

Foremost Need of Value Driven Water Education in Sri Lankan School Curriculum: Science

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Abstract

The school education from kindergarten to grade 11 for value based water education has been slow to take up the challenge of water crisis scenario and only a very small number of research publications are in Sri Lanka which actually focus on school education for water even though school life is a strong remarkable time period for long-lasting learning. This study focused predominantly on science from grade 6 to 11. Because this subject had been endorsed as a compulsory subject and water related studies were as explicitly. The study revealed that grade 6 and 7 science teacher's guides were focused in key water topics in the percentages of 10 and 4 respectively while grade 10 and 11 were not concerned. With regards to grade 8 and 9, although water related topics like natural disasters and sustainable use of natural resources were, water studies were not mainly focused. Therefore, it is a foremost need that teacher's guide should be prioritized to value based water education especially in science curriculum due to main subject for all learners up to ordinary level. Additionally, these teacher guides should also provide lesson ideas for teachers with existing publications. In detail, it should lead and inspire children to contribute sustainable development goal 6 how a sequence of day to day activities can be engaged in real world water contexts and which should be not only promoting an understanding of water-related topics but also participate actively in the sustainable management of their environment in a water context and effective water related solutions.

Key words: Foremost need, Science curriculum, Value based water education, Sri Lanka

1. Introduction

Education is one of most highly valued concepts globally, because education provides numerous opportunities. People believe that otherwise would be hard to compete with world. In terms of sustainability, Education in the early years is a significantly under-practiced, under-resourced and under-examined field, even though young children are the ones who will bear the consequences of our actions and inactions on sustainability-related issues (UNESCO,2012) [1]. Accordingly schooling is a biggest step not only because of the curriculum that the students learn from but also this is the time when the students begin to set objectives which field of study they are good at. (Daniel.J ,2004) [2]. Hence, schools are one of the critical steps in getting an education where growing teens learn material that shapes their ability of thinking. Further, teachers and school curriculum have enormous influence on teens' education. Teachers commonly teach based on a curriculum that is already developed by ministry of education. Undoubtedly, school curriculum is a critical tool that teachers rely on to teach their students.

Today's children are born into a world where there are serious concerns for the sustainability of our planet. In other words, plight of the environment has been going up internationally for a more sustainable future. Early childhood education for sustainability (ECEfS) has been nationally and globally recognized as having the potential to nurture caring, capable and responsible citizens, by providing children with knowledge about sustainability problems, a voice in decision-making about these issues and the skills to do something about it

(Davis,2005).[3] Professor Charles Hopkins, UNESCO Chair in Reorienting Teacher Education towards Sustainability, stated that, during his first international workshop on education for sustainable development with specific reference to young children provocative questions were raised such as ‘What does it mean to be more instead of having more?’, ‘What is enough?’, ‘What is for all’ (Pramling Samuelsson & Kaga, 2008).[4]

In Sri Lanka education structure is classified into five. These are primary (grades 1-5, ages 4-10), junior secondary (grads 6-9, ages 10-14), senior secondary (grades 10-11 ages 14-16) collegiate (grades 12 -13, ages 16-19) and tertiary. Students who are pursuing tertiary education must pass the G.C.E O/Ls in order to enter the collegiate level to study for another 2 years (grades 12-13) to sit for the G.C.E Advanced Level. After, successful completion of this examination, students can move on to tertiary education. (Statistic branch of ministry of education Sri Lanka ,2006).[5]

Water scarcity can be defined as the non-availability of a required amount of water of useable quality at the required time and location, for human and environmental use. The most often quoted indicator or measure of water scarcity is the Falkenmark Indicator, which relates the more or less fixed amount of renewable fresh water resources in the world to population, using a per capita estimate of water required to satisfy domestic, agricultural and industrial needs. This method suggests that a country with less than 1,700m³ of water per person per year will experience water stress. In Sri Lanka per capita water availability will be end up with 1800m³/person/year by 2025, which is just above the water scarcity threshold of 1700 m³/capita. Therefore, failure to achieve a sustainable water scenario would lead us to a water crisis probably by 2025 or sometime thereafter. (International water management institute ,2007).[6]

