



Strategy: 2010 - 2012

October 2010

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)¹ 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.

Programme activities take 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.

The Programme adopts a holistic approach by considering the progression of students from school, through university and into the workplace. It facilitates the involvement of those currently within the workforce into undergraduate programmes of study, and at the same time encourages employers to work collaboratively with universities to enhance the undergraduate curriculum and support their outreach and widening participation activities.

The Programme examines the current undergraduate curriculum, explores the teaching of the critical STEM skills, and encourages the development of innovative practices to ensure graduates of all ages are adequately prepared for their workplace. It encourages universities to look at their teaching, learning, assessment and support mechanisms, and develop innovative practice that is then shared across the sector through collaborative working.

Higher education institutions are encouraged to engage with both employers and employees on a regional basis and develop flexible and tailored programmes of study to meet regional skills needs. The Programme supports higher education institutions to enter into two-way dialogue with employers regarding the provision that they offer and how they offer it. It examines successful current practice, particularly from other disciplines, to see how this may be transferred to the STEM subjects and how such provision can be piloted, evaluated and rolled out nationally; it also encourages and supports innovation in this area exploring alternative forms of learning and assessment.

A fundamental principle underpinning activities of the Programme is widening participation. The Programme will support higher education institutions enhance their practices when targeting groups of learners not traditionally well represented within STEM higher education, be they currently within school, college, or the workplace. In addition, work focused upon the higher education STEM curriculum will not only aid retention amongst all learners, but will also enhance progression to and within the workplace. Activities to engage those currently within the workplace will seek to support both employers and employees interested in accessing STEM provision.

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

The National HE STEM Programme 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. Engagement by individuals with the Programme provides ready access to a national community of expertise, support, resources and opportunities. 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.

At the heart of the Programme is work to assist higher education institutions adopt and embed proven approaches that increase the impact of their activities and enhance the overall learning experience of all students who engage with the STEM disciplines. Through collaborative working and the sharing of ideas, higher education institutions are supported to try new approaches that bring benefit to both their staff and students.

The Programme builds upon the previous activities of four disciplinary Pilot Projects that have a wealth of tried and tested approaches relating to outreach, curriculum design, and student support available for higher education institutions to adopt with the support of Programme partners. The Programme will continue to develop a range of activities to respond to regional needs in a collaborative manner, and undertakes specific activities to meet disciplinary needs and priorities. In a flexible manner, the Programme makes available opportunities for engagement by the higher education sector.

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

1. HE focus – recognising likely developments in public sector funding from Autumn 2010, all activities should 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 will build upon existing proven practice.
3. Sustainability – All activities should be sustainable in the longer-term.
4. Institutional change – The Programme itself won't focus upon direct delivery. Its focus will be upon enabling changes in institutional practices.
5. Collaboration – All activities should be built around partnership and collaboration, both within and across the STEM sectors.
6. Value-added – The activities of the Programme should not duplicate those of others, but work to bring added value to the HE sector.
7. Sharing – Programme outputs and resources will be made freely available to the HE sector.

The National HE STEM Programme will encourage and support students participating in higher education from non-traditional backgrounds, and enhance the skills and knowledge base within the global workforce. A series of outcomes will indicate success:

- 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.

- 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.
- 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.
- Greater awareness of sector-wide STEM activity and the transfer of best practice between higher education institutions.

While the Programme's strategy is focused around supporting UK higher education institutions, the UK itself competes within a competitive global marketplace. Successful implementation of the Programme's strategy 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

The Aim of the National HE STEM Programme is as follows:

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 overall strategy is summarised by Figure 1, and brings together the individual strategies for delivery within its three areas of activity defined in full in section 1: 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 details a series of activities within each strand that are measurable, and that will ensure the Programme meets its overall aims and objectives.

A natural level of overlap exists between the three strategies and this is to be expected. In particular, aspects of the Programme's Higher Education Curriculum Strategy are more appropriately embedded within the Higher Skills Strategy as they reflect activities intended to increase undergraduate engagement with employers, and employer based skills and practices. The three strategies should therefore be considered collectively, and progress against each will enable the overall progress of the Programme to be monitored.

