms, sunshine, wind, are sparsely listed. The first lesson under the unit two is a memoir named 'Oondu banam relgadi'. The lesson makes some references like camel, bushes, desert, dried grass, sunshine etc. The lesson 'Nili asmani chathari' is a film song. The poem 'Akaal or uske baad' make some references to the victims of famine. The two stories under the same unit 'Takur ka kuva' and 'Eak thaal chandu bhara' make environmental references like water, well, light, sheep, shade, moon, cold, hotness etc. The lesson 'Basant mere gaavu ka' describes the orbiting of sun in Himalaya with references like seasons, mountains, grassland, snow etc. The lesson 'Jaisalmer' is a travelogue describe the place based references like weather, climate, earth, wind, desert, sand, dried grass, water, wind etc.. The poem 'Jagahom ke nam' describes the aesthetic beauty of environment with references like pine tree, squirrel, birds, shadow, jungle, grassland etc.. The poem 'Bache kam par jarehehe' under the last unit depicts references like snow, morning, ground, atmosphere, termites, grassland etc

Infused environmental concepts in Mathematics (STD:X)

The part one mathematics textbook of standard X includes six chapters such as 'Arithmetic sequences', 'Circles', 'Mathematics of chance', 'Second degree of equation', 'Trigonometry' and 'Coordinates'. Besides a few references to the use of maths in daily life there exists hardly any environmental concepts in the text book. The part two mathematics textbook of standard X consists of five chapters in continuation with the part one. The chapters 'Tangents', 'Solids', 'Geometry & Algebra', and 'Polynomials' are having no

references with regard to environment and its components. The problems in the last chapter 'Statistics' have a few references related to daily life such as amount of rainfall, usage of electricity, babies and their birth weight and haemoglobin level in kids.

Infused environmental concepts in Physics text book (STD: X)

The part I Physics textbook of standard X consists of five chapters. The first chapter 'Wave motion' explains in detail how sound waves are propagated through air. But there is no mentioning about the causes and effects of sound pollution which could have been easily infused along with the content. The after effects of earthquake along with photographs are given .

In the second chapter 'Effects of electric current' one among the learning outcomes was the explanation of the functioning of fluorescent lamps and how they reason environmental pollution. It states that the fluorescent lamp and the compact fluorescent lamp contain mercury vapour which is detrimental to environment. Hence they should not be thrown out carelessly after use. One of the activities given was to arrange seminars to campaign against the menace and to prepare posters to create social awareness. Further the advantages of Light emitting diode lamps (LED) includes i) as there is no filament, there is no loss of energy in the form of heat ii) since there is no mercury in it, it is not harmful to environment and iii)it requires only a small quantity of power . The chapter makes the point that increasing the usage of LED lighting is one strategy for resolving the energy crisis. The creation and distribution of posters to educate the public about the need to reduce electrical energy usage was one of the extended activities in the third chapter, "Electromagnetic induction." The fourth chapter, "Power transmission and distribution," describes the roles played by various kinds of power plants. The chapter also emphasizes the need to conserve energy for tomorrow and that although power is a necessity for daily life, consumption should be kept to a minimum. It serves as a reminder that when a switch is turned off, any water that was saved is kept in the dam. The final line of the chapter reads, "Saving electricity is equivalent to generating electricity." Making and displaying posters emphasising the importance of electrical energy conservation was one of the more involved activities. The final chapter, "Heat," goes into great length with the topic of global warming in relation to environmental preservation. According to one definition, it is a phenomenon whereby too many greenhouse gases cause the earth's surface and atmosphere to warm up. The information in the box for additional reading is on the different greenhouse gases, the reasons for the rise in greenhouse gases, and the environmental issues brought on by global warming. The chapter is then strongly finished with the warning that if we do not stop global warming, which poses a threat to life as we know it on Earth, we will be doing a huge injustice to future generations. Giving advice on how to stop global warming resulted in the assignment of gathering more information and statistics about the issue in order to display them on the school bulletin board. Explaining global warming, the causes of it, offering solutions, and using those solutions in real-world circumstances were some of the learning objectives. Chapters make up the second section of the Physics reader. Electronics and modern technology's seventh chapter is closed with a discussion of the necessity to control e-waste. It makes me think about how much electronic garbage is being accumulated in schools, districts, and states. A task was assigned to identify the dangerous materials present in school-related e-waste. Used CFLs, mercury vapour lamps, etc. should be treated carefully because throwing them away causes major environmental issues. The two indicators provided for debate are the social and environmental issues brought on by outdated electric and electronic gadgets and the reasoning behind the caution that is advised while handling e-waste. With the aid of information gathered from the area, a task was provided to illustrate

