

Integrated approach to ESD towards enhancing Knowledge on sustainable development

Dr. Jubilee Padmanabhan¹, Dr. Shireesh Pal Singh²

¹Centre for Education
School of Education
Central University of Punjab, Bathinda, India 151001

²Centre for Education
School of Education
Central University of Punjab, Bathinda, India 151001

Corresponding Email: jaopara@yahoo.com

Keywords: Education for sustainable development, Environmental Education, Integrated approach to ESD, Knowledge on SD

ABSTRACT. Sustainable Development (SD) is one the most discussed issue now days, which is gaining priority day by day due to the exploitation of nature in a drastic way. It is from this apprehension that 'Education for sustainable development' (ESD) emerged with an immediate urge to preserve and conserve our nature and natural resources. The concept of ESD entangles the different countries and states across the world as a whole for a sustainable society, which merges the environment, economic and social dimensions. The paper discusses about the effect of integrated approach to education for sustainable development on the students' knowledge on sustainable development. The investigator developed a curriculum by integrating SD concepts into science and social science of VII standard of NCERT syllabus and various learning activities for their transaction by incorporating several pedagogical strategies that lead to constructing knowledge, developing social perspectives and analytical abilities. The study was of quasi experimental in nature with two group pre-test- post-test design, whereby the integrated curriculum was taught to the experimental group for about five months and the control group was exposed to the conventional curriculum and methodology. It was found that there was a significant difference on the knowledge on sustainable development between experimental and control group. The experimental group had a higher mean knowledge score than the control group. On the basis of the findings from the study, it is concluded that there is a sheer need to highlight the importance of integration of SD components in pedagogy at all levels.

1. INTRODUCTION

There are many views and definitions of Sustainable Development. The most acceptable definition is that Sustainable Development is "development which meets the needs of the present without compromising the ability of future generations to meet their own needs" (Brundtland Commission, 1987). Without a proper ecosystem, it is impossible to maintain a better society and economic development for our own and future generation. Thus environmental dimension can be regarded as the ultimate boundary for Sustainable development. The Social dimension is to meet the basic requirements of all people without intersecting the boundaries of the ecosystem. The economic dimension is a means to realize the goal within the limits of a socially and environmentally sustainable manner. So *Education for Sustainable Development (ESD)* cannot be considered as having link only with environment. It is a development of social and economic aspect also. These "three pillars" of ESD are called as 'triple bottom line' or 'triad' of sustainable development.

2. NEED AND SIGNIFICANCE OF ESD:

Education for Sustainable Development is intended to educate all the stakeholders including the students, society, corporate etc. about the importance and need for SD in the present world. ESD

involves a broad approach to educational reform around the globe due to the drastic environmental pressure created by human activities. It outspreads the boundaries of school subjects and requires the openness of teachers, educational administrators, curriculum agencies and all stakeholders working in the field of education. Integrating the objectives, concepts, learning experiences of ESD, appropriate process skills and assessment practices, into teaching programmes is an imperative part of such reorganization. *“A basic premise of education for sustainability is that just as there is a wholeness and interdependence to life in all its forms, so must there be a unity and wholeness to efforts to understand it and ensure its continuation. This calls for both interdisciplinary inquiry and action. It does not imply to work within traditional disciplines. A disciplinary focus is often helpful, even necessary, in allowing the depth of inquiry needed for major breakthroughs and discoveries”* (UNESCO,1997). Since ESD is a subject for creating knowledge, necessary skills and values, so that the child can take his/her place responsibly in the society for sustainable development of the future, the pedagogical methods to be followed should be different. The pedagogical situations should be created in such a manner in order to make the child sensitive to the world around him and create meanings from the surroundings and from his own experiences.

