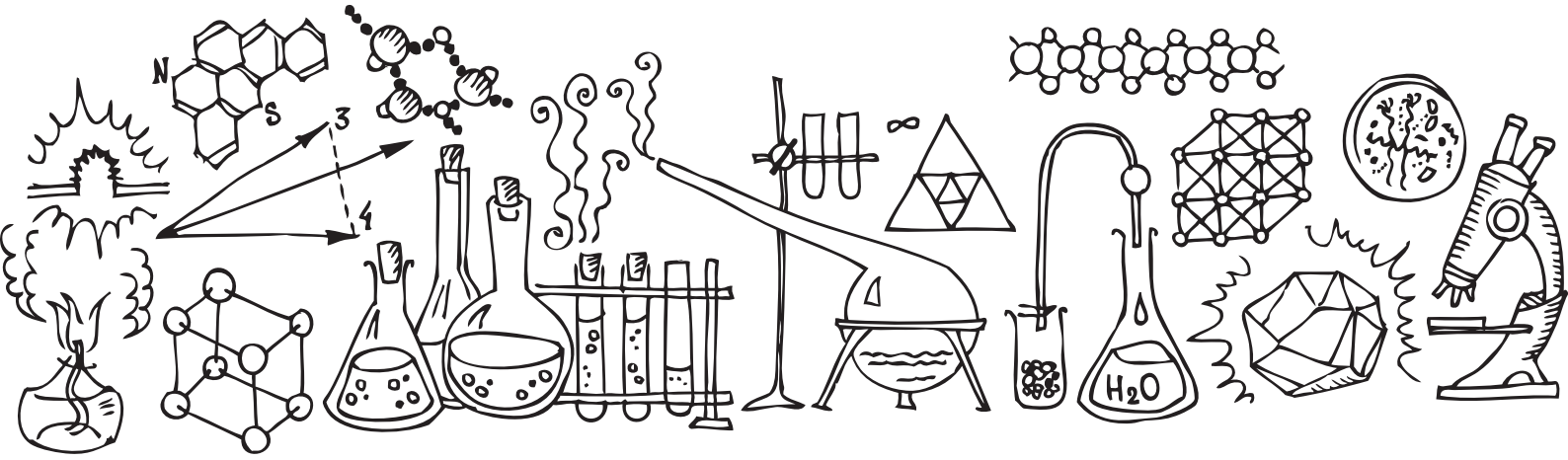
SUCCESS THROUGH STEM

STEM STRATEGY

In response to the 'Report of the STEM Review'

HELPING TO EMPOWER FUTURE GENERATIONS THROUGH SCIENCE, TECHNOLOGY, ENGINEERING AND MATHEMATICS TO GROW A DYNAMIC, INNOVATIVE ECONOMY



2011

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1. INTRODUCTION

Commissioned by the Department for Employment and Learning (DEL) and the Department of Education (DE), the review of Science, Technology, Engineering and Mathematics (STEM) commenced formally on 29 June 2007. Chaired by Dr Hugh Cormican, founder and former Chief Executive of Andor Technologies Ltd., the steering group comprised representatives from business, government and academia and the Programme Manager for the review was Dr Alan Blair, from the Association of NI Colleges (now Colleges NI).

Three working groups reported to the steering group, each of which was responsible for taking forward a key strand of the Review. These working groups ensured a focus on the respective roles of business, education, and government in promoting the STEM agenda.

The 'Report of the STEM Review', published on the 30 September 2009, considers the education system in the context of a STEM artery and identifies the constraints and losses at each stage in the artery. In doing so, it identifies a number of issues and challenges, including, particularly, the risks associated with increasing disengagement from STEM, as evidenced by reducing enrolments across various STEM subjects in post-primary schools, further education colleges and universities. The natural consequence of that is a reducing flow of people qualified in STEM subjects at all levels into our workforce. However, it is worth noting that more recent statistical evidence shows that this decline is starting to reverse with a 2.4% increase in the number of students studying STEM in the post 16 cohort between 2007/2008 and 2008/2009.

The Report contains 20 recommendations grouped under four 'imperatives'.

- **Imperative 1** - Business must take the lead in promoting STEM.
- **Imperative 2** - The key constraints in the STEM artery must be alleviated.
- **Imperative 3** - There needs to be increased flexibility in the provision of STEM education.
- **Imperative 4** - Government must better coordinate its support for STEM.

This STEM Strategy forms Government's response to the 'Report of the STEM Review'.

Each Department will produce an implementation plan containing fully costed projects and timescales which will have their outcomes linked to their contribution towards the recommendations contained in Annex B. It should be noted that departmental contributions will be designed to be affordable within a constrained public expenditure context.

2. CONTEXT

Achieving the current Programme for Government's priority of growing a dynamic and innovative economy relies heavily on the skills of the workforce. Widening the skills base is central to growing and rebalancing the economy. Recent research[1] indicates that the growing sectors of the economy will require an increasing number of skilled workers with qualifications in STEM. This is supported by the evidence of the Independent Review of Economic Policy (IREP) report[2] and the work carried out by the Department of Enterprise, Trade and Investment's (DETI) Matrix Science Panel as well as Sir Gareth Roberts' Review[3] and Lord Sainsbury of Turnville's Review[4]. However, at the same time and in common with other regions and countries, we face the challenge of declining interest in, and uptake of, STEM subjects among our young people.

This issue of declining STEM enrolments is not unique to NI. A report by the Organisation for Economic Co-operation and Development's (OECD's) Global Science Forum[5] shows that, as a proportion of all enrolments, enrolments in STEM areas have been falling for a prolonged period across much of the developed world including in the United States, France and Germany.

This decline begins in the latter years of primary education and continues through post primary and tertiary education. It manifests itself in reducing enrolments in particular subjects at post primary level, and is creating a potential shortfall in the supply of those with STEM qualifications at various levels required for the growth of the economy[6].

The 'Report of the STEM Review' cites many reasons for this at each stage of the supply artery including:

- Children developing negative attitudes to science in primary school and many primary teachers lacking the knowledge, skills and confidence to deliver a science and technology programme which develops progressively the children's skills and knowledge;
- A disjoin between Key Stage 2 and 3 meaning that pupils often repeat work which they mastered in primary school; and
- The perceived difficulty of these subjects at Key Stage 4.

Between 2004/05 and 2009/10, the number of GCSE entries in STEM subjects in schools here decreased by 10.3%. However, it should be noted that the year 12 cohort in mainstream post primary schools dropped from 25,792 pupils in 2004/05 to 24,244 pupils in 2009/10. Between 2004/05 and 2009/10, the number of A level entries in STEM subjects in schools here increased by 14.4%.

Relative to Great Britain, the proportions of STEM students in further education here are much higher. However, data for further education show that the trend in declining enrolments in NI is similar to that in Great Britain. For the last four years for which published data are available (2003/04 to 2006/07) STEM enrolments[7] in further education here have dropped by 8.2% (from 82,193 to 75,421) compared to an 8.4% decline (from 275,900 to 252,700) in enrolments in STEM subjects in further education in Great Britain[8].

[1] 'Forecasting Future Skill Needs in Northern Ireland', Oxford Economics, February 2009
[2] 'Independent Review of Economic Policy', R. Barnett, September 2009
[3] 'SET for Success', Sir Gareth Roberts, April 2002
[4] 'The Race to the Top', Lord Sainsbury of Turnville Review', October 2007
[5] Report on the Evolution of Student Interest in Science and Technology Studies, OECD Global Science Forum (May, 2006). See http://www.oecd.org/dataoecd/16/30/36645825.pdf
[6] 'Report of the STEM Review', Department of Education and Department for Employment and Learning, September 2009
[7] STEM related qualifications include qualifications in the following subject areas; Medicine & Dentistry, Subjects allied to Medicine, Biological Sciences, Veterinary Sciences, Agriculture & related subjects, Physical Sciences, Mathematical Sciences, Computer Science, Engineering & Technology and Architecture, Building & Planning
[8] Results from the Republic of Ireland are not directly comparable

When we consider our university system, more students study STEM as a proportion of all enrolments. Of the 48,200 students enrolled at our higher education institutions in 2007/08, 23,055 (48%) were enrolled on STEM related courses. The equivalent percentages for England, Scotland and Wales are 40%, 47% and 37% respectively.

In addition to this, the most recent data (2008/09) shows that over 8,000 people locally domiciled are currently enrolled on STEM related courses at higher education institutions in Great Britain and the Republic of Ireland. Recent research[9] suggests that the vast majority of students who leave, do so because they wish to broaden their horizons or attend a university based on its reputation or because it offers the course they want to study. However, many do not return [67% of 2007/2008 domiciled leavers who attained STEM related qualifications through full-time study at Great Britain's higher education institutes did not return to NI for employment]. The reasons are various. The 'Report of the STEM Review' notes "Graduates are becoming increasingly mobile and will be attracted by the offer of substantial higher salaries in economies such as that of the USA."

This demonstrates that, at present, the issue is not so much the potential supply of people with skills in STEM but rather the low employment returns on STEM educational investment here compared with elsewhere.

In support of this, the number of jobs available in the STEM sector has not increased significantly over recent years and, as the 'Report of the STEM Review' highlights, "the pay level of graduates has not shown any increase locally". Both these facts do not suggest a problem with supply at the present time.

However, if the economy grows as predicted by supporting and growing indigenous STEM businesses and attracting inward investment in these sectors, then demand will increase and, in the longer term, demand is likely to substantially outstrip supply.

This is supported by the 'Forecasting of Future Skill Needs in NI' and is a key theme of the revised and updated Skills Strategy, "Success Through Skills – Transforming Futures".

The latter contains a 'Strategic Goal' to "increase the proportion of those qualifying from higher education institutions with graduate and post graduate level courses in STEM subjects (with an emphasis on Physical and biological Sciences, Mathematical and Computer Science, Engineering and Technology) by 25% - 30% in 2020 from a baseline of 18% in 2008".

The Executive is committed already to growing the number of people studying STEM subjects in the post 16 cohort and to increasing the number of students, especially those from disadvantaged communities, at graduate and post graduate level studying STEM subjects. This commitment has been reflected in the Programme for Government's Public Service Agreement targets for 2008 – 2011 and the revised and updated Skills Strategy, 'Success Through Skills – Transforming Futures'.

It is important to note that the future need for a STEM skilled workforce relies on the demand from business. At the same time as improvements are made to the STEM artery, local businesses reliant on STEM expertise and opportunities from Foreign Direct Investment (FDI) must grow at a similar rate and offer attractive employment opportunities. If an increase in attractive employment opportunities does not occur, there is a risk that the students qualified in STEM will continue to migrate to other regions where there are better employment opportunities or will continue to shun the opportunity to study subjects in STEM areas. This has been recognised in the draft framework for the new economic strategy published by the NI Executive sub committee on the Economy (January 2011). The framework highlights the importance of Innovation and the commercialisation of Research and Development as a key driver of economic growth.

[9] 'After School: Attitudes & perceptions of Northern Ireland school leavers towards higher & further education, training and employment' Osborne et al, June 2008 http://www.delni.gov.uk/after_school.pdf

It is of utmost importance that all departments (in particular DE, DEL, DETI, the Department of Culture, Arts and Leisure (DCAL) and the Department of Health, Social Services and Public Safety (DHSSPS)) continue to work together to identify the role they can play in helping to increase both the numbers studying STEM subjects at school, college and university and the attractiveness of the opportunities in the sector.

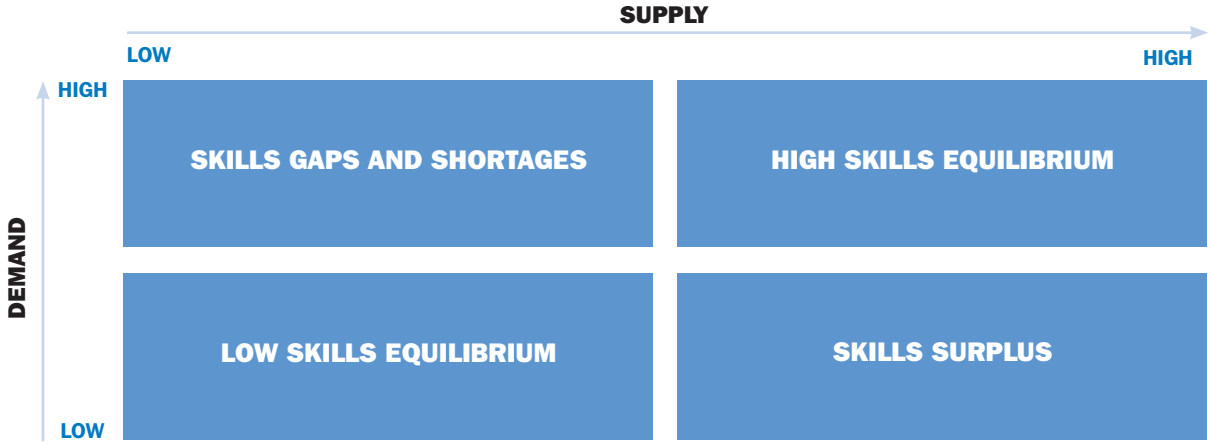
Business (in terms of private sector employers) must consider the role it needs to play, especially in growing demand. In many ways, it is the kingpin governing the success, or otherwise, of this strategy. Employers have a crucial role to play in terms of improving the attractiveness of the STEM sector and in highlighting the opportunities that exist locally, particularly in the private sector. As the 'Report of the STEM Review' notes "If the private sector here does not take steps to improve remuneration for STEM employment, it will be difficult to present a credible promotion of the benefits of STEM careers within the private sector, to parents and pupils alike".

Government, therefore, cannot increase enrolments etc on its own. It requires concerted effort by employers, Sector Skills Councils and the supply side including schools, further education, training providers and higher education.

The challenge for the Executive will be to grow the STEM skills of the workforce at the same time as the economy grows through attracting more STEM based FDI into NI and expanding our local STEM based businesses, i.e. balancing supply and demand in a growing economy. In doing so, we will be able to move from the current low wage; low skill equilibrium (see figure 2.1) ''to an economy which is characterised by a sustainable and growing private sector with a highly skilled, flexible workforce working in high productivity innovative firms which compete in global markets[10]''.

Supply and demand need to grow together and this strategy centres on this key concept and how we can couple the two elements together in a programme for growth. In doing so, this strategy outlines how Government will address the recommendations contained within the 'Report of the STEM Review' which fall under its remit and help to facilitate business to take forward the recommendations which are their responsibility.

Figure 2.1: Moving from a low to high skilled equilibrium



(Source: LEED Designing Local Skills Strategies project, 2007-2009 adapted from Green et al, 2003)

[10]Consultation of priorities for sustainable Growth and Prosperity - DETI Jan 11

3. THE ROLE OF THE DEMAND SIDE

Business (in terms of private sector employers) must consider the role it will play in growing the supply of STEM skills into the local workforce. Employers have the key role to play in improving the attractiveness of the STEM sector and in highlighting the opportunities that exist locally and in working with the supply side to articulate demand and ensure that the courses that are in place meet their needs.

