LSIS STEM Support

Science, Technology, Engineering and Mathematics (STEM) education in the FE and Skills Sector

The Learning Legacy

LSIS LEARNING AND SKILLS IMPROVEMENT SERVICE

Support for STEM (Science, Technology, Engineering & Maths) across the FE & Skills Sector.

An overview of the resources created and lessons learned from the three-year programme.

Practical tips for subject-specific CPD and support developed through sector-led practice.

Raising awareness of the support available for STEM education.

LSIS STEM Support: The Learning Legacy

Introduction

Welcome to The Learning Legacy from LSIS STEM Support. In the three years from September 2010, LSIS STEM Support implemented a range of effective approaches to Continuous Professional Development (CPD) for teachers and managers of Science, Technology, Engineering and Mathematics (STEM). This document aims to share those approaches, consider lessons learnt and signpost resources and ongoing support infrastructure available to improve teaching and learning across STEM in the Further Education and Skills sector

Contents

LSIS STEM Support: The Programme

Funded by LSIS (the Learning & Skills Improvement Service), the STEM Support programme was delivered by a consortium of the National Science Learning Centre, The Royal Academy of Engineering (RAEng) and the National Centre for Excellence in the Teaching of Mathematics (NCETM). In turn, these partners connected with leading STEM organisations to ensure that the FE and Skills sector had access to the wealth of STEM resources and expertise available across education, industry and government. LSIS STEM Support also offered on-the-ground support through nine regional STEM Advisers all of whom were practitioners in the FE and Skills Sector and well-positioned to create and support local collaborative learning communities, run CPD activity, disseminate best practice and advise on resources needed to improve STEM teaching and learning.

Lessons Learnt

During its three years, LSIS STEM Support developed a menu of activities and resources aligned with national priorities for improvement across STEM subjects, delivered in a context appropriate to regional needs. Monitoring of impact, assuring quality of delivery across a regionally devolved programme and responding to needs identified by the sector, enabled lessons to be learned about effective support for STEM:

- Pedagogy needs to lie at the heart of STEM support; professional development approaches should model effective pedagogies and mirror the active delivery methods recommended to improve teaching and learning.

- Engagement of managers and leaders is essential to achieve meaningful organisational impact and raise awareness of the importance of STEM.

- Teaching and learning support should be sector-led but enabled to draw on additional subject-specific expertise, resources and support available from the wider STEM community.

- Practitioners should lead on needs analysis, identifying areas for improvement and support which then inform national strategy.

- A subject-specific focus needs to be at the heart of CPD and networking activity.

- Follow-up support and monitoring of impact increases the effectiveness of professional development activity.

- It takes time to build capacity and expertise in this sector. The impact of LSIS STEM Support increased over the life of the programme.

The Structure of the LSIS STEM Programme

Pedagogies lay at the heart of LSIS STEM Support, both in terms of creating effective CPD and supporting teaching and learning. To embed effective pedagogical practice, LSIS STEM Support focused on the following:

- Developing and delivering subject-specific CPD.
- Creating a portfolio of resources including activities that could be used directly with learners; effective practice case studies; and CPD tools.
- Connecting with expert organisations across the STEM community.
- Developing and delivering subject-specific CPD.
- Embedding awareness of STEM educational issues within a provider to inform CPD and development strategies.

Resources

LSIS STEM Support created a range of resources developed from its work with practitioners. The aims of the resources include:

- sharing effective practice,
- embedding pedagogy,
- implementing CPD strategies,
- enhancing subject-specific knowledge, and
- promoting STEM.

The full collection of LSIS STEM resources is available on the National STEM Centre. What follows here is a summary of the different type of resources created and the aspects of STEM education they support.

