STEM By Nature
An Introduction

STEM By Nature: STEM teaching & learning in nature settings, using Outdoor Learning approaches
Guidance for a 2-3-hour training session

This session introduces and explores what is meant by 'STEM By Nature' and how it can be applied. It can be adapted to suit a range of locations and group/learner needs.

Its audience is teachers and educators, including youth workers, outdoor instructors, Countryside Rangers.

Whilst some facilitation and group management skills are needed, it's designed to be delivered by non-specialists – you do not need to be an expert in STEM learning or the outdoors.

STEM By Nature Introduction – Aims

- **Build STEM skills and confidence** through use of nature settings and Outdoor Learning approaches.
- **Introduce the concept** of STEM By Nature.
- Highlight Curriculum for Excellence, STEM, and Learning for Sustainability connections.
- Explore creativity in relation to STEM skills and nature settings.
- Demonstrate methods of pupil/learner enquiry.
- Highlight examples and opportunities for Interdisciplinary Learning.
- Address gender/equity in relation to outdoor settings.

Structure and Content

This introductory session offers an overview of STEM By Nature. It highlights some learning contexts and themes that are relevant to a range of STEM subjects, including:

- Employability skills
- Learning for Sustainability as a Curriculum for Excellence entitlement
- UN Sustainable Development Goals
- Nature Connection
- Pupil/learner enquiry
- Interdisciplinary learning
- Creativity
- Gender and equity

These can apply to themed STEM By Nature sessions e.g. Citizen Science, Coasts & Waters, Climate.

Welcome and context setting

As participants gather set an ice-breaking task with an open leading question such as:

- 'What do you do in relation to STEM at your establishment?'
- 'Do you currently deliver anything in outdoor settings?'

Collate responses on flip chart, share with group.

Introduce STEM By Nature, its origins and rationale. Confirm STEM By Nature as 'STEM teaching & learning in nature settings, using Outdoor Learning approaches'.

Note that it's a broad concept and an approach, not just a Professional Learning session or specific subject.

Outline session aims.

Note the inclusive 'educator' audience; session has relevance to a wide range of ages and backgrounds, not just schools/teachers.

Signpost to any relevant local links to Outdoor Learning, STEM, session themes; acknowledge any relevant expertise within group (and incorporate as appropriate).

Learning contexts and themes

Introduce learning contexts and themes relevant to STEM By Nature (see below), and use the time outdoors to integrate discussion and reflection at suitable points.

Note that this session is anchored by Nature Connection and that other sessions are available to explore particular themes in more depth.

STEM Employability Skills

It's useful to introduce STEM employability skills early. Ask participants to consider how progression in these skills can be observed/developed whilst engaged in activities outdoors. Review at session end.

Learning for Sustainability

Use the Learning for Sustainability Word Cloud to consider and explore its relevance to STEM By Nature.

Learning for Sustainability is a Scottish educational approach to learning that encourages learners and educators to explore the concepts of sustainable development, global citizenship and outdoor learning in ways which develop the skills, knowledge and values needed to live sustainable lifestyles. At its most effective, it is delivered across the curriculum and extends to influence the life and ethos of an educational setting. There is strong evidence of the effectiveness of Learning for Sustainability in developing pro-environmental attitudes and behaviours, and that it has an impact on broader educational outcomes.

Learning for Sustainability is aligned to the United Nations Sustainable Development Goals, offering a starting point to explore local issues within a global context and vice versa. It is an entitlement of all pupils, a professional registration requirement of the General Teaching Council for Scotland, and currently a priority in Scottish education.

Reference: The Impact of Learning for Sustainability on Educational Outcomes: A Summary of Findings
Reference: A summary of Learning for Sustainability resources
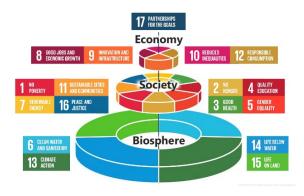
UN Sustainable Development Goals

Ask participants which UN Sustainable Development Goals relate to STEM By Nature; share this [Biosphere](#) model of how they can be seen to interconnect.

STEM By Nature sessions can be set up to link STEM learning with specific Sustainable Development Goals and related initiatives e.g. land-based surveys, trees and woodland studies (Citizen Science), Climate Ready Classrooms, Year of Coasts and Waters. A session can be set in a context of one or more UN Sustainable Development Goals e.g. #14 Life Below Water, #15 Life on Land, or other relevant Goals relating to ecological and sustainability issues.
Reference: [Sustainable Development Goals](#)

STEM, Outdoor Learning and Nature

The most urgent, challenging issues for individuals and society, locally and globally, have STEM and Nature at their core, helping with our understanding and identifying potential solutions. Taking learning outdoors engages learners in active ways and gives opportunities for learning in real life contexts. Nature provides rich, multi-sensory experiences that can be a catalyst for curiosity and an important starting point and context for STEM learning.

Nature Connection is good for us, with potential for vitality, purpose and happiness (see summary of benefits in [Noticing Nature](#) p.41). Nature connection and actions that can result can also be good for the planet. Nature experiences can impact on values, reinforcing concern for issues such as biodiversity loss and climate change, and motivate people towards environmentally friendly lifestyles.