the seriousness of the problem posed by e-waste. The chapter's point is that it is crucial to make sure that contemporary technology is applied for societal good. The goal of the new generation is to prevent any negative impacts from being felt by humanity. The implications of e-waste on the environment are also covered in detail in the research box. The air is severely polluted by mercury from electrical and electronic equipment as well as the toxic fumes released when PCB, condensers, and other materials are burned in incinerators. Dioxins, acids, mercury, furans, and other hazardous compounds cause extremely damaging effects on the earth and consequently in water when the e-wastes interact with the soil. The recycling and disposal of electronic trash puts workers' health at serious risk, even in affluent nations. Such dangerous e-wastes ought to be handled with the utmost care. The amount of e-waste also serves as a reminder of the sad state of the e-waste problem. One of the learning objectives was to describe the environmental issues caused by e-waste and participate in actions to raise awareness of them. It was suggested for evaluation to write a brief remark about the environmental issues brought on by e-waste. The last chapter, "Energy Management," cites population growth as the main reason behind the sharp rise in energy use. The research box serves as a reminder of the issues that result from carbon monoxide mixing with the environment as a result of partial combustion, which in turn results in atmospheric pollution. There is a task that asks students to record instances of atmospheric pollution caused by combustion from sources other than their homes and cars. The next task required participants to examine and talk about a figure that was created by a child as part of a drawing contest related to energy saving. The illustration provoked contemplation and highlights the dearth of fossil resources. Fossil fuels are explained in detail in the study box. The metamorphosis of plants and animals that lived beneath the crust of the earth millions of years ago produces fossil fuels. Without air, at high pressure, and at a high temperature, the change took place. The three types of fossil fuels are coal, oil, and natural gas. They are not renewed or replenished in accordance with their utilisation. They are also called as nonrenewable fuels as a result. There was some thought-provoking discussion that emphasized the limiting use of fossil fuels. The preparation of various posters to demonstrate the value of fossil fuels and the need for careful use was one of the activities present. When burned, good fuels barely pollute the atmosphere. The next section of the chapter covers the creation of biogas from home and garbage trash. The chapter offers the chance to talk about why community biogas plants are necessary. A task was provided to set up a lecture in PTA about the benefits of properly using household waste. The chapter then makes an effort to explain to its readers the benefits of using solar energy.

Infused environmental concepts in Chemistry textbook (STD: X)

Standard X's part I Chemistry textbook is divided into four chapters. Only in the first chapter, "Periodic table and electronic configuration," is there a brief mention to Kerala's mineral wealth in the list of recommended readings. A caution regarding the prudent use of this priceless mineral wealth is included with the description. The remaining chapters, including "Mole concept," "Rate of chemical reactions and chemical equilibrium," and "Reactivity series and electrochemistry," include no references to EE. Four chapters make up Part I's continuation in Standard X's Part II Chemistry textbook. There are practically any EE concepts in chapters 5 and 6, which are respectively titled "Production of metals" and "Nomenclature of organic compounds." The utilisation of many natural and synthetic polymers in daily life is discussed in chapter seven, "Chemical reactions of organic compounds." The thermal cracking technique can be used to transform plastic wastes, which are hydrocarbon polymers, into simpler hydrocarbons, hence reducing pollution to some extent. The extended task included identifying the contexts in which various hydrocarbon

chemical reactions are used in daily life. The definition of chemistry as the branch of science that aids in man's development and quick progress in every aspect of life, including agriculture, industry, healthcare, food, shelter, clothing, adornment, transport, and research, is given at the beginning of chapter eight, "Chemistry for Human Progress." The chapter also discussed the potential changes to the environment brought on by the significant increase in carbon dioxide levels in the atmosphere as a result of the burning of all organic fuels. Reminds us of the dangers of carbon monoxide poisoning caused by incomplete combustion. It suggests holding a lecture in the class to discuss how excessive gasoline consumption harms the environment. The conclusion of the chapter notes that numerous scientific breakthroughs have produced materials that pose a threat to the environment. Large-scale pollution is caused by the raw resources used to create useful goods and the trash we dump. Thus, the chapter emphasizes the necessity for green chemistry, which is founded on specific rules that restrict the quantity of reactant atoms and molecules to the necessary precise proportion in chemical reactions, thereby limiting the amount of harmful by-products to the minimum. The major objectives of green chemistry that should be covered include: i) transforming harmful chemicals into useful and safe compounds; ii) creating environmentally friendly products; iii) reducing pollution; and iv) minimizing the use of deadly products. By acknowledging chemistry's unique role in the advancement of humanity and minimizing the negative consequences of human interference on nature without impeding progress, it is concluded that green chemistry has aided nature and life. For the purpose of conducting a seminar in class, the viability and importance of green chemistry were discussed. One of the learning goals was to understand the importance of green chemistry and how it is used in daily life. The extended learning activities include identifying the roles played by green chemistry in everyday life scenarios and conducting a survey by looking at the buildings around you and making a list of those built of environmentally friendly materials.