FE STEM Planning Tools

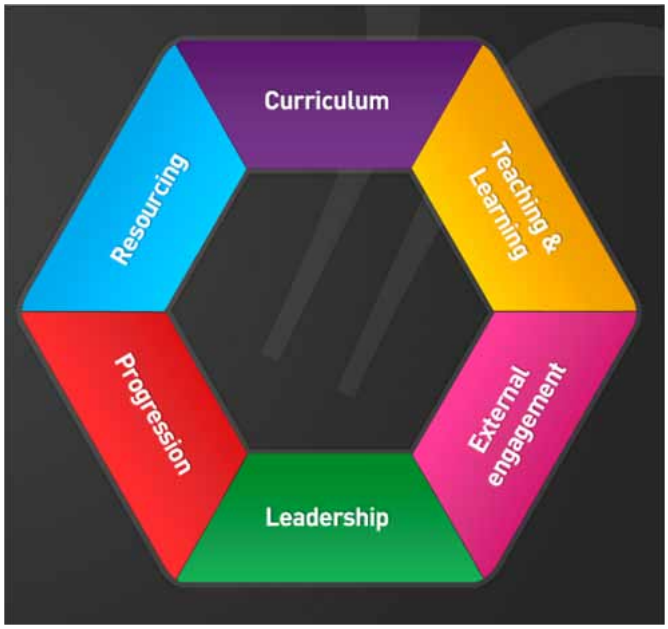
The FE STEM Planning Tools offer a gateway to all of the resources developed by the LSIS STEM Support Programme and its predecessors - Subject Learning Coach Programme and the National Teaching & Learning Change Programme.

The FE STEM Manager tool has been designed to help managers think about the ways in which STEM provision can be improved within their organisation. It draws together reports, documents and resources - many produced by managers and practitioners in the sector. By using the FE STEM Planning Tools, practitioners can explore key areas of developing and delivering improved STEM provision:

- Curriculum
- Teaching & Learning
- External engagement
- Leadership
- Progression
- Resourcing.

Explore the tools >

The Elements of the FE STEM Planning Tools



LSIS STEM Collection

This collection brings together the best resources created by LSIS STEM Support. The resources include case studies, reports, tools such as activity and discussion cards, and resources to embed effective pedagogy in teaching and learning.

[Explore the collection >]

Action Research Projects

These research reports describe a wide range of improvement projects in post-16 education and training. The research has been performed by practitioners in STEM subjects in diverse institutions.

[Explore the projects >]

Effective Practice Case Studies

These case studies describe the work of providers in the sector and are a valuable source of information on a range of strategies for improving teaching and learning. Case studies are from providers throughout England and cover topics as varied as:

- Improving learner progression in STEM
- Enriching and enhancing STEM education
- Effective employer engagement
- Equality and diversity.

[Explore the case studies >]

Subject-Specific Professional Development

Through its lifetime, LSIS STEM Support created CPD activity which was responsive to regional needs. By listening to practitioners and using their expertise, the programme enabled successful collaborations within and across learning providers, so can offer guidance to others looking to share effective practice and support effective subject-specific CPD across STEM.

Evaluation from LSIS STEM Support CPD Events

After each event participants were asked to rate the impact of the event under four categories in terms of their CPD:

- improved knowledge and skills
- change in the teaching practice of the individual participant
- change in the organisation of the participant
- improvement in learning.

Overall impact was taken to be the highest of these four ratings. 97% of participants reported impact over a month after the event, with almost half reporting the highest rating of impact. The results show that teachers and managers who have engaged in LSIS STEM Support CPD identified improvements in practice and that these changes are beneficial to learners within their organisation.

Lessons Learned

The points below offer guidance to anyone looking to create network events or deliver CPD within their own institution.

• Targeting the Session

In order to be effective, a CPD session needs to be relevant to the participants. Publicity needs to clearly identify what the nature of the activity will be and the target audience, as well as including precise instructions about location and timings. There is real value in engaging line managers in the CPD, even if they are not STEM specialists themselves, as it raises awareness of the STEM agenda across the organisation.

Using a venue that is interesting and relevant to the event adds value and a tour can be included in the programme. Even apparently 'dull' venues can be of interest to participants; it is always interesting to see someone else's college lab. Finally, try to hold the event on Tuesday to Thursday and definitely avoid Friday afternoons.

• Demonstrating the Pedagogy

The CPD session should include activities that can be used by the participants directly in their

teaching. It is very valuable to allow enough time for the participants to do these activities as though they were students, enabling a process of empathy and reflection.

Most important of all is the use of a variety of pedagogies in the running of activities - avoid giving a lecture about active teaching!

