

HEART

HEALTH & EDUCATION ADVICE & RESOURCE TEAM

Helpdesk Report: Educational Systems and Climate Change

Date: 19 June 2013

Query: Conduct a literature review focusing on: 1) Impact of climate/environmental change on education systems in developing countries 2) The correlation between scientific literacy and attitudes to the environment 3) Evidence on climate/environment programmes in developing countries

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1. Overview

UNICEF include chronic environmental degradation and climate-related hazards among the many challenges that can prevent children from finishing school. Children are powerful agents of change, and studies have found that many children can be extraordinarily resilient in the face of significant challenges. Providing children with empowering and relevant education on disasters and climate change in a child-friendly school environment can reduce their vulnerability to risk while contributing to sustainable development for their communities. UNICEF's work on this is based on the principles of child-friendly education. They aim to integrate climate change, disaster risk and environmental issues across the education system, including within policies and legislation, education sector plans and budgets, curricula and examinations, teacher education, school infrastructure and facilities, learning environments, and school governance and management. Mainstreaming climate change rather than treating it as a separate issue is essential, given the already constrained resource base and the issues developing countries already face. Chakeredza (2009) argues for mainstreaming climate change by integrating the subject into the curricula of tertiary agriculture institutions.

Goodman et al. (2011) suggest REDD (Reducing Emissions from Deforestation and Forest degradation) projects as a critical strategic opportunity. They recommend school-based integrated educational approaches which empower young people to build better futures through life-sustaining values, practical skills and knowledge.

Findings on the correlation between scientific literacy and attitudes to the environment:

- In Finland environmental projects in schools and participation in programmes linked to environmental education or education for sustainable development was suggested to enhance students' interest in environmental issues (Uitto, 2011).

- Teksok et al. (2012) find that environmental knowledge has a significant indirect relationship with environmental attitudes and responsibility in an Environmental Literacy Components Model.
- Research in the US suggests improving the clarity of scientific information may not increase concern for climate change as the debate features cultural meaning. Communicators should create a deliberative climate in which accepting the best available science does not threaten any group's values (Kahan et al., 2012 & 2011).
- McCright (2010) finds that assessed climate change knowledge of US citizens relates positively to concern about climate change.
- Participants in a US citizen science programme for conservation literacy and scientific knowledge had increased awareness of a specific issue but little change in behaviour (Jordan et al., 2011). Some individuals reported a change in their appreciation for science; however, instruction in the nature of science did not result in change in participants' understanding of those subjects, and participation did not improve their ability to discriminate between causation and correlation.

Evidence on climate and environment education programmes was not found within the scope of this report. Anderson and Strecker (2012) note that evidence-based research about the impacts of sustainability-related education remains very limited. Some examples of programmes are presented in section 4. Of particular note is the UNESCO project Sandwatch which has participating countries in Africa, the Caribbean, the Indian Ocean and the Pacific. It links classroom activities to real-life issues relating to climate change, environment, sustainable development, cultural diversity, science and more. It links academic subjects across the curriculum from mathematics and natural science to social studies and the creative arts. It also stimulates and encourages practitioners, young and old, to take action by becoming involved in caring for their environment, and in understanding and influencing local government policy and action. Some positive feedback and results are reported.

2. Impact of climate/environmental change on educational systems in developing countries

UNICEF Climate Change and Environmental Education

Web page accessed: 14/6/2013

http://www.unicef.org/education/bege_61668.html

On any given day, more than a billion children are enrolled in primary or secondary school. But far too many of those enrolled children do not complete their education. Instead they drop out because the quality of the education they receive is poor or because of challenges that make it difficult for them to attend and participate in school. These challenges include deepening poverty, gender imbalances, emergencies and conflict situations, HIV and AIDS and disabilities. Chronic environmental degradation and climate-related hazards are also reasons why children cannot finish their education.

While children are among the most vulnerable to climate change, they should not be considered passive or helpless victims. Children are powerful agents of change, and studies have found that many children can be extraordinarily resilient in the face of significant challenges. Providing children with empowering and relevant education on disasters and climate change in a child-friendly school environment can reduce their vulnerability to risk while contributing to sustainable development for their communities. Educating girls and women is one of the best ways of strengthening community adaptation to climate change, as shown by recent studies.

UNICEF works on scaling up and mainstreaming climate change adaptation and disaster-risk reduction plans into the education sector. This work is based on the principles of child-friendly

education and aims to integrate climate change, disaster risk and environmental issues across the education system, including within policies and legislation, education sector plans and budgets, curricula and examinations, teacher education, school infrastructure and facilities, learning environments, and school governance and management.

According to the UN Educational, Scientific and Cultural Organization (UNESCO), which serves as the Secretariat of IAC-DESD, “Education alone cannot achieve a more sustainable future; however, without education and learning for sustainable development, we will not be able to reach that goal.” UNICEF has led great efforts in Education for Sustainable Development (ESD) for the past eight years through the IAC-DESD. The IAC brings together 22 UN Agencies committed to achieving DESD.

