The Education for Sustainability Programme
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Abstract
In 2011 the Catholic secondary schools that are part of the Catholic education network embarked on an extra-curricular programme for Ecological Literacy Development (ELP) developed by ELIA-Ecological Living In Action (ELIA) in collaboration with the Bureau of Catholic Education (BEC). In 2013, this evolved into the Education for Sustainability programme (EFS) that is being integrated into the curriculum work plan and school activities for three selected pilot schools in Mauritius – Loreto College Curepipe, St Mary’s College Rose-Hill and BPS Fatima Goodlands. This paper provides an overview of the EFS programme and lessons learned since 2011, with an outline of how the EFS programme will unfold over the coming years in the Catholic schools in Mauritius.

Keywords: Education for Sustainability programme; EFS pilot schools; ecological literacy for sustainability.

1. Introduction
The Education for Sustainability (EFS) programme is developed and facilitated by ELIA-Ecological Living In Action (ELIA) in collaboration with the BEC to support (conventional) educational systems to become learning organizations and communities of practice for sustainability. The main objectives of the EFS programme are:

1. Implementation and mainstreaming of Education for Sustainability principles and practices in educational systems, starting with schools.
2. Setting-up a collaborative platform for sharing best practices for promoting EFS among all relevant stakeholders, such as government schools, private schools, NGOs focused on education, stakeholders from the green building movement for development of green schools, and for attracting collaboration with key institutions for sustainability education regionally and internationally.

The EFS programme was initially developed as an extra-curricular project in 2011 for the 18 Catholic secondary schools that are part of the BEC network.

Since 2013, and after review of the initial phase, the programme is being mainstreamed into the school curriculum system in three selected pilot secondary schools in Mauritius - Loreto College Curepipe (LCC), St Mary’s College (SMC) Rose-Hill and BPS Fatima Goodlands. Through the EFS programme, the capacity of the pilot schools is being developed with the aim of replication in the other secondary and primary Catholic schools in Mauritius. The programme is also available to other schools outside the BEC network wishing to join in. As has been discussed by Deenapanray, Smitsman and Chung Kim Chung (this issue), most of the current and conventional educational systems do not foster ecological literacy for sustainability. In contrast, schools often contribute to the problem of unsustainability by failing to support teachers and students to develop the necessary competencies for contributing to sustainability solutions.
EFS competencies include, among others: integrated thinking (or systems thinking), pattern recognition, understanding of ecosystem principles and their applications in human activities and social organizations, sustainability stewardship and relationship, reflective and creative thinking, and the capacity to envision and dream a sustainable society and future.

The EFS programme has been designed to address the gap between ‘what education needs to be for’ and ‘the current reality of what education is contributing to’. When the programme started in 2011, it was developed in response to the appeal of Mgr. M. E. Piat, Bishop of Port-Louis (Mauritius) to link religious practice with ecological responsibilities. In his Pastoral letter titled “Developing a new art of ecological living”, Mgr. Piat highlighted that ecological responsibility for our planet and the wellbeing of future generations is imperative. He recommended that the Catholic educational institutions need to take a leadership role to prepare students in their ecological literacy development and capacity to act on these ecological responsibilities (Diocese of Port-Louis, 2011). This is how ELIA and the BEC developed a partnership to support the achievement of this commitment.

In February 2011, permission was granted by the management of the 18 Catholic secondary schools to introduce ecological literacy development through extra-curricular projects and teacher training. The programme started with an Ecological Footprint Analysis (EFA) project and teacher training in systems thinking, learning and development for ecological literacy, and ecological living practices. At the end of 2012, and on the basis of an evaluation exercise with inputs from all relevant stakeholders, the programme was redesigned to achieve more impact and renewed engagement and support from the school communities. Some of the decisions emanating from this review were: (i) permission was granted to continue the programme within the curriculum system; (ii) the name changed from Ecological Literacy to Education for Sustainability; (iii) three pilot schools were selected from the 18 Catholic secondary schools to implement the revised EFS programme, and; (iv) the EFS Charter and Pledge was created and signed by the EFS pilot schools and the BEC management to signify the commitment to Education for Sustainability. Section 2 provides a more detailed overview of the evolution and development of the EFS programme into its current form.

2. The evolution and development of the EFS programme from 2011-2014

When the programme started in February 2011 extra-curricular activities and training were the only options. By providing a soft introduction to ecological literacy development in this form, changes could be introduced gently without too much resistance. The initial goal of the (Ecological Literacy Programme) ELP was to: “Enhance the competencies of educators, students and practitioners in addressing sustainability issues through experiential learning.”

The objectives of ELP were to:

1. Use Ecological Footprint Analysis (EFA) as a tool to quantify the footprint of school activities through a co-learning practice between teachers and students; and
2. Train teachers to employ a systems approach so that creative and integrated actions can be found and applied.

ELP started with the Ecological Footprint Analysis (EFA) in the schools. All the 18 secondary schools in the BEC network were invited to measure their ecological footprint in terms of their consumption (food, consumables, transport, and utilities) and waste production. Each school was provided a customized Ecological Footprint (EF) calculator for Mauritius designed by ELIA together with training in EFA. As an example of EFA at St Mary’s College Rose-Hill, please see Bangari et al. (this issue). As students and teachers measured the EF of schools and learned about the growing EF of Mauritius, it became clear why learning for sustainable development is essential. Teacher
trainings were carried out in systems thinking (including system archetypes and mental models), ecological living practices, and learning and development for ecological literacy. The latter was facilitated by Prof Smitsman (retired developmental psychologist from the Radboud University of Nijmegen). These trainings were attended by selected teachers (also known as ‘mentors’) and coordinators from the 18 secondary schools.

About 50 teachers were trained over this period and approximately 10,000 students were involved either directly or indirectly in the programme between 2011 and 2012. For a summary of the lessons that emerged from this period please see Table 5 in Section 2.4.

