FSC Scotland, Citizen Science & STEM Learning

Citizen Science is "getting everyone, from experts to amateur biologists, school children to enthusiastic beginners, involved in science" (TCV). More formally, it involves the gathering, recording and analysis of scientific data by members of the public. Internet access means anyone across the globe can get involved.

Citizen Science covers a range of activities including:

- **observing and monitoring** e.g. gathering data to find out about wildlife populations
- **informing action** e.g. providing data to organisations about floods or pollution
- **promoting learning** e.g. informing learners with information about climate change
- **testing hypotheses** e.g. using science activities to test a specific question
- **crowd-sourcing** e.g. online activities to gather or analyse data to achieve a common goal
- **helping communities** learn about their local environment e.g. with a Bioblitz

An excellent resource from Education Scotland, Citizen Science and Curriculum for Excellence, highlights how these activities are relevant to sciences, numeracy & maths, literacy, social studies and health & wellbeing.

Citizen Science has much to offer as part of every learner's entitlement to Learning for Sustainability, for career awareness and digital skills, and for considering gender balance issues. It's an excellent way to engage with specific UN Sustainable Development Goals – in particular Sustainable Cities and Communities, Climate Action, Life Below Water, Life On Land - in a meaningful way. It creates natural opportunities for interdisciplinary learning across and beyond STEM subjects (Sciences, Technologies, Engineering and Maths), a significant Scottish Government priority. Through its real-life learning context and experiential hands-on approach it brings local and global issues to life, creating meaning and relevance for pupils and educators alike.

FSC Scotland, Citizen Science & STEM Learning

FSC Scotland & Citizen Science

The Field Studies Council (FSC) has a 75-year tradition of bringing people together to monitor, survey, record and analyse all aspects of the natural world. Its UK-wide network of learning centres is staffed by leading experts and specialist associates, helping to understand and sustain habitats and species. FSC has an international reputation for its residential experiences, training courses, taxonomic identification skills, and its publications and resources.

FSC has been creating and supporting Citizen Scientists since 1944, with the aim of bringing environmental understanding to all. Its work carries on traditions of Charles Darwin, sharing values of curiosity, enquiry and enthusiasm for nature, science and sustainability.

FSC is an innovator, partner and user of Citizen Science initiatives and resources. It helped set up OPAL (Open Air Laboratories) in 2007, producing survey packs, contributing to a UK-wide database and providing outreach sessions in schools. A funded OPAL focus in Scotland from 2014 to 2018 has demonstrated the value of Citizen Science activities and resources in supporting outdoor learning approaches and meeting learning needs. It has helped to pioneer Bioblitzes, and created #CityNatureChallenge and Invertebrate Challenge.

STEM by Nature

STEM learning is now a Scottish Government priority. It has "a vision of Scotland as a STEM nation: with a highly-educated and skilled population equipped with the STEM skills, knowledge and capability required to adapt and thrive in the fast-paced, changing world and economy around us".

Key questions asked of educators, practitioners and partners include:

- What experiences and opportunities help learners to acquire skills, knowledge and confidence in STEM?
- What opportunities are there to link STEM-related learning to other aspects of the curriculum and wider learning contexts/strategies?
- What professional learning opportunities enhance STEM knowledge and skills?

FSC Scotland has coined the term 'STEM by Nature'. It embraces the rich potential of Citizen Science, outdoor settings and nature-based experiences to contribute and respond to STEM learning for pupils and practitioners alike. Whilst the framing is new, the experience of these being at the heart of residentials, professional development, and practitioner support is well established.

FSC Scotland is exploring its scope and capacity to help implement the STEM Education and Training Strategy for Scotland. It's positioning its work to support Young STEM Leader programme beyond a pilot phase, creating professional development opportunities with the Raising Aspirations in Science Education (RAiSE) programme and Regional Improvement Collaboratives, and developing a 'Literacy & Numeracy through Nature & Science' Primary School offer for its residential and outreach work.

FSC Scotland, Citizen Science & STEM Learning

FSC Scotland & Field Studies

Field Studies, or Fieldwork, is practical work or the collection of raw data in the natural environment rather than in a laboratory, library, or office setting. The approaches and methods used can vary across disciplines from simply observing animals interacting with their natural habitats, to conducting field research and interviews. It's what puts the F (and S) in FSC.

These aren't currently used as general terms in Scottish education, but do have relevance to specific curriculum areas including Geography, Science and Biology. Activities such as Upland River Study, Coastal Study of Sea Defences, Geomorphological Mapping, and Investigating Highland Climate are 'fieldwork'; all sit within contexts such Learning for Sustainability and can integrate Literacy and Numeracy skills. And, clearly, Field Studies and Fieldwork are interwoven in contemporary thinking about Citizen Science and STEM learning.

Professional Development, Practitioner support

A key ambition of the Scottish Government's STEM Strategy is to ensure that educational practitioners are "well-equipped with the knowledge, skills and confidence to develop and deliver inspirational, high-quality interdisciplinary STEM teaching for all learners, across all ages and stages".

"Looking at Professional Learning and building capacity of teachers in relation to STEM and Improving Gender Balance, we need to build the confidence of 45,000+ practitioners - it's all hands on deck" according to Ian Menzies, Senior Development Officer at Education Scotland. "Outdoor Learning and Learning for Sustainability have a key part to play."

FSC Scotland, with its Citizen Science expertise and use of outdoor learning pedagogies, is well placed to instil confidence and enthusiasm, promote interdisciplinary learning and approaches, and demonstrate the relevance of STEM learning and skills.

In particular, STEM by Nature is being developed as a professional learning model. It has scope for scaling and replicating in diverse contexts and locations across Scotland, with a view to increasing the quality, variety and impact of STEM professional learning available to practitioners. Formats currently proposed include face-to-face delivery, online modules, collaborative projects and peer support within Local Authority and Regional Improvement Collaborative networks.

A collaborative approach to FSC course provision offers professional learning opportunities in design, delivery and follow-up. In helping to deliver pupil entitlement for Learning for Sustainability, FSC Scotland recognises the commitment in the GTCS Professional Standards that every practitioner, school and education leader should demonstrate Learning for Sustainability in their practice in a way that is "robust, demonstrable, evaluated". It supports effective whole-school and interdisciplinary approaches to STEM and Learning for Sustainability.

FSC Scotland, Citizen Science & STEM Learning

Ideas & Information, Links & Resources

Citizen Science and Curriculum for Excellence Education Scotland guidance on how Citizen can be used as a motivating context to promote skills development in sciences, STEM subjects, literacy & numeracy.

Scotland's Environment Links to topics and projects looking for Citizen Science contributions, with many offering tools to support fieldwork in school or community groups. It encourages everyone 'to get involved in looking after the environment, because you're part of it, everything you need comes from it, and everything you do changes it'.

Citizen Science Portal A place to share data and ideas

FSC Biodiversity Projects FSC BioLinks: "Who's who in the world of biological recording?"

National BioBlitz Network Free resources on how to run a BioBlitz event, monitor local wildlife and help biological recording efforts.

Scotland Counts TCV's project aims to ensure that every individual and community in Scotland has the opportunity to develop skills and confidence to understand their local environment through Citizen Science.

Citizen Science, an introduction A free 5-module online course for "the participation of people outside science (universities, research centres and government bodies) in scientific research" gives an accessible overview of key aspects of Citizen Science including IT, understanding participants' motivations.