Climate Change and Environmental Education

Ittus, S. 2009. UNICEF, Child Friendly Schools.

http://www.unicef.org/publications/files/CFS_Climate_E_web.pdf

Over the past decade, the child-friendly schools (CFS) approach has emerged as UNICEF’s signature means to advocate for and promote quality education for every girl and boy. Child-friendly schools enable all children to achieve their full potential. As a part of a Global Capacity Development Programme on CFS, UNICEF has developed the Child Friendly Schools Manual, a reference document and practical guidebook to help countries implement CFS models appropriate to their specific circumstances.

The purpose of this module is to provide in-depth information on how Climate Change and Environmental Education (CCEE) can be integrated into the design, implementation and practice of child-friendly schools. Many schools are incorporating CCEE in their curricula. While it is impossible to present a complete account of these efforts, this module includes the most relevant examples and illustrates the diversity of approaches.

Climate Change Adaptation and Disaster Risk Reduction in the Education Sector. Resource Manual

UNICEF. 2012.

<http://www.unicef.org/cfs/files/UNICEF-ClimateChange-ResourceManual-lores-c.pdf>

UNICEF has developed this resource manual to assist governments and education practitioners in scaling up and mainstreaming climate change adaptation and disaster risk reduction in the education sector. The manual identifies key entry points at the policy, planning and advocacy levels, and it also makes the case for a process based on country-specific evidence and socio-economic analysis. To meet the challenges and seize the opportunities for quality education, multiple stakeholders must participate, collaborate and communicate.

The ultimate goal of this resource manual is to integrate climate change adaptation and disaster risk education into the education sector to provide young people with the knowledge and skills to protect the environment and contribute to sustainable and equitable development. Environmental challenges do not change the role of education, but they do change what constitutes equitable, quality education. Such an education must be relevant, aligned with children’s rights and deeply attuned to the present situation as well as future challenges.

Climate Change Impacts on Children in the Pacific. A focus on Kiribati and Vanuatu

Burton, D., Mustelin, J. & Urich, P. 2011. UNICEF

http://www.unicef.org/environment/files/Final_Advocacy_Paper_Pacific_17_Sept.pdf

This report includes the following note and recommendations on education:

Children are sensitive to discussions surrounding negative environmental impacts. Emphasis should be given in education programmes to avoid 'doom and gloom' scenarios and instead provide children with information on positive options and how they can help. A balance between children's psychological well-being and their right to information needs to be managed accordingly: this means being mindful of possible psychological stresses created by frightful information regarding climate change impacts.

Incorporate active learning into children's activities that allow them to 'learn by doing'. For example, installing low-cost weather stations in schools and/or in villages may help foster children's awareness of how the weather and climate may affect them and their community. Children who have been educated on how to record climate data can share and compare their results with other schools, including overseas interaction.

Education about climate change for children needs to be country specific and use children's own language, such as Bislama (and other local languages) in Vanuatu and Kiribati in Kiribati. Incorporating climate change with existing environmental awareness programmes, courses and workshops is an option that has been trialled in both countries. For instance, some NGOs have included climate change as part of their environmental awareness education programmes, and both the Kiribati and Vanuatu governments have conducted workshops integrating issues concerning the environment and climate adaptation. However, mainstreaming climate change rather than treating it as a separate issue is essential, given the already constrained resource base and the issues these countries already face. Children also need to be given information that is in an easily understandable format. The majority of climate change reports are complex. For example, the Intergovernmental Panel on Climate Change (IPCC) reports are synthesised into a summary for policy-makers to ensure that the language suits that particular audience. It is important that climate change reports (IPCC documents, country NAPA reports, etc.) contain a 'summary for children' component.

Climate Change and Education. Maldives.

Das, P.K. 2010. DFID.

http://www.preventionweb.net/files/16354_climatechangeedmaldives.pdf

This publication addresses physical and social vulnerability of the Maldives in relation to climate change hazards, such as sea level rise, beach erosion, storm surges and increased rainfall; and more specifically the risks to education, including the ones from tsunamis.

It suggests some adaptation measures, including: (i) disaster safe school design and construction; (ii) life-long and open-learning opportunities; (iii) the use of information and communication technologies for teaching and learning; and (iv) building awareness about climate change hazards and possible impacts on lifestyle.

It also advocates for climate change related policies, activities and communications to put forward the case of education.