2.1. Evaluation of ELP in 2012

In May 2012, ELIA facilitated a multi-stakeholder evaluation and dialogue session to review the ELP and to chart out the way forward. After 14 months of programme implementation it became clear that several challenges needed to be addressed if the programme were to continue and achieve its objectives. Many of the teachers involved complained about the heavy workload that was added to their already busy schedules. The lack of whole school support for the ELP initiatives was also reported as an obstacle. The evaluation through multi-stakeholder dialogue was designed to find out what were the underlying causes for these experiences and outcomes. The key questions that the evaluation sought to answer were:

1. How could it be ensured that ecological literacy and learning for sustainability becomes a priority for the system of education and not marginalized to a class about environmental education?
2. By which design would teachers and students be able to carry out their commitments to programme with support and engagement from the school system of the larger school community?
3. How could the programme achieve more impact in the system of education and enhance the experience of learning for sustainability?
4. for all members of the school community?
5. How could the programme contribute to the necessary transformation of the dynamics of the school and the educational systems?, and
6. How could the programme support schools to become learning organizations and communities of learning and practice for sustainability?

For the evaluation, each of the 18 Catholic secondary schools was asked to send 2 students, 1 mentor and the school Director or Deputy Director. The stakeholders were divided into 6 groups of between 9 to 10 persons, and each focus group was mixed with respect to the type of stakeholder (student, mentor or management) and school representation. Two questions were put to each group in order to guide conversations about the philosophical foundation and value propositions of education, and to assess the attitudes about and understanding of ecological literacy.

In combination, the questions revealed to what extent ‘ecological literacy’ was seen as important and as an integral part of the ‘purpose of education’.

Q1. What is the purpose of education?  
Q2. What are the key actions for ecological literacy?

2.2 Feedback and outcomes

The different aspects of ‘purpose of education’ given in Table 1 do not follow any order of priority, and do present varying degrees of overlap. The overlaps have been maintained to better capture the nuances in the participants’ responses.
The Education for Sustainability Programme

Table 1. Consolidated results for Q1 on the purpose of education

<table>
<thead>
<tr>
<th>Index</th>
<th>Purpose of education</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>To contribute to the overall development of a fully-accomplished, and happy person (academic, moral, physical, spiritual, ecological)</td>
</tr>
<tr>
<td>2</td>
<td>To develop a sense of belonging to a community and the planet (social relationships &amp; respect for others; être bien en soi-même; emotional intelligence)</td>
</tr>
<tr>
<td>3</td>
<td><em>Avoir un système pour que l’enfant réussisse sa vie</em> (to find your way in life) avant de réussir dans la vie – a system for the child to find himself/herself and to succeed in life</td>
</tr>
<tr>
<td>4</td>
<td>Help child to develop his/her talents (academic and non-academic capabilities), and to make use of them afterwards (for autonomy)</td>
</tr>
<tr>
<td>5</td>
<td>To socialize and succeed in life (have a place in society; status-role; money)</td>
</tr>
<tr>
<td>6</td>
<td>To seek knowledge (learn consequences of human action and learn the ‘why’ and ‘how’ of things)</td>
</tr>
<tr>
<td>7</td>
<td>Transmission and sharing of knowledge, experiences and values (to pass one heritage and inspire others)</td>
</tr>
<tr>
<td>8</td>
<td>Acquisition of skills</td>
</tr>
</tbody>
</table>

*Source*: Extracted from group discussions.

Table 2 shows the consolidated answers to Q2. The order of the actions is not prioritized.²

Table 2. Consolidated results for Q2 on actions to achieve ecological literacy

<table>
<thead>
<tr>
<th>Index</th>
<th>Actions for ecological literacy</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td><em>Comprendre le sens même du mot</em> ‘ecological literacy’ – to understand the meaning of the words/of the concept ‘ecological literacy’</td>
</tr>
<tr>
<td>2</td>
<td>Introduction of ecology in existing curriculum and subjects &amp; introduce new subjects like agriculture/gardening</td>
</tr>
<tr>
<td>3</td>
<td>Learning by doing / experiential learning (especially learning in nature; by doing outdoor activities like gardening and discovering natural sites of Mauritius)</td>
</tr>
<tr>
<td>4</td>
<td>Review of teaching techniques (Use of multi-media (modern technology) in teaching and interactions &amp; not just talk and chalk)</td>
</tr>
<tr>
<td>5</td>
<td>Exchanges between secondary and primary schools</td>
</tr>
<tr>
<td>6</td>
<td>Engage in long-term green activities (review lifestyle; rationalize use of resources; car-pooling; applying 3Rs in waste management etc …)</td>
</tr>
<tr>
<td>7</td>
<td>Better relationship between students and teachers</td>
</tr>
<tr>
<td>8</td>
<td>Develop intrinsic motivation</td>
</tr>
</tbody>
</table>

*Source*: Extracted from group discussions.

In order for the actions (see Table 2) to be effective in achieving the purpose of education (see Table 1), several enabling factors have been extracted from the focus group discussions. The enabling factors form the set of resources and conditions within which the actions are implemented and the stakeholders operate.
The enabling factors are listed in Table 3. It is pointed out that the list of enabling factors may not be exhaustive since they are an indirect outcome of the brainstorming process – i.e. no question was directly put to the participants to probe the enabling conditions and resources required specifically to implement ecological literacy and to achieve the purpose of education drawn out in Table 1.

Table 3. Overview of enabling factors

<table>
<thead>
<tr>
<th>Index</th>
<th>Enabling factors</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Learning must be fun (e.g. use of games)</td>
</tr>
<tr>
<td>2</td>
<td>Ecological literacy starts at home</td>
</tr>
<tr>
<td>3</td>
<td>Need proper infrastructure (not specified)</td>
</tr>
<tr>
<td>4</td>
<td>Must start from early childhood (pre-primary / primary levels)</td>
</tr>
<tr>
<td>5</td>
<td>Introduce ‘environment’ as an examinable subject</td>
</tr>
</tbody>
</table>

Source: Extracted from group discussions.