The current Programme for Government and the IREP report both highlight the importance of increasing the number of skilled workers with STEM skills. A key recommendation in IREP was the need to place a much greater focus on innovation and research and development (R&D), and it is recognised that this means the economy will increasingly demand skills such as STEM qualifications. For this reason, IREP recommended that the local education system prepares now to meet the anticipated increased demand for higher level skills in STEM and other innovation relevant subjects arising from the greater emphasis on innovation and R&D.

Through the work of Matrix, the Northern Ireland Science Industry Panel, we now have a much clearer idea of the potential medium to long term market opportunities for the Northern Ireland economy. This includes potential markets in areas such as Life and Health Sciences, Information and Communications Technology (ICT), Agri-Food, Advanced Engineering and Advanced Materials. In addition, the Matrix Panel has finalised a study into potential markets built on telecommunications.

However, Matrix was clear that if we are to take advantage of these opportunities and grow Northern Ireland's knowledge economy, we must have a flexible and responsive skills system which can align the skills supply chain to market need. Having a workforce with a strong foundation in STEM skills is essential if we are to realise this vision.

These skills however need be relevant and informed by current and future business needs. This is where the private sector through, for example, the Matrix panel in its role of advising Government, has a critical role to play. A positive example of where this is currently happening is in relation to identification of the skills necessary for the development of new Industry-led Innovation Communities (IICs) within knowledge based sectors. The development of IICs was the key recommendation of Matrix in its first report to Government (October 2008). The IICs involve the coming together of business and academia, supported by government, in order to target key global niche markets. Such areas include renewable and environmental technologies, life sciences and digital media. These businesses will have the potential to grow rapidly and by their nature need a STEM literate workforce.

However, we must also be cognisant of the demand from the public sector and its relative attractiveness. Through its many different organisations and size, it will absorb a large number of those people leaving our education system with skills in STEM. For example, the statutory Health and Social Care sector is the biggest employer in NI with around 66,500 employees.

If NI is to have a true 'demand-led' skills system it is important that STEM users, both in terms of the public and private sectors, are able to articulate their current and likely future skill needs to the supply side. In this way, the supply side will be able to put in place courses and curriculum that reflect these needs.

To facilitate this, DEL, in conjunction with the NI Employment and Skills Adviser, has put in place a skills advisory infrastructure. This consists of the NI Employment and Skills Advisory Group, the Sector Skills Councils and Workforce Development Forums.

In order to provide as accurate a picture as possible, it is important that employers, especially those from our high number of micro-businesses, are encouraged to become involved.

However, while Government, through the supply side, can ensure that the courses and qualifications offered meet the needs of employers, the courses that young people choose to study is a decision that ultimately rests with them.

This not only emphasises the importance of delivering inspirational and motivational STEM learning experiences for young people that instil and maintain an engaged interest in STEM - at least up to the point where they make a decision as to whether to continue with further study in this field but also the crucial role of local employers in making the opportunities they have attractive.

Known influencers include potential earnings, the image of the sector, career pathways, job security and the potential cost of training. The demand side has the ability to mitigate against many of these issues. Many companies realise this and have worked hard to raise the profile of the sector and encourage young people gain the qualifications needed to work there.

Launched in 2008, Liberty IT provides one scholarship a year for students studying MEng in Computer Science at Queen's University and BSc Computer Science / BEng in Software Engineering at the University of Ulster. The value of the bursary is approximately £20,000. The Asidua scholarship programme was introduced in 2008 and is offered to at least one student at both NI Universities. The value of the bursary is approximately £25,000.

A number of professional bodies in the STEM areas also offer financial support for students entering higher education with the aim of increasing participation in their subjects. These include the Institute of Mechanical Engineers, the Institute of Civil Engineers and the Royal Academy of Engineering.

Successfully highlighting the opportunities available in NI might also have an impact on the relatively high number of people who leave NI to study STEM subjects at higher education institutions in Great Britain. Once gone, only a third (2007/08) of those who qualify return to the region. Government believes there is an opportunity for business to work more closely with these people to encourage them to return to NI so that they can use their skills here to grow the local economy.

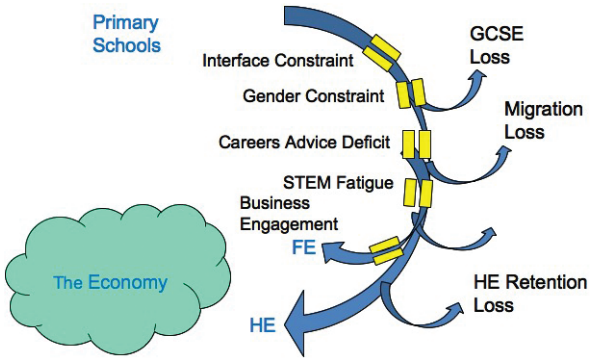
The Sector Skills Councils are already doing a lot to improve the career attractiveness of the sectors for which they are responsible. The 'Bring IT On' campaign, taken forward by the ICT Future Skills Action Group Project Team which included representation from DEL, e-skills UK (the Sector Skills Council for Business and Information Technology), Momentum (the NI Trade Federation), Invest Northern Ireland (INI) and the ICT industry is an example of the impact that can be had by a collaborative approach. Part of the 'Bring IT On' campaign was the delivery of a high profile advertising campaign across a range of media including television, cinema, radio, outdoor, press and online. In addition, a series of events and outreach activities were held in universities and schools coupled with a range of 'good news' stories relating to the campaign and ICT career opportunities featuring in the local press.

4. THE ROLE OF THE SUPPLY SIDE

It is Government's objective to ensure that the young people leaving compulsory education have the skills and qualifications that will enable them to gain meaningful employment and that those people who have left education and wish to improve their skills have access to appropriate up-skilling and re-skilling programmes.

If the demand increases as envisaged over time we will need to increase the number of people with skills in particular subsets of STEM, especially at higher education level, to meet this demand. Since the 'Report of the STEM Review' was published, a number of important actions have been taken forward which are described below. Further detail can be found in Annex A.

Figure 4.1: The STEM Educational Artery



Source: 'Report of the STEM Review'

School system

DE's key focus is on ensuring that every young person in the north of Ireland can achieve to her or his full potential. By doing well at school, and developing the skills and knowledge they need to succeed in life and at work young people will be able to make a positive contribution to their community and to the economy.

Critical to this focus is ensuring that young people have the skills they need to contribute to the Executive's wider aim of growing and rebalancing the local economy - skills that recognise the expected growth in STEM-related areas. More needs to be done to make sure that STEM-related subjects are seen as exciting, enjoyable and stimulating and that young people can see clear progression from the study of STEM-related subjects at school through to further and higher education and fulfilling careers.

DE has put in place a number of actions to promote STEM and also to link the mathematics element into the work being taken forward to improve standards of numeracy for all our young people. These have been grouped under a number of headings which are interlinked.

Stimulating interest in, and enthusiasm for, STEM

The revised curriculum is now in place across all year groups in all grant-aided schools and includes a clear focus on numeracy (and literacy) and, within its areas of learning, a specific focus on science and technology. It also provides much greater freedom for teachers to explore STEM-related learning with pupils in an interesting and innovative way.

The Entitlement Framework will, from 2013, provide greater breadth and balance in the range of courses offered to young people at 14 and above, delivering improved access to a wide range of learning opportunities to match their needs, aptitudes and interests, irrespective of where they live or the school they attend, including a minimum range of applied/vocational courses. This increased choice is being supported with improved careers education, information, advice and guidance, with a particular focus on STEM-related career opportunities.

In 2008, DE launched a specific initiative aimed at improving young people's knowledge and understanding of the opportunities for entering well paid and challenging careers which require a background in STEM subjects. This work focuses on the promotion and co-ordination of links between individual STEM based business, STEM specialist and other post-primary schools, and the development of materials to inform young people of STEM related careers and the benefits of sefiing employment in these areas.

DE is also supporting a number of programmes including the promotion of STEM-related subjects in primary and post-primary schools through exhibitions and competitions designed to encourage innovation and enquiry and celebrate achievement among young people.

Improving teaching and learning in STEM related areas

High quality teaching from expert and enthusiastic teachers can make a significant difference to the attitudes and aptitudes of young people. As part of wider work to reorganise professional support for teachers and schools, DE will ensure that there is a focus on providing professional development to primary and post primary teachers to support STEM teaching and to disseminate best practice.

Through the Specialist Schools Programme, 17 schools will be designated until August 2011 as specialist schools with particular strengths in science, technology and/or mathematics.

These schools are using these strengths not only to drive improvement across other subject areas but also to work with their partner primary and post-primary schools to share their good practice and contribute to improving teaching and learning in science, technology and maths and DE will be looking, following the end of the programme, at how best to ensure the continuation of aspects of this sharing of good practice.

Improving the range and quality of resources available to support teachers and pupils

For there to be success in our efforts to promote STEM and to make STEM-related subjects more interesting, DE has undertaken a programme to improve the range and quality of resources available to support schools in delivering high quality teaching and learning.

The Department has purchased a major new STEM resource 'the STEM truck', a state of the art facility which was launched in September 2009. The 58 square metre truck is a mobile laboratory and workshop and provides an interactive workspace with interchangeable teaching resources, allowing it to transform from a biology laboratory one day into an engineering workshop the next. It is designed to facilitate and capture the interest of our young people throughout Ireland in encouraging employment in STEM sectors.

In 2008, DE launched a specific programme of work to develop and disseminate curricular resources to support the growth of STEM take-up in schools including the development of web-based and other links with national bodies for the promotion of STEM based subjects in Britain and in the south of Ireland and the provision of materials to promote STEM in Irish-medium schools. That work is now bearing fruit, with new resources becoming available to support teaching and learning across the curriculum.

Promoting the uptake of STEM subjects post-16

It is recognised that there is more to be done to promote the uptake of STEM-related courses post-16 and that the areas referred to previously will contribute significantly to this. There needs to be a focus both on the higher end academic qualifications such as A levels and on more applied, technology-focused qualifications at both Level 2 and, particularly, Level 3. There are currently 28 STEM related courses (other than A/AS Levels) on offer to post 16 students. These courses are offered in a range of subjects, from Level 3 Certificate in Text Processing through to BTEC National Diploma in Electrical/Electronic Engineering.

Part of DE's work to embed the Entitlement Framework by 2013, includes increasing the availability of qualifications (including in STEM) that have currency with employers and higher education providers and that can provide young people with the recognition that their progress merits.

Further education and higher education

Since the publication of the first Skills Strategy for NI in 2004, DEL has worked to develop a flexible skills delivery infrastructure increasingly capable of delivering skills to meet both long term strategic needs and short term solutions to critical skills shortages. Following three years of implementation, a revised and updated Skills Strategy was published in June 2010 for public consultation. This document will form the overarching strategy for the development of skills (post 16) in NI.

DEL continues to work closely with the network of Sector Skills Councils to ensure that the qualifications delivered in NI's colleges and universities meet the needs of local businesses and the NI labour market. Each Sector Skills Council has developed a Sector Qualifications Strategy based on detailed labour market information, which sets out the priorities and strategic direction for qualifications development, through engagement with employers. The strategies sefi to remove old and disused qualifications, and help to guide the Awarding Organisations, in conjunction with the Sector Skills Councils, to develop and offer the qualifications which employers want, are economically relevant, and fit for purpose.

In addition to this, each of the colleges has a working relationship with its local Workforce Development Forum. These groups are employer led and focus on the local demand for skills and in particular areas where skills shortages are being experienced. Through collaborative working with the local college, a number of short term interventions have been put in place including the provision of the Business Improvement Techniques course in a number of engineering and manufacturing companies.

Strong industry linkages remain a critical part of further education, such linkages serving to refresh the STEM curriculum, provide opportunities for staff development and foster skills development within businesses. Furthermore, the creation of more strategic relationships is providing colleges the opportunity to assist companies in developing their products and processes. Examples of business engagement in recent years include the work by Southern Regional College as an Open Source Solutions Centre, the Innotech Centre at South West College and its support to local businesses, Northern Regional College with its many linkages to companies such as Michelin, South Eastern Regional College through its links with the polymer industry, Belfast Metropolitan College with its engagement in Knowledge Transfer Partnerships and North West Regional College with its EPICentre which was established to assist the development of technology in the region.

Other success stories within further education include the "ConnectEd" programme which has been fostering partnerships between the further education colleges and the local universities, Queen's University and University of Ulster. Many of the partnerships developed are based around STEM areas and represent a capability to better support companies here in any future growing economy.

There is perhaps no clearer evidence of the emphasis on STEM within further education than the recently launched College STEM Initiative (CSI) for which Colleges NI has licensed the successful and well known CSI brand from the CBS television network. Launched in May 2010, CSI serves as a focal point for the development of a collective STEM Strategy and Action Plan across the six regional colleges. Linked to this, BT has formed a strategic partnership with Colleges NI, which will see the colleges increasingly encouraged to promote STEM and to participate in STEM based competitions such as Young Scientist in coming years. Such activities will further enrich the STEM experiences of students within further education. Similar enriching STEM experiences within higher education support career and future study choices. The Armagh Observatory is a modern astronomical research institute and one of the UK and Ireland's leading scientific research establishments. It offers work experience and summer projects, both for secondary schools and undergraduates, which enable young people to benefit from having hands-on experience of a research environment.

DEL also has some ability to encourage the further education colleges and universities to offer particular courses through incentivised funding. For example, incentivised funding is made available to the further education colleges to encourage them to teach economically relevant subjects such as ICT and engineering and the Department has provided funding to local universities for 300 additional PhDs in economically relevant areas over three years (2008/2009 – 2010/2011). The past two cohorts have been primarily in STEM areas.

While any Government strategy to address the decline of people studying STEM must take a longer term approach (not least due to the long supply side lag time experienced in STEM) it should be noted that DEL, through its work with employers, has shown its ability to put in place short term interventions in sectors of economic importance, such as the Software Professional Course.

This ability to meet short term demand is particularly useful in meeting the needs of FDI companies looking to locate in NI or expand their existing workforce in the region. The pilot of the 'Assured Skills' project has already demonstrated the willingness for Departments across Government to work together to ensure that employers have the skills they require locally.

The role of museums and libraries

An exciting curriculum and inspirational learning experiences are critical to engaging young people and maintaining an interest and motivation in STEM. DCAL has an important role to play in terms of providing creative and innovative interventions that fully utilise the skills and resources of a range of diverse stak›olders. Key among these are the content, exhibitions and programmes provided by NI's cultural and knowledge infrastructure - the museums, libraries, W5, the Armagh Observatory and Planetarium etc. These support and enhance the delivery of the curriculum and provide STEM experiences and insights that inspire and add value to teachers and the learning experiences of students and lifelong learners.

Health Sector

DHSSPS is responsible for ensuring a ready supply of trained staff are available to meet the workforce demands of the local health service. To achieve this, the Department carries out a rolling programme of regional workforce reviews of the main health and social services professional groups. Main reviews are taken forward approximately every three years, with up-dates in the intervening years. These reviews primarily inform the commissioning of training places for these professions, through assessment of supply and demand and workforce need based on planned service provision. The reviews also explore and report on need for particular specialist areas of practice. This helps ensure that training needs are identified in line with service developments.

Training is then commissioned, from higher education and other providers to meet identified needs.