The report notes, in countries such as Bangladesh, there are already instances of very negative impact on educational infrastructure due to severe cyclone and flood that had destroyed school infrastructure, disrupting transport, and interrupting teaching and learning. The increased risk of diseases such as malaria, dengue fever and water-borne infections for both students and teachers due to these events further disrupts educational programmes. Another issue is forced migration due to disasters which can also disrupt education systems (which puts pressure on schools and parents in both sending and receiving communities), civil conflict, and the increased necessity for children's participation in agricultural labour. The

resulting social and economic costs therefore include a wide range of development concerns, from malnutrition and ill health to an increased risk of child labour and child trafficking. This seriously undermines existing efforts to increase education provision and to improve both economic and human development.

While much of the existing literature on climate change focuses on efforts at mitigation (e.g. carbon trading, reduced consumption, etc.), adaptation to climate change is also a key concern. Education plays a key role in both areas. Communities affected by either slow environmental change or more frequent and severe natural disasters will require new sets of skills and knowledge in order to either adapt their livelihoods or to move to new locations. Existing educational infrastructure (including schools, transportation, texts and other learning materials) in these areas is also likely to be heavily affected – making it imperative to consider potential climate change impacts as part of planning processes. Where these issues are not taken into account, investment in education provision will be highly inefficient. The situation is worse in the countries affected by war, civil war, political unrest and instability, etc.

Forest Community Schools: A child-centered strategy for mitigating leakage in REDD+

Goodman, D. et al. 2011. Earth Child Institute

<http://list.terc.edu/pipermail/climateliteracynetwork/attachments/20110329/97fb43a9/attachment-0001.pdf>

By 2025, children who are 18 years or younger today will represent more than half of the world's workforce. A critical strategic opportunity exists to insure the resiliency, effectiveness, and overall return on investment on 20-30 year REDD (Reducing Emissions from Deforestation and Forest Degradation) projects by investing in innovative school-based integrated educational approaches which empower young people to build better futures through life-sustaining values, practical skills and knowledge. These essential capacities will enable forest communities to convert CO₂ into things they and the world at large will thrive on – healthy ecosystems, healthy people, and healthy economic opportunities. Such education and economic empowerment of the children will mitigate leakage and ensure sustainability in REDD project areas, strengthening investor confidence. Allocation of a percentage of REDD funds flowing to such integrated school programs will reduce risk and yield social, economic and environmental benefit for all parties concerned.

Mainstreaming Climate Change into Agricultural Education: Challenges and Perspectives

Chakeredza, S. 2009. World Agro Forestry Centre

<http://www.worldagroforestry.org/downloads/publications/PDFs/WP15993.PDF>

This Working Paper lays down the key issues in climate change: who is affected and what directions are being taking if the negative effects presented by climate change are not checked. It presents a compelling argument on the role of tertiary education in making meaningful contributions and goes further to present a very reasonable action plan to be followed if we are going to keep on track with climate change adaptation and mitigation strategies.

The need for climate change in the curricula

Increasingly, climate change is becoming a challenge to agricultural production because it increases risks and uncertainties for farmers. There is a need for graduating agricultural students to be well-versed with the challenges posed by climate change if they are going to advise the communities they will be working with appropriately. They also need to understand the implications of climate change to economic development and international trade. Educating those currently at school about climate change will help to shape and sustain future policy-making. Studies on climate change have so far been limited to adaptation and

mitigation intervention strategies. Faculty and students should be able to contribute to the development of the body of knowledge as regards climate change.

Students should be aware of the various International Conventions and Protocols surrounding climate change. These include UN Framework convention on climate change (UNFCCC), Kyoto protocol and a range of other informal partnerships and dialogues that provide a framework that supports co-operation, and a foundation from which to build further collective action. The challenges are to develop good curricula, produce relevant learning resources and capacitate educators.

Integrating climate change into agricultural curricula

Climate Change should be integrated into the curricula of tertiary agricultural institutions as a matter of urgency. There is need for concrete scientific data based on African experiences to be infused into the curricula. The curricula can be handled as a separate subject or infused and integrated into the various agricultural and natural resources management subjects. The recommended teaching and learning methods should be lectures (including guest lectures), seminars, group discussions, visits to sites demonstrating the impact of climate change and or adaptation and mitigation work in progress, on-farm discussions and surveys. eLearning enhanced with research repositories can also be pursued where possible.

Disciplines could also be selected with the greatest potential to deliver on mainstreaming climate change into tertiary agricultural and natural resources management education. The objective will be to ensure that graduating students in agriculture and natural resources management fully understand and grasp the implications of climate change on the whole global economy. The thrust should be towards building a cadre of academics and researchers with appropriate knowledge and skills on the key issues affecting society and be in a position to advise policy makers, educational establishments and practitioners.

Teaching Climate Change in Higher Education: Barriers and Opportunities

Robinson, Z. 2011. In: Pedagogy of Climate Change. Haslet et al. (eds). The Higher Education Academy.