- ## Be Subject Specific

Subject-specific content is of real value, both for practitioners who may not be teaching their specialism and for those who need their subject knowledge updating with cutting-edge, real-world developments. More than a quarter of people who responded to the LSIS survey reported that increased subject knowledge was the most significant element of the impact on their knowledge and skills.

- ## Use the experts

There is a wealth of STEM support organisations who can contribute to events - providing speakers, resources and interesting projects to consider. Align activity with national strategies, responding to national concerns or agendas. For example, explore the under-representation of women in engineering by looking at teaching approaches, resources and activities that can engage and retain female students on engineering courses.

- ## Sharing Ideas & Practice

The opportunity to network and share ideas is invaluable. LSIS STEM surveys showed that the highest rated impact was from the sharing of ideas with other teachers at an event. It is helpful to structure and manage sharing sessions and give them prominence on the agenda. Ask people to bring along relevant ideas or resources.

Allow a reasonable amount of time for refreshment breaks as these provide additional, valuable, informal sharing sessions. Offer reasonable refreshments; a decent lunch can generate productive discussions.

- ## Follow up

Extend the CPD beyond the event to maximise impact. Ensure delegates can take something from the event to embed into their practice within a short timescale. For example, ask delegates to write on a postcard two actions which they will implement as a result of attending the event; then send the postcard to the delegates as a reminder a week after the event.

Encourage ongoing networking by sharing the contact details of everyone after the event (with their permission). It is also useful to collate and distribute details of all the resources presented by speakers and participants throughout the event. Finally, some kind of follow up, days or weeks after the event, reminds people to use the ideas encountered.

Sustaining STEM Support

The LSIS STEM Support Programme drew on the wealth of expertise that exists across industry, education and research, connecting with many partners, all of whom deliver resources and support for STEM teaching and learning. The organisations outlined below are not a comprehensive list but provide useful starting points for accessing STEM support.

STEM

- The National STEM Centre

The National STEM Centre houses the UK's largest collection of STEM teaching and learning resources, in order to provide teachers of STEM subjects with the ability to access free of charge a wide range of high-quality support materials.

Explore the collection >

- STEMNET

STEMNET manages a scheme of STEM Ambassadors. These are volunteers from across STEM industry and research who work with teachers to help bring real-world STEM to life for students. It is free to connect with a STEM Ambassador.

Contact your local STEMNET office >

- STEM Directories

The aim of the STEM Directories is to connect teachers with the wide range of activities in the UK that can help enhance their teaching. The online catalogue offers a searchable database of excursions and in-college activities such as shows, workshops, debates, challenges and visiting speakers to help enhance STEM learning.

Search the directories >

Science

- The Association for Science Education (ASE)

The ASE is the largest subject association in the UK, providing a professional body for all those involved in science education across all sectors.

Explore the support and events >

- The National Network of Science Learning Centres

The national network of Science Learning Centres provides the highest quality Continuing Professional Development for teachers and technicians.

Find out more >

- Institute of Physics (IOP)

The IOP is charitable organisation working to advance physics education, research and application. It also offers an online portal to a wide collection of teaching resources.

Search the IOP resources >

- Royal Society of Chemistry (RSC)

The RSC has created a large portfolio of resources both for teachers and students, including videos, games and tutorials.

Explore the resources >

Engineering

- ### Royal Academy of Engineering

Support from BP has allowed the Academy to launch a three-year programme called Engineering Further Education (EFE) which supports teaching and learning on engineering courses in general further education colleges.

Find out more about EFE >

- ### New Engineering Foundation (NEF)

NEF: The Innovation Institute is a professional body and a leading provider of SciTech innovation and growth services to business, education and government.

Find out about the NEF >

Maths

- ### National Centre for Excellence in the Teaching of Mathematics (NCETM)

The NCETM has a portfolio of free online tools designed to support your professional development as a teacher of maths and numeracy.

Explore the online centre >

- ### Further Mathematics Support Programme (FMSP)

Working with the NCETM, the FMSP supports teachers of A level and Further Mathematics through online resources, CPD, strategies for offering Further Mathematics and ideas for promoting mathematics to your students to get them engaged with the opportunities studying Further Mathematics offers.

Access Further Mathematics support >

LSIS STEM Support

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www.nationalstemcentre.org.uk/stem-in-context/support-for-colleges