

# Emphasis of Eco-friendly Concepts in the Secondary-level Science Curriculum of Sri Lanka

**U.Mathura, K.Piratheeban**

*Department of Education, Faculty of Arts, University of Jaffna, Sri Lanka.*

Research Area: Curriculum Development

## **Abstract**

This mixed-method study was carried out to examine the emphasis on environmental concepts in the secondary-level science curriculum of Sri Lanka, compared with Singapore and India, considering the gender and grades. For the qualitative phase, primary resources were revised and for the quantitative phase, 285 students were selected as samples (total population = 1078) through stratified random sampling. A questionnaire was adopted from Ugulu et al. (2013) and Kaiser et al. (1999) and categorized under three dimensions: Usage of non-biodegradable items (BioD), Eco-friendly attitude (EF) and Conservation of resources (CR) ( $\alpha=0.749$ ). Much importance is not given to direct environmental concepts in the curriculum of Sri Lanka with the insufficient number of periods allocated for environmental-related units (Grades 6-11: 11.2%, 15.4%, 0, 8.3%, 0 and 13.4% respectively). Additionally, most of the learning outcomes focus on acquiring knowledge rather than eco-friendly attitudinal change. Also, the emphasis given to environmental attitudinal change in the curriculum is identified at a low level compared with Singapore and India. Among the means of fifteen items, only the attitude of using reusable boxes instead of lunch sheets is very high ( $M = 4.34$ ). Meanwhile, dimensions EF ( $M = 3.53$ ) and CR ( $M = 3.70$ ) are at a higher level than BioD ( $M=3.28$ ). Furthermore, none of the dimensions ( $P_{\text{BioD}} = 0.512$ ,  $P_{\text{EF}} = 0.732$ ,  $P_{\text{CR}} = 0.226$ ) has a significant difference with gender. Also, it has been revealed that the grade influences eight attitudes out of fifteen selected attitudes. Therefore, this study has concluded that students' attitudes towards the environment are positive in general with dimension BioD needing more attention with no influence of gender over the environmental attitudes. In conclusion, more emphasis should be placed to environmental concepts in the existing science curriculum of Sri Lanka in order to make attitudinal changes in the students, resulting in an eco-friendly generation.

Keywords: Science curriculum, environmental attitude, biodegradable, eco-friendly attitude, conservation of resources

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## **Background**

Environmental threats have emerged as serious issues in the present world. Therefore, awareness of the environment is mandatory for every individual in order to protect sustainable environment and thus knowledge about environment should be given to the present generation (Sachitra & Kaluarachchi, 2018). In this manner, environmental education was introduced in school curriculum as per the recommendation made at the United National Conference in Stockholm to promote and develop environmental education in every nation (Kelani, 2015 & Makki et.al, 2003). As the result, environment education became as an important components in school education since 21<sup>st</sup> century (Msengi & Doe, 2017).

In the case of Sri Lanka uncontrolled and un-friendly environmental activities of humans result in natural disaster caused by inappropriate climate change, loss of bio diversity, deforestation, industrial pollution, traffic congestion and poor waste management (Alwis & Silva, 2020). Therefore, immediate attention should be given to produce environmentally literate generation to create eco-friendly society. In this manner, environmental education was introduced in Secondary level curriculum of Sri Lanka not as an individual subject but as amalgamated concept in various subjects. However, it is said that current curriculum itself is not enough to change the individuals' positive attitudes towards the environment (Alwis & Silva, 2020). Hence, this study attempts to examine the emphasis on environmental concepts in the secondary level science curriculum of Sri Lanka compared with Singapore and India. This study also examines the impacts on attitudinal change of secondary level students towards the environment.

## **Methodology**

This study is designed as a mixed-methods study. For the qualitative phase, primary resources such as Sri Lankan Science text-books from Grade Six to Eleven, teachers' instructional manuals, printed government documents related to curriculum change, school text books of India

which were given by National Council of Educational Research and Training – NCERT, lower secondary science syllabus of Singapore which was published by Ministry of Education, Singapore and other electronic documents related to this study were reviewed.

For the quantitative phase, questionnaire contained fifteen Likert-scale type closed ended questions on students’ attitudes towards eco-friendly behaviors that were adapted from Ugulu et al. (2013) and Kaiser et al. (1999) and modified as per Sri Lankan context. The population for this study was 1078 students from grade Six to Eleven studying in the year 2021 in seven schools of Palai Divisional Education Office of Kilinochchi NorthZone, Northern Province, Sri Lanka. 285 (Males = 146, Females = 139) students from the population were selected by stratified random sampling technique. Questions were adapted and categorized under three dimensions: Usage of non-biodegradable items (BioD), Eco-friendly attitude (EF), Conservation of resources (CR). The reliability of the questionnaire was tested by Cronbach Alpha test ( $\alpha = 0.749$ ) and mean comparison method was followed.