Regulations from National Bodies such as the General Medical Council, General Dental Council and the Nursing and Midwifery Council largely dictate the content of training and education curricula for professions, thereby ensuring that there is consistency across the UK including devolved administrations. Entry requirements for degree based courses vary by institution, however a strong emphasis, in some cases a mandatory requirement, is put on young people with high achievement in the sciences. Competition for places is fierce particularly for medicine and some Allied Health Professions. With an overall workforce of some 66,000 there will always be a need to maintain a ready supply of graduates for the Health Service in Northern Ireland.

Land-based, Food and Rural Sectors

The Department of Agriculture and Rural Development's (DARD) statutory authority for involvement in education and training comes from The Agriculture Act (NI) 1949. This permits DARD to "provide or arrange to provide instruction to persons in agriculture and related subjects". The majority of DARD's training provision is delivered by the College of Agriculture, Food and Rural Enterprise (CAFRE). CAFRE aims to develop the competences and values of people entering and working in the agri-food industry and to provide them with the capability to contribute to the sustained economic growth of the industry and development of the rural society. CAFRE achieves this aim through the delivery of four functional areas: (1) further and higher education; (2) industry training; (3) benchmarking and (4) knowledge and technology transfer. Recently, DARD has initiated work on developing an Education Strategy. The Strategy will sefi to provide a broad strategic direction and framework for education for land-based, food and rural sectors in Northern Ireland up to and beyond 2015.

Even with Government's existing actions it is clear that more will need to be done over the coming years to address these loss stages so that the supply of skilled people can be increased in line with projected demand. The further actions which Government needs to take forward in response to the recommendations contained within the 'Report of the STEM Review' are detailed in the following chapter.

5. RECOMMENDATIONS FOR ACTION

As demonstrated in the previous chapter and Annex A, since commissioning the 'Report of the STEM Review' Government has taken forward a large amount of work aimed at increasing the supply of STEM skills into the workforce to meet the forecasted demand for these skills.

However, it is clear that work needs to be taken forward in a more co-ordinated manner if we are to meet the likely forecasted demand for STEM skills. This section sets out actions that will be taken forward to address the specific recommendations contained within the 'Report of the STEM Review'. An overview of this work is contained in Annex B.

Imperative 1: Business must take the lead in promoting STEM

In order for this STEM Strategy to deliver the outcomes sought, it is clear that STEM employers must take the primary role in promoting STEM. As noted in the 'Report of the STEM Review', "Business must take the leadership role in firmly establishing STEM as the centre of a global innovative economy. Government, universities, further education colleges and schools need to support the initiatives but only business can provide the credible and effective leadership to achieve the goals".

Government has already undertaken some work in these areas. However, it is key that business takes the initiative in ensuring recommendations 1 to 5 are implemented.

It should be noted that the actions indicated below are indicative only. It will be the responsibility of the Business sub group to develop a set of actions in response to these recommendations.

RECOMMENDATION 1

Establish a business led STEM framework

- A Business sub group, chaired by a STEM Champion, is currently being established. This group will lead a network of stak›olders, including the relevant Sector Skills Councils, STEM charity bodies, Business Education Partnerships (BEPs) and other employer representative bodies to work with local companies and facilitate their engagement with both students and teachers within local schools, further education colleges and universities to promote STEM.
- This group will coordinate existing activity in this field to ensure that activity in this area is properly targeted and uses existing resources efficiently.
- The Business sub group also needs to work with local STEM companies to improve the attractiveness of the sector. This work should take cognisance of the comments within the 'Report of the STEM Review' relating to the current remuneration within the sector and should facilitate the engagement of the high number of small and medium sized enterprises (SMEs) to encourage them to work together to highlight the opportunities they have available.

RECOMMENDATION 2

Develop a clear STEM careers path

- The Business Sub Group will develop a programme to promote STEM careers which will engage relevant Sector Skills Councils, the NI Careers Service and the Education Service. This programme will further sefi to find innovative ways to promote STEM career opportunities to parents, in particular emphasizing the many paths offered through further education.
- The Business sub group should also sefi to increase the number of STEM ambassadors, ensuring that quantity is matched by quality.

RECOMMENDATION 3

Introduce prestigious STEM scholarships

- Using the findings of DEL's, 'Feasibility Study into the creation of STEM Bursaries and/or Scholarships', the Business sub group should encourage and coordinate STEM businesses to work together to build on the number of scholarships available for talented students studying STEM at our further education colleges and higher education institutions.

RECOMMENDATION 4

Address gender bias

- The Business sub group should work with the Sector Skills Councils and other bodies to help address gender bias especially within the physical sciences and engineering. All funded programmes in this area should take cognisance of this issue.

RECOMMENDATION 5

Develop regional STEM links

- The Business sub group should establish links with STEM businesses/organisations in other regions to build a critical mass. In particular, the group should sefi to develop a working relationship with organisations such as Discover Science & Engineering and Engineers Ireland. Such a relationship could potentially open up opportunities to link with various large multinational companies who currently engage through those bodies.
- DCAL, as NI government lead on the creative industries, will work in partnership with industry and regional and national stak›olders to develop the sector in NI and promote those creative industries with strong STEM relevance.

Imperative 2: Alleviate key constraints in the STEM Artery

RECOMMENDATION 6

Address the disparity in STEM performance amongst schools

- Through implementation of 'Every School a Good School: A Policy for School Improvement', DE will ensure a focus on supporting schools to improve outcomes for all pupils, with a particular focus on mathematics and also on literacy and ICT in the north of Ireland.
- As part of wider work to reorganise professional support for teachers and schools, DE will ensure that there is a focus on providing professional development to primary and post primary teachers to support STEM teaching and to disseminate best practice. This will include a focus on improving teaching and learning – and pupil attainment – in key areas including, for example, the physical sciences.

- DE will ensure better targeting of STEM and business education activities funded through the Department towards those schools which do not have a strong track-record of involvement in STEM-related activities.

- DE will explore the opportunity for the introduction of a specific focus on tackling underachievement in STEM-related subjects into the work of the North/South Educational Underachievement Working Group established under the auspices of the North South Ministerial Council.

- DCAL, through its learning strategy and sponsored bodies, will sefi to maximise the uptake of STEM learning and promotional opportunities by schools. The Department will sefi more effective and collaborative marketing of such resources, expertise and learning opportunities.

RECOMMENDATION 7

Support primary school teachers in teaching the area of learning, The World Around Us

- DE has already commissioned an audit of resource needs in STEM to inform the development of new resource material for primary schools. In response to this recommendation and the findings of that audit, the Department will ensure the production of STEM case studies and STEM-based curricular resources and associated guidance for teachers in Key Stage 2.

- Recognising the impact of the unavailability of suitable resources in the past, DE will ensure the provision of new materials, tailored to the needs of schools that can help promote STEM in Irish-Medium schools across Ireland.

- The Council for the Curriculum, Examinations and Assessment (CCEA) is now making available a STEM microsite which will house additional STEM-related resources for teachers and pupils and to showcase STEM activities in primary schools. The website, produced with assistance from DETI and MATRIX, involves making connections between the curriculum and the world of work using local and high technology businesses, by promoting STEM related subjects to raise awareness of the role of these in society and our economy and to encourage young people to consider STEM related areas as career opportunities.

- DCAL will encourage its Arm's Length Bodies to continue development of resources and programmes for learning that are matched to the revised curriculum for schools and specifically STEM related aspects. The development of programmes supporting continuing professional development for teachers will be encouraged as will partnerships that support closer working arrangements with the formal and non-formal education sectors and the adult and life-long learning sector.

RECOMMENDATION 8

Review ongoing developments in mathematics in relation to STEM provision

- DE will introduce new end of Key Stage assessment arrangements for all grant-aided schools in the north of Ireland that include a focus on numeracy and on use of mathematics as well as on using ICT (and, of course on communication) and that will assess skills as well as knowledge and reflect progression routes from Key Stage 1 through to GCSE and beyond.

- DE will explore the scope to introduce additional level 2 qualifications to recognise achievement in literacy and numeracy to complement existing GCSE courses in English and Mathematics.

- DE will participate, via its examinations regulator, in the accreditation of new specifications for GCSE science to ensure that the science examinations in schools here are fit for purpose and reflect the needs of the economy.

- DE will review the provision and availability of applied qualifications at Level 2 and Level 3 in the context of the Entitlement Framework to establish gaps in relation to STEM subjects and mechanisms for filling those gaps.
- In order to address the difficulties many young people face in applying their mathematical skills at further education level, DEL will continue to deliver its Essential Skills programme.
- DEL will work with further education colleges to consider a course that can be used to underpin those courses with a strong science and mathematical bias which develops the numeracy skills taught through the Essential Skills programme.
- DCAL will encourage the education sector to make more effective use of the resources, expertise and learning opportunities, provided by its Arm's Length Bodies, that support numeracy development and the application of mathematical skills within practical and inspirational settings.

RECOMMENDATION 9

Make STEM learning more enquiry based

- DE will promote the increased use by schools of the new, state-of-the-art, STEM truck, ensuring that the opportunity to avail of its facilities is extended, particularly to primary schools and those schools serving areas of significant social disadvantage.
- In commissioning new resources for primary schools, DE will ensure that there is a particular focus on enquiry-based learning and on providing pupils with opportunities to develop their thinking and problem-solving skills throughout the north of Ireland.
- DE will ensure the production of new resources for post-primary pupils at Key Stage 3 that focus on innovative, ICT-based opportunities to enhance STEM learning and teaching and to promote pupils' skills of enquiry and exploration.
- In order to make STEM taught in further education more investigative, DEL will work with Sector Skills Councils and Awarding Bodies at the design and development stage of vocational qualifications, and then providers at the delivery stage, to examine how courses could be adapted, for example, to include more practical elements within the learning unit, or the inclusion of work placements within the taught unit. There is potential to link in with the work being done on STEM curricula at primary, secondary, further and higher education, establishing a streamlined system where STEM is made appealing at all levels. In addition, a potential recommendation arising from the development of the Sector Qualification Strategies / Qualifications and Credit Framework policy may be that all Sector Skills Councils include a section on STEM in their Sector Qualification Strategies NI action plan.
- DCAL will encourage more effective uptake of the resources, expertise and learning opportunities provided by its Arm's Length Bodies to facilitate more innovative, engaging, interactive, enquiry based and 'learning by stealth' opportunities .
- Additionally, the future implementation of a revised model to recognise 'excellence' in the sphere of employer engagement will provide opportunities for NI's six further education colleges to focus their delivery on particular niche areas, including those with a strong STEM related focus.

RECOMMENDATION 10

Improve planning at the Key Stage 2 / Key Stage 3 interface

- DE will monitor implementation of the recommendations in the ETI report on the teaching of science within the revised curriculum in primary schools which has a specific focus on co-operation between primary and post-primary schools in the north of Ireland to ensure that children's science learning is progressive and continuous when they transfer from Year 7 to Year 8.
- DE will use the findings in the recently published ETI report entitled 'An Evaluation of Transition in Mathematics: Primary to Post-Primary' to inform the numeracy component of its new literacy and numeracy strategy and will also communicate the recommendations to schools.
- DE will review the regulations governing the formative record of achievement to ensure that post-primary schools receive relevant information on transferring pupils' progress and achievements so that they can plan teaching in a way that builds on that progress rather than duplicates prior learning.
- DCAL will encourage the education sector to consider how best the range of primary and post-primary learning programmes provided by its Arms Length Bodies can assist with improved continuity and progression from Key Stage 2 to Key Stage 3 so that the teaching of STEM builds effectively upon children's earlier learning.

Imperative 3: Increased flexibility in the provision of STEM Education

RECOMMENDATION 11

Increase the focus on the core sciences and mathematics subject

- DE will ensure a clear focus on attainment in mathematics from Key Stage 1 to GCSE recognising the importance of mathematical skills as the basis for learning in all STEM-related subjects.
- As part of the Entitlement Framework, DE will ensure that pupils have access to a broader, more balanced range of courses that include mathematics as well as the area of learning of science and technology and that can enthuse and excite young people and enable them to succeed in STEM-related subjects.
- DE will support opportunities for pupils in the north of Ireland to participate in competitions, exhibitions and other events designed to increase schools' and pupils' focus on the core sciences and mathematical subjects, ensuring a particular focus on those schools that do not already have a track-record of engagement in such events and on promoting attainment in science and maths at the highest levels.
- DEL has asked the Employment and Skills Adviser to review the current priority skill areas which receive incentivised funding.
- DEL will also work with Sector Skills Councils to explore the extent to which they have identified core subjects as 'key qualifications' in their Sector Qualification Strategies.

- To inspire, encourage and promote an interest in core sciences and mathematics subjects, DCAL will encourage the education sector to make more effective use of the innovative STEM related resources, expertise and learning opportunities provided by bodies such as the Armagh Observatory and Planetarium, libraries, W5, and National Museums NI.

RECOMMENDATION 12

Facilitate easier two-way transfer between further education and higher education

- DEL will continue to work with the relevant Sector Skills Councils and the further education regional colleges to ensure that Foundation Degrees in STEM disciplines are developed which meet the needs of employers and are industry-led.
- DEL through its Apprenticeship NI programme will encourage progression from Level 3 to Foundation Degrees and higher level qualifications.
- DEL will provide funding for the Step-Up programme at the University of Ulster in the North West and Belfast and will give consideration to an expansion of the programme into schools in the East Antrim area.
- DEL will consider what other activities could be introduced to increase transfer routes, informed by the identification of best practice both nationally and internationally.

RECOMMENDATION 13

Reduce barriers to obtaining support in STEM

- The NI Employment and Skills Adviser will advise DEL on ways in which to encourage employers to offer appropriate work placements and, particularly in STEM subjects, scholarships for students from universities and colleges.
- As part of the Review of the Future Policy on Higher Education Tuition Fees and Student Finance Arrangements in Northern Ireland, DEL is reviewing the financial support available to students at higher education institutions (including those studying STEM subjects). A public consultation on the policy proposals is expected to commence in 2011.
- DEL commissioned research undertaken by FGS McClure Waters to examine the impact of introducing bursaries to increase the number of people enrolling at colleges and universities in NI and going on to be employed in STEM areas. There is little evidence to suggest that bursaries would provide a sufficient return on investment. Instead the report supports recommendation 3, the introduction of prestigious STEM scholarships.

RECOMMENDATION 14

Develop a STEM Continuing Professional Development (CPD) framework

- DE will ensure the provision of professional development opportunities for teachers throughout the north of Ireland that are designed to promote and support effective STEM teaching in the primary and post-primary sectors within the revised curriculum and to disseminate best practice.
- DE will provide an opportunity for additional professional development for A level teachers of ICT and Computing which will also provide opportunities for effective engagement between teachers and industry representatives.
- Queen's University has the capacity to address CPD needs through the School of Education and their STEM Schools and they wish to develop closer, more formal, links with specialist subject schools.

- The continuation of an industry standard professional up skilling programme for further education lecturers remains a DEL priority.

- DCAL will encourage regional stak›olders to avail of the STEM related teacher resources and CPD opportunities provided by its Arm's Length Bodies – in particular the diverse range of programmes and initiatives delivered by W5 and the Armagh Planetarium. The Department will sefi to develop such opportunities in keeping with leading standards and national best practice.

