

The role of science and technology education essay



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The notion of sustainable development recently emerged in social sciences in the 1970s with the realization that the post-second world war boom had brought devastation upon the environment. The evolution of such a concept has been progressing steadily over the past three decades (Leal Filho 2000). Although there have been many speculations about the term “ Sustainable Development”, it may be defined as “ development that meets the needs of the present without compromising the ability of future generations to meet their own needs” (WCED, 1987). For this to occur, Education may be considered as one of the main strongholds.

The various definitions of the term “ sustainable development”, are reflected in the variety of proposals which have emerged for education for sustainable development, e. g., Environmental Education (EE) (UNESCO 1980); Earth Education (van Matre 1990); Environmental and Development Education (EDE) (UNCED (United Nations Conference on Environment, Development) 1992); Environmental Education for Sustainability (EEfS) (Tilbury 1995); Education for Sustainability (EfS) (Huckle and Sterling 1996); Education for a Sustainable Future (ESF) (UNESCO 1997); Education as Sustainability (EaS) (Foster 2001); Sustainable Development Education (SDE) (Smyth 2002).

There have been various efforts to redefine the aspect of education that would bring about change for sustainable development. In line with this thinking, the United Nations declared 2005-2014 as the Decade of Education for Sustainable Development (DESD) to push the agenda of transformative education throughout the world. Many countries have set clear goals in various sectors, especially in the education sector, in favor of sustainable development. Mauritius is no exception to this. The choices of subjects or <https://assignbuster.com/the-role-of-science-and-technology-education-essay/>

fields by young Mauritians seem to be of major concerns for the Mauritian government.

Introduction

Sustainable Development in Mauritian Education System

Over the past two/three hundred decades, Mauritius has been witnessing major changes in consumption patterns and lifestyle. These changes were due to industrialization, urbanization and agricultural practices which are adversely affecting our livelihood and the future of the planet. Consumption has increased considerably, resulting in production of more waste and pollution of the environment with plastics, metal cans, polystyrenes and organic waste from our households, factories, industries and other sectors of activities. With the gradual improvement of our economic system and the influence of communication, consumption patterns have changed, and Mauritians are thus paying little attention to waste minimization and recycling.

On the other hand, there are positive steps being taken by the government to curb down wastages, limit harms caused to the environment and promote sustainable development. Furthermore, Mauritius has embarked on a comprehensive reform programme to move to its next level phase development, capitalizing on human resource and Information Technology. One of these positive footsteps is the Kyoto Protocol which was signed in May 2001. However, Mauritius is a very small island with little competitive edge and is very poor as far as natural resources are concerned. It can only draw its strength from the human resource. Thus, empowering the labor

force and providing people with proper knowledge is the only way to equip our country to face the forthcoming challenges. This may be realized only through education. The promotion of fields like science and technology may prove to be fruitful in favoring sustainable development and allow us to expect a better future.

Side by side with the above, science and technology provide the most important explanations of different issues confronting contemporary society. Yet in recent years fewer young people seem to be interested in these subjects. The government has taken it as a challenge to re-engineer science and technical education in order to make them fit in our modern world. In this line of thought, the Ministry has come up with a National Curriculum Framework for secondary school to meet the needs of students. Such actions have as aims, as stated in the report, to prepare students to face as adults the various challenges related to modern environmental problems including waste problems and to come up with solutions. Hence, Science and Technology is vital in achieving economic and social objectives of the Mauritian Society. Therefore, the importance of education in promoting sustainable development cannot be questioned.

However, there are lacunas in the Mauritian Education System to the detriment of sustainable development. This is not only the case for Mauritius but in some other countries also this has been observed- When asked to identify the main obstacles to implementing the principles of sustainable development in educational and economic systems, respondents were of the opinion that the causes and consequences of unsustainable practices are not analyzed, i. e., there was little insight and readiness to change unsustainable

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practices. In addition, due to the fact that the principles of sustainability and the concepts behind this approach had not been explained sufficiently, most people still did not understand it. (Filho et al 2008)

According to Verbitskaya et al (2002), achievement of sustainable development of education is necessary condition for achieving sustainable development in the wider sense. Our Mauritian education system seems to be failing in this respect. This is the main reason why the need for change is felt. Sustainable development requires a new way of thinking, and a long-term approach (Striebig et al 2006). Inculcating this “ new way of thinking” is the role of educational institutions. Education institutions have a responsibility to develop human resources with the knowledge, attitudes, and skills necessary to address the challenges arising from swift and unanticipated environmental, social, and economic change. This requires holistic approaches in the field of Environmental Education for Sustainable Development (EESD) (Angelina P. Galang 2010). To further highlight the importance of education in promoting sustainable development the following statement can be considered- To teach our future leaders sustainable development (SD) is the key issue for our planet to survive: the challenge is so enormous that we need to mobilize all the brainpower that we can get. Education is of key importance (Karel F. Mulder 2009).