There is an urgent need on an overall review of the existing approach in the education system with a sharper focus on attaining ESD which can sensitize the knowledge towards attaining a sustainable development. There is a need to integrate ESD in the entire curriculum starting from pre-schooling, which should be executed in a meaningful manner using various appropriate pedagogical strategies. Iyengar (2007) suggested that reorienting the education towards ESD is a proposal that is useful, but require careful consideration in each country and differently. One will have to consider whether ESD should become part of curriculum or it should be taught separately. There is a danger for instance that if it is incorporated in the curriculum then its teaching would be left to the whims and fancies of the teacher. Dharmani (2007) suggested that at the primary level interdisciplinary approaches to be adopted and should be integrated into each subject area. Patel (2007) has stressed the importance of structuring and placing ESD in the curriculum. Looking into the research conducted in the past, Kumar & Ram (2006), Deopuria (1984), Padmini (2007), Church & Elster (2002)) which were more concerned with creating environmental awareness and studying environmental attitude, and the trend in the world's concern which is focused on sustainable development, it was intended to research upon ESD. This study attempts to develop an intervention programme by integrating ESD in the Science and Social Science subjects of VII standard, which in turn measures the change in knowledge towards sustainable development as a result of the programme.

3. OPERATIONAL DEFINITIONS:

➤ **Integrated approach to ESD:**

“Sustainable development is the development, which meets the needs of the present without compromising the needs of the future generations to meet their own needs”. (Brundtland Commission, 1987). The present study adopts the above meaning to sustainable development wherein the concepts of ESD was integrated meaningfully with the appropriate pedagogical techniques in the content of Science and Social Science of class VII of NCERT textbook in order to develop the desirable understanding, skills and values in students towards sustainable development.

➤ **Knowledge on Sustainable Development:**

Knowledge on sustainable development is viewed as the ability to recall simple facts and figures, recognize, analyse, apply, interpret and predict the concepts related to sustainable development like; agriculture, consumption and production patterns; atmosphere and climatic change; biodiversity and forests; water, fresh water, oceans and seas; land management; energy; disaster reduction and management, desertification and drought; toxic chemicals, hazardous wastes, radioactive wastes and solid wastes; health and sanitation; demographics, human settlement and poverty, international law and international cooperation for enabling environment and decision making.

4. PROCEDURAL DETAILS OF THE STUDY

Identification of the components of sustainable development that can be incorporated in the contents of Science and Social Science was done based on various reviews and the recommendations of the United Nations Division for Sustainable Development. “The areas identified coming within the scope of sustainable development are agriculture, atmosphere, biodiversity, biotechnology, capacity-building, climate change, consumption and production patterns, demographics, desertification and drought, disaster reduction and management, education and Knowledge, energy, finance, forests, fresh water, health, human settlements, indicators, industry, information for decision making and participation, integrated decision making, international law, international cooperation for enabling environment, institutional arrangements, land management, major groups, mountains, national sustainable development strategies, oceans and seas, poverty, sanitation, science, sustainable tourism, technology, toxic chemicals, trade and environment, transport, waste (hazardous), waste (radioactive) and waste (solid) and water”. (UNESCO, 1992)

The contents from Science and Social Sciences were selected after a thorough analysis of the content and identifying the plug points where the concepts of sustainable development can be integrated meaningfully. The topics for the integrating the ESD concepts were selected from the Science and Social Science textbooks prescribed for seventh standard students of CBSE schools following the NCERT syllabus for the academic year 2010-2011 in India. After integrating the concepts of sustainable development into the existing curriculum of Science and Social Sciences, it was validated by giving to the experts and teachers working in the area. Teachers were consulted to know more about the students’ understanding level, suitability of the topics and to ensure that the units taught in the experimental groups would be the same as that are taught in the control group during the experimental period.

Science textbook of VII standard contained eighteen units out of which nine units had more scope of integrating the concepts of sustainable development (*Nutrition in plants; Fibre to Fabric; Heat; Weather, climate and adaptations of animals to climate; Wind, storms and cyclones, Soil, Water: A precious resource; Forests: our lifeline; Waste water story*). These nine units were analysed to integrate the concepts of sustainable development meaningfully.

Social Science textbook of class VII is divided into three textbooks namely; History, Civics and Geography. No units were selected from History as the content become too crowded. Out of the ten units in Civics two units had the scope for integrating the concepts of sustainable development (*On Equality; Role of the Government in health*). Geography had ten units out of which eight units had the scope for integrating concepts of sustainable development (*Environment; Inside our earth; Our changing earth; Air, Water, Natural vegetation and wild life; Human environment- Settlement, transport and communication; Human environment Interactions The tropical and the Subtropical Region*). These ten units of Social Science were selected for the integration of concepts of sustainable development.