RECOMMENDATION 15

Increase the emphasis on STEM careers advice and guidance

- This recommendation will reflect the work being taken forward by the Business sub group under Recommendation 2, the development of a clear STEM careers path.

- DEL and DE, including through the Careers Advisory Service, will implement the STEM Careers Strategy, outlined in 'Preparing for Success' and ensure that work to secure the provision of high quality careers education, information, advice and guidance includes a focus on promoting STEM career opportunities.

- Schools, colleges and universities along with Sector Skills Councils and other organisations should consider innovative ways in which to better engage with parents to highlight the opportunities that exist within the STEM sector. The programmes, initiatives and infrastructure provided by bodies such as W5, the Armagh Observatory and Planetarium, the libraries and museums can support such endeavours.

Imperative 4: Government must coordinate its support for STEM

RECOMMENDATION 16

DE and DEL, supported by other relevant Government departments, should develop a clear STEM strategy and vision

- Through the Programme for Government, the Executive has placed a focus on the increased delivery of STEM skills to grow a dynamic and innovative economy.

- A Government sub group has been established as part of a wider STEM Implementation Steering Group. It brings together the key government stak›olders (DHSSPS, DETI, DARD, DCAL, DEL and DE). This group will oversee the implementation of this STEM Strategy once it has been approved and consulted upon.

RECOMMENDATION 17

DE and DEL, supported by other relevant Government departments, should introduce cross-departmental structures to help develop appropriate STEM strategies and policies

- In addition to the Government sub group mentioned above, DEL is committed to working with Matrix and the IREP delivery groups, with a view to facilitating the development of the skills necessary for emerging market opportunities. Work is being taken forward through the interdepartmental work on the development of IICs and the development of a specific skills delivery system.

- DEL, DETI and Invest NI are working together to support new NI based Foreign Direct Investment companies by working with colleges and universities to increase the number of people with the skills sought by these companies in order to secure high value employment in NI.

- DCAL will support such cross-departmental activity through its leading role in the creative industries and in the promotion of creativity.

RECOMMENDATION 18

Develop a more proactive approach to managing STEM supply and demand

- DEL has in place structures to enable employers to articulate their demand for skills at both a local and regional level. They are supported by labour market information and forecasting exercises, such as Oxford Economics' 'Forecasting of Future Skill Needs in Northern Ireland' report. This demand side model continues to be assessed and improved upon.
- DEL will ensure that its employer engagement mechanisms and existing main streamed provision offered at colleges and universities has the capacity to respond to the STEM skills needs of local businesses.
- In an employer led approach to STEM apprenticeships, DEL will encourage the Sector Skills Councils and employers to develop and bring forward approved frameworks to be funded under the ApprenticeshipsNI professional and technical training provision. The Department will also work with its contracted training organisations to ensure that the quality of STEM apprenticeship programmes meet the standards expected by employers.
- DEL will fund approved frameworks that have been developed for Apprenticeships in STEM areas.

RECOMMENDATIONS 19

Increase the number of applications for physical sciences and mathematics places in Initial Teacher Education courses

- DE will, as part of the annual process of determining intakes, reflect the need for high quality teachers in STEM-related subjects by ensuring the provision of STEM-related places in Initial Teacher Education matches the needs of schools in the north of Ireland.

RECOMMENDATION 20

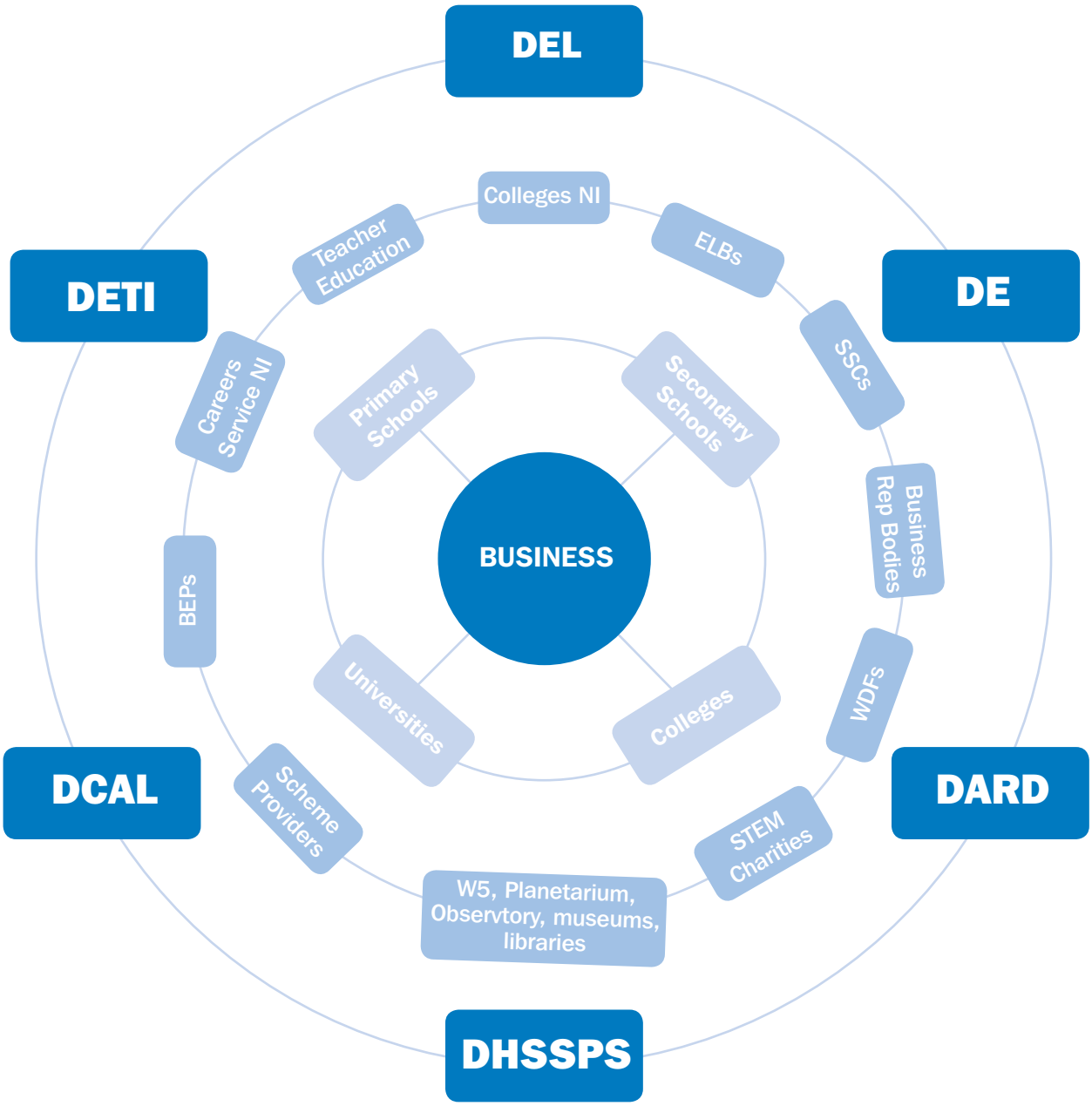
Expand the capacity to respond to critical skills shortages as they arise

- DEL will build upon the existing work being taken forward by the Colleges and Universities through the introduction of a skills brokerage service.
- Where appropriate, DEL will consider the introduction of conversion courses similar to the Software Professional Course.

6. STRUCTURES FOR IMPLEMENTATION

As with any Strategy, it is important to create appropriate delivery structures to ensure successful implementation. However, as can be seen in figure 6.1 there are a number of key players within the STEM arena.

Figure 6.1: STEM Key players



The possible appointment of a Government Chief Scientist has been considered in detail a number of times, most recently by DETI in relation to Matrix. This matter is ongoing but it should be noted that DHSSPS and DARD, and to a degree DETI, already have scientific advisers in place. However, it is believed that a 'STEM Champion' who would be a prominent STEM business person, should be identified to chair a 'STEM Implementation Steering Group' and therefore lead the delivery of the STEM Strategy and champion STEM in general to society.

The STEM Implementation Steering Group would then consist of the STEM Champion who would be joined by two representatives from a Government sub group (DE and DEL) and two or three representatives from a Business sub group (see figure 6.2).

The Government sub group includes representation from:

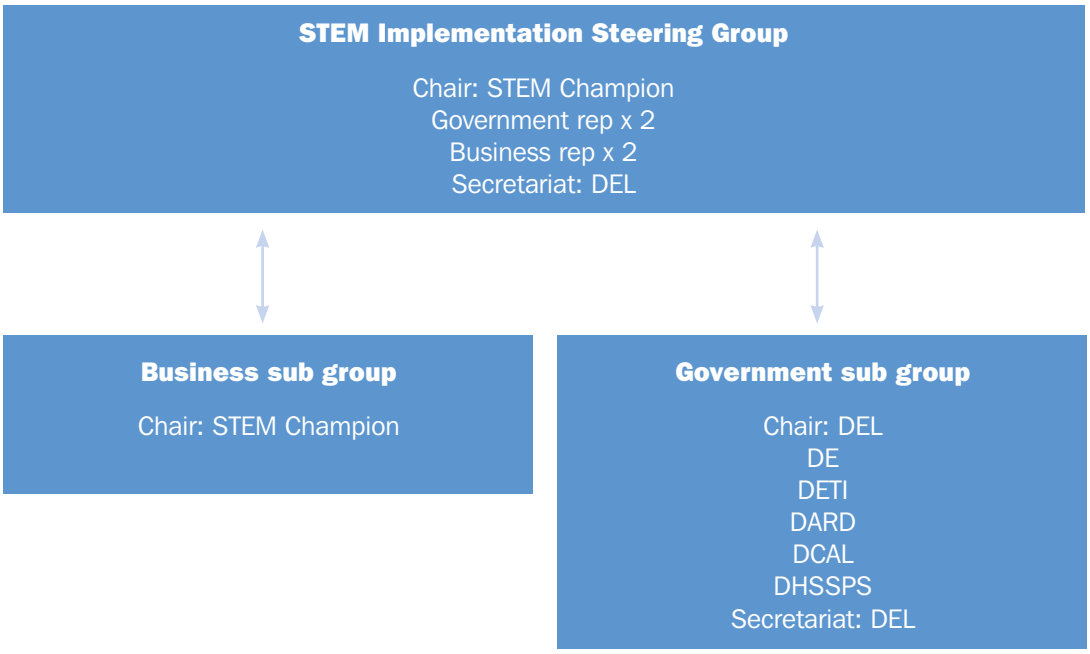
- DEL (Chair and Secretariat);
- DE;
- DHSSPS;
- DARD;
- DCAL ; and
- DETI.

The secretariat for the overarching steering group and the Government sub group will be provided by DEL in acknowledgement of the tie in between the outcomes of these groups and the Programme for Government skills targets for which it is in the lead.

Each Department will be responsible for the actions which fall to it.

The Business sub group will be led by the STEM Champion and membership will be made up of representatives from business.

Figure 6.2: STEM Delivery Infrastructure



7. CONCLUSION AND PRIORITY ACTIONS

From Annex A it is clear that there is a vast array of work already being taken forward in this field by a number of organisations. In addition to this work, this Strategy outlines the actions that the Executive wishes to take forward with a view to building the supply of STEM skills as the demand for STEM skills grows in the years to come. However, it should be noted that the full implementation of these actions is dependent on resources. **Given the current fiscal constraints, the following three areas have been identified as priorities for the Executive to take forward in the short term**.

PRIORITY ACTION 1: Coordinate Business Links

As noted in the 'Report of the STEM Review', "only business can provide the credible and strategic leadership to achieve goals". However, the NI economy is predominately made up of micro-businesses employing ten people or less. Engaging with these companies is the single biggest challenge in taking the STEM strategy forward. It will be vitally important for the Business sub group to interact with and gain the support of local SMEs.

Better linkages will facilitate a more coordinated approach to articulating local demand, improving sector attractiveness, highlighting available opportunities, CPD and careers advice and guidance.

Engaging business effectively requires the Business sub group, in conjunction with organisations such as business representative bodies and Sector Skills Councils, to identify and engage companies and encouraging them to link with government funded and STEM focused bodies and venues and other organisations to facilitate engagement between businesses and schools.

In establishing these links progress will be able to be made against the business recommendations and will also support the further development of CPD and careers advice and guidance.

PRIORITY ACTION 2: Manage STEM sector attractiveness

There is a clear need to find ways to engage with parents and young people to highlight the opportunities that are available in STEM throughout NI. There is a wealth of information on careers, yet there still remains an apparent lack of awareness of the opportunities and paths that lead to STEM careers.

This process should be improved by building on links between the Careers Service, the education sector and government funded organisations with wide public engagement such as museums and similar STEM focused bodies, and with other organisations. Further use of STEM ambassadors will help forge partnerships with schools but innovative ways will also need to be considered to reach parents.

PRIORITY ACTION 3: Facilitate STEM Continuous Professional Development

Professional Continuous Professional Development is essential to help teachers and lecturers in schools, colleges and universities to better contextualise their subjects. It also has a significant influence on initial careers thinking. It is clear that DCAL, through their support for the likes of W5, the Planetarium and the Observatory, has a significant role to play. However, there is a need for business through the Business sub group to facilitate this.

A small cross-departmental team comprising DE, DEL, DCAL and DARD should work together to develop STEM CPD framework and policy. CPD programmes should be coordinated with input from the Business sub group to facilitate business engagement and support.

This group should also coordinate with the STEM Careers Group to identify opportunities for joint CPD and Careers Education, Information, Advice and Guidance teacher events.

Further information:
Telephone: 028 9090 5271
Fax: 028 9090 5360
Email: successthroughstem@delni.gov.uk
Website: www.delni.gov.uk

ANNEX A

DEPARTMENT **DE**

Name of activity	Brief outline of STEM activity	Impact of activity
The Revised Curriculum	The revised curriculum is now in place across all year groups in all grant-aided schools. From Foundation Stage to Key Stage 3, Science and Technology remains a core part of the curriculum in the north of Ireland. Crucial too to the STEM agenda is the focus of the revised curriculum on skills as well as knowledge and on helping pupils develop the skills of enquiry, innovation and creativity.	By providing much greater freedom for teachers to explore STEM-related learning with pupils in an interesting and innovative way, it is expected that more young people will be inspired by and will choose to pursue STEM related subjects.
Resources to Support Teachers & Pupils in STEM Subjects	To promote STEM and to make STEM-related subjects more interesting, we recognised the need to improve the range and quality of resources available to support schools in delivering high quality teaching and learning DE commissioned the STEM truck, a new, state of the art facility which is the first of its kind on these islands.	This will improve the range and quality of resources available to support schools in delivering high quality teaching and learning and will make STEM-related subjects more interesting and attractive to our young people.
	DE has commissioned CCEA to take forward a programme for the development and dissemination of curricular resources to support the growth of STEM take-up in schools. CCEA is leading the development and dissemination of curricular resources to promote and support STEM in the primary and post primary sectors including the development of web-based resources and other links with national bodies for the promotion of STEM based subjects in Britain and the south and the provision of materials to promote STEM in Irish-medium schools.	This will improve the range and quality of resources available to support schools in delivering high quality teaching and learning and will make STEM-related subjects more interesting and attractive to our young people.
The Entitlement Framework	The Entitlement Framework is designed to ensure that, from Key Stage 4, young people have more equitable opportunity to follow a broader and more balanced range of courses, regardless of the area or type of school in which they are enrolled. Giving pupils greater choice, supported through high quality teaching and with improved careers education, information, advice and guidance, should allow more young people to access and succeed in areas that interest them, including STEM-related areas, and, importantly, to access the more applied courses that are crucial to the future success of our economy.	This will increase the availability of qualifications to pupils (including in STEM) that have currency with employers and higher education providers and that can provide young people with the recognition that their progress merits.