The feedback and input from participants through the evaluation and dialogue session revealed that the following key issues needed to be addressed for the redesign and further implementation of the programme:

1. The ‘purpose of education’ generated by the participants are fully aligned with the objectives of the Ecological Literacy Programme, yet many participants had not grasped that ecological literacy answered to the deeper purpose of education;

2. Participants voiced difficulties in understanding the concept of ‘ecological literacy’ when answering Q2, while their understanding of the purpose of education showed otherwise. This paradox seems to be rooted in a misunderstanding of the word ‘ecological’ (or of the word ‘ecology’), since it is clear that the understanding of the vision of ‘ecological literacy’ is already acquired;

3. Experiential learning, such as provided by the Ecological Footprint Analysis (EFA), needs to be reinforced by scaling up the application of EFA, and through other activities like more contact with nature and further development of relational skills. Further, the learning (and the process of learning) should be fun;

4. Use of methodologies other than ‘chalk and talk’ should be promoted (e.g. games and multi-media);

5. Creative ways must be found to introduce the concepts associated with ‘ecological literacy’ in the existing curriculum;

6. Since ‘talents’ are multi-dimensional, ‘methodologies’ (point 4) and ‘creative ways’ (point 5) should foster learning and enquiry across multiple dimensions (all senses, abilities [academic and non-academic], imagination and multiple intelligences) and across the curriculum;

7. There is a need to investigate ways to bridge the gaps between secondary-primary-pre-primary.

2.3. Moving forward

Based on the above recommendations, changes were made to the programme. Table 4 compares and contrasts the initial (2011-2012) and revised (2013-2018) ELP. The revised ELP is now known as the Education for Sustainability (EFS) programme.
## Table 4. Programme Developments 2011-2018

<table>
<thead>
<tr>
<th>Period</th>
<th>Name of Programme</th>
<th>Implementation</th>
<th>Activities</th>
<th>Trainings</th>
<th>Schools</th>
</tr>
</thead>
<tbody>
<tr>
<td>2011-2012</td>
<td>Ecological Literacy (ELP)</td>
<td>Extra-curricular</td>
<td>• Ecological Footprint Analysis (EFA)</td>
<td>• EFA</td>
<td>18 Catholic secondary schools part of the BEC network</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• EFA competition between schools</td>
<td>• Systems Thinking</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• EFA competition between schools</td>
<td>• Learning &amp; Development principles for EL</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• EFA competition between schools</td>
<td>• Ecoliving practices</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• EFA competition between schools</td>
<td>• Ecoliving practices</td>
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<td></td>
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<tr>
<td></td>
<td></td>
<td></td>
<td>• EFA competition between schools</td>
<td>• Ecoliving practices</td>
<td></td>
</tr>
<tr>
<td>2013-2018</td>
<td>Education for Sustainability (EFS)</td>
<td>Within the curriculum system of the schools:</td>
<td>• Three subjects: Sciences, Social Studies, and Human Values – synergy</td>
<td>• Curriculum implementation in 3 pilot schools: LCC, SMC, BPS Fatima</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• Activity Clubs</td>
<td>• Linked-in learning opportunities for the other Catholic schools (primary &amp; secondary)</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• Eco-Student clubs</td>
<td>• EFS Charter implementation</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• Eco-Clubs</td>
<td>• Stewardship &amp; Peace education</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• Eco-retreats</td>
<td>• Communication &amp; social media</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• EFS campaigns</td>
<td>• EFS Teacher training</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• Sustainability Awareness days</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Source: Authors’ elaboration.*

To implement the programme, each pilot school has identified teachers who are willing to act as EFS mentors. These mentors are being trained to teach other teachers in the basics of EFS. The mentors also receive training on engagement and communication for EFS. A key objective of the learning-by-doing capacity building approach is for the pilot schools to run the EFS programme without external support by 2019 at the latest.

### 2.4. Lessons learned

The implementation of the ELP over the period 2011-2012 provided many valuable lessons. The approach taken was to make the most of the openings that the system provided to introduce ecological literacy development via a ‘learning-by-doing’ and project-based approach. As with many things new or different, resistance did arise in schools from teachers and management to different degrees. This was particularly acute in persons who are not intrinsically convinced about the need for sustainability education, and reluctant to make the behavioural changes that were identified through the EF measurements.

Table 5 provides a summary of the main lessons learned and how they have been addressed in the redesigned EFS programme.
Table 5. Overview of issues, lessons learned, and implementation in 2013-2018

<table>
<thead>
<tr>
<th>Main Issues</th>
<th>Lessons learned</th>
<th>Implementation</th>
</tr>
</thead>
</table>
| **A. Time pressure and multitude of tasks; students & teachers are working with tight school curriculum and private tuition, which makes it difficult to introduce something new.** | 1. Find ways to implement EFS as part of the curriculum to ensure that EFS activities and training take place within school hours as much as possible.  
2. Demonstrate how EFS competencies support and enhance the development of conventional competencies.  
3. Work with the curriculum subjects as much as possible, avoiding adding new course content. | • Since 2013 EFS is implemented in three subject areas – Sciences, Social Studies and Human Values  
• Since 2014 Ecological Footprint Analysis is conducted as part of Activity Classes and is broken down in different levels, starting with Form 1 in 2014, Forms 1 & 2 in 2015, Forms 1, 2, and 3 in 2016 up to Form 5 in 2018.  
• During EFS trainings, teachers are invited to provide examples and case-studies of their deliverables and challenges. EFS competencies like systems thinking is then offered in support of those deliverables. Pedagogy for EFS is provided to support student engagement and improve student-teacher relationships. |
| **B. Difficulty in getting other members of the school community involved (fellow teachers, students), support from non-teaching staff) in the Ecological Footprint Teams on the basis of only interest and commitment.** | 1. Interest and voluntary commitments to EFS alone are insufficient to develop continuity of learning for sustainability over time.  
2. Involvement on the basis of interest and commitment alone does not lead to embedding of the EFS principles in the system of education. | • EFS participation is compulsory since 2013 for the EFS pilot schools.  
• Since 2013, training and support is given to the three pilot schools to embed the EFS principles and practices in the school system and create synergies between the curriculum subjects.  
• Since 2014, Ecological Footprint activities for teachers and students of the selected subjects and Activity Classes are part of the curriculum activities and are thus compulsory.  
• Extra-curricular activities through Eco-Student Clubs remain possible for those who like to go beyond the school requirements. These students and teachers are supported to help drive, mentor and catalyse changes for sustainability within the school system and community. |
C. Lack of engagement and support from other staff members and students who were not directly involved in the EFS activities.