The learning activities were planned for the selected units of Science and Social Science. It was done by taking the previously developed integrated concepts of sustainable development as well as the textual content by using various pedagogical techniques. The learning situations were visualized and created by posing several inquiry and problem based episodes that lead to group thinking, exploration activities, and reflection. Several pedagogical strategies that lead to constructing knowledge, developing social perspectives and analytical abilities were incorporated appropriately for transaction of content. Planning of a unit include the scope of the unit, issues to be raised, unit questions, Learning objectives, resources needed, the activities that are planned and the projects if appropriate to the unit.

5. TOOLS USED IN THE STUDY

Non-verbal intelligence of the students participating in the study was measured by administering the standard form of the Raven’s Progressive Matrices Test (Raven, 1958). This test of intelligence

estimates the subjects' ability to discern and utilise a logical relationship presented by non-verbal materials.

To measure the entry behaviour and terminal behaviour of the pupils, a knowledge test on sustainable development was constructed by the investigator based on the integrated concepts of Sustainable development. While planning the construction of the Knowledge test, the objectives of Science and Social Science education was kept in mind so as to include the items coming under cognitive categories like recalling simple facts and figures, recognising, analyzing, applying, interpretation, and predicting. The areas that were considered for constructing the tool was agriculture, consumption and production patterns; atmosphere and climatic change; biodiversity and forests; water, fresh water, oceans and seas; land management; energy; disaster reduction and management, desertification and drought; toxic chemicals, hazardous wastes, radioactive wastes and solid wastes; health and sanitation; demographics, human settlement and poverty, international law and international cooperation for enabling environment, decision making.

The test was used as the pre-test and post-test in order to study the effectiveness of the intervention. For establishing the content validity of knowledge test on sustainable development, the investigator subjected the test items for experts' evaluation. As per the evaluation of the experts, the test contents cover the items that are designated in the areas and dimensions. Thus the content validity of the Knowledge test on sustainable development was established. A representative sample of one hundred students in three divisions of VIII standard were chosen for establishing reliability of the Knowledge test on sustainable development which was done by using test- retest method. The correlation coefficient of the two sets of scores was found to be 0.82. The obtained values of reliability suggest that the test has acceptable psychometric qualities to measure the Knowledge on sustainable development of VII standard pupils.

6. SAMPLE

The population of the study consisted of students from upper primary schools that follow the CBSE syllabus. Purposive sampling technique was used wherein the sample was drawn from the two intact divisions of standard VII of *Chinmaya Vidyalaya, Taliparamba* and *Chinmaya Vidyalaya, Payyannur* as experimental group and control group respectively. The sampling was of purposive sampling, since it was not possible to employ randomization, which would upset class schedules. The class as a whole in its natural settings was considered for implementing the study. The students belong to the age group of 12- 13 years. The medium of instruction followed in the school was English. The sample consisted of 37 students in experimental group and 35 students in control group.

7. EXPERIMENTATION

The study was of Quasi- experimental in nature involving pre-test and post-test, wherein the effects of the treatments were judged by the differences in the pre-test and the post-test scores. There was an experimental group which was taught by the investigator using the integrated content of ESD in Science and Social Science and one control group where the original Science and Social Science content prescribed by NCERT was used for transaction by the regular teacher through the teaching method followed in that school. The experimental and control group were equated on intelligence using the Standard Progressive Matrices.

In the Experimentation phase, there were mainly three stages; Administration of Pre-tests, Experimental Treatment, Administration of Post-tests. The tools were administered as pre-test for measuring intelligence and Knowledge on sustainable development. The tests were administered to the students belonging to the experimental and control group.

The seventh standard, division B of *Chinmaya Vidyalaya, Taliparamba* was selected as the experimental group and seventh standard, division A of *Chinmaya Vidyalaya, Payyannur* was taken as control group. In experimental group, the integrated ESD content was taught by the investigator using various inquiry approaches and social learning strategies that lead to construction of

knowledge related to ESD. The control group was taught the prescribed science and social science content of NCERT by the regular teacher using the conventional teaching practices that included more of explanatory methods.