Further, water poverty index (WPI) is a new holistic model to contribute more effective water management. Its methodology was developed through pilot project in South Africa, Tanzania and Sri Lanka in 2002. Accordingly the following reference bar chart proves water stress of Sri Lanka. (Sullivan.et, al, 2003).[7]

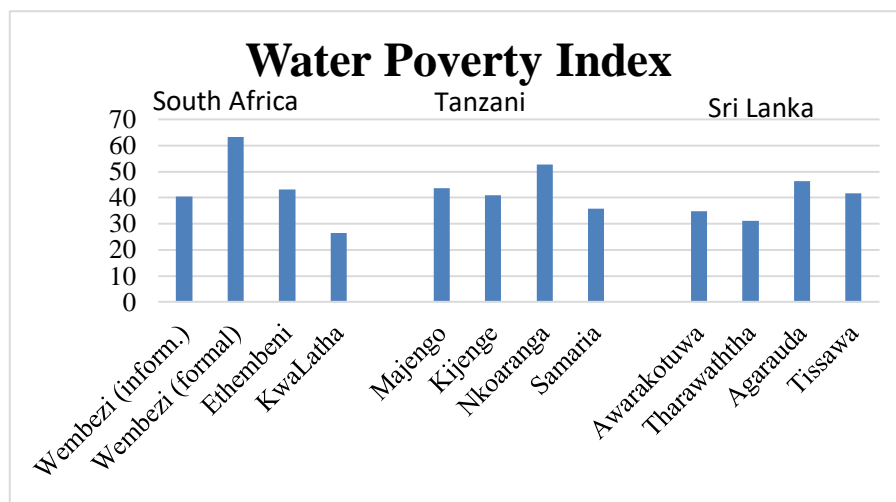


Figure 1: Water poverty Index Values

Source: Natural resource forum 27 (2003) 189–199 [8]

WPI value is between 0 and 100. The highest value 100, is taken to be the best situation (or the lowest possible level of water poverty), while 0 is the worst. According to the 2002 study, Sri Lanka fell into medium WPI value.

It is a needs to enacting sustainable practices in relation to water awareness. Water is a finite resource, availability of freshwater resources significantly affects livelihoods of people including for drinking, household use, farming and industrial processes. Hence, water education at all levels needs to be improved because education plays a crucial role in transforming values of water which promotes sustainable water management. Therefore, water education topics should be prioritized in school curriculum. A study revealed that

while students' attitudes towards water were positive, their daily water use habits did not match attitudes. To make curriculum more effective in changing students' attitudes and behavior regarding water use and conservation. Therefore, water-topics should be taught in accessible ways using values-driven education and innovative methods, field trips and school life activities. (Omar Amahmid, et, al, 2018 September) [8]

Early childhood education for environmental sustainability (ECEfES) has become significant in the early years. (Pollok.K,2017)[9] Another study was done by Queensland university of technology. Their aim was to identify program attributes and pedagogies that supported learning and action taking for water conservation, and to investigate if and how the program influenced children's and teachers' practices. Findings showed that the program expanded children and teachers' ideas about water conservation and increased their water conservation practices. The children were found to influence the water conservation practices of the adults around them, thus changing practices at school and at home. (Miller Melinda. G 2014) [10]

In addition, other studies were done in Australia. It is called Australian curriculum project (ACP) from 2013 to 2015. Aims of the project were to explore how key water topics fitted in the Australian curriculum, identify opportunities to promote existing quality resources that were already aligned to the Australian curriculum, develop new resources to fill identified gaps for a national audience. The project focused on an analysis of water topics in the Australian curriculum, an audit of existing curriculum resources with a gap analysis and recommendations for further actions. And science, geography and history subject areas were focused because these subject areas had been endorsed by all State and Territory education ministers for implementation. (Australian water association ,2013-2015) [11]