In our context it has been noted that a majority of students have a tendency of evading subjects which are closely related to Sustainable Development (compared to other subjects).

Academic institutions have the responsibility and the opportunity to provide experiences that touch students deeply through all aspects of campus life and the learning environment (Angelina P. Galang 2010). Since the Mauritian Education Systems seems unable to promote sustainable development to the desired extent, this research is aimed at finding if a change in curriculum and pedagogy will eventually help in promoting sustainable development. Such changes have indeed been fruitful in some countries like Japan- This resulted in the selection of many projects with community outreach activities and provided different examples of community and town development work (Ko Nomura 2010).

3. 0 Rationale

Mauritius is since long trying to become a green island. The ' Maurice l'ile durable' (MID) concept is being applied in almost all organizations and systems, but there is a need to assess how successful the concept has been implemented. Education plays a major role for the development of a nation. It is believed that sustainable development should be inculcated in our young citizens during their years of schooling in order to responsabilize them towards the sustainable ideal imagined by Mauritius. One major project in preparation in this line of thought is ' science for all' concept to be applied at secondary level. In fact, this is the introduction of a new subject " 21st Century Science" made compulsory to non science students up to Form 5. This subject is aimed at creating environment friendly technology users of tomorrow. This project is currently on pilot testing in eleven schools in Mauritius and Rodrigues and will certainly be adopted across the board by next year.

This research intends to investigate the role of science and technology at lower secondary level in the sustainable development of Mauritius. Science and technology will include a wide range of subjects like pure sciences and applied sciences such as computing, Design and Technology, Home Economics and Agriculture. Thus this paper aims at assessing achievements of the designed curriculum in promoting a sustainable development attitude among our students in the lower secondary. The research also intends to detect drawbacks in the curriculum which hinders the development of the MID concept among the lower secondary students. Students of the lower secondary have been chosen because they are at a stage of psychological development where they can get easily molded in any direction depending on the nature of stimuli that is they can be either made to develop a sustainable or an anti-sustainable attitude as per the nature of information and guidance provided to them.

4.0 Objectives

According to a report from Nuffield foundation (2008) in Europe entitled “ Science Education in Europe, a critical reflection”, 5 recommendations were proposed to European schools.

These recommendations are as follows:

Encouraging effective environmental clubs in the routine education curricula.

Teachers should have up-to-date knowledge about science and technology.

Developing and extending the ways in which science is taught is essential for improving student engagement.(New curriculum & Innovative pedagogy)

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With respect to the 4th recommendation students perception about science should be change.

At the end of this study the above stated recommendations will be analyzed to see if there is a need to implement them in the Mauritian context.

In a nut shell we can say that this research aims at assessing achievements of the designed curriculum in promoting a sustainable development attitude among our students in the lower secondary.

Hypothesis

Can a change in pedagogy in secondary school helps in achieving a green Mauritius?

5. 0 Method

Method

A non-experimental research design (Pedhazur, Pedhazur, & Schmelkin, 1991) and quantitative research methods were used in the study. Schools, teachers and students were randomly selected from the population of secondary education in Mauritius. We have used survey methods to collect data from the correspondents.

Survey

Surveys are used to collect quantitative information in a given population. As most survey involve administering questions to respondents depending on its purpose, it may focus on opinions or factual information. It is an efficient way of collecting information from a large number of respondents. It is also cheaper to conduct. But the validity depends on the motivation, honesty and

ability of the participants to respond, as the participants are not keen to answer open-ended questions. The questionnaire consists of both open and closed questions where participant has to choose either “ Yes” or “ No”, thus both quantitative and qualitative data will be collected. The participants were asked to rank their knowledge toward sustainable development on a 5-point Likert-type, ordinal scales (i. e., 1 = bad to 5 = excellent).

Questionnaire

The use of a questionnaire was chosen since it was the most suitable method to assess and record students’ and teachers’ attitudes towards sustainable development in the educational system of Mauritius. Moreover, questionnaire is the most commonly used tool for research and regarded as the most proper method for mix research attempts. Furthermore, researchers are familiar with it (Javeau, 1996; Vamvoukas, 1998; Labaw, 1980; DeVaus, 1986). Therefore a well designed and proper use of questionnaire will provide very useful and vital information both qualitatively and quantitatively (Mucchielli, 1968). Thus a high level of validity and consistency of the study is guarantee.