## Results and discussion

### Environmental concepts in secondary level science textbooks – a qualitative analysis

According to the analysis done on the time allocated for environmental related concepts in secondary level science curriculum as per teachers’ instructional manual of grade six to eleven, comparatively more emphasis (15.4%) has been given in grade seven than other grades to the environmental concepts which are directly related to environmental attitudinal changes. However, no unit or time is allocated for environmental related concepts in grade eight and ten. Grade six, nine and eleven have 11.2%, 8.3% and 13.4% allocated time respectively for environmental concepts (table 1).

**Table 1**

*Units allocated for environmental related concepts from grade six to eleven*

Grade	Total time (min)	allocated time (min)for environmental related concepts	allocated time as a percentage (%)
6	134 x 40	15 x 40	11.2
7	156 x 40	24 x 40	15.4
8	148 x 40	0	0

9	157 x 40	13 x 40	8.3
10	160 x 40	0	0
11	164 x 40	22 x 40	13.4

(NIE, 2015)

### **Attitudinal change through environmental concept**

Some of the units in the textbooks directly relate to the environmental concepts whereas some of the units indirectly relate to the environmental concepts. However, the learning outcomes that are expected to be achieved through the units mostly focus on knowledge development of environmental concepts and not on eco-friendly attitudinal change. For this part, one directly environmental related subject and one indirectly environmental related subject of grade six and one indirectly environmental related subject of grade ten were analyzed. Based on that, it is proven that whether the unit is directly related or indirectly related to the environmental concept, less than 20% emphasis is given to attitudinal change in eco-friendly behavior (table 2).

**Table 2**

*Expected outcome on environmental concepts*

<b>Grade</b>	<b>Unit</b>	<b>Total Expected outcomes</b>	<b>Knowledge</b>	<b>Skill</b>	<b>Attitude</b>
6	Water as a natural resource (Directly relates to environment)	10	06	01	03 (20%)
6	Food - related interactions (Indirectly relates to environment)	12	10		02 (16.7%)
10	Chemical basis of life (Indirectly relates to environment)	11	08	01	02 (18.2%)

(NIE, 2007)

## **Comparison of Environmental Concepts in Sri Lankan Secondary level Science Curriculum and Curricula of Selected Countries**

### **Sri Lanka vs. India**

Since it was proven in this study that more periods are allocated for environmental concept in grade seven compared with other grades, grade seven text book of Sri Lanka and

grade seven teachers resource book were compared with grade seven text book of India and teachers' energized resource manual of India.

Based on the analysis, grade seven textbook of Sri Lanka has three units (20%) that are directly connected with environment whereas grade seven text book of India has five units (28%) for direct environmental concepts. Also the title of each unit of Indian syllabus focus on conservation of the resources (Example: water: a precious resource) (table 3).

**Table 3**

*Comparison between Sri Lankan and Indian school text books*

Country	Total units	No. of units Directly related to environment	units Directly related to environment	Percentage of directly environment related units
Sri Lanka	15	03	Functions of water	20
			Atmosphere	
			soil	
India	18	05	Weather, Climate and Adaptations of Animals in Climate	28
			Soil	
			Water: A Precious Resource	
			Forests: Our Lifeline	
			Wastewater story	

(NIE, 2019 & CBSE, NY)

### **Sri Lanka vs. Singapore**

For the comparison between Singapore and Sri lankan syllabus, expected outcome of Sri Lankan science curriculum and learning objectives of Singapore curriculum were analyzed.

In Singapore curriculum, out of ten learning objectives, eight focus on knowledge development, one focuses on skills and two focuses on attitudes (table 4). Though, the overall learning objectives for knowledge, skill and attitude development look similar in number to Sri

Lanka (table 4 compared with table 2), learning outcome which is expected to be achieved through education is more focused on attitudinal change in Singapore than in Sri Lanka. Following learning outcomes are example for creating attitudinal change on eco-friendly behavior: evaluate the impact of human activities and technology on the environment (e.g., motor vehicles and modern lifestyle), show an awareness of how some cultures practices sustainable living through their interactions with the environment (MOE, 2020).

**Table 4**

*Singapore Science Curriculum*

<b>Competency</b>	<b>Competency level</b>	<b>Learning objective</b>	<b>Core ideas (Knowledge)</b>	<b>Practice (skill)</b>	<b>Values, Ethics &amp; Attitudes (Attitudes)</b>
Interactions	Interactions within Ecosystems	10	07	01	02

(MOE, 2020)

### **Prevalence of eco-friendly attitudes in day-to-day activities**

Means of the fifteen selected Likert-scale questions on environmental attitudes and means of three dimensions of the questions were analyzed based on the following tabulated scale.

