Education and Culture DG
Lifelong Learning Programme

Education, Audiovisual & Culture Executive Agency

Lessons from Nature

(LfN)

Final Report Public Part

Project information

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Executive Summary

We live in an unsustainable world. Pressure on natural resources to drive the European economy is increasing year on year. We cannot continue to meet the needs and aspirations of Europe without significant change to the way we live and consume. There is a need to promote learning that will change the way we design our economies, businesses and products. LfN (Lessons from Nature) takes a unique approach to addressing this need.

LfN worked with six partners in the UK, Netherlands, Bulgaria, Latvia, Romania and Spain to develop innovative learning modules that meets the needs of a sustainable Europe and the aspirations of young people for a bright green future. The project developed 32 modules. Training workshops delivered training for 631 teachers resulting in LfN modules being implemented by 210 schools for the benefit of 6211 students.

The LfN modules inspire teachers and students to approach issues of sustainability from a positive perspective. Too much education for sustainable development focuses on negative scenarios and does not equip students to create the exciting and sustainable future they want. LfN is different. LfN learning inspires students through understanding how nature works and applying this new knowledge to redesigning human systems; all the time understanding the desires of the students to have a prosperous and happy future.

In this report you will find testimony from teachers and students demonstrating the real impact LfN can have, a real evaluation of the success of the project as this poem by a 13 year old student clearly demonstrates.

Future We Want

We want the future, the future we want,
Let's think all positive, never say "can't",
The future is bright, ours for the taking,
Let's get it right, what of it we're making,
Cool and trendy, new building designs,
Innovative thinking, creative minds,
Inspiration is all around,
Up in the sky and in the ground,
Be inspired by nature, and respect it too,
It really delivers, where inspiration is due,
Everyday we're thinking up new inventions,
Nature really inspires us, no one even mentions,
Let's put on our thinking caps, and make our future,
Design it creatively, like an awesome creature,
The future is out there, up in the stars,
Let's reach for it high, and make it ours,
Let's think all positive, never say "can't",
We want the future, the future we want.

(UK student aged 13 years)

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1. Project Objectives

The overall objective was to 'develop innovative approaches to sustainable development that builds the capacity of schools and organisations working with young people to prepare students to take an active role in building the green economy and society.'

The project worked to:

- Improve the capacity of schools and organisations working with young people to address sustainable development through the outdoor classroom in new and innovative ways, and integrate this into different curriculum areas.
- Provide young people with a wide range of experiences outside the classroom relevant to their participation in building the green economy and society.
- Produce new resources that link learning about natural ecosystems with the skills for building a green economy and society.
- Provide easy access to information, knowledge, expertise, guidance and resources.
- Share and enhance existing criteria for successful learning outside the classroom (LOtC).
- Develop a network of good practice amongst educators to continually share ideas and resources.
- Increase the profile of sustainable development and LOtC across the partner countries and the EU.

Lessons from Nature worked with teachers and young people aged 12-16. We also promoted the results to education providers and local education departments. The partners worked with schools and teachers to trial and develop the LfN (Lessons from Nature) resources. Once the resources were developed the resources were launched into schools through teacher training workshops, in-school workshops for students and a range of dissemination activities.

Through engaging with LfN participants gained new insights into how their futures can be met sustainably. There is a key emphasis on preparing young people to thrive in a changing economy which will become increasingly natural resource constrained. The EU2020 strategy represents a significant push towards a green economy in Europe. LfN is an educational response to this imperative, providing young people with an exciting and realistic way to meet the need for green growth. In undertaking the LfN activities, young people develop a wide range of competencies for the jobs of the future. These include creativity, critical thinking, evaluation and reflection, sharing and entrepreneurship.

2. Project Approach

2.1 Using insights from nature to inspire and build a brighter future

The way Lessons from Nature (LfN) works is simple, we want young people to be inspired and excited about their future, the possibilities it holds and the role they will play in it. LfN believes the future can and should be bright for all young people. This does not mean the future will be the same as today; change is the only constant. Communities will need to learn how to redesign themselves to combat some serious environmental and social issues; and business will need to learn how to develop economics in a natural resource constrained world. LfN provides the tools for a hopeful future.

LfN asks what sort of future young people would like to live in and how this preferred future can be made reality. It challenges traditional assumptions about how things are made, economies managed and lives lived. The project is not about individuals feeling guilty or doing less harm and delaying a point of crisis; instead it is about re-thinking the future. It attempts to present a more hopeful and realistic way for young people to achieve the sort of future they want. After all it will be their future.

LfN presents opportunities to learn through first-hand experience helping to inspire discovery and foster real understanding in relation to insights from nature that can be applied to the modern world. In undertaking the LfN activities, young people develop a wide range of competencies for the jobs of the future. These include creativity, critical thinking, evaluation and reflection, sharing and entrepreneurship.

2.2 How does LfN work?

LfN ensures good choices get made, not to say what those choices are. We all have our own dreams for the future and of course as we grow they change and develop. How can we keep those dreams alive? LfN believes we can by learning and applying the same principles that nature has used for over 4.5 billion years to design human systems that are abundant, beautiful and resilient. To do this we follow four steps: inspiring the learner, helping them discover how nature works, understanding how nature's principles can be applied to human systems, and finally applying these new insights to their own lives (see figure 1).

This simple model can be applied again and again and again. By learning how nature works, we can find solutions that continue today, tomorrow and always. These solutions are not limited to the few; nature's solutions can provide opportunities for all regardless of wealth or location.

LfN starts with young people. It does not tell young people what they can or cannot do, rather it asks what are your dreams, how can we get you there? LfN connects with individuals and communities real needs, desires and dreams. LfN does this through reconnecting with the natural world, however not in a way that is separate from people's real world concerns of jobs, housing and health care.....day trips to the

woods are great but seldom is it asked what relevance the woods have to our daily lives in anything other than a superficial way.

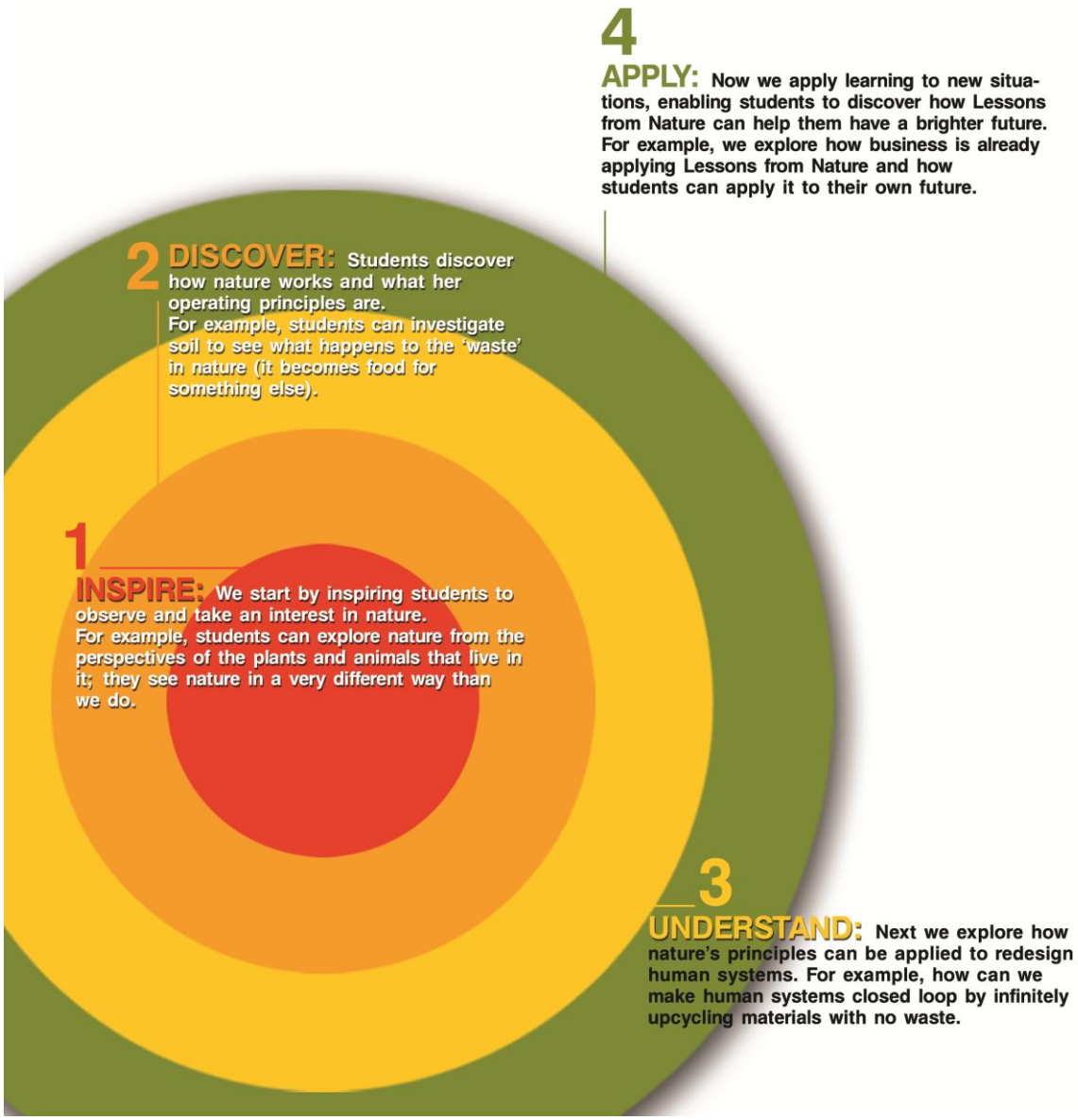


Figure 1: LfN Learning Model

LfN asks what the woods/nature can teach us about health care, running economies on limited resources, providing homes that self cool and heat. Because nature does all these things far better, far more effectively and far more beautifully than humans do.

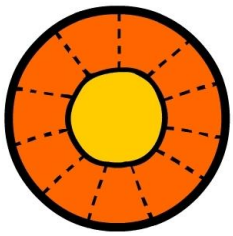
2.3 What are the LfN principles?

We have identified six principles from nature to mentor and measure how we redesign human systems. They are not the only natural principles, however, they do provide a foundation to understand the circular thinking needed.

The first three principles form the foundation. These three work synergistically. The second three principles add increased benefits so long as the first three are implemented.

Waste equals Food: In nature everything is cycled so what looks like waste is actually food for the next cycle. For example, dead tree leaves decompose to become food for insects. This insight can be applied to turn current linear human production systems into closed loop systems in which waste is eliminated.

Multiple Benefits: In nature organisms have multiple benefits; they do not simply have one purpose. The goal of a tree is to reproduce to provide the next generation and in doing so it also provides food for insects, shelter for animals, nutrients for the soil from their decomposing leaves, turn carbon dioxide into oxygen, and help regulate temperature and rainfall.



Run on Solar Income: Nature runs on renewable energy, it does not use more energy than it can produce itself. Nature does not create energy sources that pollute the atmosphere, and designs its processes to work efficiently.

Diversity gives Strength: Nature relies on a large variety of species, systems and organisms that allow it to withstand external shocks. Diversification effectively reduces risk.

Nature Optimises: Nature accepts limits but is not restrained by them. Nature finds creative solutions to provide multiple services without damaging its own services. Nature lives off its interest, not its capital.

Nature is Adaptive, Dynamic and Responsive: Nature never stays the same, it is constantly changing and adapting, responding to feedback. What worked in the past might not work in the future.

2.4 Framing the Message

LfN is about supporting young people to critically think about their future and how it can be inspirational. The content and the process of the modules is a means to achieve this. It is recognised that most teachers and learners will have to work within the limits of educational systems but in so far as possible we hope LfN is:

- about young people and their desires, not a top down curriculum designed by adults to meet their needs, or what they think young people need.
- young person centred, not teacher, school or adult centred.
- about finding better ways to view the future of young people, rather than predicting the future.
- focusing on process rather than answers.
- preparing young people for their future. The 'doing' is a reflective process rather than something practical.
- transcending current views/thinking rather than being progressive.

2.5 Lessons from Nature in Practice

LfN is not a theory, some of the world's biggest companies and some countries are starting to put these principles into practice. They are realising that in a resource constrained world we cannot continue with an industrial model of take – make – dump.

The LfN modules contain lots of examples, a simple illustration is coffee. Now, as I write this I am drinking my favourite cup of coffee. Think for a few minutes and we'll see that my cup of coffee has very few benefits. Sure, it is a nice drink for me but what about all the waste produced in processing the coffee? In fact only 0.2% of the coffee tree reaches my cup. Surely we can do better, yes we can.

The 99.8% that is traditionally seen as waste can be used. The coffee pulp can be used as a low grade fertilizer or used as a substrate to grow mushrooms. It can be fed to animals which themselves produce very high grade fertilizer or even used to produce thread for producing t-shirts. You can add the coffee plant cuttings into a bio-digester to produce bio-gas. So, what looks like a single use product can be a multiple benefit for the farmer. The next time coffee prices fall, the farmer has several sources of alternative income and can provide all his/her cooking gas for free. A great economic and ecological model.

Figure 2: LfN and the Story of Coffee

2.6 The LfN Modules

The project is aimed at learners aged 12-16. The learning supports a range of subjects including:

- Science
- Geography
- Design Technology
- Business Studies

The modules aims to inspire young people and provide learning that will equip them with the skills, knowledge and understanding for jobs in the future. They promote learning that contrasts significantly with traditional ESD 'do less harm' approaches (a world with fewer toxins and less useless waste still has problems, and reducing economic activity is unlikely to bring prosperity).