DEPARTMENT **DE**

Name of activity	Brief outline of STEM activity	Impact of activity
STEM-focused Careers, Education, Information and Guidance (CEIAG)	STEM-focused careers education, information, advice and guidance (CEIAG) is also a crucial element of our efforts to promote STEM subjects and pathways. In 2008, DE launched a specific programme aimed at improving young people's knowledge and understanding of the opportunities for entering well paid and challenging careers which require a background in STEM subjects. This work is focusing on the promotion and co-ordination of links between individual STEM based business, STEM specialist and other post-primary schools, and the development of materials to inform young people of STEM related careers and the benefits of sefiing employment in these areas.	By promoting STEM-related careers and raising pupils' awareness and aspirations they will have a better knowledge and understanding of the opportunities for entering well paid and challenging careers which require a background in STEM subjects.
STEM Related Competitions and Exhibitions	DE recognises the important role of STEM-related competitions and exhibitions in promoting interest in STEM in both primary and post primary schools and is continuing to support schools' participation in major events of this nature.	This will secure increased opportunities for pupils to participate in competitions, exhibitions and other events designed to increase schools' and pupils' focus on the core sciences and mathematical subjects and on promoting attainment in science and maths at the highest levels.
STEM Focussed Organisations	The Department provides support to a number of organisations to ensure that they can link schools with business (including STEM) and covering topics such as employability, enterprise, and learning for life and work in the north of Ireland.	This will secure increased opportunities for pupils to participate in competitions, exhibitions and other events designed to increase schools' and pupils' focus on the core sciences and mathematical subjects and on promoting attainment in science and maths at the highest levels.

DEPARTMENT **DE**

Name of activity	Brief outline of STEM activity	Impact of activity
Specialists Schools	Through the Specialist Schools Programme, 17 schools with specialist designations in science, technology and/or mathematics have been supported to use their strengths in STEM-related areas not only to drive improvement across other subject areas but to help their partner primary and post-primary schools improve provision in the specialist areas by sharing their good practice.	By sharing information and planning transitions with their partner and main feeder primary schools, it has ensured that strengths in teaching science, technology and mathematics are recognised and that good practice approaches are disseminated more effectively.
The 'STEM Experience'	DE has been supporting 'The STEM Experience' during the period from 2008/09 to 2010/11 to focus on stimulating interest among young people at the key primary/ post-primary transition point.	This has secured increased opportunities for pupils to participate in competitions, exhibitions and other events designed to increase schools' and pupils' focus on the core sciences and mathematical subjects and on promoting attainment in science and maths at the highest levels.
Improving Teaching and Learning in STEM Related Areas	High quality teaching from expert and enthusiastic teachers can make a significant difference to the attitudes and aptitudes of young people. DE commissioned a programme of professional development for teachers to promote and support STEM in the primary and post primary sectors within the revised curriculum. The programme aims to provide by 2012, professional development to primary and post primary teachers to support STEM teaching and to disseminate best practice.	This will ensure the provision of new professional development opportunities for teachers designed to promote and support effective STEM teaching and to disseminate best practice.
Promoting the Uptake of STEM-Subjects Post 16	To promote the uptake of STEM related courses post-16 and as part of our work to embed the Entitlement Framework by 2013, we have tasked CCEA to increase the availability of qualifications (including in STEM) that have currency with employers and higher education providers and that can provide young people with the recognition that their progress merits.	This will ensure that pupils have access to a broader, more balanced range of courses, including mathematics and in the area of learning of science and technology that can enthuse and excite young people and enable them to succeed in STEM-related subjects.

DEPARTMENT **DEL**

Name of activity	Brief outline of STEM activity	Impact of activity
Sector Skills Councils	A number of Sector Skills Councils have submitted proposals through the Alliance for STEM activity that will address recommendations 2, 4 and 11 of the Report of the STEM Review.	It is envisaged that the proposals will help to raise the profile of opportunities available in the STEM sector.
	Research project for renewables / STEM in Northern Ireland schools funded for 2010/11. This is the first research project undertaken by a collaboration of SSCs in Northern Ireland looking specifically at how the education sector and the renewables / low carbon industry interact.	Will help all stak›olders and employers understand the issues relating to STEM careers in the renewables / low carbon industry.
Additional PhDs	The Department is on track to achieve the Programme for Government commitment to "increase by 300 the number of PhD research students at local universities by 2010.	The additional places are confined to areas of economic priority as agreed with DETI.
Step-Up Programme	The Department provides funding for the Step-Up to Science programme at the University of Ulster. The programme encourages pupils from secondary schools in disadvantaged areas in Londonderry and Belfast to study science at university. The programme has been running successfully for 8 years.	Since the programme commenced in 2000, approximately 700 students have progressed to universities to study engineering related courses/degrees.
STEM Bursary / Scholarship Feasibility Study	DEL commissioned a feasibility study conducted by FGS McClure Watters into possibility of providing a bursary or scholarship to those studying STEM subjects in Northern Ireland Further Education or Higher Education institutions.	This study recommends that a limited number of industry led scholarships are introduced.
Engineers Make It Happen	This programme provides accurate information on career prospects and the skill needed in engineering business and industry to a range of stak›olders, in conjunction with Sentinus.	Increase the number of young people entering and experiencing engineering.
Careers Advisory Service	STEM Careers Strategy includes a pilot action plan to examine the potential benefits of providing full time STEM co-ordinators.	Proposals for a revised approach to CEIAG should deliver more coherent arrangements for education/industry links, highlighting the role of STEM and their potential contribution and importance to the local economy.

DEPARTMENT **DEL**

Name of activity	Brief outline of STEM activity	Impact of activity
Further Education Activities	The six further education colleges in Northern Ireland deliver a wide range of provision in STEM subjects.	Colleges carry out a range of specific activities aimed at increasing participation in, and completion of, provision in STEM subjects at NVQ, A Level, BTEC, HND, Foundation Degree and Degree level. This includes marketing campaigns, which focus exclusively on the promotion of STEM provision; collaboration with NI University partners through the 'Connected Programme' to promote joint projects in STEM curriculum areas; and the development of industry linked Foundation Degree programmes in STEM subject areas.
Belfast Metropolitan College	Belfast Metropolitan College (in conjunction with Northern Regional College, Southern Regional College and North West Regional College) has recently received funding to introduce a Bioscience Skills Academy.	Its aims are to research technical competences and training needs, strengthen industry-connected learning for existing programmes, work with others to promote sector career paths, strengthen value-add linkages between Further Education and industry, explore areas for all-island benchmarking and collaboration.
Northern Regional College	Direct engagement with various companies including Toyota, Michelin, Schrader Electronics, Ryobi, Lafarge and FG Wilson.	Helps to promote the development of young people within the world of engineering, addressing recommendation 1 and recommendation 20 of STEM Review.
	College Engineering staff have (in conjunction with LSDA) drawn up and delivered careers seminars.	Helps to deliver against recommendation 2 of STEM Review.
North West Regional College	EPI Centre established to assist the development of technology in the region.	
Southern Regional College	Open Source Solutions Centre.	

DEPARTMENT **DEL**

Name of activity	Brief outline of STEM activity	Impact of activity
South Eastern Regional College	Links with Polymer industry.	
South West College (SWC)	Staff from the college participate in the South West Workforce Development Forum to formally gain feed back from industry on current and future skill requirements including STEM areas.	Impacts on recommendation 1.
	The college works closely with a variety of Sector Skills Councils to anticipate and respond to skills requirements.	Impacts on recommendation 1.
	The college has assisted with the development of a dedicated web portal to support career paths in engineering.	Helps to promote clear paths for STEM students.
	The college has organised dedicated 'engineering for girls' skills workshops in the college.	Assists with recommendation 4.
	The InnoTech Centre delivers a programme of outreach STEM activities to schools across Northern Ireland. This includes the carbon footprint for schools, robotics and reverse engineering and 3D scanning programme. To date 24 dedicated events and activities have been delivered to 1500 pupils.	Increases the number and range of STEM activities for schools which could be delivered by science and technology staff from Further Education colleges.
	South West College is planning to construct a new teaching and exhibition space within the college which will be focused on STEM. The space will be known as the South West College STEM Centre.	Will help to implement recommendation 9.
Queens University	Queens University. The university's STEM Group has identified strategies to address the lack of engagement with STEM and is targeting the 11 to 13 and the 16 to 18 age groups. A new STEM website will soon be launched, creating a directory of STEM activities throughout the university, co-ordinating outreach and marketing to schools and developing the university's STEM Academy and building stronger engagement with parents.	Better co-ordination of activities, outreach talks and stronger engagement with parents.

DEPARTMENT **DARD**

Name of activity	Brief outline of STEM activity	Impact of activity
Careers Teachers Conferences	Update on the courses and career opportunities within the agri-food industry aimed at school career and science teachers.	Raised awareness of STEM courses and careers within the agri-food and rural industries. Conferences have initiated interest in future CAFRE interactive displays promoting STEM subjects in schools.
Education Activities	Various events organised by CAFRE at its Campuses and in local schools to promote education programmes in agriculture, horticulture, equine and food and careers in the agri-food industry.	Raised awareness of STEM courses and careers within the agri-food and rural industries with over 4000 young people. These events also promoted the facilities at CAFRE.
Syllabus Support / Curriculum Support	SSS events organised by Loughry Campus and included Microbiology and Chemistry workshops aimed at syllabus support to GCSE and A level Home Economics and Applied Science pupils. Also curriculum support events at Greenmount Campus arranged for schools who were delivering either GCSE in Biology, Environment or Land-based Science, First Certificate in Agriculture, Horticulture, Occupational Studies in Horticulture.	Raised awareness of STEM courses and offered syllabus support in GCSE and A level pupils.
Lisburn STEM Careers Event (CAFRE)	Event organised by the SEELB STEM Careers Adviser aimed at Year 10 pupils from 12 schools in the Lisburn Area Learning Community Partnership. CAFRE input included interactive displays promoting Horticulture, Agriculture, Equine and Food	Raised awareness of STEM courses and careers within the agri-food and rural industries and promoted selection of STEM GCSE subjects. Event was attended by 1500 Year 10 pupils.
Postgraduate Agricultural and Food Studentships Awards	8 PhD Postgraduate Studentships are awarded each year to the top applicants meeting the set criteria and obtaining the highest interview scores.	The research topic must meet DARD priority research areas, which are aligned to DARD's Evidence & Innovation Strategy (2009-2013). The studentships make an important contribution to investment in our agri-food and rural community science base and knowledge transfer to practical application.

DEPARTMENT **DARD**

Name of activity	Brief outline of STEM activity	Impact of activity
Genetic Research, Food and Environmental Microbiology (AFBI)	Programme included statutory forest survey, tissue culture/plant physiology, molecular biology tools and nematology/ environmental science.	Impact is not yet known but will provide teachers with hands on experience in the field they are teaching.
Fisheries and Aquatic Ecosystems & Agriculture Environment (AFBI)	Programme for this year not yet complete.	Fisheries and Aquatic Ecosystems & Agriculture Environment (AFBI) Impact is not yet known but will provide teachers with hands on experience in the field they are teaching.

DEPARTMENT **DETI**

Name of activity	Brief outline of STEM activity	Impact of activity
DETI/MATRIX Support for Pilot CCEA STEMWORKS Project	This project is aimed at promoting STEM related subjects and to raise the awareness of the role of these in society and our economy. In doing so, it is hoped to encourage young people to consider STEM related areas as career opportunities. An important aspect of this involves making connections between the curriculum and the world of work, involving businesses in supporting science teachers delivering the KS3 science curriculum through examples from NI industry. DETI and MATRIX have assisted CCEA in involving high technology businesses in developing world-class online resources to help teachers to enrich science lessons at KS3. The website which includes teaching enquiry based learning and teaching resources including video and animation. The connections with successful NI companies are a valuable element of this resource.	The MATRIX report has assisted CCEA by providing a strategic market context for the work. As the project has progressed DETI and MATRIX members have continued to support and advise CCEA and to help with business linkages. The STEMWorks website can be accessed at www.rewardinglearning.org.uk/STEM/

DEPARTMENT **DCAL**

Name of activity	Brief outline of STEM activity	Impact of activity
Whowhatwherewhenwhy (W5)	W5 is an award winning science and discovery centre at the Odyssey in Belfast. It delivers interactive science and technology exhibits and initiatives which schools and families use throughout the year. Such activity has been developed to support the curriculum and is designed to provide a unique and stimulating experience. W5 has established a range of partnerships and relationships with renowned scientific and educational institutions and local businesses.	W5's mission is to fire the spirit of discovery by unlocking the scientist and creativity in everyone. W5 attracted an audience of 218,969 during 2009/10. This includes 39,149 formal education visitors and 13,004 informal visitors.
W5 – Outreach and Exhibitions	W5 delivers science shows and events in the community and specialist temporary exhibitions throughout the year.	Outreach events occurred in 144 venues and involved 23,966 participants during 2009/10. This included the Young Scientist of the Year at the RDS and involvement in the BBC Bang Goes the Theory road-show in Belfast. Exhibitions during 2009/10 have included Nature Quest - developed with the NI Environment Agency Darwin Today Titanic: Designed and Made in Belfast; Tunnel Visions: developed with NI Water to highlight the Belfast sewers project Wildlife Photographer of the Year Leading Lights – photographic exhibition of 19 leading STEM Ambassadors.
W5 - Northern Bank Science and Maths Counts	W5 outreach teams deliver a Science Show to schools and technology workshops to KS2 pupils in rural and urban settings.	Between Oct 2009 and Mar 2010, the initiative has involved 44 schools and 3,228 pupils. Engagement with the business sector.
W5 - Partnership with UK Centre for Excellence in Public Health Research at Queen's University	W5 delivers related programmes to schools and the public. It also delivers a major two year programme funded by the Wellcome Trust entitled Genetics, Risk and Lifestyle: Can I blame it on my genes? This involves CPD for teachers and A-Level workshops.	The Wellcome Trust project is ongoing and involves 500 pupils and 50 teachers. A key impact involves the multiplier effect of CPD for teachers.