Infused environmental concepts in Biology textbook (STD: X)

Eight chapters make up the conventional X biology textbook. The first chapter, "Sensations and Responses," explains the structure and function of the neuron and focuses mostly on receptor, stimulus, and response. There are no EE-related learning outcomes. No learning outcomes are addressed as a component of EE in the second chapter, "Windows of knowledge," which describes the anatomy of human sense organs. The third lesson, "Chemical messages for Homeostasis," describes how different hormones work in both humans and plants. The unchecked use of synthetic hormones and chemicals, which can lead to a variety of health and environmental problems, is mentioned. The ability to evaluate and describe how the use of synthetic plant hormones aids in agricultural development is one of the learning objectives. The fourth chapter, "Keeping diseases away," provides information on the pathogens that cause numerous diseases in both people and plants. Only a passing mention of a sickness brought on by an unhealthy lifestyle. The chapters conclude with the maxim "Healthy people are a society's true wealth." Posters expressing the idea that social hygiene is just as important as personal hygiene are one of the longer activities. The body's various defense mechanisms are discussed in detail in chapter five, "Soldiers of defense," and traditional treatments based on local bioresources and the need to protect biodiversity are both mentioned. This chapter also serves as a reminder of the need to maintain a healthy society through the consumption of nutritious food, maintaining hygiene and a proper life style. The planning and execution of initiatives to eradicate mosquitoes at home and on school grounds is one of the learning activities as a whole. The idiosyncrasies of a person's body are caused by inheritance and variation, according to the sixth chapter of the book, "Unravelling Genetic Mysteries." A key environmental premise is conveyed by the chapter's

assertion that human differences are mainly cultural in nature and that, genetically speaking, all people are of the same race. In the seventh chapter, "The Genetics for the Future," there is a collage that illustrates how genetically modified plants hurt native species and could be harmful to people's health. Is human intervention with nature detrimental to life? is one of the markers for debate in the final chapter, "The Paths Traversed by Life," which is one of the chapters in the book. The next item in the box states that different rates of biodiversity expansion have been documented throughout history. Five catastrophic extinctions have been documented in evolutionary history; each one was followed by a rapid restoration of biodiversity. Globally, biodiversity has recently risen more than at any other time in history. However, the influence of humans has put this biodiversity in a serious decline. According to statistics, during the next 50 years, 14 of all species of life on earth will cease to exist if these circumstances continue. If it occurs, it will be the sixth and biggest mass extinction of species in recorded history. The chapter ends with a reminder that modern humans are thought to be the planet's final extant species and that it took millions of years for all other species to evolve into what it is today. It posed the issue, "Will intelligent humans' imprudent interference destroy the continuity of life on Earth?" as a topic for discussion. It serves as a further reminder that everyone is aware of the difficulties posed by climatic changes brought on by human activity and the loss of animals. Programmes to conserve the environment are actively supported by individuals and organizations. This underlines the fact that only the existence of numerous other different ecosystems makes it possible for humans to live on Earth. People are able to predict the future.