Discovery learning, activity based learning and Learning Outside the Classroom are utilised to stimulate a desire for understanding. In developing the pedagogy for delivery, learning outside the classroom is a key component. Learning outside the classroom has been shown to provide significant benefits in terms of learner engagement. It offers opportunities for students to improve their knowledge and challenge their values in ways related to their own experience. Learning outside the

classroom as used in LfN is applied in two aspects: firstly a direct experience with the natural world to understand the principles of how it works; secondly relating discoveries about nature to solving problems related to the students own life and preferred future. Learning outside the classroom it blended with discovery and activity based learning to where appropriate, provide the teacher with a range of delivery options relevant to their situation.

A total of 32 learning modules have been developed. Initially each partner developed three modules which were shared and critiqued. Partners then chose to add additional modules of their own and adapted partner modules to their own education systems. Each module includes activities that deliver the learning model: inspire – discover – understand – apply.

The modules are designed so that learners can progress without the need for teacher support. The principal benefit of this is that learners are not dependent upon the prior knowledge of teachers. There is no need for teachers to fear that they don't have enough knowledge of some of the areas of learning that may be unfamiliar to them. Having said that good teachers can make a significant difference to the progress pupils can make in their learning through the LfN activities. Good teachers will be able to:

- Ensure that the learning locations are safe and appropriate (school grounds, parks, woodlands and other places).
- Ensure that the resource materials (clearly identified in the modules) are made ready in advance of the learning.
- Guide learners to modules that might best fit their needs.
- Support less able learners.
- Encourage wider and deeper critical and creative thinking in more able learners.
- Apply insights from nature to planning of their own futures and in the planning for the school.
- Share insights from nature and promote the programme to others.
- Adapt modules to specific needs.
- Develop new modules to add to those already on the website.
- Share good practice.

The most essential role of class teachers in the project is to facilitate learning.

2.7 LfN Assessment and Evaluation

Assessment is part of the LfN learning process, not an additional activity that appears at the end of the modules. Assessment is integrated into the modules because it is important that learners assess and reflect on their own learning as a critical part of the LfN process.

LfN is not about traditional school knowledge, and as such traditional assessment approaches are not always valid. LfN is a learning process in which students are aware of and reflecting on the meaning of their learning (What have I done? What

does it mean for me? etc). Reflection fits into Kolb's learning cycle on which the modules are based and it supports and adds value to the activities in each module. At the end of each section there is a reflection task. Learners are asked to add notes to the Reflection sheet including how the learning could impact their future.

In addition to reflecting on their own learning and how it has progressed through taking part in the modules learners will also assess competency and whether the modules have challenged and influenced their view of their future.

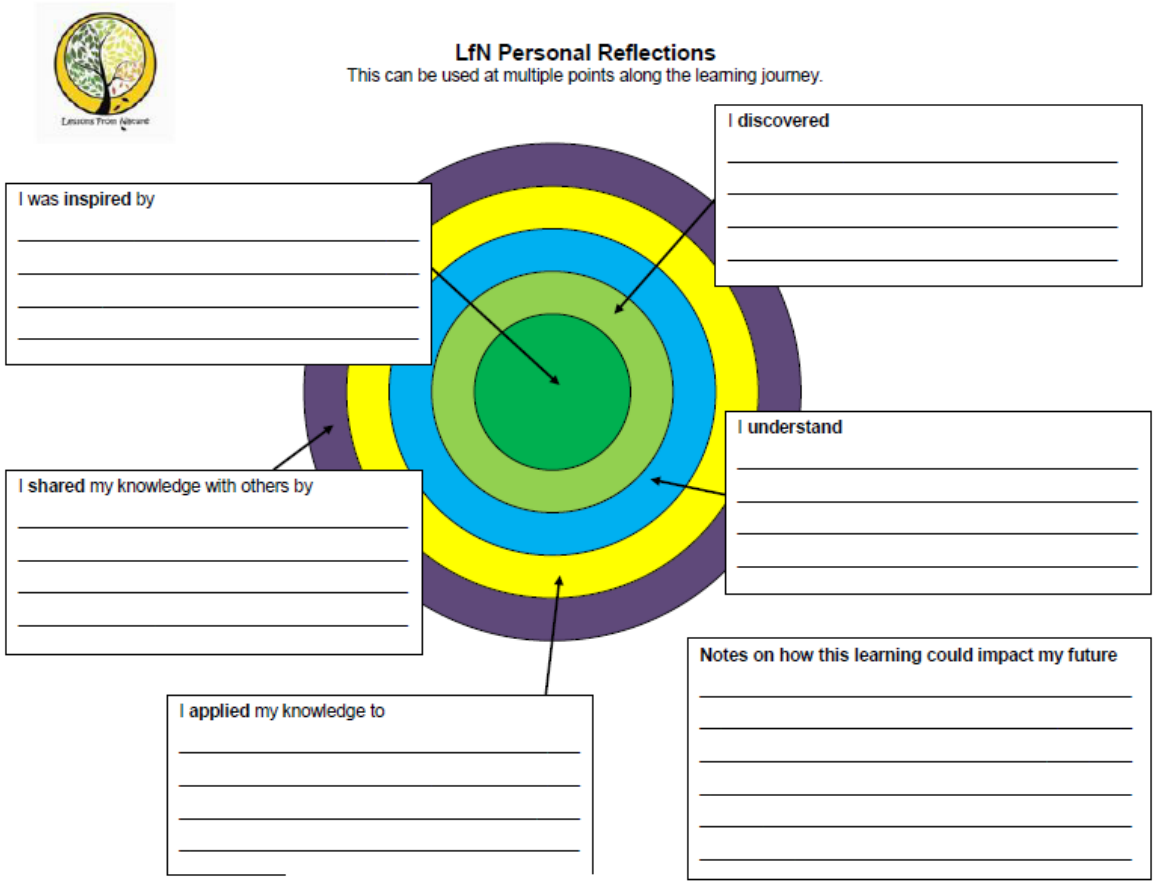


Figure 3: Learner Reflections Sheet

2.7.1 Assessing competencies – learning wall

In a rapidly changing world learners must be able to research, debate, evaluate, and judge for themselves the relative merits of contesting positions. A learning wall has been developed to cover the following competencies:

Critical thinking

- Questioning: asking open questions, seeking new/better questions.
- Analysing information: sorting, classifying, comparing, looking for reliability, assessing validity (fact/fiction), providing reasons to support judgments.

Evaluation and reflection

- Reflecting: seek a range of different views/opinions, explores ideas from others, reflect on my own without invitation, reflect on feelings-reactions-your actions,
- Evaluating: develop criteria, apply them.

Creativity

- Using imagination: seeks new ideas, looks for the unorthodox, uses imagination, looks for new questions not just answers.
- Using initiative: seeks own information, does not rely on others (all the time), looks in unusual places (e.g. art to help understand science).

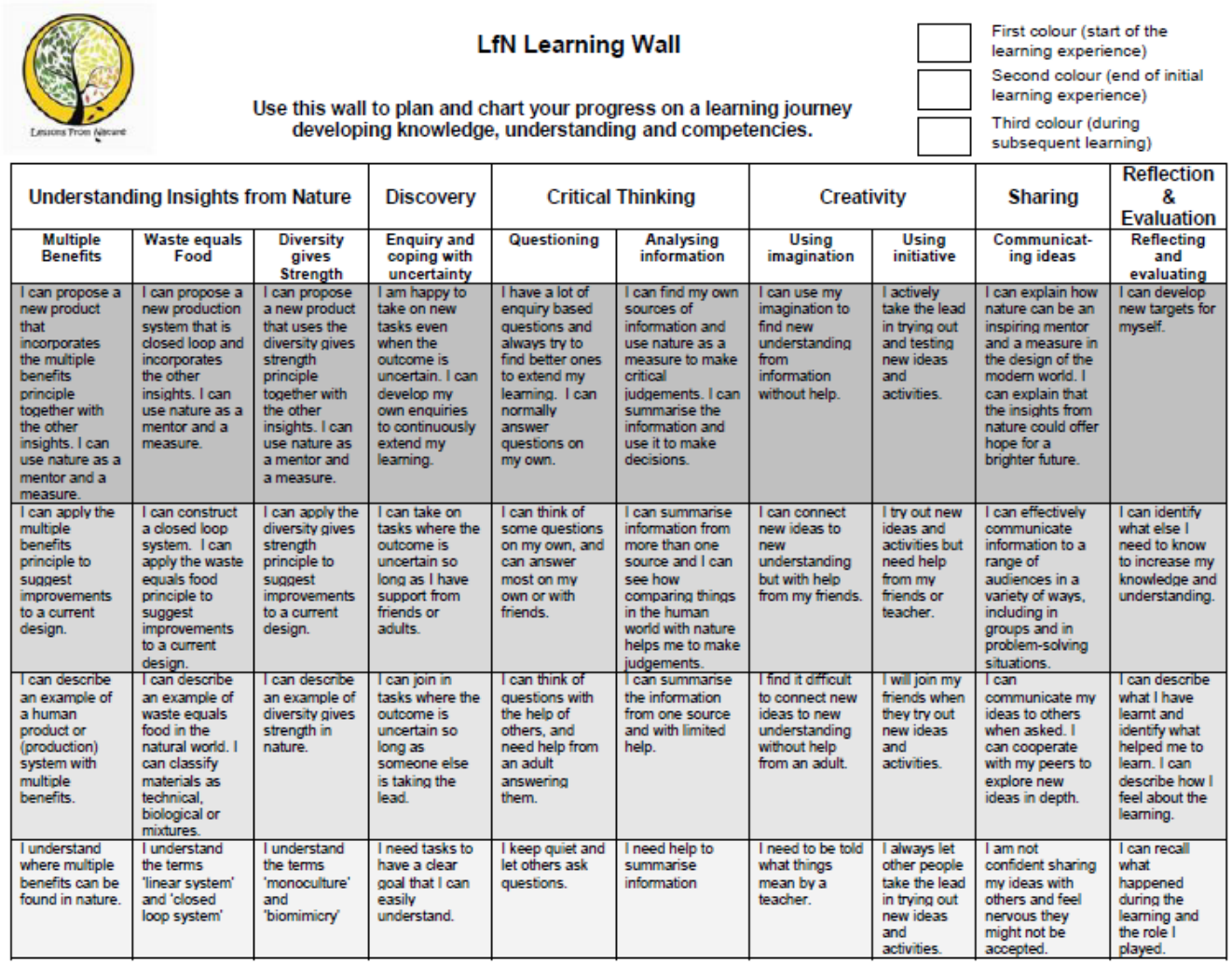
Discovery

- Enquiry and coping with uncertainty: not fixed on results, process important.

Sharing

- Sharing: share ideas with others (self, friends, family, others, blog, presentations etc)
- Communicating ideas: different ways of communication, seeks best way to communicate a message.

To be able to see progress throughout the learning journey learners should identify where they are on the learning wall before beginning the activities. Learners chart their progress on the learning wall at the end of each section. The learning wall is a form of ipsative (forced choice) assessment where a learner is assessed against their own previous standards. It can measure how well a particular task has been undertaken. This type of assessment can enhance motivation to learn.



LfN Learning Wall

Use this wall to plan and chart your progress on a learning journey developing knowledge, understanding and competencies.

First colour (start of the learning experience)
Second colour (end of initial learning experience)
Third colour (during subsequent learning)

Progression

Understanding Insights from Nature			Discovery	Critical Thinking		Creativity		Sharing	Reflection & Evaluation
Multiple Benefits	**Waste equals Food**	**Diversity gives Strength**	**Enquiry and coping with uncertainty**	**Questioning**	**Analysing information**	**Using imagination**	**Using initiative**	**Communicating ideas**	**Reflecting and evaluating**
I can propose a new product that incorporates the multiple benefits principle together with the other insights. I can use nature as a mentor and a measure.	I can propose a new production system that is closed loop and incorporates the other insights. I can use nature as a mentor and a measure.	I can propose a new product that uses the diversity gives strength principle together with the other insights. I can use nature as a mentor and a measure.	I am happy to take on new tasks even when the outcome is uncertain. I can develop my own enquiries to continuously extend my learning.	I have a lot of enquiry based questions and always try to find better ones to extend my learning. I can normally answer questions on my own.	I can find my own sources of information and use nature as a measure to make critical judgements. I can summarise the information and use it to make decisions.	I can use my imagination to find new understanding from information without help.	I actively take the lead in trying out and testing new ideas and activities.	I can explain how nature can be an inspiring mentor and a measure in the design of the modern world. I can explain that the insights from nature could offer hope for a brighter future.	I can develop new targets for myself.
I can apply the multiple benefits principle to suggest improvements to a current design.	I can construct a closed loop system. I can apply the waste equals food principle to suggest improvements to a current design.	I can apply the diversity gives strength principle to suggest improvements to a current design.	I can take on tasks where the outcome is uncertain so long as I have support from friends or adults.	I can think of some questions on my own, and can answer most on my own or with friends.	I can summarise information from more than one source and I can see how comparing things in the human world with nature helps me to make judgements.	I can connect new ideas to new understanding but with help from my friends.	I try out new ideas and activities but need help from my friends or teacher.	I can effectively communicate information to a range of audiences in a variety of ways, including in groups and in problem-solving situations.	I can identify what else I need to know to increase my knowledge and understanding.
I can describe an example of a human product or (production) system with multiple benefits.	I can describe an example of waste equals food in the natural world. I can classify materials as technical, biological or mixtures.	I can describe an example of diversity gives strength in nature.	I can join in tasks where the outcome is uncertain so long as someone else is taking the lead.	I can think of questions with the help of others, and need help from an adult answering them.	I can summarise the information from one source and with limited help.	I find it difficult to connect new ideas to new understanding without help from an adult.	I will join my friends when they try out new ideas and activities.	I can communicate my ideas to others when asked. I can cooperate with my peers to explore new ideas in depth.	I can describe what I have learnt and identify what helped me to learn. I can describe how I feel about the learning.
I understand where multiple benefits can be found in nature.	I understand the terms 'linear system' and 'closed loop system'	I understand the terms 'monoculture' and 'biomimicry'	I need tasks to have a clear goal that I can easily understand.	I keep quiet and let others ask questions.	I need help to summarise information	I need to be told what things mean by a teacher.	I always let other people take the lead in trying out new ideas and activities.	I am not confident sharing my ideas with others and feel nervous they might not be accepted.	I can recall what happened during the learning and the role I played.

