



National  
**HE STEM**  
Programme



# STRATEGY 2010 - 12

*Enabling the HE sector to engage with schools, enhance curricula, support graduates and develop the workforce.*



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# 1 VISION, MISSION AND VALUES

## The National **HE STEM**

Programme supports higher education institutions in encouraging the exploration of new approaches to recruiting students and delivering programmes of study within the Science, Technology, Engineering and Mathematics (STEM)<sup>1</sup> disciplines. It enables the transfer of best practice across the higher education STEM sector, facilitates its wider adoption, and encourages innovation. Through collaboration and shared working, the Programme focuses upon sustainable activities to achieve long-term impact within the higher education sector.

The Programme works with the higher education institutions to encourage and support students participating in higher education from non-traditional backgrounds, and enhance the skills and knowledge base of the global workforce. Widening participation underpins the work of the Programme, and it supports higher education institutions enhance their practices when working with groups of learners who are traditionally not well represented within the STEM disciplines in higher education, be they currently within school, college, university, or the workplace.

The work of the Programme takes place across three related strands:

1. Widening participation within the STEM disciplines at university level, by supporting HEIs to work with those currently within the school and FE sectors;
2. Higher education curriculum developments focusing upon course delivery and design and student support, to enhance student knowledge, progression and skills;
3. Encouraging those currently within the workforce and society to engage with further study to develop enhanced knowledge and skills.

It undertakes a range of strategically targeted activities to bring real benefit to those involved with the disciplines of Chemistry, Engineering, Mathematics and Physics within higher education. It acts as a focus for **HE STEM** sector activity, supports those who wish to adopt or share good practice with others, and develops new and innovative practices. It brings together those with a common interest and vision to improve the way we recruit students and deliver programmes of study within the STEM disciplines. Engagement by individuals with the Programme provides ready access to a national community of expertise, support, resources and opportunities.

<sup>1</sup>Within the context of the National HE STEM Programme, STEM refers primarily to the disciplines of Chemistry, Engineering, Mathematics and Physics.

A series of core values underpin all aspects of the work of the Programme:

1. HE focus – activities focus upon supporting and enhancing the short to medium term practice of higher education institutions, but always with a view to enabling longer-term sustainability.
2. Evidence informed practice – where possible, the Programme builds upon existing proven practice.
3. Sustainability – all activities have potential for sustainability in the longer-term.
4. Institutional change – the Programme itself chooses not to focus upon direct delivery. It focuses upon enabling and supporting changes in institutional practices.
5. Collaboration – activities are built around partnership and collaboration, both within and across the STEM sectors.
6. Value-added – the activities of the Programme do not duplicate those of others, but work to bring added value to the higher education sector.
7. Sharing – Programme outputs and resources are made freely available to the higher education sector.

While focused upon supporting UK higher education institutions, the UK itself competes within a competitive global marketplace. Success for the Programme and its activities will not only enhance the experience of UK home students, but also the experience of international students choosing to study within the UK. It aims to place UK Higher education Institutions at the forefront of the global HE marketplace.



## **2 PROGRAMME AIMS AND OBJECTIVES**

**To contribute to the development of a national Higher education STEM sector which:**

- **Engages collaboratively to increase and widen participation**
- **Promotes, supports and champions the STEM disciplines, and**
- **Is increasingly responsive to the skills needs of both employers and employees**

**In order to support the development of a strong, diverse and sustainable workforce that will meet the economic needs of the UK for the 21st century.**

Key objectives designed to support achievement of this aim are:

1. To develop infrastructures which enable the higher education and employment sectors to offer a collaborative and sustainable supply of life-long-learning opportunities to support the UK workforce from school, during university and within the workplace.
2. To develop innovative and transferable models and programmes of activity across the disciplines of Chemistry, Engineering, Mathematics and Physics, relating to access, skills development and employer engagement through the integration and strategic development of existing activities, initiatives and resources, that will offer demonstrable long-term benefit to the higher education sector.
3. To broker and facilitate the community-wide sharing and dissemination of good practice in relation to higher education STEM activities, education and employer engagement.
4. To establish a culture of sustainable collaboration within the national higher education STEM sector by working in partnership with HEIs, employers, professional bodies, and existing and future initiatives and organisations.
5. To act as a catalyst for institutional change so that the National **HE STEM** Programme may be embedded within the higher education sector to create a long-term and sustainable programme of activity.
6. To develop an efficient, effective and adaptable programme of national activity that responds to emerging sector needs, national and devolved policies and priorities, and offers a high quality experience to all who engage with it.