<http://www.gees.ac.uk/pubs/other/poccc/chapter%204.pdf>

Teaching the topic of climate change comes with it a responsibility to support students to develop more holistic, informed and considered views and understanding. However, the teaching of climate change and related sustainability issues is subject to a number of challenges. Learners have existing mental models of climate change issues and hold widely diverging views in terms of their belief about the importance of humans in recent climate change trends, personal responsibility to tackle climate change, and the importance of the impacts of climate change. Further barriers to the effective teaching of climate change include 'over-saturation' from media and curriculum coverage, existing misconceptions, incomplete knowledge, and difficulties with threshold concepts and areas of troublesome knowledge such as timescales, systems thinking, interdisciplinarity and scientific uncertainty. Climate change educators should also be aware of the great opportunities and benefits that effective climate change education can bring to learners, educators, institutions and to wider society. These opportunities include providing a framework and context for students (and educators) to form a more holistic and interdisciplinary world view; providing a topical context for teaching core discipline concepts; and through increasing students' environmental awareness, contributing to enhanced environmental citizenship and behavioural change amongst the student cohort, the world's future leaders

Combating Climate Change Through Quality Education

Anderson, A. 2010. The Brookings Institute. Global Economy and Development Policy Brief.

http://www.brookings.edu/~media/research/files/papers/2010/9/climate%20education%20anderson/09_climate_education.pdf

This brief reviews the current policies and actions on climate change and the barriers to engaging the education sector in the discussions on climate change mitigation and adaptation. At present, there is no coherent dialogue on how to expand the climate change agenda to include education as a tool in adaptation and mitigation strategies. However, leveraging education for climate change action is indeed possible through existing international agreements and relevant agendas. The brief presents a framework for the existing communities of practice to mobilise around in order to promote education for sustainable development and also integrate disaster risk reduction, quality learning, and environmental and climate change education.

An Education for Sustainable Development agenda that integrates the core principles of the quality learning, disaster risk reduction, and environmental and climate change education agendas could combat mitigation and enhance adaptation through the following components: relevant content knowledge, critical thinking skills, safe and adaptive schools, and green schools. These four components can build the capacity of education systems to integrate risk reduction while also providing learners with the knowledge base and critical thinking skills to help shape and sustain future action and policymaking about climate change and other uncertainties.

There are two cross-cutting issues that are important in realising each of the previous four components: (1) the active participation of the community, especially children, as agents of change and (2) enhanced linkages with climate researchers.

A framework for agricultural adaptation to climate change in Southern Nigeria

Ozor, N. et al. 2012. International Journal of Agriculture Sciences, 4 (5). pp. 243-251
http://centaur.reading.ac.uk/28884/1/13425102734_5_4_IJAS.pdf

This paper identifies a need to climate-proof all courses in universities. This means that the environmental implications of courses taught in universities should be emphasised as part of curriculum review. New courses in relevant disciplines should be offered especially at postgraduate levels to provide in-depth knowledge on climate change science; adaptation and mitigation; agrobiodiversity; pastoralism; climate extension and economics; global warming, policy issues; etc.

3. Correlation between scientific literacy and attitudes to the environment

a. Scientific literacy and environmental attitudes in the general public

The Polarizing Impact of Science Literacy and Numeracy on Perceived Climate Change Risks

Kahan, D.M. et al. 2012. Nature Climate Change, 2, 732–735
<http://www.nature.com/nclimate/journal/v2/n10/full/nclimate1547.html>

Seeming public apathy over climate change is often attributed to a deficit in comprehension. The public knows too little science, it is claimed, to understand the evidence or avoid being misled. Widespread limits on technical reasoning aggravate the problem by forcing citizens to use unreliable cognitive heuristics to assess risk. The authors conducted a study to test this account and found no support for it. Members of the public with the highest degrees of science literacy and technical reasoning capacity were not the most concerned about climate change. Rather, they were the ones among whom cultural polarisation was greatest. This result suggests that public divisions over climate change stem not from the public's

incomprehension of science but from a distinctive conflict of interest: between the personal interest individuals have in forming beliefs in line with those held by others with whom they share close ties and the collective one they all share in making use of the best available science to promote common welfare.

The authors contend that one aim of science communication should be to dispel this tragedy of the risk-perception commons. A communication strategy that focuses only on transmission of sound scientific information, the results suggest, is unlikely to do that. As worthwhile as it would be, simply improving the clarity of scientific information will not dispel public conflict so long as the climate-change debate continues to feature cultural meanings that divide citizens of opposing world-views.

Communicators should endeavour to create a deliberative climate in which accepting the best available science does not threaten any group's values. Effective strategies include use of culturally diverse communicators, whose affinity with different communities enhances their credibility, and information-framing techniques that invest policy solutions with resonances congenial to diverse groups. Perfecting such techniques through a new science of science communication is a public good of singular importance.

The Tragedy of the Risk-Perception Commons: Culture Conflict, Rationality Conflict, and Climate Change

Kahan, D.M. 2011. Cultural Cognition Project Working Paper No. 89.