Figure 4: Learning Wall

2.8 Project Monitoring and Evaluation

The project has been evaluated by an external evaluator from University of Wageningen. The external evaluator facilitated the monitoring and evaluation process and worked closely together with project partners. Evaluation was feedback to the project through interaction with partners, reflection on the process and proceedings, and through collective learning. Thus the monitoring and evaluation process became a pedagogical tool that enables participants to become more reflective about what they are doing, how they work and how they can improve the way they are working. The external evaluator strove to optimally embed monitoring and evaluation activities into the project. An emergent research design was used, with flexibility to respond to emerging issues. The evaluation framework is shown below.

EVALUATION FRAMEWORK				
Level	***Subjects and questions***	***Results M&E, example indicator***	***Method***	***Responsibility***
Input Societal context and issues; the means	**The pressure on natural resources increases. Project partners observe the need to make significant changes in the way we live and consume, and move towards a more sustainable lifestyle. There is a growing need to promote learning that will change the way we design our economies, businesses, products and the way we live our lives.**	**-**	**-**	**-**
Throughput Processes	**Project activities, cooperation between partners.** ▪ **Do project team members co-create a common vision?** ▪ **How do project team members deal with identified challenges?** ▪ **Are project team members inspired and challenged?**	**Result:** **Description how project team members deal with identified challenges (dynamic learning agenda).** **Example indicator:** **Project team members are able to explain LfN in 1 sentence.**	**Dynamic learning agenda**	**Anne:** **Facilitates sessions, coordinates dynamic learning agenda.**
Output Deliverables : the products and direct effects of the project	▪ **What products have been developed?** ▪ **What kind of learning activities have been initiated?**	**Overview**		**Project team members / coordinator**
	▪ **A clear and simple message**	**Result:** **The clear and simple message** **Example indicator:** ▪ **Project team members are able to explain LfN in 1 sentence.** ▪ **Partners wear a T-shirt with the message during meeting 3 or 4, in this way they show**		**Project team members / coordinator**

		the spirit of embodying the message.		
Outcomes Short term results of the output	**Quality of learning, motivation and satisfaction of learners and teachers.** ▪ **How do they experience the activities?** ▪ **How are products and knowledge used by participants?** ▪ **Are activities embedded?** ▪ **Do we signal changes?** ▪ **Do the participants themselves observe change in themselves, in others and in the organizations and networks to which they belong?**	**Results:** **M&E activities are integrated into project activities. Reflection/evaluation as part of activities thus serves a double goal: personal reflection in order to deepen learning + production of results for M&E.** **Example indicators:** ▪ **Teachers are able to explain LfN in 1 sentence.** ▪ **Social media attention.** ▪ **Diversity of ways in which students express Lessons from Nature**	**Possible method: Most Significant Change method** **How we will do this is not clear at this moment as activities are not yet developed: focus of next meeting**	**Project team members facilitated by Arjen and Anne (advice, feedback, in between and during meetings)**
	Quantitative results ▪ **Number of educators, students and institutions involved** ▪ **Number of learners using the resources** ▪ **Number of schools/teachers taking young people outside the classroom** ▪ **Number of teachers involved in training** ▪ **Insight into social media attention**	**Overview**		**Project team members (country coordinators) / programme coordinator**
Impact Results on the long term, related to societal issue which is addressed	▪ **Have conditions for impact been created?** ▪ **Will project partners continue their cooperation?** ▪ **Are there indicators that the results contribute to the societal issue at stake?** ▪ **Are there indicators that the results contribute to a societal change**	**Results:** **Not yet defined.** **Example indicators** ▪ **Other teachers, countries are enthusiastic and want to teach LfN: phone calls, questions.** ▪ **Social media attention continues or grows.** ▪ **New projects**		**Final meeting**

2.9 Project Methodology

The project methodology followed a broadly social learning model illustrated below.

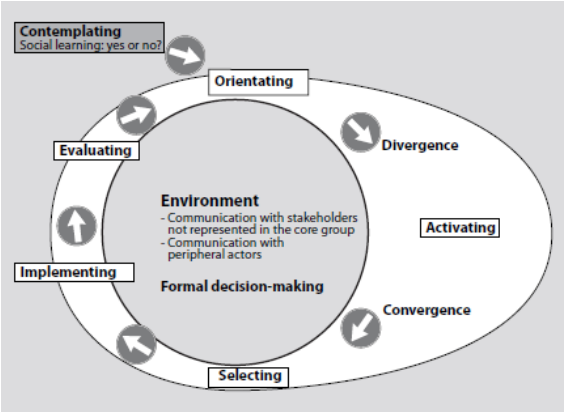
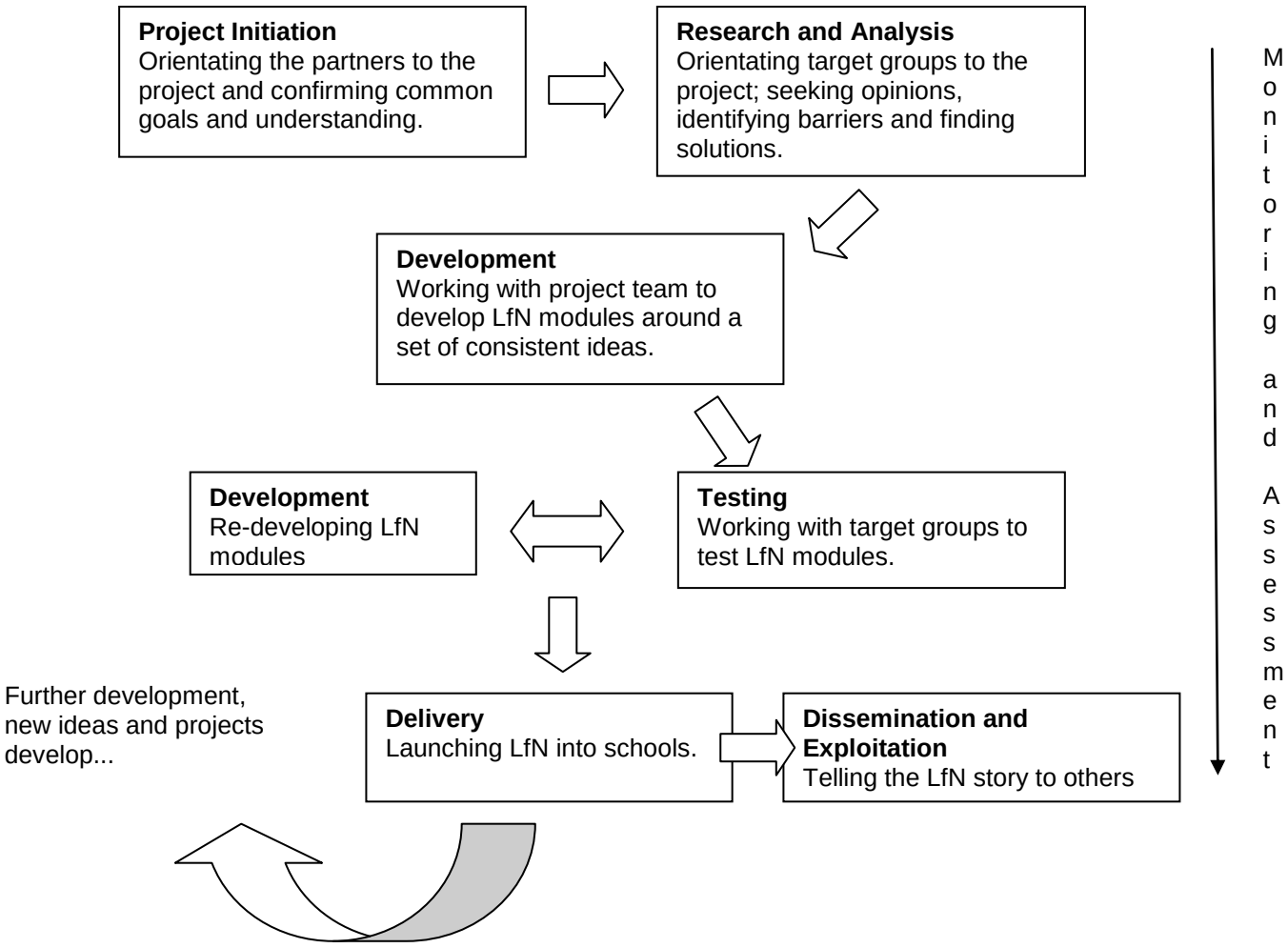


Figure 4: Social Learning Process (from Social Acoustics of Learning; Wals et al; Wageningen Academic Publishers 2009)

The project had a number of formal structures to assist deliver such as Partner Meetings, monitoring reports and an online management platform to share ideas and results. The project methodology is better illustrated in diagrammatic form.



The project approach selected comes with risks as figure 5 below shows. LfN does not start with a fixed view of what will be delivered or how the learning will emerge. In fact, the resulting modules keep this approach through their contents and pedagogy. This is built on an understanding of future uncertainly and the types of change that are currently taking place in society and education. It has been a challenge for some partners to move from the divergent stage of creativity as new ideas and modules are being developed, to the convergent stage when ideas are committed to paper and learning delivered. In an ideal world the LfN modules would have gone through further stages of development, however, the need to deliver into schools took over.

Certainty Axis	Types of Goals	Type of Intervention	Intervening Role	Results Axis
Traditional EE & ESD with certainty regarding direction and solutions	Closed / pre-determined / established.	Transmission	Instruction	Hard results emphasising concrete products and measurable change.
LfN approach with major emphasis on learner engagement, reflection and planning own future needs.	Open / to be determined through dialogue / flexible	Transformation	Facilitation	Soft results emphasising processes and quality of learning

Figure 5: Table showing relative certainty of traditional ESD and LfN

Such an approach to learning and change presents challenges to the traditional project management style whereby results are agreed and known from the outset. Whereas the project did use the funded proposal as a measure for progress, with a focus on results and target groups, to be successful in creating a significantly different approach to learning for a green economy and society it had to take risks. Within the resulting learning resources these risks can be seen to have succeeded and been very worthwhile. In the engagement of schools in the project there is a more mixed picture, especially in the western European countries where engagement with schools requires 'bending a project' to pre-defined national education priorities. This does not always lead to innovative learning.

2.10 Dissemination and Exploitation

The aim of the LfN Dissemination and Exploitation was to:

- Increase impact.
- Transfer results.
- Ensure integration.
- Target locally, regionally, nationally and across the EU.

Our dissemination activities provided information about effectiveness and relevance of project results. Our exploitation activities made use of and derived benefit from the project results, and was based on:

- Mainstreaming: transferring results to appropriate decision-makers and systems e.g. curricula.
- Multiplication: ensuring more people use the project results.

A common framework was used by the partners to structure their dissemination and exploitation activities.

Topic	**Information**
Target groups / beneficiaries	Which groups are you aiming to reach? Why? What will they gain? How will they benefit?
Opportunities	What opportunities are there to reach your target groups (new and existing)? What should be disseminated/exploited and to whom (hard and soft outcomes)?
Tools/methods	What is the best way to reach and influence your target groups? How will you do this?
Actions & timetable	How will you reach your target groups? When? What will you need to do to be successful?
Resources	What resources will you need to achieve this? (people, travel, etc)
Measuring success	How will you know if you have been successful?

As a result of the dissemination activities an estimated 8269 people were reached. Headline results include:

- The project website formed a key part of project dissemination. It was designed to be a simple and effective tool for teachers. As such, login's and other barriers to access were not included. The website focuses on providing basic information to engage with the project, access to the learning resources, and an area for students to add their comments. The website has received 181080 visits and LfN modules have been downloaded 20792 times in the partner countries (Latvia: 5015 downloads; Spain 4252 downloads; Bulgaria 2669 downloads; Romania 2765 downloads; UK 5358 downloads; Netherlands 713 downloads). A total of 59 countries accessed the site.
- LfN represented at 26 conferences.
- LfN features on more than 20 websites.
- LfN was promoted in a range of regional and national media including TV and radio.
- LfN built into new projects by UK, Bulgarian, Spanish and Latvian partners.
- A wide range of organisations involved in exploitation including local education departments, exam boards and national networks.
- LfN materials built into new courses for teachers at university.
- Training workshops delivered to 631 teachers.

3. Project Outcomes & Results

The Lessons from Nature project has successfully delivered its key outcomes. These are summarised below and described in detail in the following sections.