Questionnaire has been chosen to conduct this research as:

It stimulates the interest and increases the involvement of the participant in the study (Javeau, 1996);

It lends itself to collect information about views and ideas provided by people as these may not be detected easily using other means (Fraise and Piaget, 1970); and

It allows continuous testing and alterations to ensure proper design (Javeau, 1996).

These are the steps followed in designing this research:

Formulate the objectives of the research.

Formulate the research hypothesis.

First a trial questionnaire was designed and distributed to a small number of students and educators (30 students and 20 educators chosen at random).

The answers of the modeled questionnaire were elaborating and determining the ambiguity of the questions and also questions that are difficult to answer.

Finalize the questionnaire.

Defining its scope.

Collect the completed questionnaires and coded (using variables)

Elaborate the answers using statistical program like SPSS, version 14. 0 and Ms excel.

Write the study, evaluate the results provide recommendations and draw conclusions.

A questionnaire consisting of 29 and 34 statements were distributed the students and educator respectively, to record their attitudes towards

sustainable development in education. More specifically, the 29 statements contain questions in 5 major areas, which concerned:

- (1) The teaching methodology (pedagogy) and sustainable development in education;
- (2) The role of sustainable development in the curriculum;
- (3) The choice of subjects;
- (4) The students versus science subjects.
- (5) Future orientation of the students

Sample

A stratified probabilistic sample of students was chosen to answer the questionnaire using the convenience sampling techniques. The students are from state, private and confessional schools in the four zones. We have chosen form 3 and 5 as at these stages the students make their choice of subjects according to their career orientation and level of difficulties. There are 200 form 3 students and 103 form 5 for a sample size of 303 students and confidence interval of 5%. From the sample of form 3 respondents, there are (162, 81%) male and (38, 19%) female. The schools distributions of form 3 students are as follows: (108, 54%) confessional, (46, 23%) state and (46, 23%) private. For the form 5 respondents, there are (69, 67%) male and (34, 33%) female.

For the educators, a random and convenience sample was selected from the population of teachers in the secondary schools in Mauritius with a sample

size of 313 with a confidence interval of 6%. The educators are from state, private, confessional and fee paying schools, 56. 9% of the respondents were male and 43. 1% were female. They were taken at random independent of their subject taught or specialisation. The participants are mostly grade 1 teacher with teaching experiences from 1 to 20 years. The selected teachers across the schools are as follows: (145, 46. 3%) private, (87, and 27. 8%) state, (51, and 16. 3%) confessional and (30, 9. 6%) fee paying.

The sample size was calculated by the formula provided by the following link: <http://www.surveysystem.com/sscalc.htm>.

Teacher

Male

Female

Private

State

Confessional

Fee paying

Total

178

135

145

87

51

30

Percentage

56.9

43.1

46.3

27.8

16.3

9.6

Form 3 students

Male

Female

Private

State

Confessional

Fee paying

Total

162

38

46

46

108

Percentage

81

19

23

23

54

Form 5 students

Male

Female

Private

State

Confessional

Fee paying

Total

69

34

12

91

Percentage

67

33

11.7

88.3

6.0 Analysis and Results

6.1 Respondent profile

Questions

Form 3 Students

Form 5 Students

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Teachers

Gender

Male

Female

Male

Female

Male

Female

162

38

6. 2 Results for Recommendation 1: Encouraging effective environmental clubs in the routine education curricula.

6. 1. 1 Participation of students in environmental clubs

Figure 1 : Bar Chart showing students participation in environmental clubs

According to the research paper from Nigeria (Contributions of Environmental Clubs Toward

Improved Environmental Programs in Selected Secondary Schools in Ibadan, Nigeria), it is said that Environmental education is very demanding in schools regarding the structure and practices in developing countries. Filho (1996)

has provided a list that Environmental education should include, example <https://assignbuster.com/the-role-of-science-and-technology-education-essay/>

education for biodiversity, for sustainability, for conservation, ecological, education for sustainable development, for overall development, and for sustainable living. Thus YES clubs were introduced in 12 schools in Ibadan in Nigeria, these clubs were purely voluntary, informal, non religious design by Division of Environmental Health (1996).