<https://www.law.upenn.edu/academics/institutes/regulation/papers/Kahan%20Tragedy%20of%20the%20Risk-Perception.pdf>

The conventional explanation for controversy over climate change emphasises impediments to public understanding: limited popular knowledge of science, the inability of ordinary citizens to assess technical information, and the resulting widespread use of unreliable cognitive heuristics to assess risk. A large survey of U.S. adults (N = 1540) found little support for this account. On the whole, the most scientifically literate and numerate subjects were slightly less likely, not more, to see climate change as a serious threat than the least scientifically literate and numerate ones. More importantly, greater scientific literacy and numeracy were associated with greater cultural polarization: respondents predisposed by their values to dismiss climate change evidence became more dismissive, and those predisposed by their values to credit such evidence more concerned, as science literacy and numeracy increased. It was suggested that this evidence reflects a conflict between two levels of rationality: the individual level, which is characterised by the citizens' effective use of their knowledge and reasoning capacities to form risk perceptions that express their cultural commitments; and the collective level, which is characterised by citizens' failure to converge on the best available scientific evidence on how to promote their common welfare. Dispelling this "tragedy of the risk-perception commons," the authors argue, should be understood as the central aim of the science of science communication.

The Effects of Gender on Climate Change Knowledge and Concern in the American Public

McCright, A. M. 2010. *Population and Environment*, 32:66–87

<http://link.springer.com/content/pdf/10.1007%2Fs11111-010-0113-1.pdf>

This study tested theoretical arguments about gender differences in scientific knowledge and environmental concern using 8 years of Gallup data on climate change knowledge and concern in the US general public. Contrary to past research on general scientific or environmental knowledge, women exhibit more scientifically accurate climate change knowledge than do men, and women express slightly greater concern about climate change

than do men; this gender divide is not accounted for by differences in key values and beliefs or in the social roles that men and women differentially perform in society. Contrary to the “Environmental Knowledge” hypothesis or “Knowledgeable Support Hypothesis”—but consistent with some earlier empirical results regarding environmental concern, assessed climate change knowledge relates positively to concern about climate change. This analysis provides an opportunity to adjudicate among competing environmental concern hypotheses, while also improving understanding of the American public’s beliefs and attitudes about this impending global environmental problem.

b. Educational programmes to improve scientific literacy in the context of promoting environmental awareness

Knowledge Gain and Behavioural Change in Citizen-Science Programs

Jordan, R. C. et al. 2011. Conservation Biology Volume 25, Issue 6

<http://www.ncbi.nlm.nih.gov/pubmed/21967292>

Citizen-science programs are often touted as useful for advancing conservation literacy, scientific knowledge, and increasing scientific-reasoning skills among the public. Guidelines for collaboration among scientists and the public are lacking and the extent to which these citizen-science initiatives change behaviour is relatively unstudied. The authors studied 82 participants, over two years, in a three-day program that included education about non-native invasive plants and collection of data on the occurrence of those plants. Volunteers were given background knowledge about invasive plant ecology and trained on a specific protocol for collecting invasive plant data. They then collected data and later gathered as a group to analyse data and discuss responsible environmental behaviour with respect to invasive plants. We tested whether participants without experience in plant identification and with little knowledge of invasive plants increased their knowledge of invasive species ecology, participation increased knowledge of scientific methods, and participation affected behaviour. Knowledge of invasive plants increased on average 24%, but participation was insufficient to increase understanding of how scientific research is conducted. Participants reported increased ability to recognize invasive plants and increased awareness of effects of invasive plants on the environment, but this translated into little change in behaviour regarding invasive plants. Also, some individuals reported a change in their appreciation for science; however, instruction in the nature of science, such as what kinds of data scientists use and the certainty and durability of scientific inferences, did not result in change in participants’ understanding of those subjects, and participation did not improve their ability to discriminate between causation and correlation or to control confounding factors in scenario-based questions.

The methods one might use in a citizen-science project may not be effective for achieving both educational and scientific goals. For example, deep learning benefits from practice, from discovering and working through mistakes, and from allowing ample time for reflection. The links between education and change in attitude, behaviour, and support for science are not always direct, and knowledge of how people learn and the effects of their attitudes and beliefs on their decisions is imperative for selecting learning goals and designing the methods to achieve them. Furthermore, the participants must be interested in deep learning. Many people engage in projects to provide labour for a greater good or for a social experience, not to learn. Although it does not appear that participation in the project was associated with gains in science-process skills, even with explicit instruction, some volunteers entered the project with these skills. Across project types, these individuals may have the potential to act as deeply engaged citizen scientists who can help with project design and its undertaking; possibly furthering the reach of professional scientists.