DEPARTMENT **DCAL**

Name of activity	Brief outline of STEM activity	Impact of activity
W5 - Partnership with the Royal Society	W5 helped the Royal Society to deliver its 350th anniversary by developing a high profile programme of public and schools events to celebrate local heroes. These events highlighted scientific achievement from scientists like George Walker, Hans Sloane, Denis Weaire, and Lord Kelvin.	Six school lectures by University Academics from QUB, UU, Plymouth and Exeter and 3 public events, with two FRS scientists and Kew Gardens. So far the initiative has involved 1,434 participants
W5 - Partner with GSNI/ BGS Schools Seismology Project	W5 is currently developing an exhibit with Geologists from the British Geological Survey and GSNI to show earthquake activity from around the world.	Raised awareness and interest in the physical sciences.
W5 - Partner with the School of Mathematics and Physics at QUB.	Development of an exhibition on the physics of radiotherapy.	Raised awareness and interest in the physical sciences.
W5 -Teacher In Service Training STEM	A number of W5's education programmes involve teacher in-service as part of the consultation process or for specialist programmes. W5 is involved with a final year joint module for trainee teachers at Stranmillis College. W5 is also delivering 8 in-service events for teachers linking university research to the classroom. This is in association with the ELB's and the National Science Learning Centre.	Approximately 80 participants. A key impact involves the multiplier effect of CPD for teachers and trainee teachers.
W5 - Education Programmes and Events	W5 delivers an extensive programme of workshops and events to reflect the revised curriculum of Northern Ireland - promoting learning experiences that are enjoyable, challenging and relevant for each key stage.	During 2009/10, 26,504 pupils have been reached. Programmes are available from Nursery through to A-Level students and link STEM, Numeracy and Literacy to everyday life through practical experimentation and exploration.
W5 - Biodiversity in Your Backyard	W5 secured funding from the Biology and Biotechnology Research Council for this school based programme which targeted Primary 7 classes and tied in with research taking place at School of Biological Sciences at Queen's University Belfast. Teachers were also provided with background information on biodiversity based on current research, links to the curriculum and activities which could take place in the classroom.	134 primary pupils reached. Once back in school, in addition to teacher led activities, the pupils used LearningNI as a tool for independent study and communication, giving them opportunities to discuss the programme with other participating schools. The programme raised awareness of and interest in STEM and the connection between research science and practical applications.

DEPARTMENT **DCAL**

Name of activity	Brief outline of STEM activity	Impact of activity
W5 - Engineering the Future	W5 secured funding from the Royal Academy of Engineering to deliver an innovative programme exploring the role of engineering in society today. Partnership with the Schools of Mechanical and Aeronautical Engineering; and Electronics, Electrical Engineering and Computer Science at Queen's University and Bombardier Aerospace. Key themes: Reducing the carbon footprint of aeroplanes; Renewable Energy and Transport; and Renewable Energy.	Events were delivered for schools and the general public with an audience of over 600 reached, with 41 engineers trained in public engagement activities. Engagement with the business sector.
W5 - Wind Farm or No Wind Farm?	This event was developed in partnership with Action Renewables and explored whether the Isle of Lewis should have the largest on-shore wind farm in Europe. It was a decision-making exercise where facts, information and expert advice were given to help students to consider the evidence, weigh up arguments and work in groups to come to a decision.	124 students reached in October 2010. Demonstration of the connection between R&D and its practical applications. This event allowed students to enter the decision-making process, taking on the role of planners in a real-life issue, using real information and genuine opinions.
W5 - National Pathology Wefi	To celebrate National Pathology Wefi in November 2009, W5 teamed up with the Royal College of Pathologists to develop and deliver a unique and innovative programme of new events.	The event reached 443 students.
	Virtual Autopsy - sheds light on the often misunderstood procedure, the Autopsy or Post Mortem examination, which not only tells us how a person died but also provides vital information to help the living.	KS4 audience - Students went through the process of a genuine post mortem using a model playing a corpse.
	Change of Heart - Moments from the history of pathology were portrayed using drama and comedy, looking at the past, present and possible future of the heart.	KS3 Audience.
	Disease Detectives - How do doctors think? Students learnt how doctors piece together the clues that lead them to a diagnosis and decide what tests are best for each condition.	AS/A level Masterclass.

DEPARTMENT **DCAL**

Name of activity	Brief outline of STEM activity	Impact of activity
W5 – Irish Origins, Darwin 200: Teachers' CPD and Linked Schools' Lecture	To celebrate Darwin 200, W5 teamed up the School of Biological Sciences at Queen's University to provide an innovative CPD session exploring modern uses of genetics within animal biology. This programme linked to a subsequent A Level lecture for students by Professor Dan Bradley from the Smurfit Institute of Genetics, Trinity College Dublin, relating to human genetics and the story of people's movement to Ireland.	Teacher CPD. Funding for this programme including sub-cover was secured by W5 through BBSRC.
W5 - Green Teacher of the Year Awards	In partnership with Belfast Harbour Commissioners and Action Renewables, W5 hosted the Green Teacher of the Year Award. Students took part in a fun, interactive demonstration show in W5's lecture theatre then were challenged to build a wind powered racing machine.	November 2009. 177 participants.
W5 - STEM Careers - ELB STEM Advisors	Working in partnership with the STEM Careers advisors across the ELBs, W5 developed new design concepts, brand imagery and artwork for a series of exhibition stands and brochures to engage young people and their parents with the opportunities presented through STEM careers.	Sept 2009 – Jan 2010. This branding and materials have been rolled out across all post primary schools in Northern Ireland.
W5 - STEM Careers programme with SEELB / Lecale Area Learning Cluster	Development and delivery of a programme of activities which are linked to career talks for Year 9 students across the Lecale Area Learning Cluster. Activities took place over March 2010. The events at each school included three elements: a) A presentation and overview of STEM Careers and their relevance to everyday life; b) 'It's Force of Course!' Science Demonstration Show; c) Technology Trials Workshop.	The main aim of this programme was to work with the STEM Careers Officers at the SEELB and the Lecale Area Learning Cluster to raise awareness and promote STEM activities and show their explicit links and relevance to future careers within Northern Ireland and beyond. 681 pupils took part in this programme.
W5 - Extended Schools programme – Urban East Belfast	The Extended Schools project was an outreach programme to four urban East Belfast primary schools, organised in conjunction with Elmgrove Primary School. At each of the four schools W5 delivered a 60-minute workshop (Let's Take Flight) to their after-school P6/P7 classes.	Feb – Mar 2010. 120 pupils reached. All the schools who took part were then invited to a special event day in W5, where the pupils got a Lecture Theatre show (Freeze), a Qwizdom quiz about flight and a special "Paper Flying Machine Challenge" event in the Atrium, as well as a visit to the W5 exhibition floors.

DEPARTMENT **DCAL**

Name of activity	Brief outline of STEM activity	Impact of activity
W5 - ECO wefi with Banbridge District Council – March 2010	In partnership with Banbridge District Council, W5 developed and delivered a new demonstration show for Eco Wefi in March 2010.	The programme reached 1578 pupils from 16 schools across the Banbridge area. Promotion of STEM and sustainability issues.
W5 - Bombardier Supported Events:	In addition to workshops and Demonstration Shows, W5 has developed a range of STEM events for Primary and Post Primary schools: Your Career in Aerospace - As part of a careers initiative led by Bombardier staff, W5 delivers an interactive show on flight, introducing the forces involved and illustrating the challenges facing engineers when designing passenger aircraft. The careers sessions also include information on Bombardier's 'Modern Apprentice Programme', and a tour of the Bombardier factory. Flight Competition – this annual competition continues to grow in popularity with primary and post primary schools.	Sep 2009 – Mar 2010. More than 450 students reached by this programme. Raised interest and understanding of STEM career opportunities and application to NI industry. 282 pupils and 47 teachers from 23 schools took part in the Flight Competition in 2010. Engagement with the business sector.
W5 - Belfast Zoo	W5 has established partnership events with Belfast Zoo where the W5 outreach team perform events and activities at the Zoo over July which is then followed by a reciprocal visit by the Zoo's education team to W5.	July 2010 - 145 visitors reached. This increases the capacity and reach of both organisations and will be developed further in 2010/11.
W5 - Conversations with Africa	This programme is funded by the ROI Department of Foreign Affairs and the British Council. W5 worked in partnership with the British Council in Ireland, Northern Ireland, Ghana and Ethiopia, and M.Sc. Students in Leadership for Sustainable Development from the Gibson Institute at Queen's University Belfast, to develop and deliver this programme for 14-18 year old students. The key aspects included a teachers CPD day; formative outreach programme; in-school project work; and four video conferences at W5.	Sept 2009 – Mar 2010. 3 NI Schools; 4 ROI schools; 2 Ghanaian Schools; 2 Ethiopian Schools. The overall aim of this programme was to engage young people with the issues central to the international poverty reduction agenda and the Millennium Development Goals, in particular 'Ensuring Environmental Sustainability'.
W5 - First Lego League	The FIRST Lego League is an international competition for students (ages 9-16). Each year the contest focuses on a different real-world topic related to the sciences. The robotics part of the competition revolves around designing and programming Lego robots to complete tasks.	Sept – Nov 2009. 144 pupils reached from 16 schools. W5 works in partnership with IET, SAP, QUB and a wide range of industry sponsors including UU, FG Wilson. Engagement with the business sector.

DEPARTMENT **DCAL**

Name of activity	Brief outline of STEM activity	Impact of activity
W5 - Near Earth Object	W5 secured funding from the Science and Technology Facilities Council to develop and deliver this STEM challenge.	Oct 2009 – Mar 2010. 483 pupils reached in-house and 284 pupils reached through outreach. The event highlighted how space exploration relates to the science they currently are doing in school, particularly maths and physics.
W5 - Computing and Electronics - Welcome to the Virtual World!	In Partnership with the QUB School of Electronics, Electrical Engineering and Computer Science, W5 delivered a new lecture exploring how these fields of engineering are responsible for most major technological advancements in the last century, including anything from i-pods and mobile phones to high-tech medical equipment, computers and virtual reality.	Mar 2010. 418 students reached. This Lecture was of particular relevance to maths and science students.
W5 - Belfast Sewers Project	Pupils heard from engineers who worked directly on the Belfast Sewers Project before getting their hands on a practical and fun engineering challenge.	Feb 2010. 60 students reached. It provided an excellent opportunity to expose pupils to the challenges and opportunities of real life civil engineering.
W5 - Debating Science Issues	Supported by the Wellcome Trust, this programme challenged students from across Ireland to explore and debate topical biomedical issues, for example Genetic Testing, Stem Cell Research, Nanotechnology and Immunisation programmes. The programme involved W5 and Universities from across Ireland.	Jan – Apr 2010. 8 schools and 140 students reached. Heats were held in each province with the winners from Ulster, Munster, Leinster and Connacht taking part in a final in Dublin in April 2010. The Ulster Finalists, Our Lady and St Patrick's College, won the overall competition.
National Museums Northern Ireland (NMNI)	NMNI encourages visitors to explore, engage with and enjoy the rich and diverse collections and sites it holds in public trust. NMNI presents inspirational collections that reflect the creativity, innovation, history, culture and people of Northern Ireland and beyond.	Programmes and facilities provide educational, inspiring, interactive, practical and enjoyable learning opportunities that directly support curriculum needs. All educational sessions have been designed and developed by teachers and are delivered by a dedicated learning team. Innovative learning opportunities across all NMNI sites cover Pre-School, Primary and Secondary School activities.
NMNI - 'Figures in the Folk Museum'	Numeracy Trail at Ulster Folk and Transport Museum (UFTM)	Support for increased levels of numeracy at KS3 level

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Name of activity	Brief outline of STEM activity	Impact of activity
NMNI - 'Science on the Move'	Science Trail in Transport Gallery, UFTM.	Supporting increased levels of science awareness at KS2 and KS3.
NMNI - 'Formula One Event'	UFTM provides venue for this annual event. 500 students participated this year.	Awareness within schools of comparison between 19th/ 20th century technology and 21st century technology.
NMNI - 'Sentinus Young Innovators 2010'	Ulster Museum (UM) and UFTM STEM Ambassadors provide judging.	Promotion of role of museums in STEM provision
NMNI - 'High Flyers Club'	Partnership with Bombardier Aerospace to investigate flight and design. Flight Gallery UFTM.	350 children per annum participate in this programme. Engagement with business sector.
NMNI - 'Garden Show Ireland'	Investigation of the science of horticulture and issues of sustainability	Increased awareness of horticulture and sustainability issues.
NMNI - 'Cosmic Explorers'	Partnership with Northern Ireland Space Office and the Armagh Planetarium. 3D space journey celebrating 20th anniversary of Hubble Space Telescope	Event pending August 2010.
NMNI - 'World Oceans Day'	Partnership event with Northern Ireland Environment Agency exploring the marine environment. Lectures, talks and range of activities in Discover Nature Area, Ulster Museum.	Event pending June 2010.
NMNI - 'RSPB/Ulster Museum Partnership'	Focus on biodiversity and worldwide conservation issues.	Raises awareness of the significance of conservation and the role of museum visitors in conservation.
NMNI - 'Discover Nature'	Focus on biodiversity displays to reflect International Year of Biodiversity.	Raises awareness of local and worldwide biodiversity.
NMNI - Maths Trail	Ulster American Folk Park trail for KS1, KS2, KS3.	Regular usage by school visitors.
NMNI – Ulster Museum formal education classes	Stuffee Inside and Out - KS1; Stuffee, The Full Works - KS2; Dinosaurs to Fossils - KS1; Dinosaurs Were Not Alone - KS2; Minibeasts - KS1; Wild Things - KS1; Master of Disguise - KS1; Life without a Backbone - KS2; Rocks and Landscapes - KS3.	All programmes are delivered to schools from across Northern Ireland. To date programmes have involved around 200 schools.

DEPARTMENT **DCAL**

Name of activity	Brief outline of STEM activity	Impact of activity
Libraries NI	Libraries NI aims to provide and promote a range of high quality library and information services for everyone in Northern Ireland. A range of services include access to books, resources and newspapers; advice on information sources; reader development; access to cultural information; Local Studies Service; and Arts events. The People's Network provides computers in public libraries giving high speed access to the Internet for everyone.	Libraries provide a dynamic focal point in the community and assist people to fulfil their potential. They are catalysts for learning and community engagement and deliver inspirational education opportunities that are open and accessible to all of the community. A range of learning and outreach initiatives aim to enrich and enhance the lives of individuals and communities.
Libraries NI - Moneyville	Northern Bank project aimed at primary school children. Website linked to revised curriculum and intended to support financial capability and numeracy. Promoted with additional resources through public libraries.	Numeracy development and practical demonstration of maths skills.
Libraries NI - Bookstart	Early learning resources (packs at <1year and 3 years) delivered through a range of partners to all children of pre-school age.	Evidence of impact on children's early numeracy.
Libraries NI - Children's clubs	As part of programme of activities for children, cyber clubs will be running in most flagship libraries by the end of the year promoting safe use of the internet and supporting development of ICT skills.	Engagement of children in ICT.
Libraries NI - Resources	Libraries provide a welcoming, neutral environment for children and free access to a range of resources including free internet access.	89,431 children under 16 years old regularly use libraries in Northern Ireland.
Armagh Observatory	The Vision of the Armagh Observatory is "to build on its position as a thriving astronomical research institute, and to continue to expand our understanding of the Universe and of humanity's place in it." The Observatory's programmes of Science in the Community were assessed as "World-Leading" in the 2008 Research Assessment Exercise.	Astronomy is an imagination driver that stirs people's minds and leads to a more creative and scientific way of thinking. It is well suited for developing cross-cutting educational programmes in STEM. It provides many scientific "hooks" that facilitate a synoptic approach to learning across disciplines.