1. When changes and new competencies are introduced as extra-curricular it marginalizes the priorities for these changes and new competencies.
2. The structure of extra-curricular activities limits communication and system engagement of support from other stakeholders within the system.
3. Those who do not share similar interests and convictions find it hard to understand why priority is given to the development of these new competencies.
4. Those who are not directly involved and observe how much extra time is demanded for involvement maybe reluctant to support out of fear that support may lead to requests of their involvement.

D. Resistance to change

1. People are reluctant to change their habits and patterns if they do not observe personal and professional benefits from these changes.
2. People are reluctant to change their behaviour if this upsets their deeper belief systems and securities in life.
3. People are reluctant to embrace change of something new unless they understand and accept the deeper meaning and purpose for these changes.
4. People feel uncomfortable with too many changes at the same time; one step at a time in a way that leads to ownership of these changes tends to give better results.

- See implementation of A & B for the change from extra-curricular to implementation within the curriculum work plan.
- An EFS Charter and Pledge was developed in 2013 and signed on 19 February 2014 by the 3 pilot schools and the leadership of the BEC. This sent a clear message to the larger school community about the importance that was given to transformation of the educational system to achieve EFS.
- Communication strategies have been created and are being implemented in each of the pilot schools to explain the EFS Charter and Pledge to the entire school community.
- EFS case-studies and best practices from the pilot schools are shared through the EFS platform and EFS social media. This news sharing and positive feedback and acknowledgement from local and international community stimulates further commitment and engagement.

- The EFS programme has secured support at the highest level of the school leadership for changes resulting from implementation of the EFS principles and practices.
- Training in System Thinking to safely reveal and expand mental models supports the deeper changes in personal convictions and helps transform barriers to learning for sustainability.
- Training in climate change, sustainability challenges, and Ecological Footprint provide a compelling framework of meaning, purpose and relevance for the necessary changes. This also reminds participants that these changes are required from everybody in society.
- The context of change is embedded in real life examples and experiences to ensure that participants can personally relate with the changes required.
- The deeper changes within the system have been prepared through training of mentors over three years to drive the changes on the ground.
E. Involvement of parents and the Parent Teachers’ Association (PTA).

1. Due to limited time availability of EFS trainers, the large size and scope of the programme, and by prioritizing on meetings with teachers over parents it has been challenging to have direct contact with parents and PTAs.

- In 2014 emphasis is placed on the EFS schools to communicate the EFS programme to the parents via school newsletters and sharing of the EFS platform.
- EFS mentors in each of the pilot schools are asked to involve the PTAs of their school to ensure that parents understand the changes at school and support their children’s ecoliteracy at home.

F. Engagement of students & teachers via online learning platform and social-media.

1. Many teachers and students lack the technological and social media skills and means for participating through online platforms.
2. Many students and teachers are shy or reluctant to share their opinions and feedback online when they feel unsure about the extent of their own literacy of sustainability issues.
3. It is difficult to get people to voluntarily adopt new habits of communication unless there is an immediate need and incentive.

- In 2011, an online learning platform was created as part of the BEC website. This was not very successful due to lack of participation from stakeholders and the platform became dormant.
- In 2014, a new platform has been created with full social-media integration and online forums and registered under the name of the programme on its own domain and server.
- Since 2013, training is given to the EFS mentors on how to use social media and technology to communicate their work and create engagement of others from the school community.
- Training of students in social media and computer technology for participation in the online EFS platform is provided as part of the curriculum activities in the Computer + Communication & Media Clubs.
- Engagement on the EFS platform by stakeholders outside the school community is provided to help boost online conversations and reduce barriers to communicating.
- EFS teaching and sustainability awareness resources are provided through the EFS platform and social media networks to encourage teachers and students to go online to access and apply these resources in their work with students.

Source: Authors’ elaboration.
3. The Education for Sustainability (EFS) programme 2013-2018

The integration of the EFS programme into the school curriculum and school system is ground-breaking in Mauritius. Between September and October 2013, ELIA together with the EFS pilot schools developed an EFS Charter and Pledge that outlines the vision, mission, principles and actions for education for sustainability. These principles are based on David Orr’s foundations for ecological literacy (Orr, 1992, pp. 90-92; Deenapanray et al., this issue, Table 4). The EFS principles are:

1. All education is education for sustainability.
3. Experiential learning in and from nature.
4. Education in dialogue with place.
5. Schools as Learning Communities.

On 19 February 2014, the 3 pilot schools together with the BEC Leadership, Mgr Maurice E. Piat (Bishop of Mauritius), and ELIA-Ecological Living In Action signed the EFS Charter & Pledge. The contents of the EFS Charter and Pledge emanate from the school communities via multi-stakeholder dialogues involving students, teachers, school management, and non-teaching staff. For more information about the EFS Charter and principles see Chung Kim Chung and Smitsman, and Deenapanray et al. (this issue).

3.1. The formal context of education in Mauritius

In order to better understand the Mauritius context for the EFS programme, we provide a brief overview here of the government’s strategic commitments to educational reform and the direction it proposes education should provide for. The educational systems in Mauritius consist of public, private and semi-private educational institutions. The public institutions are largely based on the French and English educational models, inherited from the colonial systems that were in place until Mauritius gained independence in 1968. As Chung Kim Chung and Smitsman discussed (this issue), the educational system in Mauritius (and this is also the system for the EFS pilot schools) is still conventional. It follows the post-industrial model: at secondary school level subjects are taught in time-table slots of 40 minutes, learning is still heavily dependent on prescribed textbooks, and not much time is left for experiential learning and group work, except during activity periods. However, initiatives are starting to make learning more interactive and enquiry-based. Gradually, more emphasis is placed on development of competencies via project-based learning and by building bridges between curriculum subjects (MIE, 2009).