Infused environmental concepts in Social science text book (STD: X)

Eleven chapters pertaining to political science, sociology, and history make up Standard X's Part One Social Science. The history is covered in the first seven chapters. In the first chapter, "Revolutions that Influenced the World," the various revolutions of the world are compared purely through allusions to agriculture. France was on the verge of bankruptcy due to the country's repeated droughts and agricultural failures. Under the tsarist rulers' despotism, Russia's farmers and industry workers endured a miserable way of life. The farmer's income was impacted by the poor agricultural output. In addition, the farmers who lacked land had to pay a high tax. Despite having abundant natural resources, Russia produced very little industrial goods. The vast majority of the industries there were under foreign control. During Mao Zedong's voyage through China, they took agricultural land and villages from local lords and handed them to the farmers. The Kuomintang Republic took steps to promote both industry and agriculture. The Second World War, Nazism, Fascism, and the Post-War World are all covered in length in the second chapter, "World in the Twentieth Century." At the beginning of the 20th century, the Europeans divided the continent after arriving in pursuit of natural resources. As a result of imperialism, natural resources were extensively exploited and colonial residents were pushed to grow cash crops rather than traditional food crops. The main problems that globalisation brought to emerging nations included the eradication of indigenous cultures, a sharp decline in the price of agricultural goods, and resource looting. Krishi Bhavan is mentioned as a government organization that supports agriculture in the third chapter, "Public Administration." The government's support for increasing rice cultivation was one of its key decisions regarding the wellbeing of the populace. The British land revenue system impoverished Indian farmers, which prompted the commercialization of agriculture, according to the analysis in chapter four, "British exploitation and Resistance." In the past, Indian peasants participated in agriculture primarily to provide for their families and the requirements of their hamlet. They were required to grow crops in accordance with market demands when under British

authority. As a result, commercial crops rather than food crops were mostly grown. Agriculture has undergone a shift known as commercialization. The most productive area of the farmland was also required to be used for the cultivation of indigo. Therefore, the land utilized for growing food grains was to be set aside for indigo plantations. Farmers only earned a reduced price for their indigo because British agents meddled in the harvesting process. . In the future, after the creation of artificial hues, indigo was no longer used. This made the farmers' predicament even worse because they had dedicated a large portion of their land to the growing of indigo. British policy and the commercialization of agriculture were the topic of a debate exercise. Across the present-day states of Bengal, Jharkhand, and Bihar, the Santhal are a tribe that lives in the valleys of the Raj Mahal Hills. They farmed and collected forest products for a living, living in close proximity to nature. They had a robust, hardworking culture that was all their own. When British control was established, it disrupted their daily routine. The Raj Mahal Hills consequently became a theatre of war between the Indians and the British. Rule by the British led to the tribes becoming victims. Their main sources of income were gathering forest products, raising livestock, relocating crops, and hunting. They suffered under the British government's draconian Forest Acts. When the British designated forests to be protected, it was forbidden for them to enter them. The British had a need for forests with a lot of trees, thus they were designated as protected forests. For plantations, railway construction, shipbuilding, and other purposes, the British extensively cut down trees in forests. On the forest products that the tribes had collected, the British had imposed additional taxes. Tribes were prompted to fight the British by these circumstances. Kurichya's primary causes are as follows: . Land confiscation for unpaid taxes was one of the main causes of the Kurichya uprising. The chapter also examines the causes of the decline in the handicraft industry. The people who had been employed in the textile sector moved to the villages and worked in tasks related to agriculture. As a result, there were more people who turned to agriculture as a source of income. India experienced famine and starvation-related deaths as a result of the collapse of the agriculture and handicraft industries. Swadeshi Movement: A novel form of resistance that promoted the widespread use of locally produced goods in place of imported ones was launched. The "Culture and Nationalism" chapter lists the factors, including social reform movements, journalism, education, literature, and art, that aided in the rise of nationalism. The national movement, once restricted to the upper class and the educated, eventually became a popular movement, as discussed in chapter six, "Struggle and freedom." An passage from Mahatma Gandhi's "My Experiments with Truth," titled "The stain of Indigo," which describes the extreme hardships endured by thousands of farmers who grew indigo in Champaran, opens the chapter. Further information regarding local conflicts is included in the chapter, including information about the Champaran indigo farmer's strike, the Ahmedabad cotton mill workers' strike, and the Kheda farmer's strike. Analyses of the worker and peasant movements' contributions to the struggle for freedom were also made. Peasant movements were launched in India by farmers who saw the value of a coordinated uprising. The All India Kisan Samiti convention, which was held in Bombay, resulted in the creation of a farmers' manifesto that outlined all of the fundamental demands of Indian peasants. The subsequent demonstrations by farmers and labourers fueled the Indian National Movement. There are five chapters in Part 2 of the Social Science I text book. India after Independence, the seventh chapter, covers the difficulties India encountered after becoming independent and its path to development. Alvaro Venhov, a Portuguese sailor who landed in Kerala with Vasco de Gama on May 20, 1498, left diary entries at the beginning of chapter eight, "Kerala towards modernity." It talks about Kerala's natural beauty. By assuming administrative control, the British were able to purchase goods from