4. Underpinning Principles

Underpinning the National HE STEM Programme's strategy are a series of principles. These are: Widening Participation; Sustainability; Employer Engagement; and Efficient and Effective Delivery. During implementation of the strategy, the principles should be considered to inform and underpin the development of all Programme activities.

4.1. Widening Participation

The focus of the National HE STEM Programme is upon widening participation within the STEM disciplines, and as such its implementation will need to focus upon ensuring a broadening of the intake of learners into the STEM disciplines:

- 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.

The approach recognises that while activities can take place across the STEM disciplines represented by the Programme to widen participation, differences exist in patterns of student participation between the disciplines that require explicit attention.

4.2. Employer Engagement

Engagement with employers will be crucial if the Programme is to fully and successfully implement its Higher Skills Strategy. It will be 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 in fulfilment of the strategy 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 of the Higher Skills strategy and engage employers in appropriate aspects of the Programme's other strategy areas, the Programme will seek to undertake the following:

- Develop definitions of employer engagement within the context of the STEM disciplines, and identify and disseminate effective models of higher education and employer collaboration;
- Develop sustainable mechanisms for increasing levels of employer engagement in supporting Higher education STEM curriculum development and delivery;
- Build capability within Higher education institutions across the STEM subjects to engage with employers;
- Articulate the two-way benefit of higher education and employer interaction to both sectors;
- Support higher education institutions to enter into more efficient and effective dialogue with employers by working with established networks and utilising established communications channels;
- Work with employers to stimulate and create demand for higher education amongst their employees;
- Use graduates now within the workplace to act as ambassadors for encouraging wider higher education and employer engagement.

4.3. Sustainability

Sustainability is a core focus of the National HE STEM Programme. The sustainability of the Programme's activities will not only focus 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 will seek 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 will:

- Ensure activities are focused around higher education institutions and targeted to provide clear benefit to the HE sector;

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- Undertake activities that have the potential for wider adoption and embedding by Higher education Institutions or that inform HE sector policy and practice;
- Provide equal opportunities for individuals and higher education institutions to engage with the Programme and its activities;
- Provide advice, support and guidance to those from the higher education sector to build expertise within higher education institutions.