Introduce *5 pathways to nature connection*: 'a route for new closer, healthier and more sustainable relationship with nature comes through noticing, feeling, beauty, celebration and care'.
See [The Pathways to Nature Connectedness postcard](#) for the framework and some things to try.

Pupil/Learner Enquiry

Ask practitioners what they understand by pupil/learner enquiry, and what techniques and activities they have used to promote it.

It's an approach where learners decide for themselves, ask their own questions and carry out their own independent investigations. It is typically active and learner-centred, with practitioners taking on a facilitator role to develop skills (e.g. information processing, problem solving) and nurture inquiring attitudes.

See *Spectrum of Enquiry* in STEM By Nature & Citizen Science Session.

Interdisciplinary learning

STEM refers to a collective of specific subjects (Science, Technology, Engineering and Maths). STEM By Nature embraces nature settings and outdoor learning approaches (whilst encouraging creativity and integrated use of the arts too).

[Interdisciplinary learning](#) enables educators and learners to make connections across learning through exploring clear and relevant links across the curriculum. It supports the use and application of what has been taught and learned in new and different ways. It provides opportunities for

deepening learning, for example through asking big questions, exploring an issue, solving problems or completing a project. STEM By Nature offers rich potential for Interdisciplinary Learning.

Outdoor Activities

Present activities as introductions and 'tasters' rather than fully delivered, to keep within a limited timeframe, to share a wide variety of ideas, and to give space to integrate and discuss elements noted above. Monitor opportunities to consider STEM Skills, methods of pupil/learner enquiry and interdisciplinary learning as they arise.

Icebreaker - Outdoor Learning journey

Ask participants to arrange themselves in a 'scale of experience' semi-circle, based on where they are in their own Outdoor Learning journey (using the outdoors frequently/ infrequently). Discuss briefly.

Nature Connection: Self-guided activity

Offer participants a selection of nature connection activities in suitable outdoor settings. Examples can be found on the Nature Pathways postcard, or via Mission:Explore (Food, Water, John Muir) e.g. walk barefoot in the grass, create a soundmap, hug a tree (see Sharing Nature for introductory video for these activities).
Invite participants to reflect on benefits of noticing nature.

Creativity and STEM Learning

Frame activities in the context of using art and creativity in nature settings as part of STEM learning.
Introduce The Lost Words (see below) and The Lost Words Explorer's Guide.
Read different poems aloud in groups.
Find 1 or 2 suitable short activities e.g. write a collective group poem – Poetree.
Reference: OWL Tree Stories; OWL Wolf Brother's Wildwoods
Reference: @STEAMFife, " Sharing and promoting all things to do with Science, Technology, Engineering, the Arts and Maths in Fife" and STEAM Activities.

Review with STEM Skills

Reference STEM employability skills.
Review each of the session's outdoor activities using the
STEM Employability skills map to highlight particular skills
used and/or developed. (Add review notes to display
board/flip chart as participants return indoors).

Gender Equity and STEM

Show 2 minute film about unconscious gender bias:
Inspiring the future: redrawing the balance.
Discuss how Improving Gender Balance and Equalities
(IGBE) ties in with national priorities. Gender imbalance is a
particular issue with STEM subjects and related
employment opportunities.
Signpost IGBE resources on the National Improvement Hub.
If possible, share some hard copies.

Encourage practitioners to look at classroom/centre and outdoor interactions and complete a gender audit (of indoor and outdoor classroom/centre/relevant setting displays, gender ratios in activities/groups, and descriptive language used) as part of a local learning/homework ask.

Signposting and wrap up
Introduce the STEM Self-evaluation and Improvement Framework: "a framework to stimulate dialogue and action towards a whole setting approach STEM". It can be integrated with the quality indicators within 'How good is our school?' and 'How good is our early learning and childcare?'. The framework aligns with expectations within the STEM Education and Training Strategy, Developing the Young Workforce and other priorities in education.

Open discussion/round robin: "What can you take away with you from this session?"
Introduce STEM By Nature Information & Resources padlet: a place to collate relevant and referenced resources (along with other relevant locations of resources e.g. Glow).
Create a padlet to share participant conversations and activities.

Local Learning Task suggestions
Discuss ways to make use of the STEM Self-evaluation and Improvement Framework with colleagues.
Reflect on gender stereotypes in relevant indoor and outdoor settings.
Share a photo/quote/tweet. Note use of relevant hashtags for social media sharing e.g. #STEMByNature.

Resources – links and signposting
Have hard copies of these resources available (or web access and links) for participants to view.
John Muir Award Sustainability Resource Guide
John Muir Award and Curriculum for Excellence
John Muir Award Literacy & Nature Resource Guide - highlights how nature and the outdoors can inspire and support literacy skills, and can easily be adapted for a STEM learning context.
The Lost Words: Information & resources including free Explorer's Guide download plus posters of Dandelion, Otter, Kingfisher, Conker, Bramble; Padlet for sharing creative outputs; #TheLostWords.

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