Another project was done in California. Where education system did not have a curriculum to teach high school students about water usage in agriculture and what the role of industries in terms of valuable resources. Therefore, that was critical to have that curriculum. Hence it needed to be implement into all of the California high schools. According to the project team's objectives were to research and understand how to make a curriculum for a high school agriculture science class, teach students about scarcity of water, raise awareness about agriculture and water issues the industry is facing and will be facing in the near future, develop a curriculum that could be used in a high school classroom. (Daniel.J,2004).[1]

For achieving sustainable level of water consumption and managing the impact of water on the environment teaching young the value of water and importance of using water wisely were one of the public utilities board's (Singapore's national water agency, ministry of sustainability and the environment) objectives. To get involved the preschool, primary schools, secondary schools, tertiary institutions and communities, PUB works closely with them and the ministry of education also educate and excite students on water-related topics. In addition, they have a host of programs, activities and resources targeted at various levels to underscore the importance of conserving, valuing and enjoying our water resources. (Public utility board ,n.d.)[12]

In Sri Lanka, it is compulsory that zero children are out of school till grade 9 (age 14) at which point they can choose to continue their education or drop out and engage in apprenticeship for a job or farming. However, the Ministry of education strongly advises all students to continue with their studies at least till the G.C.E ordinary level. Hence which is evident that after G.C.E ordinary level number of citizens who access water education are less or no although secondary and tertiary levels focus water education. Therefore, it is clear that enhancing water education in schools (Kindergarten to grade 11), improving the capacity of teachers and formal educators, development of improved teaching aids, guiding and providing technical supports to schools, curriculum development on water resources and coordination with water sectors are compulsory. Therefore, based on the references referred by authors, this article focused

how the opportunities to learn about water presented by the Sri Lankan curriculum Science (grades 6 to 11), and explore key water topics in the Sri Lankan curriculum Science (grades 6 to 11).

2. Methodology

The study focused predominantly on science from grade 6 to 11. Because this subject had been endorsed as a compulsory subject and water related studies are as explicitly. In addition, Science focuses on developing student understanding about science and its contribution to our lives and making decisions about local, national and global crisis. which highlights the importance of nurturing students’ sense of discovery and curiosity as they explore their world. Of course, water contexts can be used in other subjects as well such as geography, history, English, mathematics and technological subjects but they are not explicitly referenced in the curriculum. Here, ‘Hotspots’ for water topics were identified in the Science teachers’ guide (English medium) in particular year levels (grade 6,7,8,9,10 and 11) of the Sri Lankan curriculum. The Sri Lankan curriculum website was searched for it. (National institute of education. (n.d.) [13]

3. Discussion

As mentioned, key water topics are identified by water educators (authors) in Sri Lankan Curriculum Science from grade 6 to 11. The Science teacher’s guide of grade 6, 7, 8,9,10,11 were implemented in various years 2015,2016,2017,2018,2015 and 2016 respectively. Following observations describe (table 1) some of the key ‘hotspots’ where water topics appear in grade 6 science teachers’ guide. Which consists 141 total periods while 15 periods allocated for key water topics. Key water topic is water as a natural resource. Under that, sub lessons are included namely, states of water, types of water based on salinity, types of water based on availability, importance of water as a natural resource. Although unit 15 was water related topic “weather and climate change” it was not considered by authors here because as mentioned in the methodology, authors found out only key water topic. However, water related topics also included in the table.

Table 1: Identified key water topics in Sri Lankan curriculum grade 6 Science

Key water topics	Sub topics
3.Water as a natural resource (15periods)	<ul style="list-style-type: none"> • States of water (Ice, water and water vapor) • Types of water based on salinity (Fresh water, Sea water, Brackish water) • Types of water based on availability (Ground water, Rain/precipitation, Surface water) • Importance of water as a natural resource
Unit: 11 Weather and Climate (15 periods)	<ul style="list-style-type: none"> • Weather (Climate Studying Data Related to Weather) • Designing Apparatus to Measure Weather (Measuring the temperature, Measuring the rainfall, Measuring the speed and direction of wind, Measuring the humidity of atmosphere,) • Natural Disasters Occurred Due to Climatic Changes (Cyclones, Flood, Drought, Landslides)