The graph above shows that among 303 students, only 14. 5% of 200 form 3 students are active in environmental clubs and form 5 45. 6% of 103, but most of these students will not pursue higher studies, they will be on the work market soon. Moreover student in lower forms are less likely to participate in these clubs. It should have been the way round, there should have more students in clubs than teachers as the student would the leaders of tomorrow. Study has seen that 49. 5% of form 3 students are not aware of environmental club in the school, moreover 71. 1% do not participate in competition concerning environmental issues. In Nigeria the students were actively engaged in environmental issues in schools and their local community despite the lack of some essential infrastructures such as boreholes. Moreover in the early adolescent the youngsters are in search for their identity.

6. 2. 2 Students and teachers awareness of environmental clubs at schools.

Figure 2: Bar chart showing students awareness of environmental clubs at school

The graph shows more emphasis should be put at lower level to market the environmental clubs, so as to encourage students to actively engage in

these clubs, for their own benefits, thus the school environment and also Mauritius. As school environment plays an important role in the child's overall development since it is an integral part of the child's entire social environment according to the Federal Ministry of Environment (2005). Thus, it is the most appropriate time to provide guidance and support as in the clubs the students would be able to share ideas and values, there would be a space where they can discuss about key issues and voice out their views and take part in decision making.

But all the environmental clubs should have the same frameworks so as to achieve the desire goals both locally and nationally but can have different names, but not imposed by the Ministry of Education. Proper training in Environmental Education must be given to teachers, so that the implementation and monitoring of the clubs achieve the desire goals. But in the Mauritian schools the teachers are not trained in Environment Education this may explain why 51.8% do not promote sustainable development in their subject.

The members of these clubs will develop critical thinking, and learn more by discovery learning, as the clubs could organise debates, dramas and sharing of views among schools. Furthermore, the awareness towards environment and sustainable development will increase. Since environmental education is the solution to sustainable development. In Mauritius although there are environmental clubs in certain schools, the awareness about sustainable development is low as shown in figure 3 below. But researchers argue that the YES clubs in Nigeria have increased the student's awareness toward sustainable development.

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6. 2. 3 Students knowledge about Sustainable development

Figure 3: Students knowledge about sustainable development

If the students were active in such clubs their views would have changed, and the results would be different. Since the student in these clubs would plant ornamental trees to improve the schools' environment, thus as there about 194 schools across Mauritius, the whole island will benefit from these clubs

6. 3 Results for Recommendation 2: Teachers should have up-to-date knowledge about science and technology

6. 2. 1 Teacher knowledge on Sustainable development

According to the Nuffield report (2007), good quality teachers with up-to-date knowledge and skills are the pillars of any system of science education. Quality of teachers is indeed a very important determining factor of any education system around the globe. In other words, the success of any education system depends greatly on how well its teachers are dynamic concerning understanding new updated knowledge in their own subject matter.

In our survey, it has been decided to test the knowledge of teachers on terms commonly associated with sustainable development. As mentioned before it is very important for teachers to be knowledgeable in a particular field in order to communicate the desired trend among their students, in this case a positive attitude towards sustainable development and sustainable living. The results of the survey are displayed below.

Figure 4: Bar chart showing teacher's knowledge with respect to sustainable development

According to the graph, it can be seen that more than 80% of teachers have a good knowledge of common terms with respect to sustainable development. The corresponding figures are 90% for the term sustainable development, almost 100% for the term Durable, around 80 % for 3Rs that is Reduce, Recycle and Reuse, and around 85% for clean energy.

Figure 5: Bar chart showing - knowledge of teachers with respect to Science related terms

According to the survey, the knowledge of teachers with respect to science related terms like Global Warming, Ozone Depletion, solar Energy, Wind Energy, Wave Energy, Biodegradable and Pollution is highly optimistic since the rate of bad knowledge is relatively very low.

6. 4 Results for Recommendation 3: Developing and extending the ways in which science is taught is essential for improving student engagement. (New curriculum & Innovative pedagogy)

6. 4. 1 Teachers perception upon changes that should be made in school curriculum, pedagogy and recourses available to promote sustainable development.

Figure 6: Bar chart showing changes to be made in the education system to promote sustainable development

From the above graph most teachers think that promotion of sustainable development will not be a success unless the above 3 components are reviewed by policy makers.

6. 4. 2 Teaching strategies that are mostly used during teaching irrespective of subject being taught.

Figure 7: Pie chart showing teaching strategies used at school

Although we are in the 21st century whereby teaching and learning strategies has evolved towards a more constructivist approach, 50. 67 % of teachers is still using lecturing (classical teaching strategy) most of the time.