Objectives	***Outcomes and Results***
Improve the capacity of schools and organisations working with young people to address sustainable development through the outdoor classroom in new and innovative ways, and integrate this into different curriculum areas.	• Baseline research to confirm school needs and goals of LfN. • LfN framework and principles explored and agreed. • Training of project partners carried out and capacity development for staff in each partner organisation. • Training provided to 631 teachers. • New learning resources developed (see below)
Provide young people with a wide range of experiences outside the classroom relevant to their participation in building the green economy and society.	• Learning resources developed include a significant element of outdoor learning. • Baseline research on needs of young people and preferred futures. • Workshops delivered for 63 schools. • LfN modules used in 210 schools and delivered to approximately 6211 students.
Produce new resources that link learning about natural ecosystems with the skills for building a green economy and society.	• Learning modules developed based on LfN principles. • At least three modules produced by each country, with some adapted to other languages. A total of 32 modules produced. • Teacher guidelines developed to support delivery of modules.
Provide easy access to information, knowledge, expertise, guidance and resources.	• Website launched. • Website received 181080 visits. • LfN modules have been downloaded 20792 times in the partner countries (Latvia: 5015 downloads; Spain: 4252 downloads; Bulgaria: 2669 downloads; Romania; 2765 downloads; UK 5358 downloads; Netherlands 713 downloads); 59 countries accessed the site.
Share and enhance existing criteria for successful learning outside the classroom (LOtC).	• Exploitation and Dissemination Plans implemented. • Best practice reviewed and built into LfN approach.
Develop a network of good practice amongst educators to continually share ideas and resources.	• Partners meeting with education providers and building networks of support.
Increase the profile of sustainable development and LOtC across the partner countries and the EU.	• Partners developed links with influencers. • School feedback demonstrates increased understanding.

3.1 Improve the capacity of schools and organisations working with young people to address sustainable development through the outdoor classroom in new and innovative ways, and integrate this into different curriculum areas.

We have developed a set of resources that are critically distinct from traditional approaches to environmental education (EE) and education for sustainable development (ESD). Why has this been important? It is the partners belief that traditional approaches to EE and ESD are not sufficient to deal with the current environmental and economic crisis we face and which are reflected in a crisis for society at large. The partners believe that traditional EE and ESD is too much based on negative scenarios of the future and ask young people to forego the benefits that today's adults have enjoyed. Our LfN resources are very different, they believe in a bright future, one that young people can, if they choose to, look forward to. The bedrock of the LfN resources is a creative response to the needs of young people, their future dreams and realistic solutions to get them there. This is challenging and innovative.

Do our results support this? We have worked with teachers and students to deliver our LfN modules and review the results. Here are some samples of feedback:

Teachers:

> *'A genuine progression from first principles through to a deeper insight and understanding of closed loop systems' (UK teacher).*
>
> *'This project enabled students to understand the ways that they can learn and that by working with nature we can create a better world to live in' (UK teacher).*
>
> *'To me Lessons from Nature mean reconstructing the Bulgarian Educational System' (Bulgarian teacher).*
>
> *'I discovered that Lessons from Nature could, in a unique way, change the way children see the world. LfN can help me to work towards further developing and mastering their key competences' (Bulgarian teacher).*
>
> *'The students are taking LfN really well. It was difficult for them to believe we can make circular shoe' (Bulgarian teacher).*
>
> *'LfN project has been a marvelous stimulus for creativity and innovation for all of us as educators and teachers' (Spanish teacher).*
>
> *'LfN could be a useful approach to change educational and economical paradigms, using insights from nature rather than focusing on care for nature' (Spanish teacher).*
>
> *'Very successful and need to take the workings of nature as an example and extrapolate it to other aspects of society in a beneficial way' (Spanish teacher).*

'By this project I learned a new and very interesting way to approach the questions of the development and the sustainability. During my long pedagogical career this project was one of the most interesting experiences' (Romanian teacher).

'Great content, great methodology! We need such innovative methods in our school system' (Romanian teacher).

'The advantage of the LfN modules are that they require active student involvement, but the teacher is just his consultant' (Latvian teacher).

'LfN modules made the learning more active, providing cross-curricular links, helped to develop students' creativity' (Latvian teacher).

Students:

'We can learn how nature does things well, such as closed loop systems and incorporate them into society and technology' (UK student).

'I applied my knowledge to changing the concepts of the future' (UK student).

'I discovered the meaning of closed loop systems' (UK student).

'Money creates two islands: those of the rich and the poor, of the Global South and North. They place the material above the spiritual. We have to take examples from nature. Let's take this one – there is no money in nature' (Bulgarian student).

'The future depends on us; we can have a bright one if we preserve nature' (Bulgarian student).

'Yes, they offered me a new way of thinking. I see the products that I threw in the bin yesterday and a resource for other products to be made, new ones for the society of the future' (Bulgarian student).

'For me were interesting to learn new things, mostly the mimicry and biomimicry, I learned how can imitate the livings each other' (Romanian student).

'The nature represents inspiration, purity and silence. The nature is the tree of the life! Let's protect it!' (Romanian student).

'I was impressed, that we can improve our quality of life using ideas from nature' (Latvian student).

'I was impressed, that we can learn so much from the Nature and that everything is cyclic in the Nature' (Latvian student).

Education providers:

> *'As part of our work to promote learning outside the classroom…we are noting the rise in learning in the natural environment. Indeed many teachers are adapting lessons to learn about the natural environment. However, this (LfN) is the first time that I have seen materials designed specifically to support teachers develop lessons to promote learning from the natural environment. I believe this is a fundamental part of education for all young people.' Council for Learning Outside the Classroom.*

> *'Our secondary teachers are presently working to implement Curriculum for Excellence through interdisciplinary learning, so the Lessons from Nature material will be a very practical help to them in presenting them with a fresh and innovative approach to ESD. Health and well-being, including emotional, social and physical wellbeing are the responsibility of all teachers in Scotland and I was particularly glad to see that the Lessons from Nature materials strongly support young people's engagement and participation through collaborative approaches to learning. Learning from nature about resilience, interdependence and self-regulation promotes the formation of adaptive competence in our young people and I congratulate you on putting this at the forefront of your approach.' Education Scotland.*

It has been important in developing our LfN modules that they both challenge how we can achieve a better future but that they also integrate into the existing education system as far as possible. Each module has been specifically adapted in each country to fit within that country's education system: curriculum, subjects, lesson periods, class sizes and teacher aptitude. That said, we have not compromised our principles that the modules should represent a progressive pedagogy that is student centred and approach based.

We have not only worked with schools but also engaged with a range of education providers, for example:

> *'I have been hugely impressed by its innovative re-presentation of Education for Sustainable Development (ESD) and Learning Outside of the Classroom. Lessons from Nature (LfN) is designed to empower learners and provide a sense of optimism for the future. This is powerful and commendable message. The resources…are excellent. They allow the learners to explore unusual and complex ideas through a coherent set of activities. Each of these activities represents a part of a tapestry of ideas around sustainability. The activities…frequently pose very challenging questions.' (Cris Edgell, Qualifications Manager Science, AQA)*

We developed learning walls to assess the competencies students develop through the use of our modules. Whilst recognising that competencies are developed through a range of contexts, our results are positive. Some examples from students show progress:

Analyseren van informatie	Informatie beoordelen	Verbeelding gebruiken	Initiatief	Omgaan met onzekerheid
Ik kan informatie analyseren en zelfstandig samenvatten. Ik kan de resultaten gebruiken om zelf beslissingen te nemen.	Ik bekijk meer dan 1 bron en kan beoordelen of de informatie betrouwbaar is.	Ik kan mijn eigen verbeelding gebruiken om nieuwe ideeën te bedenken zonder hulp.	Ik neem actief de leiding in het uitproberen en uittesten van nieuwe ideeën en activiteiten.	Ik vind het leuk om nieuwe dingen uit te proberen, het maakt niet uit wat de uitkomst is.
Ik kan op een goede manier informatie analyseren en samenvatten met hulp van mijn groepsgenoten. Ik kan de resultaten gebruiken om beslissingen te nemen met wat hulp van anderen.	Ik bekijk meer dan 1 bron, maar heb hulp nodig om te bepalen of de bron betrouwbaar is.	Ik kan nieuwe ideeën toepassen. Dit kan ik zonder hulp van mijn groepsgenoten.	Ik probeer nieuwe ideeën en activiteiten uit, maar heb daarbij hulp van mijn groepsgenoten of de leerkracht nodig.	Ik kan taken uitvoeren waarvan de uitkomst onzeker is, als ik maar wel hulp krijg van mijn groepsgenoten.
Ik vind het moeilijk om informatie te analyseren en samenvatten zonder hulp van de leerkracht.	Ik heb hulp nodig om informatiebronnen te vinden en te bepalen of de bronnen betrouwbaar zijn.	Ik vind het moeilijk om nieuwe ideeën toe te passen zonder hulp van een leerkracht.	Ik vind het leuk om mee te doen als mijn groepsgenoten nieuwe ideeën en activiteiten uitvoeren.	Ik doe mee met taken waarvan de uitkomst onzeker is, zolang iemand anders de leiding neemt.
Ik kan geen informatie analyseren en samenvatten zonder hulp van de leraar.	Ik kijk naar 1 informatiebron. Ik heb hulp van anderen nodig om te bepalen of de bron betrouwbaar is.	Ik heb iemand nodig die verteld wat alles betekent.	Ik laat het initiatief aan anderen om nieuwe ideeën en activiteiten uit te proberen.	Ik heb taken nodig die een duidelijk doel hebben en die ik makkelijk kan begrijpen.

Figure 6: sample learning wall

Understanding Insights from Nature			Discovery	Critical Thinking		Creativity		Sharing	Reflection & Evaluation
Multiple Benefits	Waste equals Food	Diversity gives Strength	Enquiry and coping with uncertainty	Questioning	Analysing information	Using imagination	Using initiative	Communicating ideas	Reflecting and evaluating
I can propose a new product that incorporates the multiple benefits principle together with the other insights. I can use nature as a mentor and a measure.	I can propose a new production system that is closed loop and incorporates the other insights. I can use nature as a mentor and a measure.	I can propose a new product that uses the diversity gives strength principle together with the other insights. I can use nature as a mentor and a measure.	I am happy to take on new tasks even when the outcome is uncertain. I can develop my own enquiries to continuously extend my learning.	I have a lot of enquiry based questions and always try to find better ones to extend my learning. I can normally answer questions on my own.	I can find my own sources of information and use nature as a measure to make critical judgements. I can summarise the information and use it to make decisions.	I can use my imagination to find new understanding from information without help.	I actively take the lead in trying out and testing new ideas and activities.	I can explain how nature can be an inspiring mentor and a measure in the design of the modern world. I can explain that the insights from nature could offer hope for a brighter future.	I can develop new targets for myself.
I can apply the multiple benefits principle to suggest improvements to a current design.	I can construct a closed loop system. I can apply the waste equals food principle to suggest improvements to a current design.	I can apply the diversity gives strength principle to suggest improvements to a current design.	I can take on tasks where the outcome is uncertain so long as I have support from friends or adults.	I can think of some questions on my own, and can answer most on my own or with friends.	I can summarise information from more than one source and I can see how comparing things in the human world with nature helps me to make judgements.	I can connect new ideas to new understanding but with help from my friends.	I try out new ideas and activities but need help from my friends or teacher.	I can effectively communicate information to a range of audiences in a variety of ways, including in groups and in problem-solving situations.	I can identify what else I need to know to increase my knowledge and understanding.
I can describe an example of a human product or (production) system with multiple benefits.	I can describe an example of waste equals food in the natural world. I can classify materials as technical, biological or mixtures.	I can describe an example of diversity gives strength in nature.	I can join in tasks where the outcome is uncertain so long as someone else is taking the lead.	I can think of questions with the help of others, and need help from an adult answering them.	I can summarise the information from one source and with limited help.	I find it difficult to connect new ideas to new understanding without help from an adult.	I will join my friends when they try out new ideas and activities.	I can communicate my ideas to others when asked. I can cooperate with my peers to explore new ideas in depth.	I can describe what I have learnt and identify what helped me to learn. I can describe how I feel about the learning.
I understand where multiple benefits can be found in nature.	I understand the terms 'linear system' and 'closed loop system'	I understand the terms 'monoculture' and 'biomimicry'	I need tasks to have a clear goal that I can easily understand.	I keep quiet and let others ask questions.	I need help to summarise information	I need to be told what things mean by a teacher.	I always let other people take the lead in trying out new ideas and activities.	I am not confident sharing my ideas with others and feel nervous they might not be accepted.	I can recall what happened during the learning and the role I played.

Progression

Figure 7: sample learning wall

One final area to consider is whether students feel more inspired about their future and how this can be realised as a result of using the LfN modules. Students were asked to complete reflection questions.