### 3 ABOUT THE STRATEGY

The Programme's strategy collectively defines its approach across its three delivery strands: enhancing HE sector engagement with the school and college sectors; higher education curriculum developments; and, encouraging those within the workforce to engage with university study. It defines areas of activity within each strand that are measurable, and that ensure the Programme meets its overall aims and objectives.

A natural level of overlap exists between the delivery strands. The three strands therefore need to be considered collectively and as a coherent national programme of activity.





## 4 UNDERPINNING PRINCIPLES

Underpinning the National **HE STEM** Programme's strategy and its work are a series of principles: Widening Participation; Sustainability; Employer Engagement; and Efficient and Effective Delivery.

### **4.1 Widening Participation**

The Programme focuses upon widening participation within the STEM disciplines, and as such works to ensure a broadening of the intake of learners into the STEM disciplines within higher education:

- Provide opportunities for engagement with higher education by those traditionally not represented within the STEM disciplines;
- Increase participation, retention and progress throughout the learning cycle by learners from all backgrounds.

While activities take place across the STEM disciplines represented by the Programme to widen participation, differences exist in patterns of student participation between these disciplines that require explicit attention. The Programme's strategy allows flexibility to enable the Programme to address individual disciplinary needs.

### **4.2. Employer Engagement**

Engagement with employers is vital for the Programme to fully and successfully implement its activities focused upon higher level skills. It is critically important to identify and respond to the differing and varied needs and circumstances of the whole range of employers in this respect, from multinationals to small and medium sized enterprises, including being duly responsive to the demands of the sectors in which they customarily operate. Where we refer to 'employer engagement' throughout this strategy we acknowledge that employers do not constitute a homogenous group, and relationships and solutions will vary from case to case. As such, the activities undertaken should engage employers in an appropriate two-way manner; they will not solely focus upon what employers can offer to the higher education sector, but also what the higher education sector can offer to both employers and their employees.

To support and underpin implementation and engage employers actively in its work, the Programme undertakes the following:

- Develops definitions of employer engagement within the context of the STEM disciplines, and identify and disseminate effective models of higher education and employer collaboration;
- Develops sustainable mechanisms for increasing levels of employer engagement in supporting Higher education STEM curriculum development and delivery;
- Builds capability within Higher education institutions across the STEM subjects to engage with employers;
- Articulates the two-way benefit of higher education and employer interaction to both sectors;
- Supports higher education institutions to enter into more efficient and effective dialogue with employers by working with established networks and utilising established communications channels;
- Works with employers to stimulate and create demand for higher education amongst their employees;

## UNDERPINNING PRINCIPLES 4

- Uses graduates now within the workplace to act as ambassadors for encouraging wider higher education and employer engagement.
- Provides equal opportunities for individuals and higher education institutions to engage with the Programme and its activities;
- Provides advice, support and guidance to those from the higher education sector to build expertise within higher education institutions.

### **4.3. Sustainability**

Sustainability is a core focus for the Programme and at the heart of all its activities. The sustainability of the Programme's activities not only focuses upon embedding activities within the curricula and core practices of higher education institutions, but also upon building and sustaining capability within the sector. The Programme works to ensure that underpinning its activities is the vision that they inform and influence future institutional strategies and priorities.

To support long-term sustainability of its activities the Programme:

- Ensures activities are focused around higher education institutions and targeted to provide clear benefit to the HE sector;
- Undertakes activities that have the potential for wider adoption and embedding by Higher education Institutions or that inform HE sector policy and practice;