Kerala at a discount and resell them at a premium. With this, Kerala's rural communities' self-sufficient economies were devastated. Kerala joined the global market as foreign trade expanded throughout the region during the British era of administration. The agriculture industry was promoted by the British as being market-driven. In overseas markets, demand for coconut products was very high. As a result, rice was not grown as extensively as coconut. In certain areas, hunger resulted from the lack of grains. In Kerala, cassava was widely grown to combat the famine. The three main economic shifts that pushed Kerala towards modernity were the alteration of land relations, commercialization of agriculture, and industrial expansion. The components of a state and the obligations of citizens are discussed in the chapter "State and Political science." The chapter assesses how negatively high and low population affect each other. In the chapter titled "Civic Consciousness," the importance of civic awareness in a democratic society is covered. The first image in the chapter is of the well-known environmentalist Kallen Pokkudan, who dedicated his entire life to the preservation of mangroves. His extensive mangrove planting made him a great role model for raising environmental awareness. His life serves as a shining example of how even regular people can make a positive impact on society. Civic consciousness is the understanding that each citizen serves the society and that each person's interests align with those of the community as a whole. Citizenship-minded people are constantly willing to contribute to society. The development of the state and society is influenced by civic consciousness. People will become egotistical and only work towards their own goals if there is no civic conscience. Social life will suffer as a result. There won't be any security or serenity in such a society. The title "summer heat intense: acute water shortage," "city under threat of pollution: potential for epidemics," and "poison in vegetables: food security department for vigorous steps" are examples of difficulties facing society. Only the people's collective action and cooperation are required for a solution to be found. Water scarcity and environmental pollution are only two examples of societal issues that are addressed along with remedies. The chapter goes into great length about the significance of civic consciousness determinin factors, ways to enhance civic awareness and morality, issues with civic consciousness, social science learning and civic consciousness. The various societal issues can be resolved through civic awareness. a task that requires students to create a brief movie about a topic—say, corruption awareness or environmental protection—and present it in class. In the areas of environmental preservation, human rights defence, philanthropy, etc., there are numerous nonprofit organisations. Individuals may become more aware of the environment and human rights thanks to these associations. Photographs of several individuals with excellent civic conscience who made significant contributions to society were distributed, and one of them included Mayillama. She led the charge in the battle with Pepsi. One behaviour that demonstrates civic consciousness is listed as "It is my responsibility to protect nature." As an illustration of behaviour lacking civic conscience, it is stated that there is nothing wrong with disposing of trash in public areas. The eleventh chapter, "Sociology: what, why," examines the value of sociology as a field and offers numerous sociological techniques for examining social phenomena. There are five lessons in the portion I Social science -II textbook for standard X. The numerous seasons, as well as the climatic and environmental changes associated with each, are described in the first chapter of the book, "Seasons and Time." The various wind types, their formation, and impacts are covered in the second chapter, "In search of the source of wind." The study box contains information about preventing desertification. Along the edges of deserts, trees are frequently planted. It is a measure to lessen wind speed in order to stop deserts from growing. The quantitative and qualitative dimensions of human resource development in India are listed in the chapter. through correctly utilising natural