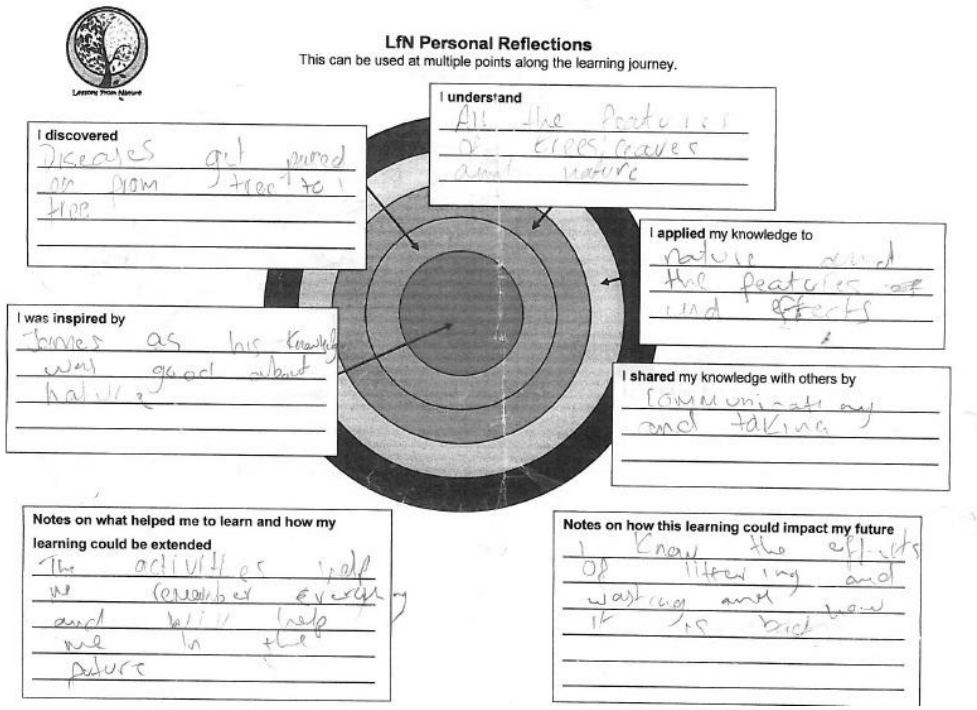


Figure 8: sample reflective questions

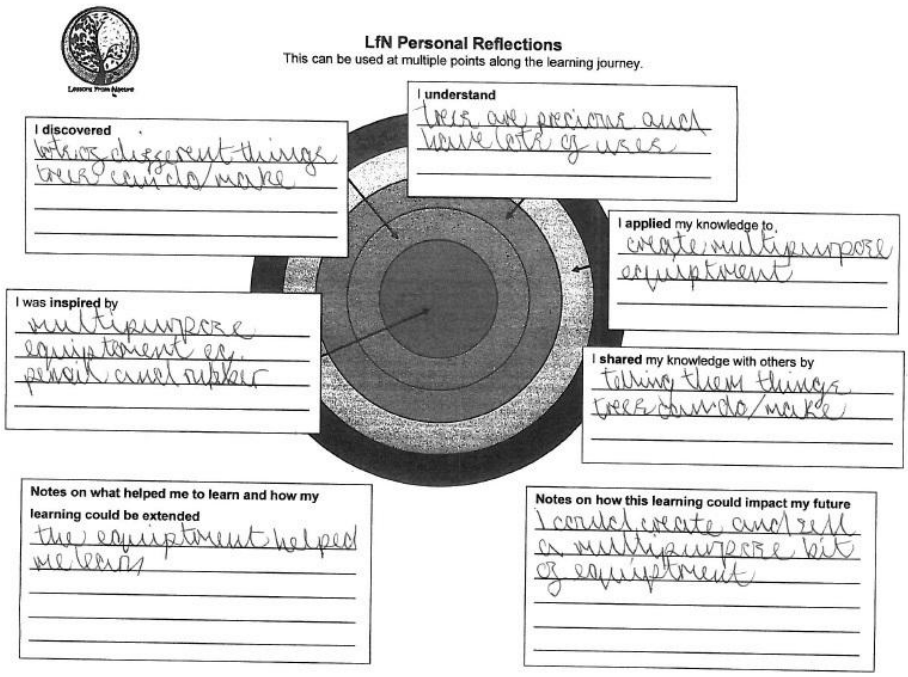


Figure 9: sample reflective questions

Many students agree that LfN does inspire them:

'I was inspired by what nature does.'

'It has shown me that everything isn't doom and gloom.'

'LfN has inspired me a lot because instead of thinking we are running out so use less, we can take from nature the abundance idea and think positively about the future.'

'Everything what we are using in our life has the origin in the nature, so it's important to return to the nature.'

'I was impressed, that we can learn so much from the Nature and that everything is cyclic in the Nature.'

3.2 Provide young people with a wide range of experiences outside the classroom relevant to their participation in building the green economy and society.

This outcome builds on the outcome above. Nature is the bedrock of the LfN approach. LfN is based on six natural principles:

- Waste equals food.
- Multiple benefits.
- Diversity gives strength.
- Run on solar income.
- Nature optimises.
- Nature is adaptive, dynamic and responsive.

Each module is built on one or more of these natural principles and uses the natural world to teach them. For example, waste=food is taught by exploring how nature composts its own waste to produce nutrients for another plant/animal. This principle if then applied to human systems asking how a product such as a training shoe can be designed to be upcycled.

Activity examples:

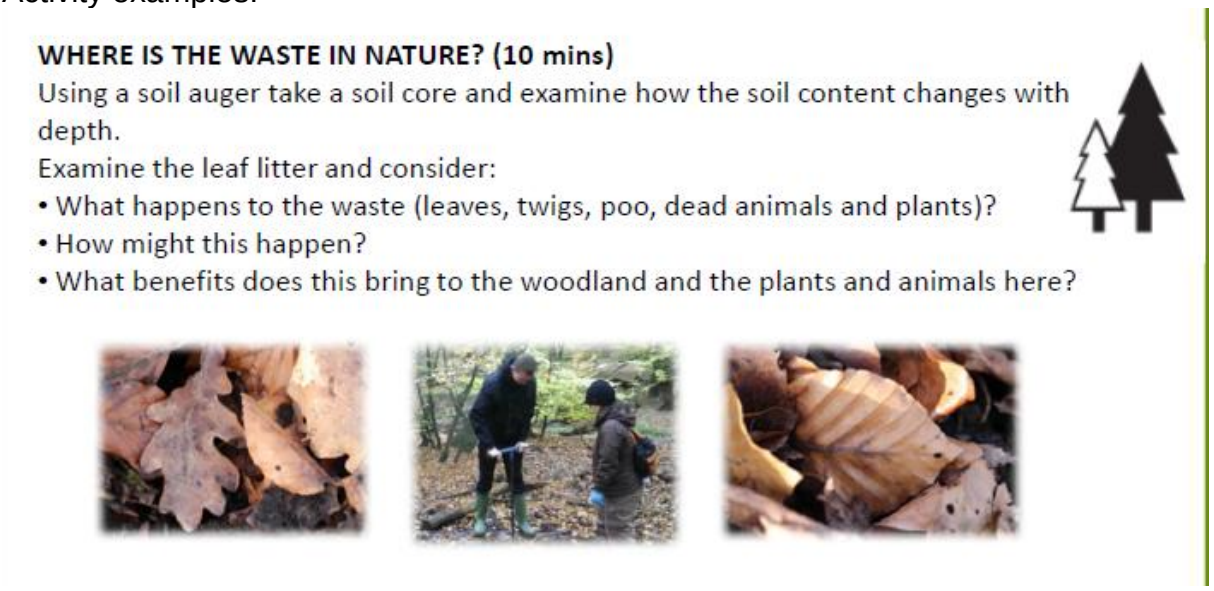


Figure 10: sample outdoor activity from UK

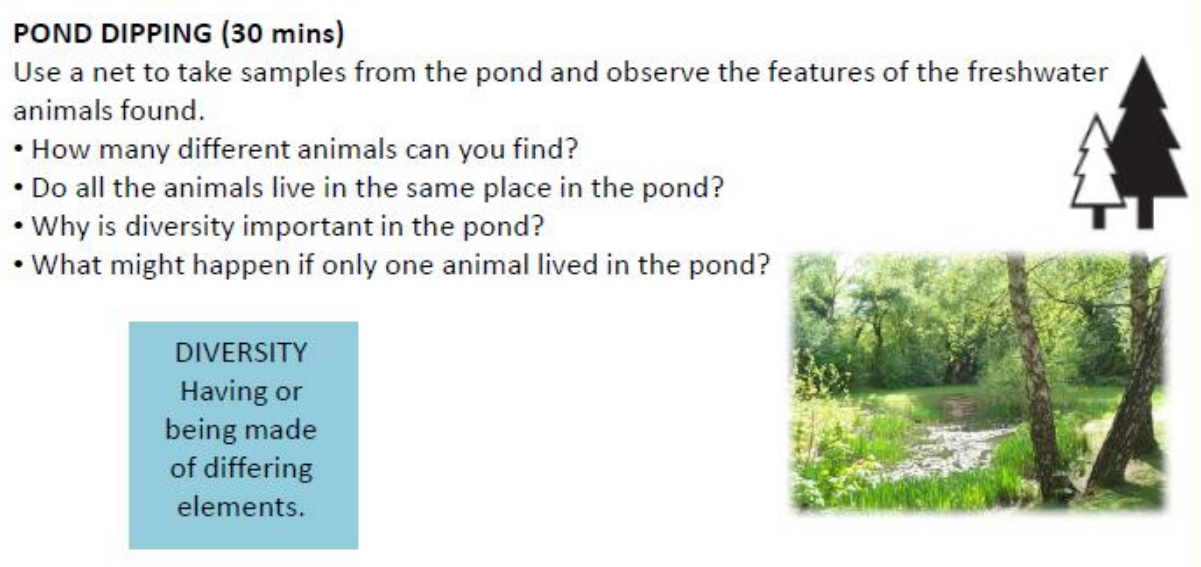


Figure 11: sample outdoor activity from UK

Figure 12: sample outdoor activity from Spain

Two countries delivered student conferences as an additional activity to provide an increased range of opportunities. In Romania 19 schools participated in a one day

conference to showcase LfN. In Latvia the Students Innovation Conference showed how well teachers and students understood the project idea and were able to explain their ideas to other schools. At the conference 23 schools presented their results, with a total of 47 schools and seven other organizations in attendance.

Critical to the success of the modules is whether students can start to make the transition to seeing the LfN principles working in nature and then apply them to a human context. The answer is a tentative yes as the following student feedback quotes suggest:

> *'We applied our knowledge to society and technology and how new things could be developed using natural solutions' (UK student).*
>
> *'I have discovered that Mother Nature can help our generation advance much more' (UK student).*
>
> *'I learned how to modify modern day inventions using nature as an inspiration' (UK student).*
>
> *'I believe we can create better products using nature' (UK student).*
>
> *'From the way nature is organized we can learn how to function as society, economy, and personalities. To become better in all we do' (Bulgarian student).*
>
> *'We, the young ones, tell you, the big ones: You know how to preserve nature and save life on Earth. Do it! And teach us how!' (Bulgarian student).*
>
> *'The Lessons from Nature can help me to act in my own life and help others do the same' (Bulgarian student).*
>
> *'I was impressed, that we can create things which never been created before!' (Latvian student)*
>
> *'I discovered that even my brain can create such interesting ideas!' (Latvian student)*

3.3 Produce new resources that links learning about natural ecosystems with the skills for building a green economy and society.

As the results above demonstrate, this outcome has been achieved. We chose to focus on tangible economic and business examples rather than a larger view of the whole economy. We could have selected examples from large companies, for example Cisco Systems, that are adopting a cradle-to-cradle approach. However, large examples can be disempowering for young people as they cannot be realised by themselves. We selected more tangible examples that are close the real life of young people and/or could realistically be influenced by young people.

A total of 32 modules were developed in 7 languages (Romanian modules were produced in Hungarian to cater to the Hungarian speaking community in Romania).

Figure 13: examples of modules

Each module is based on the inspire, discover, understand and apply model (see section 2 for details). Each module contains a number of core elements: objectives, key competencies, curriculum links, student reflection, follow-up activities and learning wall.