6. 4. 3 Relationship between subject taught and sustainable development

Cross tab showing results of subject being taught with respect to sustainable development

Relationship between subject taught and Sustainable development

Total

Subject Taught

yes

no

English

Expected Count

29. 61

20.39

50.00

% within Subject taught

68.00

32.00

100.00

% of Total

11.18

5.26

16.45

French

Expected Count

17.17

11.83

29.00

% within Subject taught

48.28

51.72

100.00

% of Total

4.61

4.93

9.54

Art & CDT

Expected Count

9.10

7.86

16.96

% within Subject taught

62.31

37.69

100.00

% of Total

1.97

1.97

3.95

Business

Expected Count

3. 55

2. 45

6. 00

% within Subject taught

66. 67

33. 33

100. 00

% of Total

1. 32

0. 66

1. 97

Computer

Expected Count

15. 39

10. 61

26. 00

% within Subject taught

61. 54

38. 46

100. 00

% of Total

5. 26

3. 29

8. 55

Maths

Expected Count

15. 99

11. 01

27. 00

% within Subject taught

33. 33

66. 67

100. 00

% of Total

2. 96

5. 92

8. 88

Physics

Expected Count

7. 70

5. 30

13. 00

% within Subject taught

61. 54

38. 46

100. 00

% of Total

2. 63

1. 64

4. 28

Account

Expected Count

7. 70

5. 30

13. 00

% within Subject taught

38. 46

61. 54

100. 00

% of Total

1. 64

2. 63

4. 28

Biology

Expected Count

10. 07

6. 93

17. 00

% within Subject taught

52. 94

47.06

100.00

% of Total

2.96

2.63

5.59

Chemistry

Expected Count

5.33

3.67

9.00

% within Subject taught

55.56

44.44

100.00

% of Total

1.64

1.32

2. 96

PE

Expected Count

5. 33

3. 67

9. 00

% within Subject taught

44. 44

55. 56

100. 00

% of Total

1. 32

1. 64

2. 96

H. Economics

Expected Count

6. 51

4. 49

11. 00

% within Subject taught

54. 55

45. 45

100. 00

% of Total

1. 97

1. 64

3. 62

Sociology

Expected Count

2. 37

1. 63

4. 00

% within Subject taught

50. 00

50. 00

100. 00

% of Total

0.66

0.66

1.32

Management

Expected Count

1.18

0.82

2.00

% within Subject taught

0.00

100.00

100.00

% of Total

0.00

0.66

0.66

Commerce

Expected Count

3. 55

2. 45

6. 00

% within Subject taught

33. 33

66. 67

100. 00

% of Total

0. 66

1. 32

1. 97

Economics

Expected Count

4. 74

3. 26

8. 00

% within Subject taught

75.00

25.00

100.00

% of Total

1.97

0.66

2.63

History

Expected Count

1.18

0.82

2.00

% within Subject taught

100.00

0.00

100.00

% of Total

0. 66

0. 00

0. 66

Integrated Science

Expected Count

2. 96

2. 04

5. 00

% within Subject taught

100. 00

0. 00

100. 00

% of Total

1. 64

0. 00

1. 64

Food & Nut

Expected Count

1. 18

0. 82

2. 00

% within Subject taught

0. 00

100. 00

100. 00

Travel & Tourism

Expected Count

3. 55

2. 45

6. 00

% within Subject taught

100. 00

0. 00

100. 00

% of Total

1. 97

0. 00

1. 97

Religious Studies

Expected Count

13. 02

8. 98

2. 00

% within Subject taught

83. 33

16. 67

100. 00

% of Total

1. 64

0. 33

1. 97

Agriculture

Expected Count

2. 37

1. 63

4. 00

% within Subject taught

100. 00

0. 00

100. 00

% of Total

1. 32

0. 00

1. 32

Expected Count

180. 00

124. 00

304. 00

% within Subject taught

59. 21

40. 79

100. 00

% within Do the teaching subject give info about SD

100.00

100.00

100.00

% of Total

59.21

40.79

100.00

Chi-Square Tests

Value

df

Asymp. Sig. (2-sided)

Pearson Chi-Square

45.36

26.00

0.01

Likelihood Ratio

56.19

26. 00

0. 00

Linear-by-Linear Association

3. 02

1. 00

0. 08

N of Valid Cases

304. 00

a

32 cells (59. 3%) have expected count less than 5. The minimum expected count is . 82.

Symmetric Measures

Value

Approx. Sig.

Nominal by Nominal