Source: National institute of education grade 6 Science teacher ’guide English medium ,2015.[14]

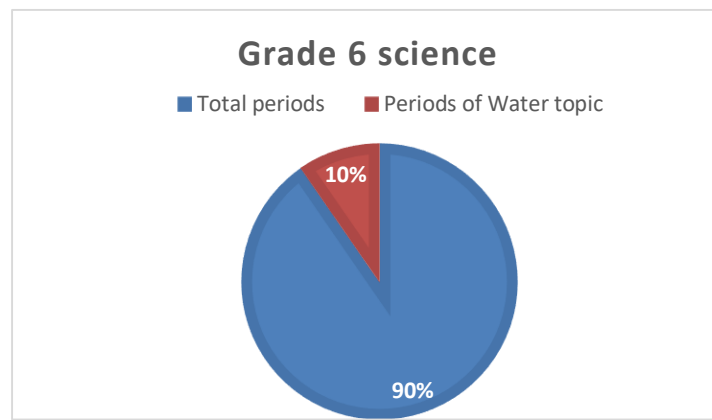


Figure 2: Opportunity to learn about key water related studies in grade 6 Science

Grade 6 science provides 10 % opportunity to learn key water topics (figure 2). Which included both theory and practical.

This paragraph focuses the objectives of the study in Sri Lankan curriculum grade 7 Science. Accordingly, the key water related topic observed in the grade 7 Science teachers ‘guide unit. 4 is functions of water and sub contents were water as a solvent, water as a coolant, water as a medium of life. This lesson also provides opportunities to actively practice, observe and record the functions of water.

Table 2: Identified water topics in Sri Lankan curriculum Science grade 7

Key lesson	Sub lesson
Unit: 4 Functions of Water (6 periods)	<ul style="list-style-type: none"> • Water as a solvent (Uses of separating materials dissolved in water) • Water as a coolant (Uses of coolant property of water) • Water as a medium of life

Source: National institute of education grade 7 Science teacher ‘guide English medium ,2016.[15]

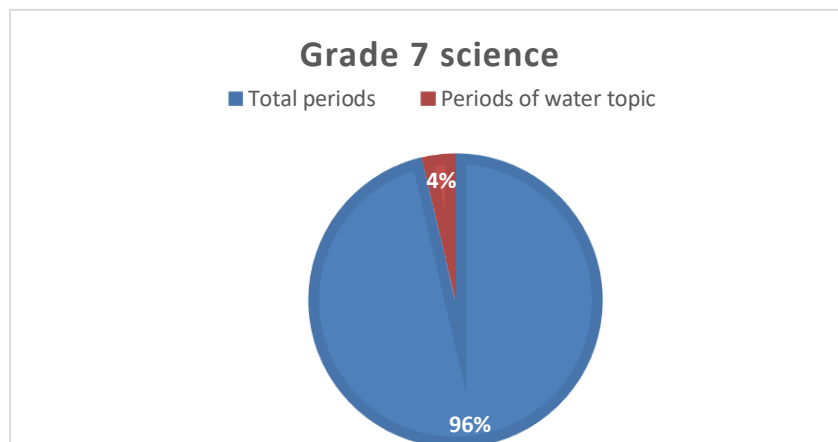


Figure 3: Opportunities to learn about key water topics in Sri Lankan curriculum grade 7 Science

The given pie chart (figure 3) shows the opportunities for grade 7 students to learn water topics which was 4 %. On the other hand, Students learn key water topics during 6 periods out of 157 total periods.