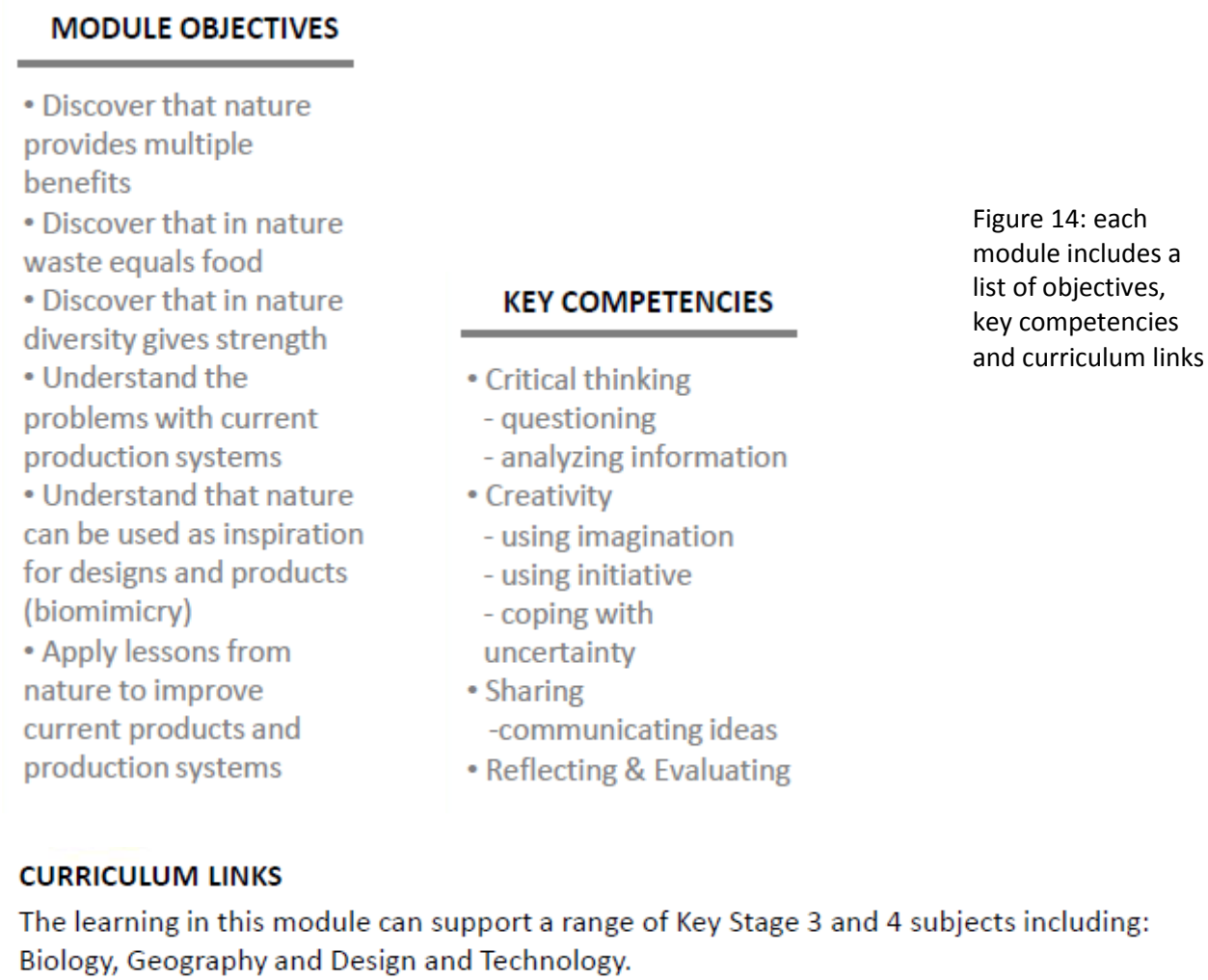


Figure 14: each module includes a list of objectives, key competencies and curriculum links

REFLECTION

This module aims to enable learners to re-think the way in which the human world works help them to shape a brighter future that meets their own aspirations.

At the end of each section there is a reflection task. Learners are asked add notes to the Reflection sheet including how the learning could impact their future.

In addition learners should chart their progress on the Learning wall at the end of each section. The activities aim to develop skills, creativity, critical thinking and understanding that will be needed for work in the post oil economy. To be able to see progress throughout the learning journey learners should identify where they are on the Learning Wall before beginning the activities.

Figure 15: each module includes a reflection and follow-up activities

FOLLOW UP ACTIVITIES

Develop your understanding of *Waste equals Food, Diversity gives Strength* and *Multiple Benefits* and apply your knowledge of the insights to redesign products and production systems. Further Lessons from Nature modules and resources can be downloaded from **www.lessonsfromnature.org**

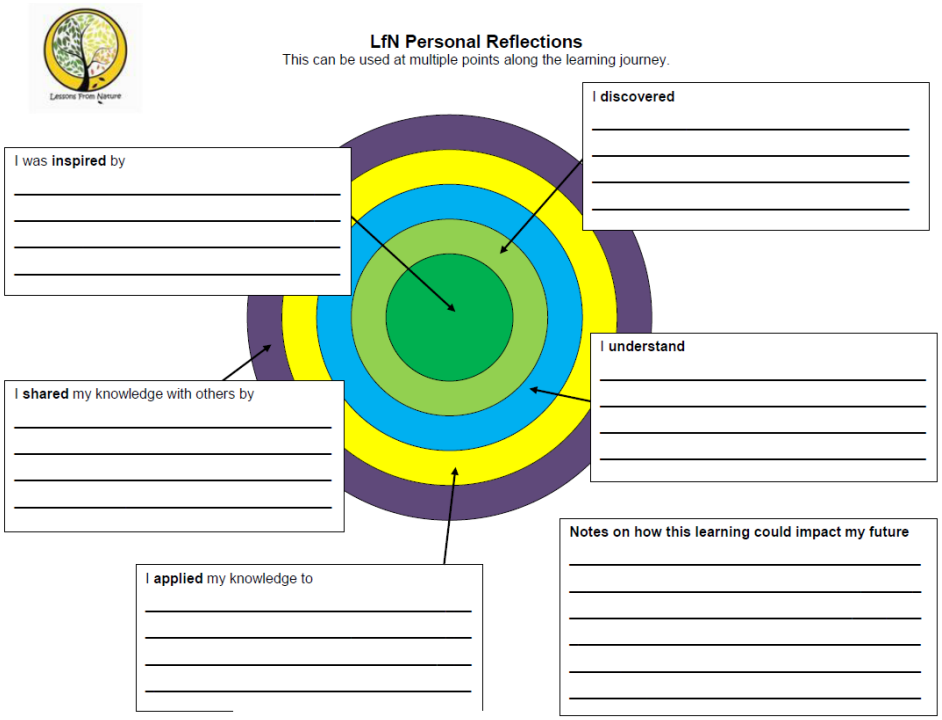
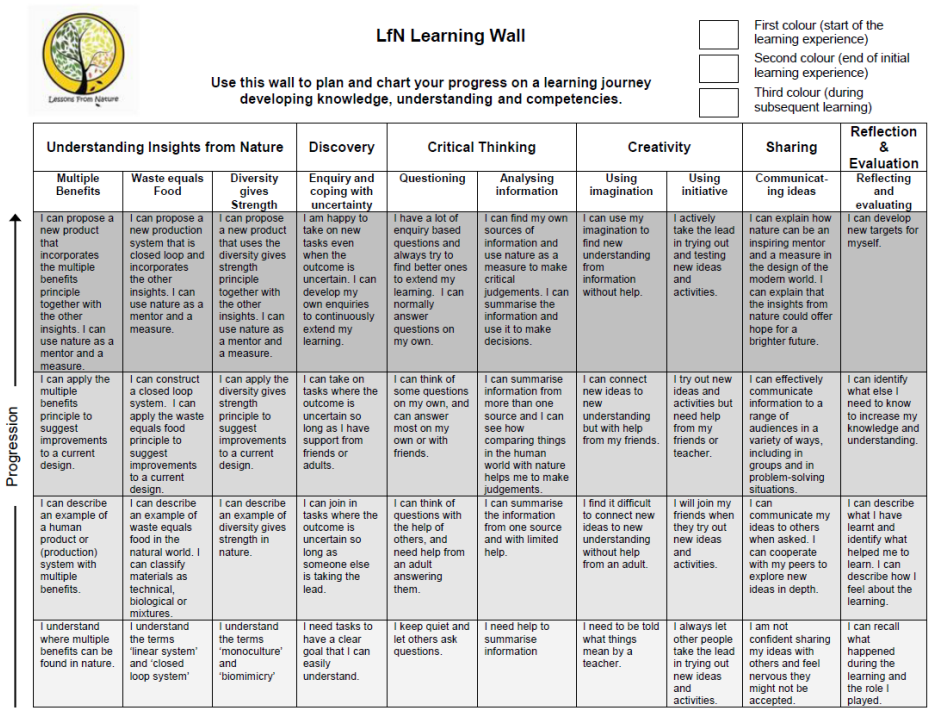


Figure 16: example of personal reflections form



LfN Learning Wall

Use this wall to plan and chart your progress on a learning journey developing knowledge, understanding and competencies.

First colour (start of the learning experience)
Second colour (end of initial learning experience)
Third colour (during subsequent learning)

Progression

Understanding Insights from Nature			Discovery	Critical Thinking		Creativity		Sharing	Reflection & Evaluation
Multiple Benefits	Waste equals Food	Diversity gives Strength	Enquiry and coping with uncertainty	Questioning	Analysing information	Using imagination	Using initiative	Communicating ideas	Reflecting and evaluating
I can propose a new product that incorporates the multiple benefits principle together with the other insights. I can use nature as a mentor and a measure.	I can propose a new production system that is closed loop and incorporates the other insights. I can use nature as a mentor and a measure.	I can propose a new product that uses the diversity gives strength principle together with the other insights. I can use nature as a mentor and a measure.	I am happy to take on new tasks even when the outcome is uncertain. I can develop my own enquiries to continuously extend my learning.	I have a lot of enquiry based questions and always try to find better ones to extend my learning. I can normally answer questions on my own.	I can find my own sources of information and use nature as a measure to make critical judgements. I can summarise the information and use it to make decisions.	I can use my imagination to find new understanding from information without help.	I actively take the lead in trying out and testing new ideas and activities.	I can explain how nature can be an inspiring mentor and a measure in the design of the modern world. I can explain that the insights from nature could offer hope for a brighter future.	I can develop new targets for myself.
I can apply the multiple benefits principle to suggest improvements to a current design.	I can construct a closed loop system. I can apply the waste equals food principle to suggest improvements to a current design.	I can apply the diversity gives strength principle to suggest improvements to a current design.	I can take on tasks where the outcome is uncertain so long as I have support from friends or adults.	I can think of some questions on my own, and can answer most on my own or with friends.	I can summarise information from more than one source and I can see how comparing things in the human world with nature helps me to make judgements.	I can connect new ideas to new understanding but with help from my friends.	I try out new ideas and activities but need help from my friends or teacher.	I can effectively communicate information to a range of audiences in a variety of ways, including in groups and in problem-solving situations.	I can identify what else I need to know to increase my knowledge and understanding.
I can describe an example of a human product or (production) system with multiple benefits.	I can describe an example of waste equals food in the natural world. I can classify materials as technical, biological or mixtures.	I can describe an example of diversity gives strength in nature.	I can join in tasks where the outcome is uncertain so long as someone else is taking the lead.	I can think of questions with the help of others, and need help from an adult answering them.	I can summarise the information from one source and with limited help.	I find it difficult to connect new ideas to new understanding without help from an adult.	I will join my friends when they try out new ideas and activities.	I can communicate my ideas to others when asked. I can cooperate with my peers to explore new ideas in depth.	I can describe what I have learnt and identify what helped me to learn. I can describe how I feel about the learning.
I understand where multiple benefits can be found in nature.	I understand the terms 'linear system' and 'closed loop system'	I understand the terms 'monoculture' and 'biomimicry'	I need tasks to have a clear goal that I can easily understand.	I keep quiet and let others ask questions.	I need help to summarise information	I need to be told what things mean by a teacher.	I always let other people take the lead in trying out new ideas and activities.	I am not confident sharing my ideas with others and feel nervous they might not be accepted.	I can recall what happened during the learning and the role I played.

Figure 17: example of learning wall

Finally, did the teachers delivering LfN think we have achieved this outcome?

'The advantage of modules is that students have tested the design process, learned the requirements for modern materials, seen the reason of waste sorting to provide materials for circular production.'

'Enabling students to understand the ways that they can learn and that by working with nature we can create a better world in which to live.'

'They help to "step out of the usual box", and look at the process of learning from a different perspective.'

'A genuine progression from first design principles through to a deeper insight and understanding of closed loop systems.'

'LfN modules were linked to the nature, student learning is built on the findings and ensure student participation, creative thinking, evaluation and reflection.'

'I work with students 15 years old. They accept very well all the activities. In March we plan to have and open day class and introduce LfN to the rest of the school.'

'The problems of our times are very complicated and this project helped us to understand better the actual problems and to involve the students in interesting activities.'

3.4 Provide easy access to information, knowledge, expertise, guidance and resources.

We used a range of methods to support the use of LfN modules. Throughout the project 631 teachers received training and 6211 students were reached. Each partner also set up email and telephone support.

The project website formed a key part of project dissemination. It was designed to be a simple and effective tool for teachers. As such, login's and other barriers to access were not included. The website focuses on providing basic information to engage with the project, access to the learning resources, and an area for students to add their comments. The website has received 181080 visits and LfN modules have been downloaded 20792 times in the partner countries (Latvia: 5015 downloads; Spain 4252 downloads; Bulgaria 2669 downloads; Romania 2765 downloads; UK 5358 downloads; Netherlands 713 downloads). A total of 59 countries accessed the site.

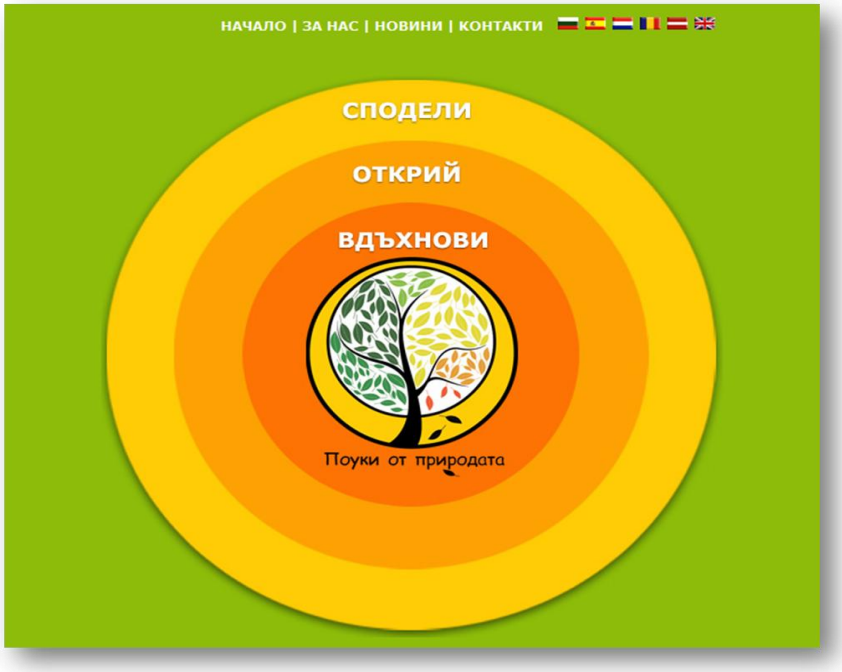


Figure 18: Front page of website in Bulgarian

Figure 19: Samples of inner website pages

The partners used a variety of methods to communicate information about the project in addition to the website. Social media and leaflets were developed. Three partners decided to produce short videos to show LfN in action and give a greater sense of the opportunities.