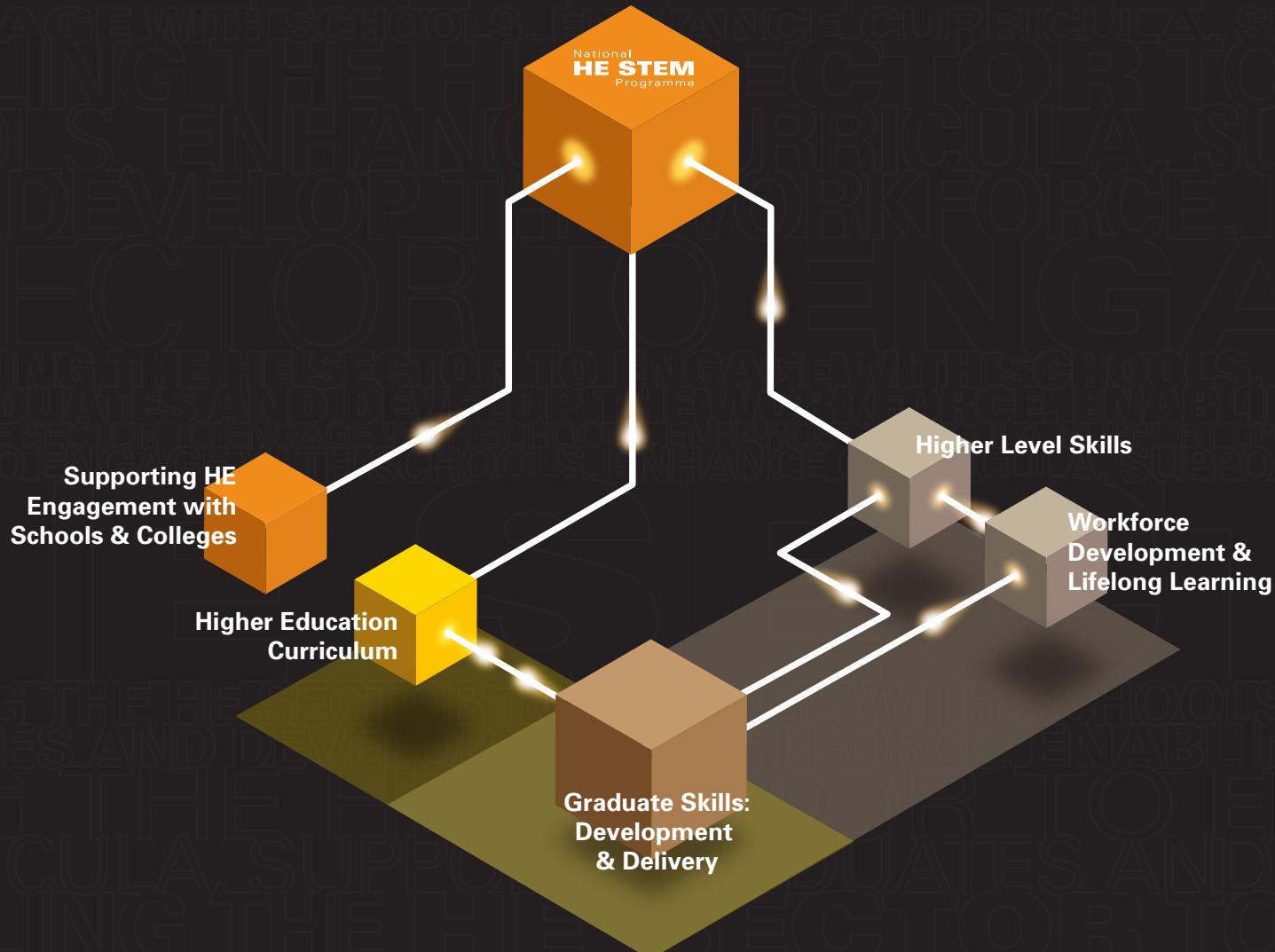
- Utilise resources in an efficient and accountable manner, to deliver cost effective activities that offer value for money;
- Ensure all Programme activities are well monitored and delivered to high quality standards;
- Communicate information, ideas, activities and priorities amongst partners to ensure a co-ordinated and coherent programme of activity and provide opportunities for collaborative working;
- Provide opportunities for external advice and guidance to shape and develop the activities and priorities of the Programme;
- Ensure ongoing opportunities for the sharing and dissemination of information relating to the Programme and its activities with the wider STEM community;
- Undertake a rigorous and systematic external evaluation of the Programme to ensure learning is available to influence future HE sector activity.

### **4.4. Efficient and Effective Delivery**

The National **HE STEM** Programme undertakes significant activity that is delivered by a range of partners across the HE sector. There is therefore an ongoing need to ensure that this activity is appropriately managed, monitored and informed, and that there exists an efficient and effective transfer of practice amongst Programme partners to avoid duplication of effort. Across all areas of activity, the Programme and its Partners:

## **Underpinning Principles:**

- Widening Participation
- Employer Engagement
- Sustainability
- Efficient & Effective Delivery





## 5 SUPPORTING HIGHER EDUCATION ENGAGEMENT WITH SCHOOLS AND COLLEGES

### 5.1. Overview

Higher education institutions have an important role within UK society in raising aspirations and encouraging those within the school and college sectors to engage in further study. The Programme recognises the wealth of good practice that exists within both the higher education and wider STEM sectors, and identifies approaches that build upon existing activities through the transfer and embedding of good practice. The Programme seeks to increase higher education sector engagement with related local and national initiatives and organisations, increase the impact of university led activities within schools and colleges, and develop learner communities focused around higher education institutions.