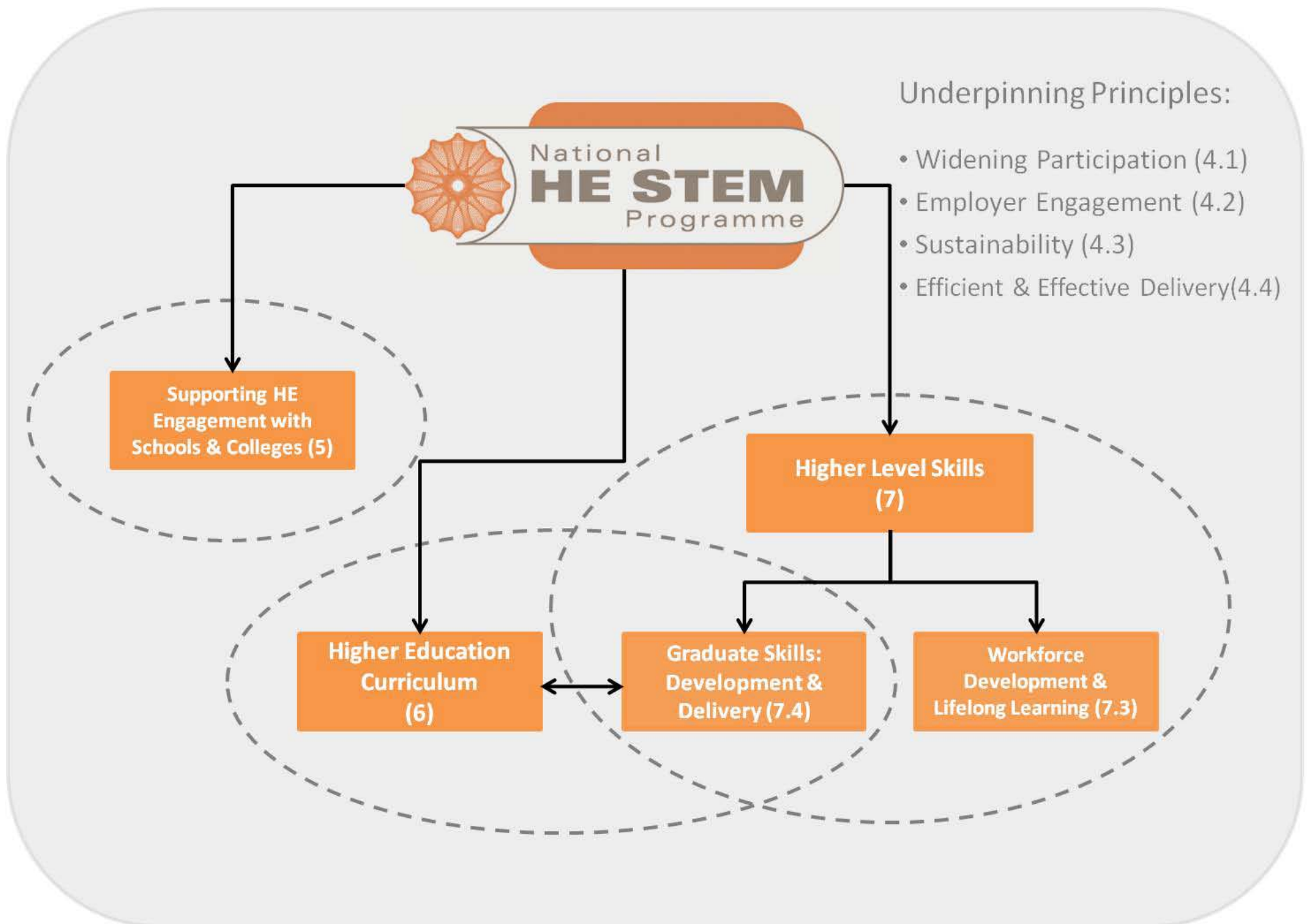


Figure 1: National HE STEM Programme Strategy

4.4. Efficient and Effective Delivery

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

- 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.

5. Strategy for 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's strategy in this area 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's strategy 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's strategy to support this aim will be:

- 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. Higher Education Curriculum Strategy

6.1. Overview

The National HE STEM Programme's Higher Education Curriculum Strategy has been developed 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 will not only have a positive effect upon their learning experience, but will also contribute to a future generation who will be keen to re-engage with higher education in support of its activities.

As demonstrated by Figure 1, the Programme's Higher Education Curriculum Strategy aligns closely with the Higher Skills Strategy.

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's strategy to support this aim will be:

- 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 Strategy

7.1. Overview

The Programme's Higher Level Skills Strategy has been developed to enable it to enhance the core practices of the higher education STEM sector in engaging with the national higher level skills agenda². It is intended to focus the activities of the Programme, and 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 approach consists of an overarching Higher Skills Strategy, with two specific sub-strategies to ensure the Programme addresses the breadth of the national higher level skills agenda. The Workforce Development and Lifelong Learning sub-strategy will enable 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-strategy will support higher education institutions to work with employers to ensure that 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 strategy 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.

7.2. 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

² Higher Education at Work – High Skills: High Value (2008) (http://www.dius.gov.uk/consultations/con_0408_hlss.html)

innovative it is, and the relationship between scientific and technological innovation and strong economic growth is widely cited.

The overarching aim of the Programme's Higher Level skills strategy 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's strategy to support this aim will be:

- 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. Sub-strategy: Workforce Development and Lifelong Learning

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

Key individual activities of the sub-strategy 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.

7.4. Sub-strategy: Graduate Skills – Development and Delivery

Whereas the previous sub-strategy related to workforce development, the STEM Graduate Skills – Development and Delivery sub-strategy focuses on ensuring those who graduate from higher education STEM Programmes possess the necessary skills and competencies to contribute fully in the workplace.

Key individual activities of the sub-strategy 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.