TIME Foundation produced two videos to support project exploitation. A video was produced about the LfN Summer Academy. The Summer Academy followed the inspire, discover, understand and apply structure of the LfN modules. The video shows a world cafe discussion about needless stuff (an activity in Bulgaria's module 3). Later the participants are seen redesigning their needless stuff based on LfN principles. In another section of the video a student describes the monetary system as something useless and the discussing how it can be replaced with time. Finally, participants are seen playing a game to redesign the production of coffee into a closed loop system and undertaking biomimicry activities. At the end of the video students share their inspirations from nature. The video can be viewed at http://www.youtube.com/watch?v=NpsN8AbU0qE&feature=youtu.be.

TIME Foundation also recorded the Gunter Pauli event about the Blue Economy which can be viewed at http://www.youtube.com/watch?v=2WfS-NAkQhw&feature=youtu.be.

Spain produced three videos to support exploitation as follows:

- Tutorial Módulo 0 (http://youtu.be/vnrbMMf2KOk) – This video shows how to use module 0 in a practical way in school to motivate teachers.
- Tutorial Módulo 3 (http://youtu.be/I6spVooWmKo) – This video shows how to use module.

- Entrevistas (http://youtu.be/3qUEv8CBreA) – Interviews with Spanish LfN team members speaking about the project, expectations and achievements.

Focus Eco Centre produced a video to exploit the results of the project to more schools. The video can be viewed at http://youtu.be/yKU1ufMqFxw and has the following content:

- Framework: young people (students) are discussing at a campfire about the problems of development and environment. There are four scenes which include the principles of Lessons from Nature, and represents the themes from the modules.
- The first scene is about the need for water and students are discussing about the drinking water, which is better to use glass bottle or PET bottle, what is happening with the packaging materials, how is PET recycled?
- The second scene focuses on how we are providing our food. How can we support the local economy, what are the consequences of the linear economy, artificial fertilizer versus natural fertilizers, multiply benefits of the biological agriculture? Solutions for individual households, for example composting, are discussed.
- In the third scene a short discussion about the final destination of the goods what we are buying takes place. In nature everything is recycled and our goods are obtained from natural materials which can be easily recycled, but what can we do with the artificial materials? How can we upcycle different things, what can we realize with a cola can? Examples: ear rings and fruit dryer realized from recycled cola and beer cans.
- The fourth scene is about the equilibrium in nature. What happens with our mobile phones? Nature is cyclic and the human economy should be the same. The six LfN principles are presented.
- The final image is a cherry tree with the text: We can learn many things from the nature.

The partners chose a range of additional strategies to support teachers. In Latvia, for example, due to the high demand from schools mini-LfN groups were established with one or two teachers in each group receiving training from the project team. These mini-LfN groups met regularly to support each other and plan delivery. Most partners provided dedicated email and telephone support for teachers and schools.

Another strategy used to increase access and usability of the LfN modules was to ensure progression and links with the National Curriculum of each partner country. In the UK for example, the LfN modules are presented as whole modules but also as individual lessons suitable for specific curriculum subjects.

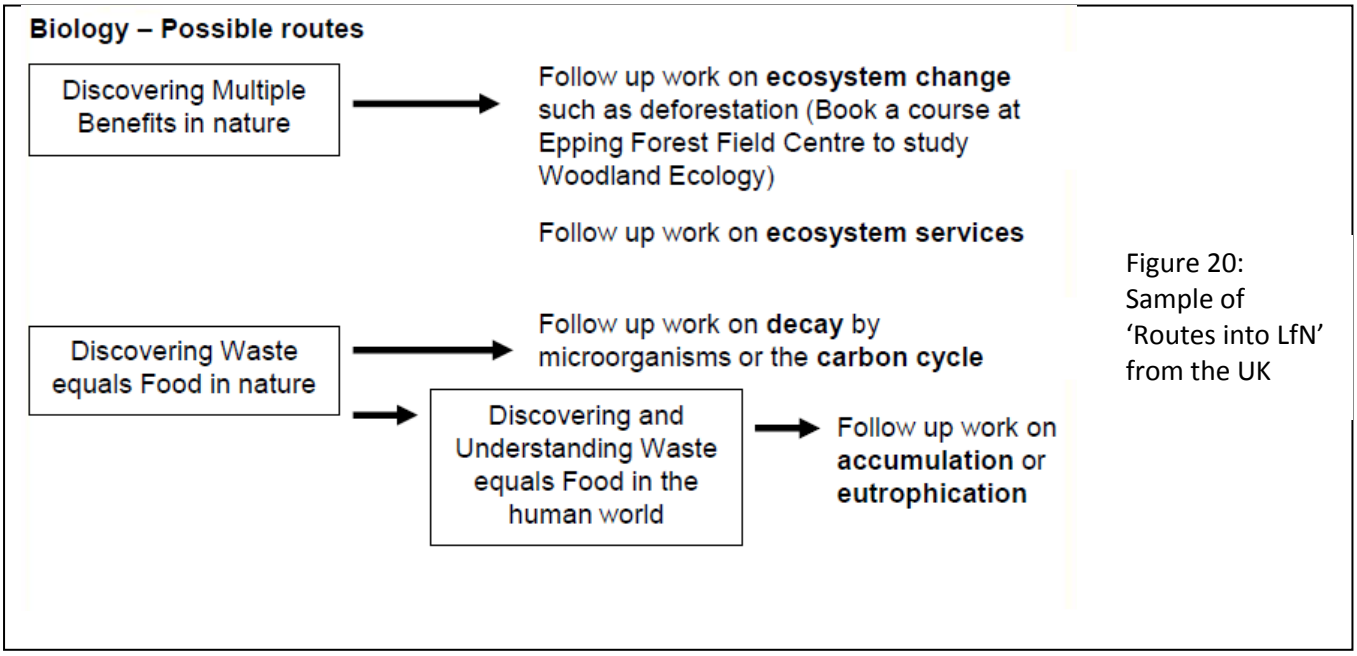


Figure 20: Sample of 'Routes into LfN' from the UK

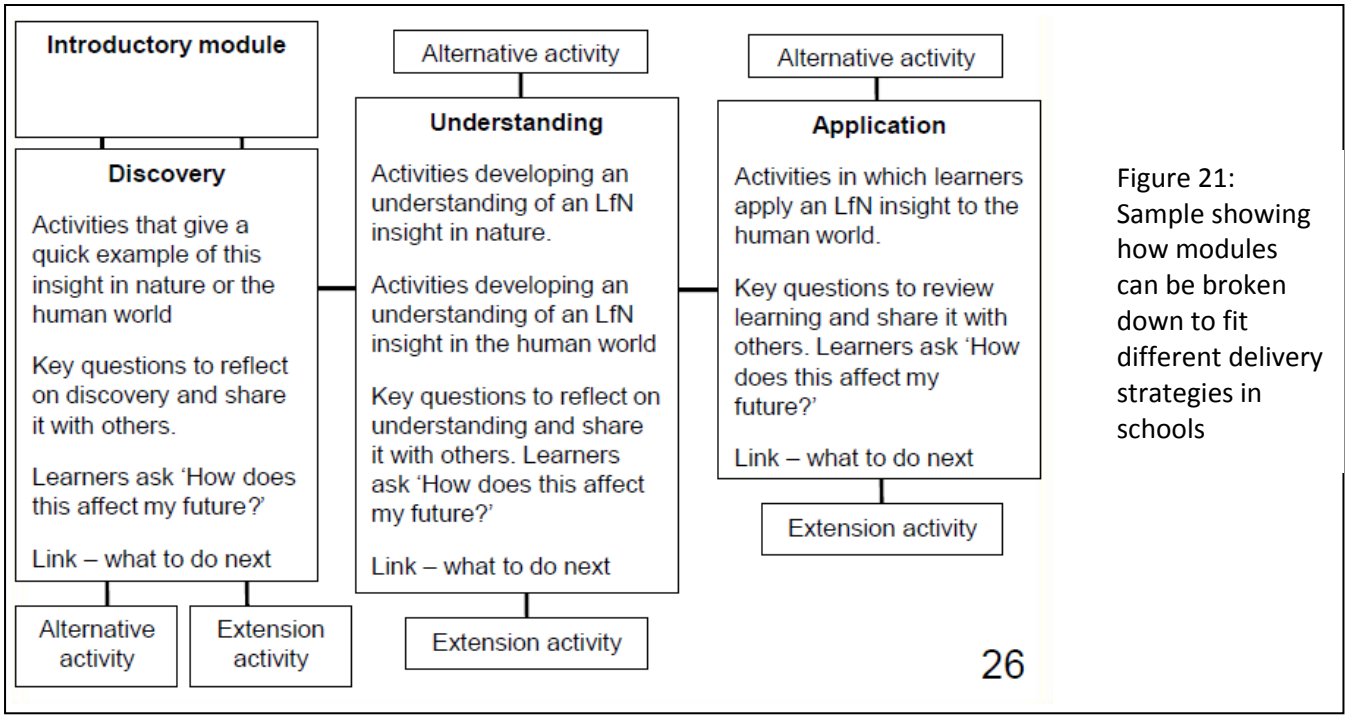


Figure 21: Sample showing how modules can be broken down to fit different delivery strategies in schools

Lessons from Nature Specification Links

OCR Business Studies GCSE Specification

The specification also requires an approach in which business activity and business behaviour is considered from a variety of perspectives. These perspectives include the:
Interests of different stakeholders in business
Need for sustainability in business
Effect of business activity on the environment
Increasing importance of ethics in business decision making
Globalisation of business activity.
The specification must also enable candidates to:
Engage actively in the study of business in order to develop as effective and independent candidates and as critical and reflective thinkers with enquiring minds
Consider the extent to which business and economic activity can be ethical and sustainable

Sample showing specific National Curriculum links in England.

3.5 Share and enhance existing criteria for successful LOtC (learning outside the classroom).

Throughout the project partners worked to integrate outdoor learning into the LfN modules. This was achievable to large extent, however, the realities of the classroom and access to the outdoors had to be weighed against the learning requirements of the project. Where appropriate alternative activities were offered should an outdoor setting not be feasible.

The partners used their experience to reflect on whether LfN has enhanced successful LOtC, and how LOtC has enhanced LfN. Below is a summary of the results showing that LfN has enhanced LOtC, which is also clearly shown in the following quote from the Director of the Council for Learning Outside the Classroom in the UK:

> *'As part of our work to promote learning outside the classroom…we are noting the rise in learning in the natural environment. Indeed many teachers are adapting lessons to learn about the natural environment. However, this (LfN) is the first time that I have seen materials designed specifically to support teachers develop lessons to promote learning from the natural environment. I believe this is a fundamental part of education for all young people.' Council for Learning Outside the Classroom.*

LfN enhances LOtC

- LfN enhances LOtC by providing a more meaningful focus and a purpose for the learner.
- Knowledge acquisition is framed to promote and understand whole natural systems and linking with/to human systems (social/economic).
- LfN provides a more systematic and holistic approach to LOtC.
- Usually LOtC is focussed in subjects like biology, natural science, ecology. LfN brings more subjects to LOtC and offers more opportunities to connect to: economy, design, arts and technology.

- LfN is an extra motivation to overcome obstacles.
- Students are motivated to go out with LfN to discover, understand, experience and apply.
- Links with the real world and real-life on economic and social issues, either through direct experience from nature or being outside the classroom.
- LFN provides examples for LOTC.
- Opportunity to link and inspire with technological processes.

LOtC enhances LfN

- Enhancing through the learning environment.
- Enhancing through the learning process.
- Enhancing through the teaching process.
- Promotes visits in nature
- Promotes more sensual activities
- Allows for activities with limited resources and time (nature abundant with materials)
- Allows different (organisation of) activities
- Learning is more relaxed and natural and thus more focused
- The ideal classroom/playground/lab/toolbox... for LfN is outside. LfN is designed mainly to be run outside, in nature.
- Nature's principles are primary... provide a measure for human designed systems
- Start anywhere outside, managing the learning process makes the difference (Nature principles)
- LfN is not only about biomimicry. Designing a product by copying nature is not necessarily sustainable. LfN focus on how nature works. In processes rather than products.
- Learning in nature gives the opportunity to feel, not only to learn or understand. There is a great difference between watching a picture of a landscape and being in that landscape: breathing, smelling, touching, feeling small... Strong feelings reinforce learning processes.
- Find examples of circular economy in real-life and nature
- Part of the LOtC activities are outside and can help understanding LfN
- LOtC is an open lab, open to constant change and is circular
- Real life experience is basis for thought process
- Very powerful learning environment
- Offers new examples and situations how nature work

What has worked well?