As Deenapanray et al. (this issue) have discussed, the Education & Human Resources Strategy 2008 – 2020 mentions that: “It is today recognized that the ultimate objective of any educational enterprise is to improve student achievement so that individuals may fulfill their personal aspirations for a sound, value-based lifestyle and also become positive contributing members of society. This requires new systems, structures, tools and knowledge. But more than anything else, the culture of the education and training system must be realigned: the focus should now shift from access – which is today a reality – to quality and relevance.” (ROM, 2009, p. 12)

The EFS programme addresses the quality and relevance of education by responding to the deeper question of ‘education for what purpose’. Furthermore, the EFS programme empowers teachers and students with the knowledge and understanding that ‘fulfilling personal aspirations for a sound and value-based lifestyle’ within the context of socio-economic systems that require major reforms to achieve sustainable development goals is challenging at best. Indeed new systems, structures, tools and knowledge are required, and this requires also a change in the ‘process for change’. This includes the transformation of the mental models on which the previous systems rested.
The government’s Education and Human Resources Strategy Plan (EHRSP) mentions: “Greater attention will be paid to curriculum development and review as a regular activity of the Ministry so as to respond to emerging and future needs of the economy and society. “Vocationalisation” of secondary schooling will be phased in while all attempts will be made to embed a culture of scientific thinking in line with the drive towards sustainable development.” (EHRSP, 2009, p.74)

Scientific thinking does not necessarily provide the framework and thought leadership for ecological literacy for sustainability (Deenapanray et al.; Smitsman & Smitsman, this issue). It only does so when it has a strong foundation in Systems Thinking and the theory of adaptive complex systems. Moreover, as UNESCO has pointed out, Education for Sustainable Development (ESD) needs more than scientific thinking, and should in fact also include learning from indigenous knowledge systems and oral traditions (see Boven & Morohashi, 2002). Moreover, the literature on ecological literacy showcases again and again, that it is not a culture of scientific thinking alone that will lead to ecological literacy for sustainability. Instead it is integrated thinking, holistic thinking, development of care and compassion, reflective thinking, creativity & arts, and most of all the ability to learn from our natural environment and each other through deep appreciation of our interconnectedness that results in ecological literacy.

The process for change is critical to the outcomes of change. If the process for change is facilitated through the same dynamics and consciousness that led to the need for change, transformation will not occur.

In the National Curriculum Framework Secondary (NCFS) it is mentioned: “(i) That teaching and learning processes be oriented for optimal cross-disciplinarity in the Lower Secondary levels (Forms I to III) in a bid to equip the learner with the broadest perspective of knowledge. Notwithstanding the specifics of subject disciplines, bridges need to be built with other disciplines to equip the learner with the bigger comprehensive pictures of reality to ensure the validity and currency of learning; and (ii) That the curriculum be holistic and provides for the overall, wholesome development of the individual in his/her physical, social, emotional, intellectual, aesthetic and moral dimensions,” (MIE, 2009, p. 14). The EFS programme, as can be seen in the sections below, contributes in many aspects to the implementation of these NCFS guidelines and objectives. The EFS programme provides schools with the process, pedagogy, and methodologies for creating an educational system that acts as a learning community of practice for sustainability through holistic and transformative education.
3.2. The EFS programme components

The EFS programme works as an interconnected system that helps develop synergies between, curriculum, school community, school activities and collaborators and partner organizations, and in such a way that this brings the EFS principles into practice through the whole school system (see Figure 1). By enhancing the connectivity of the system and creating shared learning opportunities; learning for and about sustainability becomes meaningful. As said by Blewit: “All learning really becomes meaningful when there is some resonance with the everyday lifeworld of the learner. We tend to translate abstractions into concrete examples before they are felt and make any sense – global warming with baling out the basement, for example. Resonance is therefore essential if learning is to become a key constitutive element of any transformative process leading to a more sustainable future.” (Blewit, 2006, p.10).

3.2.1. Curriculum integration

One of the main issues with the way conventional educational systems teach curriculum subjects is the lack of connection and synergy between subject areas. It is for this reason that the National Curriculum Framework for schools in Mauritius recommends building of bridges with other disciplines and between subjects (MIE, 2009). In addition, another problem with conventional education is the lack of connection between what is taught and what is meaningful for the learner (Sterling, 2002; Blewitt, 2006). Furthermore, educational systems designed to prepare students to participate in a highly competitive global market economy provides little incentives for learning and teaching through collaboration and teamwork. Systems thinking shows that the structure of a system gives rise to its behaviour (Meadows, 2008).
Hence, the EFS programme aims to create positive impact at the structure of the educational system in schools by introducing into the structure the right incentives for collaboration, synergy, exchange and co-learning between students, teachers, non-teaching staff and management. This directly impacts on the ways that curriculum subjects and activities are taught and facilitated.

To implement the objective of building bridges and enhance collaboration between disciplines, the EFS programme chose three subjects for implementing EFS competencies. In order to know which subjects to choose, a system’s map was created that revealed the linkages between the learning objectives for each subject. Figure 4 shows a part of the systems map of the lower secondary subjects that was used in 2012 for making the decision to use Sciences, Social Studies, and Human Values as the main focus areas for EFS implementation.

The School Clubs form part of the Activities classes, and are also used for achieving the objectives of EFS. One of the pilot schools, namely St Mary’s College (SMC) Rose Hill, developed an innovative rotational model for their nine different

Clubs through which the EFS principles have been implemented to achieve two objectives: (1) creating synergy and collaboration between the Clubs in such a way that all activities contribute to ecological competencies for sustainability; and (2) promoting experiential learning opportunities through Club projects that provide the hands-on-experience for competencies for sustainability (see Table 6 below).