resources, healthy people may contribute to the development of a nation, as demonstrated through human resource development and healthcare. Food that is nutrient-dense, a wholesome environment, and access to clean water are amenities that must be provided for healthcare. There is an increase in production that results in economic development when natural resources and human labour are united. Locating the precise location of geographical features is done in chapter four, "Terrain analysis through Maps." Topographic maps use a variety of colours and symbols to depict geographic elements like vegetation on the surface of the planet, such as grass, palms, coniferous trees, bamboo, dense forest, reserve forest, etc. The physical characteristics on topographic maps include the various terrain types as well as water bodies including rivers, streams, wells, tube wells, springs, etc. The fifth chapter, "Public expenditure and public revenue," discusses the characteristics of both categories. The government makes financial investments in environmental protection and clean water. The cost of running the government rises as the population grows. The sixth chapter, "Eyes in the sky and data analysis," provides information on how the deployment of satellites and contemporary computer software that aid in the study of geospatial data make geography more accessible. In order to identify forest fires in deep forests and to adopt control measures, remote sensing is used for monitoring the weather, exploring the ocean, understanding land use, monitoring flood and drought, gathering information on the size of crops and the spread of pest attacks, searching for oil, and locating locations with potential for ground water. In order to determine how different surface features on Earth are related to one another and how they have changed through time, GIS analytical tools like overlay analysis are used. Understanding changes in cropland, land use, etc. can be done with the aid of overlay analysis. The seventh lesson, "India: The Land of Diversities," examines the various physiographic characteristics of India. Here, the mountain topography that runs along India's northern border is mentioned. India has a varied geography. Huge rivers flowing over vast plains, expansive agricultural plains, extensive plateaus, scorching deserts, lengthy coastal plains, and a number of islands before emptying into the sea originate from snow-covered mountains. Our nation's diversity is incredibly alluring. These differences continue to exist in every area, including physiography, climate, way of life, culture, flora and fauna, natural resources, etc., and they are what underpin India's wealth. Protecting these differences and examining how India's physical variety affects the agricultural industry are our responsibilities. Natural resources of all kinds are abundant in India. Land area, physiographic features, climate, varieties of soil, etc. make up the basis of resource potential. For the development of the nation, resource utilisation is just as important as resource availability. This chapter discusses the geographical characteristics of several industries, including mining, transportation, and industry, which have an impact on India's economy. Since ancient times, energy needs have been met by utilising mineral resources like coal, petroleum, etc. Therefore, these energy sources are referred to as conventional sources. Due to their non-renewable nature, these minerals are however being depleted from the planet. Furthermore, the burning of these minerals significantly damages the ecosystem. We have started using alternative energy sources as a cure for this. The main non-conventional energy sources in India are biogas, wind, wave, tidal, and solar energy. India places a high focus on these accessible, sustainable, and environmentally friendly sources. There is no environmental pollution from water transportation. The topic of having to pay for even water and air is covered in the chapter "Consumer: satisfaction and protection." Resources are scarce, which is the main cause of that.

Infused environmental concepts in IT textbook (STD: X)

The IT textbook of STD IX consists of ten lessons. In the first chapter 'The world of designing' the caption 'Taste the Real Taste of Nature' was used for banner model preparation. Environmental references like elements of earth like sun, moon, purpose of maps for land use, water shed analysis; QGIS for reporting the availability of water in wells are mentioned in Chapter six: Map Reading. For preparing the story board for animation, elements of nature like sun, sky, stars, birds are used in the chapter nine: Moving Images. The two follow-up activities include i) Animate a leaf swinging from the branch of the tree on which the birds are sitting and ii) Prepare the animation of a bird, flying with its wings flapping from the animation.

Infused Environmental education concepts in standard 10th textbooks: An overall analysis

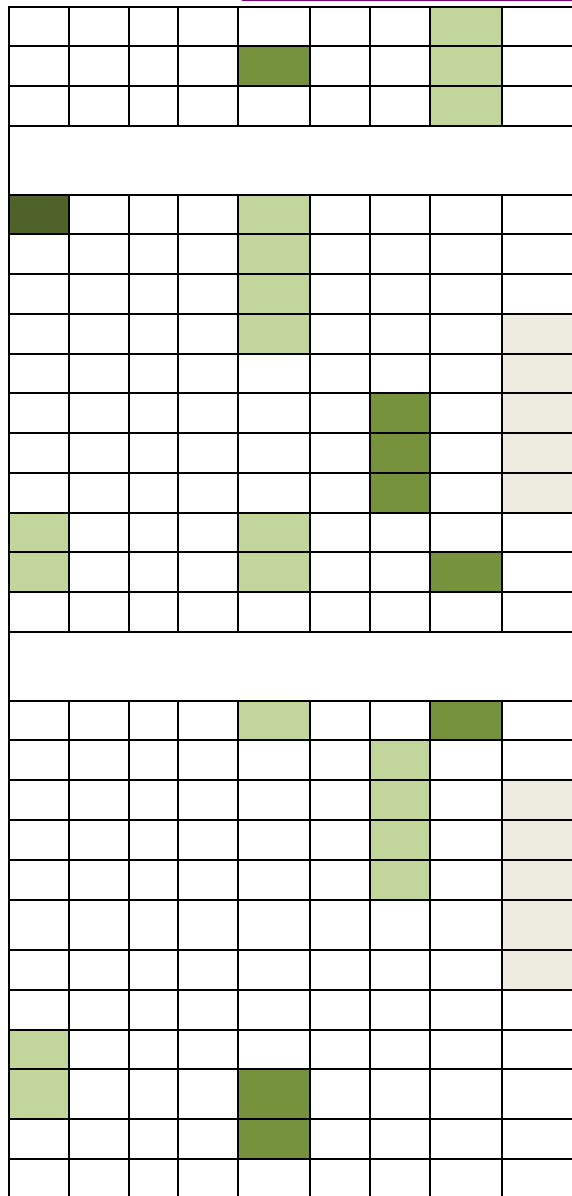
Content analysis was used to analyse the data. Data were coded, which led to the grouping of the evidence into categories that reflected progressively broader viewpoints (Cresswell & Clark, 2009:132), and the determination of linkages between categories. According to the concepts of holistic and systemic learning, the relationship between categories was examined. The researcher created five categories that were employed in this study for coding. Clarifications have been added to each category to improve the categorization procedure. The categories include