- A combination between outdoor and indoor educations. LOtC doesn't mean forgetting about the common classroom. There are some activities better developed inside (videos, web...). Some activities cannot be done 100% outside.
- Going outside to find solutions, without approaching the problem too biologically

What can be added?

- Would be interesting to open it to subjects like physics or speak directly about "blue economy".
- Probably it would be helpful to remove the traditional "nature" label, understood like nature sciences only. That's difficult because of the inertia of the concepts in society. It may take years.
- More link with real life and entrepreneurship.
- Relate LfN with values. Even if the value is consumerism, the current approach does work. For example you may want a new and bigger car. If the "blue/circular economy" can provide

you in a sustainable way, that's fine, but not fair. A different approach would be, for example: I value freedom to travel. How could I explore the way to do it in a diminishing fossil fuels scenario?

- A values focus

3.6 Develop a network of good practice amongst educators to continually share ideas and resources.

This is still a challenge for the project. We have successfully set up a network between ourselves to share good practice through Huddle. Some partners have set up social network sites for LfN – LinkedIn, Twitter and Facebook. In Romania and Latvia conferences have been held for project schools, teachers and students.

The question 'has a network of good practice amongst educators to continually share ideas and resources been established?' can be answered with a strong yes by the partners. The partners represent education bodies with strong links in their respective countries and are continuing to use LfN in their work. In Romania and Latvia it can be said that strong networks have been established and will continue. The situation in Bulgaria is less certain, however, TIME Foundation maintains strong links with schools. Veldwerk and the FSC have existing strong links with schools but it is debatable if LfN has strengthened these. In Spain, STERM is a teachers union and already acts as a strong network for teachers.

Two teacher quotes perhaps illustrate the start of successful networking:

> *'At the countryside we feel a little bit isolated and we are glad that through this project we were visited several time by the project team, we appreciate very much the information received and our school became part of a larger network.'*

> *'Many thanks for this project to the project team! They did a great job, and we hope that we can continue our cooperation!'*

3.7 Increase the profile of sustainable development and LOtC across the partner countries and the EU.

Responses from teachers and the cooperation from schools as detailed above show that the profile of ESD and LOtC has been raised through the project. Some more quotes from teachers support this:

> *'It helped me realise the potential of using nature to solve future problems' (UK teacher).*

> *'Yes being outside was important, as was the good range of examples used' (UK teacher).*

'Nature is an inexhaustible source of inspiration' (Bulgarian teacher).

'The most interesting aspect of this project is to involve directly to students, developing observation, critical thinking, and allowing implement capabilities that are essential in the daily life of students' (Spanish teacher).

'Students were really motivated after using LFN approach, they learnt a lot while enjoying the activities and the novel framework' (Spanish teacher).

'We understand better during this project how important are the circular economy. In countryside in Romania the population produces most of the food for their own consumption. We learned how important is to keep this tradition' (Romanian teacher).

'I'm a language teacher and I was thinking that the environmental problems are in the charge of the nature sciences teachers. By this project I understood that everybody is responsible for the future and I can involve my students in activities concerning environmental problems' (Romanian teacher).

The results of LfN have been connected with several high profile ESD and LOtC organisations, for example:

- Council for Learning Outside the Classroom UK
- National STEM Centre UK
- Sustainable and Environmental Education UK
- AQA (UK qualifications body)
- Education Scotland
- University of Latvia
- Daugaupils University (Latvia)
- Green Dot Latvia
- Birken Association (Spain)
- Wageningen University (Netherlands)
- Mures County School Authority (Romania)

This demonstrates that LfN has increased the profile of LfN amongst new organisations and target groups.

3.8 LfN by Numbers

Activity	Actual Numbers	Target Numbers
LfN Modules	32 modules completed (EN 3; BG 6; ES 5; NL 4; RO 6; LV 7)	Not specified
Student workshops at schools	63 workshops delivered (EN 23 workshops; RO 30 workshops; ES 1 workshop; NL 7 workshops; LV 0 workshops)	Not specified
Teacher training	631 teachers trained (UK 70 teachers; Romania 105 teachers; Spain 155 teachers; Netherlands 91	600 – exceeded target by 31

	teachers; Latvia 83 teachers; Bulgaria 127 teachers)	teachers
Students	6211 students reached (Spain 1082; Netherlands 486; Latvia 1815; Romania 1151; Bulgaria 932; UK 745)	7500 – missed target by 1289
Website	181080 visits; LfN modules have been downloaded 20792 times in the partner countries (Latvia: 5015 downloads; Spain: 4252 downloads; Bulgaria: 2669 downloads; Romania; 2765 downloads; UK 5358 downloads; Netherlands 713 downloads); 59 countries accessed the site.	Not specified
Schools delivering LfN	210 schools delivered LfN modules (Spain 49 schools; Netherlands 11 schools; Latvia 66 schools; Romania 30 schools; Bulgaria 36 schools; UK 18 schools)	Target 180 – exceeded by 30 schools
Student conference	Held in Latvia and Romania	Additional activity
Student competitions	Held in Latvia and Spain	Additional activity
Summer schools	Held in Bulgaria	Additional activity
LfN brochures	3700 printed (Netherlands 2500; Latvia 1000; Bulgaria 200; UK 2000)	Target 500 in each partner language
LfN videos	Produced in Spain, Romania and Bulgaria	Additional activity
Dissemination	8269 people reached	Not specified
Exploitation	LfN represented at 26 conferences and featured on over 20 websites; built into new projects in UK, Spain, Latvia and Bulgaria; 631 teachers trained; agreements reached with schools and education departments.	Target 600 teachers trained; 3 exploitation connections per partner

3.9 Reflections for the future.

Educational projects by their very nature are never perfect, especially ones as innovative and forward thinking as LfN. As the project has developed the project team felt it necessary to take decisions to move the project onwards when more time could have been spent, for example, critiquing and developing the modules. Project time presses forward and results have to be delivered.

During the final meeting the partners reflected on a number of critical questions and on the project's success.

Critical Question	
Is there interdependence in the principles (should we start with some and build up the others)?	Yes , it is something that needs to be explored and reflected on in the future. The principles are robust but their hierarchy will need further

	testing from experts in the field. It is felt that three principles provide the foundation without which the others cannot truly be said to contribute to sustainability. The three are: waste equals food, run on solar income and multiple benefits.
Shall we include the values question into the materials (can I keep consuming with LfN principles)?	This needs to be discussed in future reflection. A sustainable society which still contains injustice would not be appealing to many and so this element needs to be considered if sustainable development is to be more than a merely technical challenge.
We made assumptions about links between LfN and LOtC, but do they work in practice?	Yes, but have we sufficiently tested our assumptions? Ideally more longitudinal research than available in this project will be needed.
Aren't we jumping too high from where the teachers are?	This was not discussed in full and we need to work with teachers that did not engage in the project to ascertain the reasons why.
LfN is different from EE and ESD?	Yes.

4. Partnerships

LfN worked in six countries reaching 210 secondary schools, 631 teachers and 6211 students. The project partners are the Field Studies Council (UK), Children's Environment School (Latvia), This Is My Environment (Bulgaria), Focus Eco Center (Romania), Veldwerk (Netherlands) and STERM (Spain).

The partnership brings together partners from western and eastern Europe, and from differing cultural and political backgrounds. This ensures a robust discussion on the 'appropriateness' of the learning developed, and highlights differences and similarities. The result is that the resources developed are critically assessed to ensure they work in a range of socio-cultural contexts and are adapted accordingly.

In addressing sustainable development, a pan-European approach is a necessity. It is not possible to address issues such as climate change and biodiversity loss without coordination between countries. LfN plays a role in building a common consensus towards what a sustainable future might look like and how it can be achieved.

The project has forged a particularly strong partnership with the Ellen MacArthur Foundation, leading thinkers in education for sustainability. Staff from the Ellen MacArthur Foundation have supported the conceptual development of the project and in particular the learning framework. CES have been particularly successful in integrating LfN in university courses at the University of Latvia and Daugavpils University.

At the final Partner Meeting the external evaluator asked partners to reflect on the personal change resulting from participating in the project, what inspired them and of what they are most proud. A selection of the results shows the value of the partnership to the partners and individual team members.

Personal Change	Inspired by...	Proud of...
Desire to be more radical	Nature inspires: make clear to others what you can learn from it	Being able to share and to learn on different countries and people
More respect about nature and human life while learning more and more from both	I was inspired by the international team	Modules – really something new
Stronger belief that education must change to meet needs of learners	By opportunities LfN offers... real potential benefits for people, economy and environment	Successful communication / good networking
Changed the way I see education/learning	Inspired by nature (now I go to nature to look for the solution and think about some	Proud of facing a new challenge, in a new field (education) and deliver a nice

	problems)	approach and materials.
When designing education material I'm more critical	Inspired by a wonderful and diverse international team	Proud of improving most of my skills, mainly those related with communication and pedagogy
Absolutely I changed my view about the way in which society can eliminate toxics and wastes, while enhancing more local and efficient economies. Now, I believe in education as a power source of change in individuals	Inspired by nature (now I go to nature to think about problems and solutions), by a rich (mind) international team and Ken Robinson's educational approach (and all that stuff)	Proud to see how students make themselves the kind of conclusions that the project promotes
Greater awareness of people's varied talents	New stories about how nature inspired people	Scale of ambition
I feel more confident about circular economy	Inspired by different educational / learning approaches	Team willing to try new ideas and struggle for greater understanding
More attention to the assessment	Elegant simplicity of LfN	Quality of the modules
The way I see the future (not much better than before, but different anyway)	The abundance, multiple benefits and effectiveness of Cherry trees	That LfN will keep growing and adapting ... within and without the team

5. Plans for the Future

The LfN project has had a significant impact on the project partners and project team as highlighted in section 4 above. On a personal level it is clear that the project will continue to influence the thinking and the educational direction of the individual team members.

Several new proposals have resulted from the LfN project. The UK and Bulgarian partners both submitted Transfer of Innovation proposals entitled 'Sustainable Competencies for Vocational Careers' and 'Biomimicry Learning Labs.' Neither was selected for funding on this occasion, however, the partners are seeking funding from elsewhere.

The UK and Latvian partner is a member of the Schools for Resilience consortium, a Comenius Multilateral project. LfN pedagogy will be introduced to the project partners. The UK and Bulgarian partners are offering a Comenius In-Service Training course in April 2014.

Within the UK the FSC has concentrated on plans to integrate the LfN learning into its existing programmes at Epping Forest Field Centre and engage other centres. A proposal to include LfN into the existing FSC internal staff training has been made.

In Romania a strong network of schools was established and an agreement has been secured with the Mures County School Authority to carry on LfN work with schools. Focus Eco Centre have also made a number of other formal agreements with education provides and 41 school directors. Veldwerk in the Netherlands has worked to involve other education partners and business into LfN with some success. The Water Museum in Arnhem are interested to develop educational material based on LfN as are Wageningen University.

STERM in Spain has established an online teacher course for LfN to increase access to LfN. During the project this included teachers from Honduras and a link with Credia Honduras. STERM are working with the Birken Association to transfer the LfN learning to their Natura 2000 bio-itineraries programme. Formal approaches to the Government of Murcia were unsuccessful for budget and political reasons (the unwillingness of the government to work with STERM who are a teacher union). TIME Foundation have developed an annual Summer Academy programme based on LfN which will continue, and are developing links with the Blue Economy leading onto new project ideas for LfN.

CES have been particularly successful in integrating LfN in university courses at the University of Latvia and Daugavpils University. CES have also submitted a new proposal 'Learning together with Nature' for students with learning disabilities and are awaiting the result. Finally, through their team members they have been able to influence the draft version of the new science curriculum.

An exploitation website has been created to give wider access to the LfN materials (www.lessonsfromnature.eu). The website contains English versions of the modules that have been edited for an international audience with local curriculum specific

references removed. A blog will allow for news and stories to update progress of LfN and a wider sharing of the pedagogy and underlying thinking behind LfN.

6. Contribution to EU policies

LfN contributes to a number of key EU policies. The Europe 2020 Strategy places a strong emphasis on sustainable growth. In meeting the goals of a competitive low-carbon economy and protecting the environment, there is a need for employees with an in depth understanding of how nature works and how to design new technologies that work with rather than against nature. LfN meets the need for green skills for employment identified by CEDEFOP in Skills for Green Jobs.

The Council of Europe Conclusions of Education for Sustainable Development (2010) highlights the eight key competencies adapted by the European Parliament and the Council. LfN supports the key competencies for lifelong learning outlined and is mutually supportive of skills such as critical thinking, problem solving, creativity, initiative taking and decision making, all of which are essential for achieving the objectives of sustainable development. LfN further supports the Strategic Framework for European Cooperation in Education and Training which emphasises that education and training have a crucial role to play in meeting the many socioeconomic, demographic, environmental and technological challenges facing Europe and its citizens today and in the years ahead.

The Bio-economy Strategy for Europe stapline ‘working with nature for a more sustainable way of living’ is almost a carbon copy of the LfN approach. Whether the Strategy is a radical as LfN remains to be seen. However, the thinking and principles taught through LfN will skill young people to be active pioneers in the bio-economy.

Finally, LfN addresses elements of the Comenius policy context, namely ‘education for respect of the environment and of intercultural competencies should be enhanced as well.’ It also supports ‘finding ways to enhance the teaching and learning of transversal key competencies that foster initiative and entrepreneurship, creativity, innovation and adaption to the rapidly changing world of work

7. Extra Headings/Section