At the heart of Programme activity to widen participation amongst students of school and college age is the national transfer and embedding of proven practices from four discipline based projects developed independently by the Royal Society of Chemistry (Chemistry for our Future), the Institute of Physics (Stimulating Physics), the Royal Academy of Engineering (the London Engineering Project), and a consortium of mathematical

bodies (More Maths Grads), into the core practice of higher education institutions.

#### Aim:

***"To increase the impact of Higher education STEM sector activity and interventions with schools, colleges and local communities".***



Key activities of the Programme to enable this aim are:

**SC1** Develop and sustain links between higher education institutions and regional providers of STEM outreach, enhancement and enrichment activities, professional bodies, and employers;

**SC2** Develop and sustain links between regional higher education institutions and those within their local regions as a means of increasing engagement with higher education from traditionally under-represented groups;

**SC3** Transfer and embed best practices and approaches developed across the higher education sector, in particularly those of the Professional Bodies involved in the delivery of the four disciplinary pilot projects, to influence current practice and enable HE sector activity;

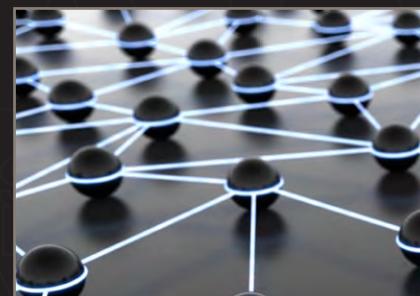
**SC4** Stimulate areas of activity to enable targeted and high quality higher education institution led interventions to support their engagement with schools, colleges and further education providers;

**SC5** Disseminate examples and guidelines of effective practices between higher education institutions and local schools and colleges and encourage greater collaboration and the sharing of information;

**SC6** Enable more effective targeting of university led outreach, enhancement and enrichment activities and interventions within schools and colleges to ensure engagement with potential widening participation cohorts;

In order to:

- Widen participation amongst those choosing to study the STEM disciplines at higher education level.





## 6.1. Overview

The Programme works to support STEM departments and faculties in enhancing their learning, teaching, assessment and support practices. Enhancing and developing existing practices to increase the retention, progression, motivation, and achievement of undergraduate STEM students not only has a positive effect upon their learning experience, but also contributes to the development of future generations who will be keen to re-engage with higher education in support of its activities.

The Programme's work around the Higher Education Curriculum aligns closely with its work on higher level skills.

### Aim:

***"To enhance delivery of the Higher education curriculum to improve the overall learning experience offered to undergraduate students within the STEM disciplines".***

Key activities of the Programme to support this aim are:

**HEC1** Transfer and embed best practices and approaches developed across the Higher education sector, in particularly those of the Professional Bodies involved in the delivery of the four disciplinary pilot projects, to influence current practice and enable HE sector activity;

**HEC2** Disseminate examples of effective practices and evidence informed approaches, and encourage greater collaboration and the sharing of information;

**HEC3.** Enable a pan-STEM approach to the implementation of higher education curriculum developments and practice;

**HEC4** Support the development of learning, teaching, assessment and support practices to enhance the undergraduate learning experience;

**HEC5** Support higher education institutions to develop and align their undergraduate curricula in response to local and national needs and priorities.

In order to:

- Increase student progression, motivation and capability within higher education, with a view to increasing the overall attractiveness of the **HE STEM** curriculum to future generations of learners.

## 7 HIGHER LEVEL SKILLS

### 7.1. Overview

The Programme's work around Higher Level Skills focuses upon enhancing the core practices of the higher education STEM sector in engaging with the national higher level skills agenda. Its activities are focused to ensure that it leaves as its legacy a more flexible sector better prepared to provide the higher level skills required by employers, employees and UK society.

The Programme's approach has an overarching focus on Higher Level Skills, but consists of two specific sub-strands to enable the breadth of the national higher level skills agenda to be addressed.

The Workforce Development and Lifelong Learning sub-strand enables the Programme to support the higher education STEM sector in providing opportunities for those already in the workforce to develop enhanced knowledge and skills.

The Graduate Skills – Development and Delivery sub-strand supports higher education institutions to work with employers to enable their programmes of study provide the necessary opportunities for undergraduate students to develop the range of knowledge, understanding, skills and

competencies required to ensure they are adequately prepared for the workplace.

The approach recognises that while upskilling the UK workforce is a priority, it is also advantageous to increase the skills and knowledge base of those within UK society more broadly. The benefits to an individual and society following engagement with higher education are well documented, and increasing the scientific literacy of UK as a whole has real potential to increase the global competitiveness of the nation through its influence on current and future generations.