The lessons were taught to the experimental group in treatment for eighty four periods of 40-45 minutes duration each. The total duration of treatment worked out to be sixty three hours distributed over nearly five months. The experimental treatment was carried out during the school timings according to the time schedule, without disturbing the school schedule. The investigator also maintained a diary where the daily observations of classroom interactions and certain anecdotes were recorded regularly. The Integrated approach to ESD was used for the experimental group in transacting selected units in Science and Social Science subjects. It was a combination of integrated concepts in ESD and also methodology to transact these concepts meaningfully. As mentioned earlier, the developed content and the lesson plans were used accordingly to transact the content. The investigator was also aware to see that the textual content was not taken lightly, and both the textual content and integrated content were transacted without causing an extra burden for the students of the experimental group. The teachers and experts were also observing some of the classes to verify that the content was transacted as mentioned in the developed material and also according to the lesson plans prepared previously.

The Science and Social Science teachers teaching the control group was consulted regarding the duration required for teaching the selected lessons, mode of teaching and assessment that they followed in that group. Some of the lessons given by the Science and Social Science teachers of the control group were observed by investigator in order to know the mode of transaction, whether the teacher is integrating any concepts of ESD and the strategies followed in that group to teach the selected units. They were following the conventional chalk and board method, followed by lecturing. The duration taken for teaching the selected units in the control group was approximately the same as that of the experimental group.

Immediately after the experimental treatment, the subjects were administered the post tests for the dependent variable- Knowledge on sustainable development. Both experimental and control group were subjected to the post test.

8. ANALYSIS AND INTERPRETATION

The following null hypotheses were formulated and tested to find the effectiveness of integrated approach to education for sustainable development on Knowledge on sustainable development among upper primary students

H₀₁ There is no significant difference between Knowledge on sustainable development of students in experimental group and students in the control group when pre-test score on Knowledge and intelligence score was taken as covariate.

To test the statistical significance of the mean scores, the ANCOVA was performed on the post test scores taking pre test scores and intelligence scores as covariates, the result of which is presented in table 1 and 2

Table 1 Analysis of covariance associated with Knowledge on sustainable development of experimental group and control group with pre-test and intelligence as covariates

Tests of Between-Subjects Effects

Dependent Variable: Post -test score on Knowledge test on SD

| Source | Sum of Squares | Df | Mean Square | F | Sig. |
|----------------------------|----------------|----|-------------|--------|------|
| Intelligence | 331.323 | 1 | 331.323 | 5.111 | .027 |
| Pre test on knowledge test | 2001.984 | 1 | 2001.984 | 30.882 | .000 |
| GROUP | 866.437 | 1 | 866.437 | 13.365 | .001 |
| Error | 4408.207 | 68 | 64.827 | | |
| Total | 106031.000 | 72 | | | |
| Corrected Total | 8716.986 | 71 | | | |

Table2 Adjusted Mean scores of Knowledge test of experimental and control group when pre-test and intelligence was taken as covariate

Dependent Variable: Post test score on Knowledge test on SD

| Name of group | Mean | Std. Error | 95% Confidence Interval | |
|--------------------|-----------|------------|-------------------------|-------------|
| | | | Lower Bound | Upper Bound |
| experimental group | 40.229(a) | 1.341 | 37.552 | 42.905 |
| control group | 33.101(a) | 1.380 | 30.348 | 35.855 |

Table 1 reveals that the difference in the mean post test scores in Knowledge test on sustainable development of the experimental group and control group is significant with $F=13.365$, $p<0.01$. Hence the null hypothesis (H_0) stating that there is no significant difference between the Knowledge on sustainable development of students in experimental group and students in the control group when the pre-test score on Knowledge test and intelligence was taken as covariate is rejected. Hence the alternative hypothesis i.e. there is a significant difference between the Knowledge on sustainable development of students in the experimental group and the students in the control group when the pre-test score on knowledge test and intelligence was taken as covariate is accepted. Also it was found in table 2 that the mean score on Knowledge test of experimental group (Adjusted mean= 40.229) is higher than that of control group (Adjusted mean=33.10), indicating that the integrated approach to ESD is more effective in improving the Knowledge on sustainable development among elementary school students.