Figure 4. A section of the systems map of the national lower secondary curriculum subjects
Source: Authors’ elaboration
# Table 6. Examples of EFS implementation in SMC Activity Curriculum Activity Clubs

<table>
<thead>
<tr>
<th>SMC - Curriculum Activity Clubs</th>
<th>Objectives</th>
</tr>
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</table>
| **Environment Protection club** | • Create awareness about environmental issues.  
• Develop an attitude of curiosity and care for Nature.  
• Develop projects using the 4 R’s concept to protect and improve our natural environment |
| **Botany and Farming club** | • Promote interest and engagement for nature conservation and animal welfare.  
• Development of basic skills for plant cultivation, composting, and permaculture.  
• Learn about the medicinal and endemic plants of Mauritius. |
| **Cooks club** | • Develop basic skills for cookery and appreciation of locally grown food.  
• Cook from the School Garden to share and promote social awareness. |
| **Media club** | • Develop social-media, writing and photography skills.  
• Provide the school with a (mini) Club newspaper and to share updates from the School campaigns on eco-social issues.  
• Document and share news about the other Clubs through social-media and School newsletters. |

*Source: St Mary’s College Rose Hill, Curriculum Activity Clubs – Rotational Model.*

For example, in the Botany Club students are growing the vegetables provided for the Cooking Club, which is documented through the Media Club and supported by the Botany & Environment Club with composting, rainwater harvesting, etc. Through the Science Club, the Ecological Footprint Analysis (EFA) of the school is carried out and monitored, which again provides feedback to the other Clubs in terms of the behaviours and practices that contribute to sustainable development, and those that do not. Permaculture classes will start in the third term of 2014 to provide further knowledge and understanding of eco-system design principles and to further support the cultivation of healthy organic vegetables and medicinal plants.

All teachers of the three subject areas and the EFS mentors are trained in systems thinking, pedagogy (learning and development principles) for EFS, and stewardship for sustainability. EFA is carried out by the EFS mentors and coordinating teachers of Sciences and selected students from the Environment Clubs. Permaculture training will be provided to the Botany and Environment Clubs for composting and school gardening.

### 3.2.2. The school community

Principle 5 of the EFS Charter and Pledge outlines (see Chung Kim Chung & Smitsman, this issue):

**Schools as Learning Communities**

*The EFS programme supports schools to become Learning Communities and Communities of Practice for sustainability.*

*In this way learning for sustainability takes place at every level of the school systems and the EFS principles become embedded within the school system and culture.*
The EFS programme supports schools to become a Learning Community for sustainability in the following ways. Representatives of the various school stakeholders (management, teaching and non-teaching staff, and students) are chosen to participate and endorse the programme to achieve whole school support for the programme. Pedagogical methodologies are shared with the schools that focus on facilitation of learning, rather than transmission of information (see Deenapanray et al., this issue, Table 3). Also, this demonstrates that learning for sustainability takes place at every level in the school system and is not limited to the classroom, or just for one category of stakeholders, namely students (see also Senge, 2012).

The Ecological Footprint (EF) project that is part of the curriculum activities requires engagement and collaboration between students, teachers, and non-teaching staff (see Bangari et al., this issue). The EFS pilot schools have all made the commitment to monitor and where necessary reduce their EF, which was formalized when they signed the EFS Charter and Pledge on 19 February 2014. To achieve this all members of the school community need to work together in sorting waste, reducing usage of paper and plastic, and by composting organic waste. By working together to bring into practice the commitments made, schools are further supported to become Learning Communities of Practice for Sustainable Living (Williams & Dixon, 2013). Table 7 below further highlights how the EFS principles are applied and their impacts on the four components of the EFS programme – Curriculum, School Community, School Activities, and Collaboration & Partnership with support organizations.

3.2.3 School activities

The EFS programme caters for activities that are part of the curriculum and those that are extra-curricular. For example, the Ecological Footprint (EF) is measured and evaluated by the students with support from the teachers as part of the curriculum activities. The EFA is gradually scaled up in terms of its measurement scope starting with Form 1 (waste), then Form 2 (consumables, and transport, buildings & utilities, and then From3 (food). The EFA is discussed in more details by Bangari et al. (this issue).

Extra-curricular activities that will also form part of EFS are, for example, yearly Eco-retreats that are organized by the pilot school to support students to learn from Nature and develop an attitude of stewardship for our Natural world through real-life experiences. The pilot schools are also using their school open-days and international awareness days for sharing their Eco-campaigns with the broader public. The Eco-Clubs or Environment Clubs of the pilot schools consist of students from all the different age groups, where students take an active role in creating awareness and engagement activities for sustainability. The students of many of these Clubs also engage in collaborative projects and initiatives with other schools committed to sustainable development and with the Maurice Ile Durable (MID) Clubs. The primary aim of the MID Clubs initiated by the government of Mauritius is to harmonise existing Environment Clubs in schools and align them together towards the MID project.
The Education for Sustainability Programme