Secondary School Students' Interests, Attitudes and Values Concerning School Science Related to Environmental Issues in Finland

Uitto, A. 2011. *Environmental Education Research*, 17:2, 167-186

<http://www.tandfonline.com/doi/pdf/10.1080/13504622.2010.522703>

This paper explores the relationship between students' interests in environmental issues, attitudes to environmental responsibility and biocentric values in school science education. The factors were investigated within the framework of three moderators: gender, school and residential area of the school. The survey was carried out using the international ROSE questionnaire with ninth-grade students (N= 3626) from 68 schools. The effect of residential area was negligible, but there were significant differences between schools in all the factors studied. A school's own environmental projects and participation in programmes linked to environmental education or education for sustainable development was suggested to enhance students' interest in environmental issues.

As many environmental issues are considered in Finnish science education and they also belong to the cross-curricular theme 'Responsibility for the environment, well-being and sustainable future' in the Finnish national curriculum of basic education (NCCBE 2004, 39–40), the authors assume that students' responses to the ROSE items, at least to some extent, reflect their awareness-related interest in environmental issues and concern with environmental problems that they have learned in school science lessons.

In general, students were not especially interested in environmental issues and there was also a large difference in interests and attitudes between the lower- and upper-quarter schools. Interest is important, because it is linked to the positive attitude towards environmental responsibility. This put strain on learning about environmental issues in science education; the question is how to teach abstract, possibly frightening and complicated issues, remote from students' daily life so that they will not reject or dismiss environmental issues.

The Importance of Scientific Literacy in Fostering Education for Sustainability: Theoretical Considerations and Preliminary Findings from a Brazilian experience

Rogério, P. et al. 2010. *Journal of Cleaner Production*. Volume 18, Issue 7

<http://www.sciencedirect.com/science/article/pii/S0959652609002856>

In this paper, the authors develop a framework for exploring scientific literacy as a function of learning about sustainable development. Scientific literacy can be considered as a new demand of post-industrial society. It seems necessary in order to foster education for sustainability throughout students' academic careers. Universities striving to teach sustainability are being challenged to integrate a holistic perspective into a traditional undergraduate curriculum, which aims at specialization. This new integrative, inter- and transdisciplinary epistemological approach is necessary to cultivate autonomous citizenship, *i.e.*, that each citizen be prepared to understand and participate in discussions about the complex contemporary issues posed by post-industrial society. During a required course for first-year undergraduate students, climate change was presented and discussed in broad perspective by using collaborative concept maps (CCmaps). The students' CCmaps are presented to show how they use concepts from quantitative and literacy disciplines to deal with the challenges posed by the need of achieving a sustainable development. The curriculum is a response to the new formative demands of the 21st century, and it institutes a set of six general disciplines to deal with various aspects of these demands. Using collaborative concept mapping to elicit and guide students' thinking about technological and scientific development when confronted with its environmental and ethical implications has been shown to promote scientific literacy and, as a consequence, to nurture a more sophisticated understanding about sustainable development.

c. Modelling scientific literacy

Modelling Environmental Literacy of University Students

Teksoz, G., Sahin, E. & Tekkaya-Oztekin, C.

Journal of Science Education and Technology. 2012. 21:157–166

<http://link.springer.com/content/pdf/10.1007%2Fs10956-011-9294-3.pdf>

This study proposed an Environmental Literacy Components Model to explain how environmental attitudes, environmental responsibility, environmental concern, and environmental knowledge as well as outdoor activities related to each other. A total of 1,345 university students responded to an environmental literacy survey. The structural equation model revealed that high levels of environmental knowledge stimulate a university student's concern, attitudes, and personal responsibility toward environmental protection. More specifically, environmental knowledge was reported to be a significant predictor of environmental concern, attitudes, and responsibility. Environmental knowledge had significant indirect relationships with environmental attitudes and responsibility. Moreover, while attitudes toward the environment were found to be a significant determinant of environmental responsibility, environmental concern held significant association with attitudes toward the environment and outdoor activities. Findings promise to give clues for finding an answer to the question “how education for sustainability can be improved in higher education curricula.”

Adaptation to Climate Extremes in Developing Countries. The Role of Education

Blankespoor, B. et al. 2010. World Bank Policy Research Working Paper 5342.

<http://www->

wds.worldbank.org/servlet/WDSContentServer/WDSP/IB/2010/06/21/000158349_2010062113123/Rendered/PDF/WPS5342.pdf

Global climate models predict a rise in extreme weather in the next century. To better understand future interactions among adaptation costs, socioeconomic development, and climate change in developing countries, observed losses of life from floods and droughts during 1960–2003 are modelled using three determinants: weather events, income per capita, and female education. The analysis reveals countries with high female education weathered extreme weather events better than countries with equivalent income and weather conditions. In that case, one would expect resilience to increase with economic growth and improvements in education. The relationship between resilience in the face of extreme weather events and increases in female education expenditure holds when socioeconomic development continues but the climate does not change, and socioeconomic development continues with weather paths driven by “wet” and “dry” Global Climate Models. Educating young women may be one of the best climate change disaster prevention investments in addition to high social rates of return in overall sustainable development goals.