9. FINDINGS

It was found from the above analysis that there is a significant difference between the Knowledge on sustainable development of students in experimental group and students in control group when pre-test score on Knowledge test and intelligence was taken as covariates. Also, the adjusted mean score of experimental group was higher than that of control group which means that the integrated approach to ESD is effective in improving the knowledge on SD. This was in accordance with the studies of Exemmal (1980) who conducted a study to find out the efficacy of environmental approach, in which it was found that the environmental approach was superior to the formal approach, Al-bashaireh (2007) who found that a program on environmental education based on a systemic approach improved the achievement of educational Sciences students at Mu'tah University/ Jordan; Ismail, Karpudiwan, Mohamed (2007) who conducted a study on integrated approach in Chemistry in teacher education program and found that the integration of active learning and green chemistry experiments into the chemistry teaching methods course enabled students to be more aware of the environmental issues, Dimitriou, Christidou and Hatzinikita (2007) who conducted a study on pupils' ideas about reducing air pollution and the results showed that pupils recognize practices and actions at both individual and societal level towards the reduction of air pollution, Pellicer (2007) who developed a methodology called 'constructing environmental understanding' and it suggests generating an adequate learning environment in which children has shown a deeper understanding of air quality issues and have been able to address those issues in local context.

Conclusion

From the study it is evident that to increase the Knowledge on sustainable development, there should be a keen attempt from the part of policy makers and teachers to reform the curriculum in a way that it also addresses the concepts of sustainable development. But one should be cautious that it does not overburden the curriculum. Pandey, Tyagi and Goel (2008), opined that ESD has connections with other programmes in education which requires a comprehensive and integrated approach. It is not a new programme but demands reorientation of educational policies and practices

so that education plays major role in capacity building of all stakeholders. The approaches such as learner centeredness, developing critical thinking, skills of enquiry, creativity, imagination and collective decision making, using a wide range of text and media resources should be the main objective in transacting ESD. All these contribute to the ability of students to envision the sort of future that they want for themselves and for society. It not only helps in improving Knowledge on sustainable development, but also helps in developing higher order thinking skills also. Hence there is a need to integrate the concepts of sustainable development in the existing curriculum.

References

- [1] Al-bashaireh, Z., (2007), The effect of an environmental education program based on a systemic approach at Mu'tah university, Paper presented in 4th International conference on environmental education: Environmental education towards a sustainable future- Partners for the Decade of Education for sustainable development, 24- 28 November 2007, CEE, Ahmedabad
- [2] Brundtland Commission (1987), Retrieved on 05.09.2007, http://en.wikipedia.org/wiki/Brundtland_Commission
- [3] Church, C., & Elster, J. (2002). *Thinking locally, acting nationally: Lessons for national policy from work on local sustainability*. York: Joseph Rowntree Foundation.
- [4] Declaration of the United Nations Conference on the Human Environment (1972), Retrieved on 05.09.2007, <http://www.unep.org/Documents.Multilingual/Default.asp?DocumentID=97&ArticleID=1503>
- [5] Deopuria, R.P., (1984), *A comparative study of teaching science through Environmental and Traditional approach in schools of Madhya Pradesh*, Ph.D. Edu., Jab U, Fourth survey of research in education (1983-1988), Vol I, M.B. Buch, NCERT, New Delhi.
- [6] Dimitriou, Christidou and Hatzinikita (2007), *Pupil's ideas about reducing air pollution*, Paper presented in 4th International conference on Environmental Education, Environmental Education towards a sustainable future- Partners for the decade of Education for sustainable development, CEE, Ahmedabad, India, 24- 28th November 2007
- [7] Dharmani, S., (2007), *Structure and placing ESD in the curriculum*, Paper presented in International conference of All India Association for Educational Research (AIAER) on Education for sustainable development, September 14- 16th 2007, Adipur, Kachchh, Gujarat.
- [8] Exemmal (1980), Fourth Survey of Research in Education (1983-1988), Vol I, M.B. Buch, NCERT, New Delhi, PP 712-713.
- [9] Hasslöf, H., Ekborg, M., & Malmberg, C. (2014). Discussing sustainable development among teachers: An analysis from a conflict perspective. *International Journal of Environmental and Science Education*, 9, 41-57. doi: 10.12973/ijese.2014.202a
- [10] Iyengar, S., (2007), *Education for sustainable development*, Paper presented in International conference of All India Association for Educational Research (AIAER) on Education for sustainable development, September 14- 16th 2007, Adipur, Kachchh, Gujarat
- [11] Kartikeya, S. V., 2000, *Strategies in Environmental Education - Experiences from India*, International Meeting of Experts in Environmental Education, Organized by Xunta de Galicia in collaboration with UNESCO, Santiago de Compostela, Spain, November, 20-24, 2000.