DEPARTMENT **DCAL**

Name of activity	Brief outline of STEM activity	Impact of activity
Armagh Observatory – OASES (Over us All is the SElfsame Sky)	An innovative programme developed by the Armagh Observatory and the Armagh Rhymers, designed to teach primary school children science by using the arts. This activity consists of: astronomy demonstration and questions and answer sessions; astronomy-inspired music and drama workshops; interactive performances; Astro-art workshops; a final show at the Armagh Observatory & Armagh Planetarium with all partnered schools.	This package helps primary school children learn science by playing. Not only does it teach children astronomy (part of "The World Around Us"), music and drama, art and design ("The Arts"), community relationships ("Personal Development & Mutual Understanding") but it also inspires them by demonstrating the interconnection between these disciplines, as well as advancing cross-community networking. This and related Astro-Art Fun workshops have a strong connection with the Observatory's involvement in the International Universe Awareness (UNAWE) programme. This provides contacts with international partners and potentially provides links between students in different countries. ("The World Around Us").
Armagh Observatory - FETTU (From Earth to the Universe)	A travelling poster exhibition featuring some of the best astronomy images ever taken. The exhibition, developed by Armagh Observatory as part of the International Year of Astronomy 2009, has already been displayed in 20 locations around the island of Ireland, often in conjunction with other astronomy-related activities.	For primary & secondary schools and general public (lifelong learning). This exhibition inspires the viewer with the beauty of the "World around us", and brings high-quality NASA & ESA images within reach, as well as being a base for teaching various science concepts.
Armagh Observatory - SSC (Discover the Stars at Armagh: School Science Conference)	A biennial schools science conference organized by the Armagh Observatory and the Centre for Cross-Border Studies (CCBS). The meeting includes a plenary lecture by a leading astronomer and a cycle of structured educational activities in the Armagh Planetarium and the Observatory's Library and Human Orrery.	The meeting brings together 250 KS3 students from both sides of the border to learn about astronomy, mathematics and related sciences.
Armagh Observatory - Work-experience and summer projects	Work-experience placements for students, both for second level (Nuffield STEM Bursary Scheme, part of Sentinus) and university level (e.g. undergraduate placements and IAESTE programme).	Students benefit from having hands-on experience of a real research environment to inform later decisions to chose an academic career and/or STEM profession.

DEPARTMENT **DCAL**

Name of activity	Brief outline of STEM activity	Impact of activity
Armagh Observatory - Faulkes Telescope project	Armagh Observatory astronomers offer specialized advice for students to work on projects using the two 2-metre class telescopes in Hawaii and Australia, remotely controlled from classrooms.	For secondary schools. Students experience controlling state-of-the-art telescopes in real time and collecting their own data for use in projects to be submitted to local and national science competitions.
Armagh Observatory - General public and school lectures	Armagh Observatory organises school and public lectures by renowned scientists.	For secondary schools and general public (lifelong learning). Participants have the opportunity to meet top scientists and listen to topics related to the latest discoveries in the world of science.
Armagh Observatory - Guided tours and visits	Groups of students and members of the public can visit the Observatory and its Demesne. There are approximately 50,000 visitors to the Astropark every year and 900 visitors take part in guided tours of the Observatory. The Observatory's web-sites also receive around 900,000 distinct e-Visitors every year.	For primary & secondary schools and general public (lifelong learning). Participants have the opportunity to enjoy the Observatory Grounds, Astropark and Human Orrery as a unique visitor attraction, leisure facility and outdoor education and learning facility.
Armagh Observatory - PhD student training	Armagh Observatory has a specialized programme of PhD placements. The students have the opportunity to work with world-leading scientists on research projects selected from a variety of astronomy topics.	Skills gained include: writing software/ programming, problem solving, subject-specific knowledge, quantitative data analysis and communication/team working.
Armagh Planetarium	The Armagh Planetarium is Ireland's leading centre for astronomical and space education - for all levels, from nursery through to retirement age. It is internationally renowned and aims to advance and promote the knowledge and understanding of astronomy and related sciences. It offers a curriculum-broadening experience for school visitors, and its educational programme has been redesigned to dovetail with the new curriculum.	It is the Planetarium's unique ability to adapt to changing audience needs that has enabled it to stay at the forefront of science education since its formation. It demonstrates to visitors the amazing objects that exist in the cosmos, but often in such a way that they do not see efforts as formal teaching. All school theatre shows are interactive and presenters and pupils take an active part in the show. The Planetarium calls this "Learning by Stealth".

DEPARTMENT **DCAL**

Name of activity	Brief outline of STEM activity	Impact of activity
Armagh Planetarium - Primary School Education Programme	Key Stage 1 and 2 interactive shows allow children to explore the Solar System. Other workshops include Rocks from Space, where they are shown how the Moon became covered in craters. They can see and touch a large 140 kg nickel iron meteorite from Campo del Cielo in Argentina. This iron meteorite probably hit the Earth around 4000 - 5000 years ago.	Workshops are designed to make the children think about the consequences of celestial events, like an asteroid impact. These topics can be explored more fully back in the classroom, and teachers will be able to emphasise the cross-curricular nature of such an investigation. Workshops involve discussion and problem solving, and simple tasks that can be carried out relating to the workshop topics.
Armagh Planetarium - Post-primary School Educational programme	"Underneath the Stars" is divided into subsets of Science, Maths, English and RE. At KS3 pupils are encouraged to use their communication, mathematical and ICT skills. They are being taught how to manage information and to use their creativity to solve problems working with their peers. Also available at the Planetarium is an inspirational show about the Christmas Star which is designed to complement the Religious Education unit of the new NI Curriculum.	The Key Stage 3 curriculum is especially rich in links to astronomy and space. There are dozens of opportunities to link the Planetarium's work to the curriculum. Thought-provoking workshops retain their power long after the Planetarium visit is over.
Armagh Planetarium - Nursery School Foundation Stage	The Foundation Stage of the primary curriculum is supported by Nursery School visitors having the chance to explore the Solar System in a way appropriate for their age and ability. This is achieved through storytelling, showing the children the night sky and the patterns in the stars and then allowing the children to respond through artwork and interaction with the presenters.	Nursery School visits are designed to stimulate and inspire young minds and to build a foundation for a lifelong curiosity about the world we live in and science in general. A new in-house show, Little Yellow Star, has been launched for the youngest visitors, plus new summer activities with balloon models of constellations.
Armagh Planetarium - Discovery Primary Science	Armagh Planetarium is a registered Discover Science Centre under the Discover Primary Science program which is being run in conjunction with Discover Science and Engineering. The Planetarium offers a workshop for any primary school from the Republic of Ireland registered as a DPS school. The workshop, entitled Cosmic Collisions, is a mixture of presentations and practical experiments.	The workshop encourages students to work in a team and explore the principles of forces as well as broaden their knowledge about space sciences. The 'Cosmic Collisions' workshop is designed to help children to investigate forces within the realm of space sciences.

DEPARTMENT **DCAL**

Name of activity	Brief outline of STEM activity	Impact of activity
Armagh Planetarium - Star Dome Outreach	The StarDome inflatable and portable planetarium can travel to locations throughout Ireland to educate audiences of all ages. It can accommodate up to 30 children or 25 adults and offers an educational experience in unique surroundings.	Since 2000 the Stardome has delighted over 100,000 children and adults all over Ireland. All shows are live and the audience is actively encouraged to participate and ask questions. It offers children a chance to come out of the classroom and learn about science in a fun and interactive way.
Armagh Planetarium - Astrogazers Clubs	The Astrogazers initiative has been developed to offer help and support to schools and school astronomy clubs throughout the whole of Ireland.	Students and teachers benefit from joining Astrogazers. Staff provide an in-depth knowledge base for use, whether Schools/ pupils are planning a visit to the Planetarium, designing a lesson plan or are completing a homework project. Students and teachers receive a copy of Armagh Planetarium's monthly publication, Astronotes, which contains helpful and informative articles on recent astronomical and space science topics.
Armagh Planetarium - STEM Funding	StarDome - Short talk on space travel and the Solar System followed by a constellation show in a inflatable StarDome, adaptable for all class groups; Rockets - Presentation on the history of rockets and demonstration of different types of rockets, as well as a workshop allowing students to build their own rocket; Electricity and Magnetism - Interactive demonstration using props on electricity and magnetism. Suitable for P4 upwards; Mission to Mars - Exploring life on other planets. Suitable for Key Stage 2& 3.	Armagh Planetarium can offer an extensive range of STEM funded activities tailored to suit particular needs.

DEPARTMENT **DCAL**

Name of activity	Brief outline of STEM activity	Impact of activity
Armagh Planetarium - ISSET Teacher Training	The Planetarium hosts teacher training entitled 'How to hold your own Space Camp'. This course has been developed by partners at ISSET (International Space School Educational Trust). The teacher training session is presented in a two day course held at Armagh Planetarium. It is delivered by the Planetarium's education team, all of whom have been trained by ISSET. The Planetarium has also arranged to host the entire first year intake from Stranmillis in the new term in Sept-Oct 2010 to give them a practical experience of what the Planetarium can do. Also accepting in service teacher placements, and trainee teacher placements for work experience and to learn about such capabilities.	Teachers are guided through the comprensive set of Information and Activity Packs provided for the course. This includes a compilation of videos, activities and experiments, which can be run from a laptop. Feedback from teachers who attended courses has been very positive as the interactive practical activities are educational, entertaining and engaging. Space Camp covers a range of topics including: Solar System; Rockets; International Space Station; Exploring Mars; Astronauts.
Armagh Planetarium -Downloads	Astronomy and STEM related downloadable materials. The downloads are supplemented by short instructional and demonstration web videos on YouTube and TeacherTube, made in house, plus new blogs, and Twitter feeds.	The Planetarium, via its website, makes available a wide range of resources for educational and non-profit making uses.
Armagh Planetarium - Astronomy Courses	Armagh Planetarium can present courses and lectures on astronomical topics aimed at adult audiences: for example, Space Exploration; Our Place in the Universe Course; The Night Sky Course. Other courses are offered on request and specialist courses can be provided in this way. The Planetarium is also planning to help in running a new Armagh centred GCSE in Astronomy, with St Patrick's (boys), St Catherines (girls) and the Royal School Armagh (both).	Lifelong learning in STEM. The courses are presented as part of QUB Open Learning, but they also earn Credit Accumulation Transfer Scheme (CATS is a UK wide standard) points towards degrees. Similar courses are offered as part of community outreach, for example with the Tara Centre in Omagh.

Name of activity	Brief outline of STEM activity	Impact of activity
Armagh Planetarium - Northern Ireland Space Office	In 2006 Armagh Planetarium launched the Northern Ireland Space Office (NISO). NISO aims to build on the interest and enthusiasm of teachers already involved in space science projects by developing resources to support all teachers in aligning the potential offered by developing technologies to the requirements of the revised Northern Ireland Curriculum. The NISO has very strong links with the BT Young Scientist competition held in January each year at RDS Dublin, and with ESA HQ in Paris, Munich, Darmstadt, Estech in the Netherlands and Frascati in Italy. NISO also works with FORFAS, Engineers Ireland and various other RoI based bodies.	The resulting resources and support materials will use the context of space to relate science, technology and mathematics to real life. The Space Office mission is to create a learning environment that encourages school children to recognise the importance of science, engineering and technology in modern industry and society.
Armagh Planetarium - ESERO UK initiative	The Planetarium is the Ireland Space Champion as part of the ESERO UK initiative. There are strong practical collaborative links with ESERO Ireland and Blackrock Castle Observatory in Cork.	This aims to: 1) establish a space education network, bringing coherence to the space education sector; 2) Raise the profile of ESA and the UK space sector within the UK education community and the wider population; 3) Act as a point of contact for teachers and lecturers and other members of the ESERO network when sefiing information about space education; 4) Host a Web Portal pointing to space education resources, and a physical resource collection ; 5) Establish several space education champions to promote the work of the space education network throughout the UK.
Armagh Planetarium public interaction: questions	Planetarium staff field many questions from the public: in person when they are visiting; by phone and letter; and also by email. Questions range from identifying “meteorites”, to discussing dangers of Solar Flares, cosmology, and the superstitious material relating to doom and extinction which frequently sweep through the internet community, e.g the 2012 “disaster”.	Increased public knowledge and understanding of astronomy and science. Questions are answered in a substantial personalised way, and do not rely on stock responses. Visitors also have the experience of talking to staff who are very knowledgeable in their specialist fields, thus they meet and interact with the scientists.

Name of activity	Brief outline of STEM activity	Impact of activity
Northern Ireland Screen	Northern Ireland Screen aims to accelerate the development of a dynamic and sustainable screen industry and culture in Northern Ireland. Its mission includes ensuring that a range of learning opportunities enable people to be motivated to enjoy, understand and explore the moving image.	Northern Ireland Screen is a key player in the development of Northern Ireland's film, television and digital content industries. It also oversees three Creative Learning Centres in Northern Ireland and a range of outreach and education programmes that have a crucial role to play in both the formal and non-formal education sectors in relation to skills development and Moving Image Education.
Northern Ireland Screen - Creative Learning Centres	The 3 Creative Learning Centres, the Nerve Centre in Londonderry, Studio On in Crossnacreev and the AmmA Centre in Armagh, provide a range of unique opportunities for children and young people, teachers, youth groups and youth workers in the creative use of digital technologies. These include digital photography, film and video making, animation and music.	They operate in collaboration with the formal and non-formal education and community sectors and provide a range of sustainable programmes designed to engage young people in new ways of learning and expression. The ethos of the Centres is very much "learning by doing" and this approach makes learning fun, thereby better engaging children and young people, especially those from hard to reach groups. The Centres also provide digital media training for teachers, making a significant contribution to the continued professional development of the teaching force. This is particularly important with the increasing take-up of the CCEA Moving Image Arts qualifications in schools across Northern Ireland.
Northern Ireland Screen - Education Policy	Northern Ireland Screen aims to broaden access to, and develop awareness and understanding of, moving image culture and heritage in Northern Ireland.	Northern Ireland Screen will "Embed the use of moving image and the creative use of related digital technologies in the curriculum in Northern Ireland" by working in partnership with key stak›olders.

Name of activity	Brief outline of STEM activity	Impact of activity
Northern Ireland Screen - Media and Moving Image Education Courses and Training	Courses and training programmes for two distinct groups: a) Teachers, trainers, educators and others interested in CPD courses in Moving Image Education and b) Those interested in a career in the media industry and professionals wanting to upgrade their skills or wanting to make a career shift.	Lifelong learning and multiplier impact of teacher and youth leader training.
Northern Ireland Screen - MA in Film and Television Management and Policy	Northern Ireland Screen backs the post-graduate MA in Film and Television Management and Policy through the University of Ulster's School of Media, Film and Journalism. This course is for those who wish to develop production and managerial competence and entrepreneurship in relation to the media industries. A Skills Bursary is available from Northern Ireland Screen.	The course will equip students with the entrepreneurial skills, cultural awareness, and organisational understanding necessary for the confident management and promotion of the creative process in film, television and other creative industries. There is a particular emphasis on the audio-visual industries in Northern Ireland.
Northern Ireland Screen - Moving Image Arts at AS and A-Level	Moving Image Arts (MIA) is a qualification in the art of the moving image being introduced to schools across Northern Ireland by CCEA. Moving Image Arts was developed by the British Film Institute and CCEA in collaboration with the Nerve Centre and Northern Ireland Screen. Teacher training and ongoing support is being provided by the Nerve Centre and CCEA.	The qualification is located within the arts curriculum and has a clear focus on the visual arts and its relationship with film. The qualification is enabling art students to develop their creative abilities through actual 'hands-on' digital film-making in the classroom.