4. Examples of climate/environment education programmes in developing countries

Sandwatch: Adapting to Climate Change and Educating for Sustainable Development

Cambers, G. & Diamond, P. 2011. UNESCO.

<http://unesdoc.unesco.org/images/0018/001894/189418e.pdf>

The Sandwatch manual provides information on beach monitoring and climate change for enhancing beach resilience.

There is no doubt that education plays a central role in the response at all levels to the projected changes in the world's climate. The key question is as far-reaching as it is urgent: how can we adjust and enhance the way we teach and learn so that we instil an understanding in children and young people of the nature and causes of climate change, while inspiring action to adapt and mitigate? This second, expanded edition of the Sandwatch manual makes particular reference to climate change adaptation within an approachable and interactive framework through which students, teachers and other practitioners can monitor their local environments, identify critical issues, and develop strategies for action.

Sandwatch links classroom activities to real-life issues relating to climate change, environment, sustainable development, cultural diversity, science and more. It links academic subjects across the curriculum from mathematics and natural science to social studies and the creative arts. Perhaps most important of all, Sandwatch stimulates and encourages practitioners, young and old, to take action by becoming involved in caring for their environment, and in understanding and influencing local government policy and action.

Sandwatch Stakeholder Workshop: Lessons-learned from Sandwatch project implementation in Aceh

Website accessed: 14/6/13

http://www.unesco.org/new/en/natural-sciences/priority-areas/sids/single-view-small-island/news/sandwatch_stakeholder_workshop_lessons_learned_from_sandwatch_project_implementation_in_aceh/

Positive feedback from the Sandwatch project was presented and discussed by stressing lessons-learned during the project implementation. It has been identified that the various activities conducted during the project have brought positive impacts to students and teachers from both schools.

By participating in Sandwatch project, the students acquired more knowledge on coastal ecosystem conservation, and at the same time they improved their communication skills particularly in public speaking during the workshop presentation. Sandwatch project also provides teachers with more teaching resources and class activities which can be implemented in multidisciplinary areas during teaching and learning process.

Four major activities, such as tree re-plantation around coastal environment in Lhoknga, beach cleanup, turtle monitoring and craft making from recycled materials will be highlighted by Kuala as their next agenda in following up their workplan in Sandwatch implementation in Aceh.

SIDS-SIDS Success Stories. An innovative partnership in South-South cooperation

UN-DESA & UNDP. 2010. UNDP.

<http://ssc.undp.org/content/dam/ssc/documents/SIDS-SIDS%20Success%20Stories.pdf>

Sandwatch results achieved:

- Student involvement in the management of the coastal environment
- Student proposals for decision-makers on the sustainable development of coastal areas
- Team work with local communities and Government officials
- Shared ideas and views on beach environments and sustainable development

Being part of a wide range of activities that includes measuring sand erosion, interviewing community members, and recycling rubbish to make new forms of art work; the students

learnt about the serious threats facing their coastal landscapes. This also enabled them to remain committed for assuming future responsibilities to help and protect their threatened natural and beautiful beaches.

Other such actions including signage on 'Not to litter the beach' brought a positive change in many other people visiting the beaches. Students also gained a sense of empowerment through the recognition provided by the Prime Minister of the Cook Islands, the Secretary of Education, the President of the House of Traditional Chiefs and UNESCO.

In designing a low-cost and highly adaptable activity, Sandwatch does require the commitment and time of dedicated educators and students in the participating institutions. A close relationship between the participating schools themselves and the education authorities in the member countries can be a significant factor in ensuring long-term benefits from Sandwatch – ideally through the integration of the Sandwatch methodology into the formal curriculum. This was achieved in the Cook Islands – an experience that is now being shared with other SIDS.

Sandwatch. An educational tool for sustainable development

Webpage accessed: 14/6/13

http://webcache.googleusercontent.com/search?q=cache:http://ccivs.org/New-SiteCCSVI/institutions/jpc-youth/youth-open-forum/4.Promotion/UNESCO/Natural_Sciences_Sector/About_Sandwatch.doc

The source of this information is unclear but the comments from communities, teachers and students are of note:

"The Sandwatch group has made a really good contribution, now the people of the community need to pitch in and carry on the effort." Dorothy Stow, community member, St. Vincent and the Grenadines

"We learnt how to take scientific measurements of the beach, we acquired social skills and learnt how to cooperate and work together, we are now aware of the importance of project planning." Students from St. Joseph's Convent Secondary School, St. Lucia

"We have used our Sandwatch project for our school based assessments at the regional Caribbean Examinations Council level. We plan to make our Sandwatch report into a book. Our hope is that soon the whole island will be on Sandwatch." Students from Coleridge and Parry School, Barbados

"One of our objectives was to help students with autism socialise with the world that surrounds them and prepare for an independent life." Teachers from Escuela Especial Dora Alonso, Cuba

Teachers have included Sandwatch activities in units on landscape, recycling, tourism and ecosystem studies. It has been very successful with the students and they enjoy studying their own environment rather than reading about someone else's." Curriculum Development Unit, Ministry of Education, Cook Islands

St. Josephs Senior Secondary School, Banjul. UNESCO ASP net Activities from October 2011 to December 2011.