-
- [12] Kumar, S., & Ram, B., (2006), *Knowledge of Environmental education among students*, MERI, Journal of Education, Vol I, No. II, Management Education and Research Institute, New Delhi
- [13] Lundegård, I., & Wickman, P.-O. (2007). Conflicts of interest: An indispensable element of education for sustainable development. *Environmental Education Research*, 13(1), 1-15
- [14] National Council of Educational Research and Training (2005). *National Curriculum Framework 2005*, New Delhi, NCERT.
- [15] Padmini (2007), *Environmental Knowledge for sustainable development- A study*, Paper presented in International conference of All India Association for Educational Research (AIAER) on Education for sustainable development, September 14- 16th 2007, Adipur, Kachchh, Gujarat
- [16] Pandey, R., Tyagi, M., & Goel, K., (2008), *Learner centered education for sustainable development in Preschool education*, MERI Journal of Education, Vol III, No.1, April 2008, Management Education and Research Institute, New Delhi.
- [17] Patel, N., (2007), *Structuring ESD in curriculum design at Higher Education level*, Paper presented in International conference of All India Association for Educational Research (AIAER) on Education for sustainable development, September 14- 16th 2007, Adipur, Kachchh, Gujarat
- [18] Patel, R., (2007), *Education for sustainable development- A curriculum design at school level*, Paper presented in International conference of All India Association for Educational Research (AIAER) on Education for sustainable development, September 14- 16th 2007, Adipur, Kachchh, Gujarat
- [19] Pellicer (2007), *Methodology for constructing critical thinking among young children to address Air Quality issues in the local context*, Paper presented in 4th International conference on Environmental Education, Environmental Education towards a sustainable future- Partners for the decade of Education for sustainable development, CEE, Ahmedabad, India, 24- 28th November 2007
- [20] Raven, J.C., (1958), *Standard Progressive Matrices*, Oxford Psychologists Press, Oxford, UK
- [21] Rio Declaration (1992), *Agenda 21-Chapter 36: Promoting Education, Public Knowledge and Training*, Retrieved on 05.09.2007, <http://habitat.igc.org/agenda21/a21-36.htm>
- [22] Rudsberg, K., & Öhman, J. (2010). Pluralism in practice: Experiences from Swedish evaluation, school development and research. *Environmental Education Research*, 16(1), 95-111.
- [23] The Johannesburg World Summit on Sustainable Development (WSSD, 2002), Retrieved on 21.05.2008, <http://www.iisd.ca/wssd/background.html> and <http://www.fao.org/wssd/>
- [24] United Nations Decade for Education for Sustainable Development (UNDESD), (2002), retrieved on 21.05.2008 <http://209.85.175.104/search?q=cache:71IoxHM4Vm0J:www.unece.org/env/esd/events.reg/UNESCO.JAN06.doc+UNDESD&hl=en&ct=clnk&cd=2&gl=in>
- [25] UNESCO (1997) *Educating for a Sustainable Future: A Transdisciplinary Vision for Concerted Action*, paragraph 89. Retrieved on 05.02.2008, http://www.unesco.org/education/tlsf/TLSF/theme_a/mod01/uncom01t05s01.htm
- [26] UNESCO (2004), United Nations Decade of Education for sustainable development: Draft International Implementation Scheme 2005- 2014, Paris: UNESCO