- 2) Biodiversity, Systems in Nature
- 3) Pollution
- 4) Vitality
- 5) The Public and the Environment
- 6) Other

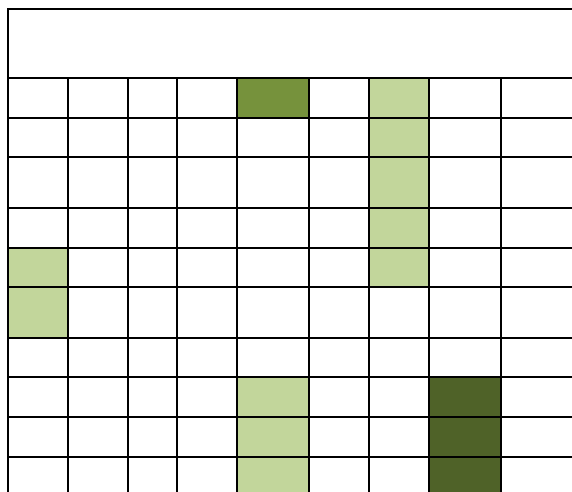
Figure 1: Presence of EE concepts in subjects of standard X (SCERT, Kerala)

		STANDARDS X								
Codes	Concepts	ENG	MAL	HIN	MATHS	PHY	CHE	BIO	SOSC	IT
Category 1:										
Systems in Nature										
NGEN	General	■	■		■	■			■	■
NUNI	Universe	■	■		■	■			■	■
NEAR	Earth			■	■	■			■	■
NBIO	Biosphere			■	■	■	■	■	■	
NATM	Atmosphere			■	■	■	■	■	■	
NWAT	Water	■			■	■	■	■	■	
NLAN	Land	■			■	■	■	■	■	■
NLAN-S	Soil				■	■	■	■	■	■
NLAN-R	Rocks				■	■	■	■	■	■
NLAN-M	Minerals				■	■	■	■	■	■
NLAN-L	Land use	■			■	■	■	■	■	■
NW&C	Weather & Climate	■			■	■	■	■	■	■
NBCY	Biogeochemical Cycles	■			■	■	■	■	■	■
NECO	Ecosystems				■	■	■	■	■	■
NECO-F	Forests				■	■	■	■	■	■
NECO-Ft	Types				■	■	■	■	■	■

BNPS	National Parks
BCON	Conservation
BISS	Issues
Category 3 Pollution-P	
PCLF	Classification
PAIR	Air
PNOI	Noise
PWAT	Water
PSOI	Soil
POIL	Oil
PTHE	Thermal
PRAD	Radiation
PSWA	Solid Waste
PISS	Issues
Category 4 Energy-E	
ECON	Conventional
ECON-S	Sources
ECON-C	Conservation
ENCO	Non-Conventional
ENCO-S	Solar
ENCON-WI	Wind
ENCO-G	Geothermal
ENCO-H	Hydro-electric
ENCO-T	Tidal
ENCO-WA	Wave
ENCO-I	Issues



Category 5 People&Evt-PE	
PECOM	Community
PEPOP	Population
PEADA	Adaptation to Environment
PEAGR	Agriculture
PEAGR-Ir	Irrigation
PEAGR-Pr	Agricultural Practice
PEURB	Urbanisation
PEIND	Settlement
PESET	Culture &religion
PECUL	Values & ethics



PEDIS	diseases &health									
PEISS	Issues									
Category 6 Others-O										
OENV	Environment									
OLAW	Law									
		63	17	17	4	305	84	93	263	0