Author unknown. 2011.

<http://www.sandwatch.ca/images/stories/food/Gambia/Girls%20School/ASP%20Net%20Club%20REPORT%20DEC.%202011.pdf>

Some positive stories from a case of Sandwatch in action in the Gambia.

Climate Change Education for Sustainable Development

UNESCO. 2010

<http://unesdoc.unesco.org/images/0019/001901/190101E.pdf>

Information on the UNESCO Climate Change Initiative.

Addressing Vulnerabilities and Building Capacity for Adaptation of Agriculture to Climate Change in China

Website accessed: 14/6/13

<http://www.sainclimatechange.org/>

Climate change is a key driver of change in agricultural systems in China and is closely linked to the causes and alleviation of poverty. A number of national and collaborative international research studies have started to explore the adaptation options of agriculture to climate change in China. However, because of the complexity of agricultural systems, many key knowledge gaps remain. Through a structured programme of knowledge exchange and bilateral research, this project will address the skills needs of two major stakeholder groups – adaptation researchers in China and farming communities vulnerable to climate change.

Strategic objectives include:

- Fostering joint research and knowledge exchange between Chinese and UK researchers concerned with adaptation of agricultural systems to climate change and the promotion of sustainable food systems
- Communicating issues of sustainability of farming systems to key stakeholders from farming communities to researchers to policy-makers
- Exploring information flows within farming communities concerned with perception of climate change and possible adaptation options and linking these with research
- Building capacity of researchers and farming communities to adapt to climate change.

Sustainable Development: A Case for Education

Anderson, A. & Strecker, M. 2012. Environment: Science and Policy for Sustainable Development, November-December 2012.

<http://www.environmentmagazine.org/Archives/Back%20Issues/2012/November-December%202012/sustainable-full.html>

This article makes a case for and defines an agenda for learning for sustainable development. It highlights promising practices in formal and nonformal education contexts that have the potential to change consumption patterns and lifestyles. The article concludes by making recommendations for policymakers working on sustainable development and poverty alleviation beyond the United Nations Conference on Sustainable Development 2012 (Rio + 20) to the post-2015 agenda.

There is a wide range of learning and education for sustainable development, lifestyles, and consumption activities and projects underway around the world. However, in spite of the growing interest at international, national, and local levels about sustainability, evidence-based research about the impacts of sustainability-related education remains very limited. The majority of evidence that exists is anecdotal, often in case-study format without

monitoring and evaluation processes in place that could lead to quantitative as well as qualitative data.

Some examples of promising practices are described including the Mainstreaming Environment and Sustainability into African Universities (MESA) partnership. Since 2004, the United Nations Environment Programme (UNEP) has led the MESA partnership, which provides a continent-wide platform for discussions on sustainable development innovations in different African contexts and universities. The partnership thus far has resulted in the initiation of a number of change initiatives in participating universities and has introduced a stronger systems-focused approach to change in the participating universities. While no formal evaluation has yet been undertaken, more than 90 universities in 40 countries have joined the partnership, creating the first network of African universities on environment and sustainability, in partnership with UNESCO, the United Nations University, the Association of African Universities, the Southern Africa Development Commission, the Horn of Africa Regional Environmental Centre and Network, and the African Network for Agriculture, Agroforestry and Natural Resource Education.

The Path To Success "Some Pioneering Examples Of Environmental Education"

IGES Environmental Education project. 2002. IGES Policy Report

<http://pub.iges.or.jp/modules/envirolib/view.php?docid=1520>

A collection of small scale environmental education projects in different countries are described with some positive results and lessons learned but no formal evaluations.

Some examples include:

- A 'Population and Environmental Education' course and textbook in Nepal
- Interactive Biodiversity Education in Costa Rica
- 'Our Land, Our Life': course in India run by the Uttarakhand Seva Nidhi Environmental Education Center
- Environmental Education Centers and nature awareness programmes in Bangladesh.
- A floating environmental education centre for school children in China
- Environmental competitions in Schools in Botswana

5. Additional information

Authors

This query response was prepared by **Laura Bolton and Geraldine Foster**

About Helpdesk reports: The HEART Helpdesk is funded by the DFID Human Development Group. Helpdesk reports are based on 2 days of desk-based research per query and are designed to provide a brief overview of the key issues, and a summary of some of the best literature available. Experts may be contacted during the course of the research, and those able to provide input within the short time-frame are acknowledged.

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