Table 7. Implementation and impact of EFS principles in the school system

<table>
<thead>
<tr>
<th>EFS Principles</th>
<th>Curriculum</th>
<th>School Activities</th>
<th>School Community</th>
<th>Collaboration &amp; Partnership</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. <em>All education is education for sustainability</em></td>
<td>EFS addresses the purpose of education and uses all existing subjects to align with this purpose.</td>
<td>Curriculum and extra-curriculum activities form part of the same objectives for EFS.</td>
<td>The dynamics and structure of the school community form part of the educational experiences of students, and are addressed where changes are needed.</td>
<td>Collaboration and partnerships with support organizations locally, nationally and internationally provide co-learning &amp; co-creative opportunities.</td>
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<tr>
<td>2. <em>Systems thinking &amp; holistic approach to education</em></td>
<td>Creating bridges and synergies between subject areas and learner central facilitation of education.</td>
<td>Creation of synergies between Club Activities+ integrated design for school projects.</td>
<td>Systems thinking is used to intuit and assess which system structures &amp; dynamics of the school community require transformation.</td>
<td>Systems mapping is used to carefully select support organizations and partnerships that help build the larger eco-system environment for EFS.</td>
</tr>
<tr>
<td>3. <em>Experiential learning in and from nature</em></td>
<td>Taking the curriculum out of the classroom and bringing Nature into the classroom.</td>
<td>School activities are designed to provide these experiential learning opportunities for students &amp; teachers.</td>
<td>The whole school community is engaged to join in the learning process for EFS. Through EFA, students encourage their parents to also reduce their EF at home.</td>
<td>Collaboration with Nature conservation NGOs, integrated farms and Natural Park &amp; Wildlife institutions extend opportunities to schools for learning in and from Nature.</td>
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<tr>
<td>4. <em>Education in dialogue with place</em></td>
<td>By making EFA part of the curriculum activities students and teachers learn about sustainable development in dialogue with their learning environment, e.g. their school.</td>
<td>School activities are designed to help students see the importance of application of SD principles in their own local context, while recognizing global patterns.</td>
<td>By learning from all members who form part of the school community, learning becomes more grounded in local reality and the school community as a whole becomes part of the dialogue with place.</td>
<td>Support organizations &amp; partnership are selected to (safely) introduce students to the social, economic, and environmental realities of their local context, to apply what they have learned at School.</td>
</tr>
<tr>
<td>5. <em>Schools as Learning Communities</em></td>
<td>Through EFS the traditional dichotomy between teacher and student falls away, and teacher and student learn to work together in a project-based way that fosters schools to become learning communities.</td>
<td>By demonstrating how the school as a whole is committed to SD, students learn that these activities do not exist in isolation but have direct positive value for society and our future.</td>
<td>EFS supports the school community to become a learning community for sustainability, where learning for sustainability takes place at every level of the system and continues to develop, deepen and expand over time.</td>
<td>By embedding the learning community principles into the partnership practices it sets up a different quality and purpose of relationship with those outside the school system.</td>
</tr>
</tbody>
</table>

*Source: Authors’ elaboration.*
3.2.4 **Collaboration & partnership**

Collaboration and partnership is actively encouraged within the school community and in relationship with others in society. This section deals with the aspect of collaboration and partnership with support organizations and individuals from outside the formal school system. Since the start of the programme in 2011, ELIA has brought in expertise from professionals (overseas and in Mauritius) who provide support to the programme. For example, Prof Smitsman provided training to the EFS mentors and selected teachers in learning and development principles. His many years of research in early childhood development from a dynamical systems perspective supported teachers to gain a more fundamental understanding of the process of learning, and the necessary conditions for the development required for ecological literacy.

The programme further encourages the pilot schools to seek partnership and collaboration with organizations that provide project-based learning opportunities for students. Especially with organizations and people that can help to increase opportunities for ‘learning in and from Nature’. ELIA is in contact with the Green Building Council in Mauritius (GBCM), which is part of the Global Coalition for Green Schools, to support the schools with the green building aspects of sustainability education. In some of the pilot schools more shaded areas need to be created, especially around the vegetable garden where outdoor learning takes place. These garden shading projects will be designed together with the students under supervision of the Green Building experts to ensure that enhancement of the physical school environment can also provide project-based learning opportunities for the students.

3.3. **Stakeholder engagement methodology**

Stakeholder engagement for feedback, evaluation, input and co-ownership in the programme is vital for the success of this programme. Stakeholders of the school include amongst others; students, teachers, parents, non-teaching staff, management, partners & collaborators, funders, and local communities impacted by the school activities. ELIA applied the following principles that form the methodology for stakeholder engagement in the EFS programme.7

1. Ensure commitment and engagement from school management and the appropriate decision-makers at the highest level, from the very start of the programme.

2. Create engagement and obtain inputs from all stakeholders who are part of the school community for adaptive learning through the iterative process of design, implementation, monitoring, evaluation and documentation of the EFS programme.

3. Use visioning and dialogue sessions for assessing shared purposes, creating commitment and engagement, and to receive input from all the stakeholders. This ensures future-orientation and facilitates a rich exchange between all the different stakeholders in a way that contributes to co-learning and co-creation for EFS.

4. Apply a ‘Learning by doing’ methodology to remove possible barriers to EFS and remain adaptive, flexible and responsive to the realities on the ground.

5. Measure and evaluate results of the EFS programme in each of the 3 pilot Schools, including ongoing measurements of the Ecological Footprint of the schools. As the EFS programme seeks closer integration in the existing lower secondary curriculum framework, evaluation will be complemented with conventional means. Students are supported in their self-evaluation of EFS competencies (please see Section 4 for more details).

6. Partnership and collaboration to exchange with experts of similar and complementary fields to further enrich the EFS programme and share lessons-learned and best practices to enhance programme visibility and secure more commitment to EFS in Mauritius.

7. Communicate and share the results of the EFS programme through school Newsletters, social-media technologies and the official EFS platforms, peer-reviewed journal articles, online publications and participation in
3.4 Pedagogy for ecological literacy development

The conventional educational system, which also applies to the EFS pilots schools, have long favored and endorsed a top-down approach for learning and development. Through the EFS programme teachers learn key principles for experiential learning and how to provide the necessary learning conditions for fostering EFS competencies. These competencies include the ability to sense, imagine and think in terms of pattern, connectedness, process, flow and interdependence. This is in sharp contrast to conventional education where students are taught to shut down their sensory and intuitive abilities, even before they enter secondary education. Tasks and assignments in conventional education are designed to stimulate analytic thought capable of dissecting information.

Teachers are trained in the key learning and development principles for EFS: (i) learning by being part of the world; (ii) mobilization of capabilities for new tasks and solutions; (iii) sustaining and enhancing our learning potential; (iv) learning through feedback systems by attuning our activities to the system dynamics; and (v) learning from and for the future. For a detailed discussion of these principles see Smitsman and Smitsman (this issue).

4. Evaluation and assessment

Evaluation and assessment is generally used to: measure learning, assess progress of a programme or policy, improve the quality of a programme, enhance accountability to stakeholders, communicate results and build up a body of evidence (Delgado, 2007). Evaluation and assessment in relation to the EFS programme has two dimensions: (1) with respect to the programme implementation and for ongoing improvements. This includes evaluation of EFS competencies for students and teachers as a result of the EFS interventions; and (2) with respect to EFS contributions to conventional educational evaluations and assessments of students.