## 7 HIGHER LEVEL SKILLS

### **7.2. Higher Levels Skills: Overarching Aims and Objectives**

Higher education has an important role in promoting and enhancing the knowledge-based aspects of the UK economy. At a political level the prominence of the STEM capability of a nation is seen as a measure of how technologically advanced and innovative it is, and the relationship between scientific and technological innovation and strong economic growth is widely cited.

The Programme recognises the importance of the contribution that the higher education STEM sector can make to meeting the current and future skills needs of the UK and its economy:

#### **Aim:**

***"To support and enable the UK higher education sector to better meet the higher level STEM skills needs of the global workplace for the 21st Century".***

Key activities of the Programme to support this aim are:

**HS1** Disseminate models and examples of previous effective practices and approaches, and stimulate and support their transfer and adoption by the higher education STEM sector;

**HS2** Develop and apply models of delivery that are transferable across the higher education STEM sector;

**HS3** Build expertise within higher education institutions to enable the sector to better respond to the current and future needs and priorities of the UK and its economy;

**HS4** Build and sustain effective higher education centred relationships with employers, employees, and those within society;

**HS5** Influence institutional approaches to the higher skills agenda by informing institutional policies and practices;

In order to:

- Enhance the alignment of higher education provision with the current and future needs and priorities of the UK economy;
- Increase the range of learning opportunities available within the STEM disciplines at higher education level;

### **7.3. Workforce Development and Lifelong Learning**

The Workforce Development and Lifelong Learning sub-strand guides the work of the Programme to support higher education institutions increase the knowledge, understanding, skills and competencies of those currently within the UK workforce who have not previously participated within higher education.

Key activities of the Programme in this area are:

- WDL1** Stimulate demand amongst employers, employees and those within wider society for engagement with higher education institutions at a local level to meet identified needs and priorities;
- WDL2** Work collaboratively with existing local, regional and national organisations to apply and develop workforce-related practices within the STEM disciplines;
- WDL3** Develop models of flexible and responsive HE provision to enable more accessible entry into higher education and to respond to immediate employer sector skills shortages while building longer-term ways of working for the higher education sector;
- WDL4** Explore new modes of delivery and assessment for higher education provision, and increased recognition of prior experience and of the provision provided by others while ensuring quality standards are maintained;

- WDL5** Articulate the benefits of engagement with higher education and successful practices to act as a stimulus for encouraging further uptake of provision by those within the workforce and society.

## 7 HIGHER LEVEL SKILLS

### **7.4. Graduate Skills – Development and Delivery**

Whereas the Workforce Development and lifelong learning sub-strand focuses upon enhancing the skills and knowledge base of the current workforce, the STEM Graduate Skills – Development and Delivery sub-strands focuses upon ensuring those who graduate from higher education STEM Programmes possess the necessary skills and competencies to contribute fully in the global workplace.

Key activities of the Programme are:

- GS1** Embed experiential learning into STEM undergraduate Programmes to provide students with real world industrial and occupational experience;
- GS2** Enable opportunities for employers to contribute to undergraduate teaching, learning or project work;
- GS3** Involve employers, or employer groups, in higher education STEM course development, design and delivery where a need or benefit exists;
- GS4** Enable higher education Institutions to provide enhanced opportunities for students to develop their wider skills as part of their undergraduate programmes of study;
- GS5** Encourage Professional Body accreditation of undergraduate programmes of study to include enhanced recognition of wider skills development.



Success of the National **HE STEM** Programme will see success across the higher education STEM sector. Indicators of success will include:

- The incorporation of proven discipline-based widening participation interventions into the core practice of higher education institutions.
- Targeted interventions, led by higher education institutions, within schools and colleges where participation in STEM higher education is traditionally low.
- More strategic targeting by higher education institutions in the delivery of their outreach, enhancement and enrichment opportunities.
- The development of new and innovative approaches to higher education based widening participation activity, the delivery of undergraduate programmes of study, and employer engagement.
- STEM Programmes of study within higher education institutions that provide increased and enhanced opportunities for undergraduate skills development and exposure to the workplace.
- Curriculum changes or developments within HEIs that contribute directly towards the enhancement of the learning experience of undergraduate students.
- An increase in the number of learning opportunities within the STEM disciplines for those who wish to engage with study on a flexible or part-time basis.
- Increased engagement between regional HEIs leading to a collaborative approach towards increasing and widening participation within the STEM disciplines.
- Increased interaction between higher education institutions and employers in the delivery of university level STEM provision and evidence of its benefits.
- Increased or enhanced interactions between higher education institutions and existing STEM initiatives and organisations.
- Greater awareness of sector-wide STEM activity and the transfer of best practice between higher education institutions.



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