- No mention
- Mentioned in one or more of times, but not discussed
- Mentioned several times & discussed briefly
- Moderate discussion

Discussion of the Findings

Extent of coverage of infused environmental concepts across the subjects:

Following a detailed examination of the infused environmental concepts taught in each academic subject, the following was discovered: The textbooks of Science (Physics, Chemistry & Biology) has a moderate discussion of several EE topics. The EE concepts in Physics part of the textbooks was greater when compared with other subjects. The Chapters covered measures for reducing noise pollution and the corresponding learning outcome was to engage in activities to reduce noise pollution. There is mentioning of the reclamation of paddy fields with an excavator and the activities by the use of which is harmful to the environment and biodiversity needed to be controlled. Use of fluorescent lamp containing mercury vapour which is detrimental to environment, Energy conservation, Global warming, effects of excess of greenhouse gases, e-waste and its health hazards, mercury pollution, fossil fuels and importance of harnessing solar energy were dealt in detail. The importance of fossil fuels and measures for its judicious use are mentioned. The chapters provide scope for numerous activities including poster preparations for conserving our environment.

The Social Science (Geography, History, and Civics) text books include the next greater number of environmental concepts that have been absorbed into them. When EE themes are examined more closely, it becomes clear that the Social Science textbooks only briefly mention animal extinction in the chapters on history all the way through the various civilisations due to environmental changes, population growth and scarcity of food. The decline of civilizations due to climate change facilities for agricultural progress under various rulers, the effects of globalization such as the destruction of indigenous culture, plunging of the price of agriculture products, and looting of the natural resources, 'British policies and commercialization of agriculture were portrayed in detail. The Geography lessons reveal the story of the unique bond between man and nature. The lessons cover a range of environmental issues and environmental protection aspects such as importance of soil and its formation, pollution of soil, conservation of soil, adverse effects of greenhouse effect, global warming and ozone depletion, international protocols on EE, layers of earth, sources of water, threats to water resources, water pollution, conservation of water and sustainable practices. Also topics like importance of farming, insolation and its effects, role of human activities in changing the surface of the earth, need for harnessing alternative sources of energy, conservation of nature and biodiversity, over exploitation of resources and degradation of nature, sustainable development, anthropogenic causes of natural disasters,

use of remote sensing in environment impact assessment etc..The civic lessons cover topics like protection of environment as a fundamental duty, importance of civic consciousness in conserving the environment and role of voluntary associations in the protection of environment.

The EE concepts in Chemistry part of the science text book was limited to reminding the judicious use of mineral wealth of Kerala, plastic as a man made polymer and its pollution, effects of the significant raise in the quantity of carbon monoxide, excessive consumption of fuels, scientific inventions and environmental hazards, concept and contributions of green chemistry. The Lessons of Biology in Standard X is limited with little EE concepts like uncontrolled use of artificial hormones/chemicals and environmental issues, conservation of biodiversity, challenges of climatic changes, extinction of organisms

The language subjects cover an average count of infused environmental concepts especially with usual references of elements of nature which are the part and parcel of prose and poems. Several activities providing enormous scope for infusion of EE are given in English textbooks of all the three standards. It is worth in mentioning that a few lessons in Malayalam and Hindi textbooks are solely dedicated to EE with references to environmental issues and environmental protection aspects.

Infusion of EE into the textbooks of mathematics was found to be very limited. A closer analysis of the secondary school mathematics textbooks reveals that none of the EE concepts find coverage in it either in the form of problems, statistics or figures. The contents of the IT textbooks of all standards provide limited scope for infusion of EE concepts. The infused EE concepts in various subjects of study are just reviewed for practising and doing activities without any conscious attempt to link with Environmental education..

Conclusion and Recommendation

The study identified the lack of systemic and holistic linkages across the curriculum with respect to the infused environmental concepts. Most of the environmental texts analyzed are informative; that is information about the environment leaving behind information through and for environment. The study determined the knowledge gaps regarding the inclusion of environmental themes in the present 10th standard textbooks used in Kerala. The results thus provide curriculum planners, textbook authors, teachers, teacher educators, and aspiring secondary teachers at secondary level insight into topics related to Environmental Education in the formal curriculum. The study's findings may be used by curriculum designers to identify gaps in the implementation of the curriculum that incorporates environmental ideas between the curriculum, textbook, and lesson plans. When creating new textbooks with an emphasis on integrating environmental ideas at the secondary level, text book authors may find the knowledge acquired to be an implicit guide.

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