4.1 Programme evaluation and assessment

The EFS programme has been evaluated in the following ways: feedback and dialogue sessions with stakeholders, interviews with EFS mentors and management, presentations by the schools, and questionnaires. Section 2 of this article provided many examples of the above. A two year research programme is currently being developed as part of the EFS programme in collaboration with relevant educational institutions and universities in Mauritius and overseas. The purpose of this research is to assess the impacts of the EFS programme on transformation of conventional educational systems. This research will also contribute to the further development of an EFS Monitoring and Evaluation System (MES) based on the Theory of Change (TOC) model that is explained in Deenapanray et al. (this issue).

4.2 Evaluation and assessment of students

Most of the conventional educational systems in Mauritius do not actively involve students to join in the assessment of their own learning process. In general, students are assessed on the basis of standard tests and scored for their performance, which is used for further selecting who can study where or to study what subjects. The aspiration of many parents in Mauritius is for their children to have the opportunity to study overseas. Those who have the best results in their final exams get the best opportunities for scholarships. The shortage of scholarships for studying overseas and the increasing pressures for students to excel may partially explain the creation of a highly competitive and what is often referred to as an ‘elitist’ educational system in Mauritius (Mauritius Times, 2014).
In such a system there is little place for students to evaluate their learning process and reflect on their learning potential, other than when this is directly results oriented.

As Smitsman and Smitsman discussed (this issue), the opportunity for self-assessment is essential in EFS. Early childhood development studies have shown that young children themselves generate information about their progress by actively exploring and attending to the system dynamics of their activities. We can extend this principle to EFS by making students and teachers more sensitive to the 5 principles of learning and development, and in particular the dynamics or information that their activities generate. Comparison of the 5 principles and current assessment strategies reveals that there is a large gap between what is required when assessment is directed to the learning process itself (the 5 principles), and current methodologies that only assess the outcomes of learning (literacy, numeracy and factual knowledge). ELIA is currently conducting research on this gap with the view to developing processes and tools to bridge it. EFS will also make use of some of the standard assessment methods to test EFS competencies, through for example use of questionnaires and multiple-choice tests. Yet, beyond these methods of assessment there is something more fundamental that we like to draw attention to and that is the effect of evaluation and assessment on the motivation for learning. In conventional education evaluation and assessment serve the primary purpose of providing feedback to the system about student progress and performance for the set targets that need to be achieved. In EFS, assessment and evaluation serves also the purpose of providing feedback to the student to further stimulate learning and development for EFS, and in a way that enhances the learning potential of the student – i.e. developing the learning ability to learn. This can only be achieved by creating the conditions for students to generate information feedback about their competencies by actively exploring the dynamics of learning. For example, learning about a forest through text-book knowledge and exams is entirely different from walking through a forest and receiving direct feedback from the forest about the degree of our ecological literacy.

When we feel that we make progress and intuit how we can stabilize our progress we get motivated to move forward and learn more. Self-assessment frameworks are in development as part of the EFS programme to support students to reflect on their own learning process and progress.

5. Conclusions

The EFS programme has been the first of its kind in Mauritius. Increasingly more schools in Mauritius (at all levels) are recognising the need to ‘green their school’. Classes about environmental awareness and sustainable development are introduced more and more, even at primary level. Students are learning how to keep their environment clean, how to reduce and recycle plastic and paper, and how to take care of our planet. These classes are usually taught as themes within curriculum subjects or else through extra-curriculum activities. Education for sustainability goes much further, however, by also addressing the system dynamics of educational systems at different levels (curriculum, management, teacher-student relationship, student-student relationship, and finally student and learning tasks).

The EFS approach reveals whether the purpose, structure and behaviour of the educational system are aligned with the systems objectives regarding education for sustainability. In this approach, the relationships that form part of the experience of learning for sustainability are just as important (if not more) as the content that is taught. For example, teaching about environment and sustainable development through teacher-student relationships that are hierarchical and discourage reflective creative thinking will not be able to foster competencies for EFS.
The authors are hopeful that the EFS programme for schools in Mauritius will be able to significantly contribute to the kind of transformation in thinking, mind-set, attitude and relationship that everybody seems to refer to when reflecting on the changes needed for a sustainable society and future. The programme is still in its infancy and much more is to be learned, explored, evaluated and researched. Most importantly, the programme receives broad support from the stakeholders in the pilot schools and increasingly more interest from other sustainability education initiatives. In the end, the people on the ground are the persons who make all the difference and full acknowledgement goes to the EFS mentors with support of their school leadership and the Director of the BEC who are aligning heads, hearts and hands to make this work. It is appropriate to conclude this article with this quote from Buckminster Fuller: "You never change anything by fighting the existing. To change something, build a new model and make the existing obsolete."

Notes

1. It may be useful to know that the Catholic schools in Mauritius also provide education to non-Christian children and are not enforcing their religious views on the students. The schools are open to any student from any background.

2. It is interesting to observe that the recommended actions for ecological literacy reflect the basic learning and development principles as outlined by Smitsman and Smitsman (this issue). In order to achieve understanding of the concept of ecological literacy (action 1), activities through learning by doing (action 3) and transformative learning relationships (action 4 and 7) are required.

3. See the Theory of Change (TOC) discussed by Deenapanray et al. (this issue).

4. Ideally, it would have been recommended to work with more than three subjects. For practical reasons, however, regarding time-availability of teachers three subjects were selected to start with.

5. The subject ‘Human Values’ is not part of the National Curriculum of Mauritius, but is part of the BEC curriculum. This systems map was carried out on the basis of the National Curriculum Framework for secondary schools in the Lower Secondary classes in Mauritius. Human Values was chosen as the third subject area for implementing the EFS principles and practices for the important role it plays to support children in developing the necessary values for ecological literacy and planetary stewardship.

6. The MID policy is the official government strategy and action plan to promote the sustainable development of Mauritius. It also functions as the long-term vision of the government for making Mauritius a sustainable island. See the MID website for more information – www.mid.mu

7. It is noted that parents were not directly engaged for their feedback and input in these beginning phases of the programme. Provisions are currently made in the programme to involve parents for their feedback and input over period 2014-2018.
REFERENCES