Mean Scale	Explanation
4.21 – 5.00	Very High
3.41 – 4.20	High
2.61 – 3.40	Moderate
1.81 – 2.60	Low
1 – 1.8	Very Low

In the overall mean analysis of the questionnaire, only the attitude of ‘not bringing food in polythene sheets (lunch sheets) to school, instead of carrying it in reusable lunch boxes’ is very high. Further, the following attitudes are reported as in high level: reading environmental related articles and news while reading newspaper, switching off the television when no one is watching, switching off lights when leaving the room, preferring to walk to nearby places (on the same street or next street) than going in a motor vehicle, not wasting water while brushing teeth in other words not keeping the tap open until finish brushing, preferring to buy eco-friendly products even if they are more expensive than cheaper environmental threatening products, using one side used-papers for studies or Maths calculation, following or telling house members to follow natural remedies (burning neem leaves) for mosquitoes instead of chemicals. And the other attitudes are in moderate level (table 5).

### **Prevalence of Ecofriendly dimensions among students**

Based on the analysis of means of three dimensions, Usage of non-biodegradable items ( $M_{\text{BioD}} = 3.29$ ) was in moderate level whereas eco-friendly attitude ( $M_{\text{EF}} = 3.70$ ) and conservation of resources ( $M_{\text{CR}} = 3.53$ ) were in high level (table 5).



**Table 5***Mean comparison of the three dimensions of ecofriendly concept*

	<b>Mean</b>	<b>Explanation</b>	<b>Themes</b>	<b>Mean of Themes</b>	<b>Explanation</b>
I do not like or support the burning of polythene and plastic materials at home	3.04	Moderate			
I do not like to drink anything in one day cup in any ceremonies	3.24	Moderate	Theme 1		
I buy soft drinks in glass bottles or cans rather than plastic bottles.	3.03	Moderate	Usage of non-biodegradable items (BioD)	3.29	Moderate
I dispose of the old pen caps only in non-biodegradable waste dustbins	2.93	Moderate			
When I eat outside, I throw trapping papers and cover papers of food in dustbins based on biodegradable and non-biodegradable verities.	3.14	Moderate			
I do not carry food in polythene sheets (lunch sheets)to school, instead I carry it in reusable lunch boxes	4.34	Very High			
When I read the newspaper, I read environmental related articles and news	3.49	High	Theme 2		
I prefer to buy eco-friendly products even if they are more expensive than cheaper environmentally threatening products	3.63	High	Eco-friendly attitude (EF)	3.53	High

I carry a reusable shopping bag with me when I go shopping for household or other needs.	3.32	Moderate			
I follow or tell house members to follow natural remedies (burning neem leaves) for mosquitoes instead of chemicals	3.69	High			
I will switch off the Television when no one is watching	3.91	High			
I switch off lights when leaving the room	3.85	High	Theme 3		
I prefer to walk to nearby places (on the same street or the next street) than going in a motor vehicle	3.53	High	Conservation of resources		
I don't waste water when I brush my teeth in other words I do not keep the tap open until I finish brushing.	3.80	High	(CR)	3.70	High
I use one side used-papers for my studies or Maths practice	3.42	High			

## Conclusion

It reveals that the time allocated for environmental-related units in the school text books are relatively low (Grades 6, 7, 8, 9, 10, 11: 11.2%, 15.4%, 0, 8.3%, 0 and 13.4%). Further, most of the learning outcomes that the students are expected to achieve focus on the knowledge development of environmental concepts and not on eco-friendly attitudinal change.

The emphasis given to environmental attitude change reported at a low level compared with selected countries, India and Singapore. The expected learning outcomes of Sri Lankan syllabus related to environment do not focus on eco-friendly attitudinal change compared to other two countries. Among the means of fifteen attitudes, only the attitude of 'not bringing food in polythene sheets (lunch sheets) to school, instead of carrying in reusable lunch boxes' is very high ( $M = 4.34$ ), while other attitudes reported high and moderate ( $M > 4.21$ ). Meanwhile, dimensions EF ( $M = 3.53$ ) and CR ( $M = 3.70$ ) are at high levels, while BioD ( $M = 3.28$ ) is at a moderate level. Therefore, this study concludes that much importance is not given to direct environmental concepts in the school curriculum in Sri Lanka. In addition, students' attitudes towards the environment are positive in general. However, dimension BioD needs more attention than dimensions EF and CR.

Though the scope of introducing environmental education in the curriculum is to create a society with positive attitudes towards the environment and Sri Lanka also included environmental education as an amalgamated concept in Science and other subjects, more concern should be given in the curriculum to improve eco-friendly attitude among the students. Therefore, it is recommended for a curriculum revision which can allocate more time for environmental related units and a revision on expected learning outcome which can deeply focus on eco-friendly attitudinal change equally to the knowledge development.

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