Table 3: Identified sub lessons (not explicitly to water) in Sri Lankan curriculum grade 8

Key lesson	Sub lesson
Unit :15 Natural disasters (8periods)	<ul style="list-style-type: none"> • Drought (Reasons for drought, some human activities that may cause drought are mentioned below, Drought disaster management) • Floods (Reasons for floods, Influences due to floods, Management of flood disaster) • Landslide / Earth slip (Pre-signs of a landslide, Management of landslides) • Lightning and thundering (Management of Lightning hazards, the things that should be done before a lightning weather condition are mentioned below, Things to avoid during a lightning weather condition, Measures to be taken in connection with a person subjected to lightning hazard) • Disaster Reasons for the occurrence of disaster

Source: National institute of education grade 8 Science teacher 'guide English medium ,2017[16]

The presented table 3 provides information about water related topics which were observed in Sri Lankan curriculum grade 8 Science. According to the objectives of this study authors tried to find out the key water topics in the curriculum. However, in grade 8 Science teacher 'guide although water related content was (natural disasters) which was not as explicit water topic. In other words, water topics are not surprisingly form a conceptual thread. Therefore, authors could not say the opportunities (in percentage) to learn about key water topics in this grade.

Table 4: Identified sub lessons (not explicitly to water) in Sri Lankan curriculum grade 9

Key lesson	Sub lesson
Unit:19 Sustainable Use of Natural Resources (5 period)	<ul style="list-style-type: none"> • Water (How water is used sustainably in the past)

Source: National institute of education grade 9 Science teacher 'guide English medium ,2018 [17]

The given table 4 gives the details of identified water related topic in Sri Lankan curriculum grade 9 Science. Although total number of study periods were 157, water topic was not mainly focused. However, the unit 19 “sustainable use of natural resources” was found. Which consisted water (how water is used sustainably in the past) as one of the sub lessons. Allocated periods for all sub lessons were 5. Hence it is clear that number of study period for water is less than 5. Similar to grade 8 Science curriculum, authors could not be able to mention the opportunities to learn water education.

Table 5: Key water topics in Sri Lankan curriculum Science grade 10 and 11

Grade 10	Total periods	Allocated periods for key water topic	Grade 11	Total periods	Allocated periods for key water topics
	165	0		164	0

Source: National institute of education grade 10 and 11 Science teacher ’guide English medium ,2015 and 2016 respectively. [18], [19]

The table 5 gives information about how grade 10 and 11 were not considered about water topics. Grade 10 and 11 consist 165 and 164 total periods for Science respectively. However, priority was not given to water education in the curriculums.

4. Conclusion

This study predominantly focused on Science curriculum English medium. Authors realized that there was so little research on the theme of the role of school education for sustainable water resources in Sri Lanka even though many researchers suggest benefits of education for sustainable development in schools. In this stage, children set ability to make good decisions about risky situations. On other words, which should inspire and guide the routine in terms of water use and conservation. But, value driven water education in school curriculum particularly grade 9, 10 and 11 is not considered. In details, key water topics in grade 10 and 11 were absence. However, in grade 6 and 7 key water topics were focused in the percentage of 10 and 4 respectively with respect to total number of periods mentioned in the Science teacher’s guide English medium. With regards to grade 8 and 9 Science teacher’s guide (English medium) although water related topics like natural disasters, sustainable use of natural resources was, objective of the lesson was not mainly focused in water studies.

5. Recommendation

Teacher’s guide should be prioritized to water especially in Science due to main subject for all learners up to ordinary level. In detail, it should lead and inspire children sustainable development goal 6 how a sequence of day to day activities can be engaged in real world water contexts and which should be not only promoting an understanding of water-related topics but also participate actively in the sustainable management of their environment in a water context and effective water related solutions. The meantime, these teacher guides should also provide lesson ideas for teachers as well which show how parts of existing publications can be used in the classroom to address the requirements of the Sri Lankan curriculum in terms of value driven water education because it is a foremost need in schools’ curriculum. Value driven water education should inspire environmentally responsible personals.[20]

Therefore, school curriculum should broadly focus water education rather than simply include in the syllabuses. Both sustainable development goals (SDG) 4(ensure inclusive and equitable quality education and promote lifelong learning opportunities for all) and SDG6 (ensure availability and sustainable management of clean water and sanitation) should strongly align each other. Hence, value based water education (VBWE) at all levels will definitely improve sustainable water resources management. Because developing capacity in schools will optimize human potential.

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