ANNEX B

Recommendation	Proposed Actions
Establish a business led STEM framework	• A Business sub group, chaired by a STEM Champion, is currently being established. This group will lead a network of stak›olders, including the relevant Sector Skills Councils, STEM charity bodies and Business Education Partnerships (BEPs) and other employer representative bodies to work with local companies and facilitate their engagement with both students and teachers within local schools, further education colleges and universities to promote STEM. • This group will coordinate existing activity in this field to ensure that activity in this area is properly targeted and uses existing resources efficiently. • The Business sub group also needs to work with local STEM companies to improve the attractiveness of the sector. This work should take cognisance of the comments within the 'Report of the STEM Review' relating to the current remuneration within the sector and should facilitate the engagement of the high number of small and medium sized enterprises (SMEs) to encourage them to work together to highlight the opportunities they have available.
Develop a clear STEM careers path	• The Business Sub Group will develop a programme to promote STEM careers which will engage relevant Sector Skills Councils, the NI Careers Service and the Education Service. This programme will further sefi to find innovative ways to promote STEM career opportunities to parents, in particular emphasizing the many paths offered through further education.
	• The Business sub group should also sefi to increase the number of STEM ambassadors, ensuring that quantity is matched by quality
Introduce prestigious STEM scholarships	• Using the findings of DEL's, 'Feasibility Study into the creation of STEM Bursaries and/or Scholarships', the Business sub group should encourage and coordinate STEM businesses to work together to build on the number of scholarships available for talented students studying STEM at our further education colleges and higher education institutions.
Address gender bias	• The Business sub group should work with the Sector Skills Councils and other bodies to help address gender bias especially within physical sciences and engineering. All funded programmes in this area should take cognisance of this issue.
Develop regional STEM links	• The Business sub group should establish links with STEM businesses/ organisations in other regions to build a critical mass. In particular, the group should sefi to develop a working relationship with organisations such as Discover Science & Engineering and Engineers Ireland. Such a relationship could potentially open up opportunities to link with various large multinational companies who currently engage through those bodies. • DCAL, as NI government lead on the creative industries, will work in partnership with industry and regional and national stak›olders in developing the sector in NI and promoting those creative industries with strong STEM relevance.

Recommendation	Proposed Actions
Address the disparity in STEM performance amongst schools	• Through implementation of Every School a Good School: A Policy for School Improvement, DE will ensure a focus on supporting schools to improve outcomes for all pupils, with a particular focus on mathematics and also on literacy and ICT in the north of Ireland. • As part of wider work to reorganise professional support for teachers and schools, DE will ensure there is a focus on providing professional development to primary and post primary teachers to support STEM teaching and to disseminate best practice. This will include a focus on improving teaching and learning – and pupil attainment – in key areas, for example, the physical sciences. • DE will ensure better targeting of STEM and business education activities funded through the Department towards those schools which do not have a strong track-record of involvement in STEM-related activities. • DE will explore the opportunity for the introduction of a specific focus on tacking underachievement in STEM-related subjects into the work of the North/South Educational Underachievement Working Group established under the auspices of the North South Ministerial Council.
	• DCAL, through its learning strategy and sponsored bodies, will sefi to maximise the uptake of STEM learning and promotional opportunities by schools. The Department will sefi more effective and collaborative marketing of such resources, expertise and learning opportunities.
Support primary school teachers in teaching the area of learning, The World Around Us	• DE has already commissioned an audit of resource needs in STEM to inform the development of new resource material for primary schools. In response to this recommendation and the findings of that audit, the Department will ensure the production of STEM case studies and STEM-based curricular resources and associated guidance for teachers in Key Stage 2. • Recognising the impact of the unavailability of suitable resources in the past, DE will ensure the provision of new materials, tailored to the needs of schools, that can help promote STEM in Irish-Medium schools across Ireland. • CCEA is now making available a STEM microsite which will house additional STEM-related resources for teachers and pupils and to showcase STEM activities in primary schools. The website, produced with assistance from DETI and MATRIX, involves making connections between the curriculum and the world of work using local and high technology businesses by promoting STEM related subjects to raise awareness of the role of these in society and our economy and to encourage young people to consider STEM related areas as career opportunities.
	• DCAL will encourage its Arm's Length Bodies to continue development of resources and programmes for learning that are matched to the revised curriculum for schools and specifically STEM related aspects. The development of programmes supporting continuing professional development for teachers will be encouraged as will partnerships that support closer working arrangements with the formal and non-formal education sectors and the adult and life-long learning sector.

Recommendation	Proposed Actions
Review ongoing developments in mathematics in relation to STEM provision	• DE will introduce new end of Key Stage assessment arrangements for all grant-aided schools in the north of Ireland that include a focus on numeracy and on use of mathematics as well as on using ICT (and, of course on communication) and that will assess skills as well as knowledge and reflect progression routes from Key Stage 1 through to GCSE and beyond. • DE will explore the scope to introduce additional level 2 qualifications to recognise achievement in literacy and numeracy to complement existing GCSE courses in English and Mathematics. • DE will participate, via its examinations regulator, in the accreditation of new specifications for GCSE science to ensure that the science examinations in schools here are fit for purpose and reflect the needs of the economy. • DE will review the provision and availability of applied qualifications at Level 2 and Level 3 in the context of the Entitlement Framework to establish gaps in relation to STEM subjects and mechanisms for filling those gaps. • In order to address the difficulties many young people face in applying their mathematical skills at further education level, DEL will continue to deliver its Essential Skills programme. • DEL will work with further education colleges to consider a course that can be used to underpin those courses with a strong science and mathematical bias which develops the numeracy skills taught through the Essential Skills programme.
	• DCAL will encourage the education sector to make more effective use of the resources, expertise and learning opportunities, provided by its Arm's Length Bodies, that support numeracy development and the application of mathematical skills within practical and inspirational settings.
Make STEM learning more enquiry based	• DE will promote the increased use by schools of the new, state-of-the-art, STEM truck, ensuring that the opportunity to avail of its facilities is extended, particularly to primary schools and those schools serving areas of significant social disadvantage throughout the north of Ireland. • In commissioning new resources for primary schools, DE will ensure that there is a particular focus on enquiry-based learning and on providing pupils with opportunities to develop their thinking and problem-solving skills. • DE will ensure the production of new resources for post-primary pupils at Key Stage 3 that focus on innovative, ICT-based opportunities to enhance STEM learning and teaching and to promote pupils' skills of enquiry and exploration.
	• In order to make STEM taught in further education more investigative, DEL will work with Sector Skills Councils and Awarding Bodies at the design and development stage of vocational qualifications, and then providers at the delivery stage, to examine how courses could be adapted, for example, to include more practical elements within the learning unit, or the inclusion of work placements within the taught unit. There is potential to link in with the work being done on STEM curricula at primary, secondary, further and higher education, establishing a streamlined system where STEM is made appealing at all levels. In addition, a potential recommendation arising from the development of the Sector Qualification Strategies / Qualifications and Credit Framework policy may be that all Sector Skills Councils include a section on STEM in their Sector Qualification Strategies NI action plan.

Recommendation	Proposed Actions
	• DCAL will encourage more effective uptake of the resources, expertise and learning opportunities provided by its Arm's Length Bodies to facilitate more innovative, engaging, interactive, enquiry based and 'learning by stealth' opportunities. • Additionally, the future implementation of a revised model to recognise 'excellence' in the sphere of employer engagement will provide opportunities for NI's six further education colleges to focus their delivery on particular niche areas, including those with a strong STEM related focus.
Improve planning at the Key Stage 2 / Key Stage 3 interface	• DE will monitor implementation of the recommendations in the ETI report on the teaching of science within the revised curriculum in primary schools which has a specific focus on co-operation between primary and post-primary schools in the north of Ireland to ensure that children's science learning is progressive and continuous when they transfer from Year 7 to Year 8. • DE will use the findings in the recently published ETI report entitled An Evaluation of Transition in Mathematics: Primary to Post-Primary to inform the numeracy component of its new literacy and numeracy strategy and will also communicate the recommendations to schools. • DE will review the regulations governing the formative record of achievement to ensure that post-primary schools receive relevant information on transferring pupils' progress and achievements so that they can plan teaching in a way that builds on that progress rather than duplicates prior learning.
	• DCAL will encourage the education sector to consider how best the range of primary and post-primary learning programmes provided by its Arms Length Bodies can assist with improved continuity and progression from KS2 to KS3 so that the teaching of STEM builds effectively upon the children's earlier learning.
Increase the focus on the core sciences and mathematics subject	• DE will ensure a clear focus on attainment in mathematics from Key Stage 1 to GCSE, recognising the importance of mathematical skills as the basis for learning in all STEM-related subjects. • As part of the Entitlement Framework, DE will ensure that pupils have access to a broader, more balanced range of courses that include mathematics as well as the area of learning of science and technology and that can enthuse and excite young people and enable them to succeed in STEM-related subjects. • DE will support opportunities for pupils in the north of Ireland to participate in competitions, exhibitions and other events designed to increase schools' and pupils' focus on the core sciences and mathematical subjects, ensuring a particular focus on those schools that do not already have a track-record of engagement in such events and on promoting attainment in science and maths at the highest levels.
	• DEL has asked the Employment and Skills Adviser to review the current priority skill areas which receive incentivised funding.
	• DEL will also work with Sector Skills Councils to explore the extent to which they have identified STEM subjects as 'key qualifications' in their Sector Qualification Strategies • To inspire, encourage and promote an interest in core sciences and mathematics subjects, DCAL will encourage the education sector to make more effective use of the innovative STEM related resources, expertise and learning opportunities provided by bodies such as the Armagh Observatory and Planetarium, W5, and National Museums NI.

Recommendation	Proposed Actions
Facilitate easier two-way transfer between further education and higher education	• DEL will continue to work with the relevant Sector Skills Councils and the further education Regional Colleges to ensure that Foundation Degrees in STEM disciplines are developed which meet the needs of employers and are industry led. • DEL through its Apprenticeship NI programme will encourage progression from Level 3 to Foundation Degrees and higher level qualifications. • DEL will provide funding for the Step-Up programme at the University of Ulster in the North West and Belfast and will give consideration to an expansion of the programme into schools in the East Antrim area. • DEL will consider what other activities could be introduced to increase transfer routes, informed by the identification of best practice both nationally and internationally.
Reduce barriers to obtaining support in STEM	• The NI Employment and Skills Adviser will advise DEL on ways in which to encourage employers to offer appropriate work placements and, particularly in STEM subjects, scholarships for students from universities and colleges. • As part of the Review of the Future Policy on Higher Education Tuition Fees and Student Finance Arrangements in Northern Ireland, DEL is reviewing the financial support available to students at higher education institutions (including those studying STEM subjects). A public consultation on the policy proposals is expected to commence in 2011. • DEL commissioned research undertaken by FGS McClure Waters to examine the impact of introducing bursaries to increase the number of people enrolling at colleges and universities in NI and going on to be employed in STEM areas. There is little evidence to suggest that bursaries would provide a sufficient return on investment. Instead the report supports recommendation 3, the introduction of prestigious STEM scholarships.
Develop a STEM Continuing Professional Development framework	• DE will ensure the provision of professional development opportunities for teachers throughout the north of Ireland that are designed to promote and support effective STEM teaching in the primary and post-primary sectors within the revised curriculum and to disseminate best practice. • DE will provide an opportunity for additional professional development for A level teachers of ICT and Computing which will also provide opportunities for effective engagement between teachers and industry representatives. • Queen's University has the capacity to address Continuing Professional Development needs through the School of Education and their STEM Schools and they wish to develop closer, more formal, links with specialist subject schools. • The continuation of an industry standard professional up skilling programme for further education lecturers remains a DEL priority. • DCAL will encourage regional stakeholders to avail of the STEM related Teacher resources and CPD opportunities provided by its Arm's Length Bodies – in particular the diverse range of programmes and initiatives delivered by the W5 and the Armagh Planetarium. The Department will sefi to develop such opportunities in keeping with leading standards and national best practice.
Increase the emphasis on STEM careers advice and guidance	• This recommendation will reflect the work being taken forward by the Business sub group under Recommendation 2, the development of a clear STEM careers path. • DEL and DE, including through the Careers Advisory Service, will implement the STEM Careers Strategy, outlined in 'Preparing for Success' and ensure that work to secure the provision of high quality careers education, information, advice and guidance includes a focus on promoting STEM career opportunities. • Schools, colleges and universities along with Sector Skills Councils and other organisations should consider innovative ways in which to better engage with parents to highlight the opportunities that exist within the STEM sector.

Recommendation	Proposed Actions
DE and DEL, supported by other relevant Government departments, should develop a clear STEM strategy and vision	• Through the Programme for Government, the Executive has placed a focus on the increased delivery of STEM skills to grow a dynamic and innovative economy. • A Government sub group will be established as part of a wider STEM Implementation Steering Group. It will bring together the key government stakeholders (DHSSPS, DETI, DARD, DCAL, DEL and DE) and will produce and oversee the implementation of a Government STEM Strategy.
DE and DEL, supported by other relevant Government departments, should introduce cross-departmental structures to help develop appropriate STEM strategies and policies	• In addition to the Government Sub Group mentioned above, DEL is committed to working with Matrix and the IREP Delivery Groups, with a view to facilitating the development of the skills necessary for emerging market opportunities. Work is being taken forward through the interdepartmental work on the development of Industry led Innovation Communities (IICs) and the development of a specific skills delivery system. • DEL, DETI and INI are working together to support new NI based FDI companies by working with colleges and universities to increase the number of people with the skills sought by these companies in order to secure high value employment in NI. • DCAL will support such cross-departmental activity through its leading role in the creative industries and in the promotion of creativity.
Develop a more proactive approach to managing STEM supply and demand	• DEL has in place structures to enable employers to articulate their demand for skills at both at a local and regional level. They are supported by Labour Market Information and forecasting exercises, such as Oxford Economics 'Forecasting of Future Skill Needs in Northern Ireland' report. This demand side model continues to be assessed and improved upon. • DEL will ensure that its employer engagement mechanisms and existing main streamed provision offered at Colleges and Universities has the capacity to respond to the STEM skills needs of local businesses. • In an employer led approach to STEM apprenticeships, DEL will encourage the Sector Skills Councils and employers to develop and bring forward approved frameworks to be funded under the ApprenticeshipsNI professional and technical training provision. The Department will also work with its contracted training organisations to ensure that the quality of STEM apprenticeship programmes meet the standards expected by employers. • DEL will fund approved frameworks that have been developed for Apprenticeships in STEM areas.
Increase the number of applications for physical sciences and mathematics places in Initial Teacher Education courses	• DE will, as part of the annual process of determining intakes, reflect the need for high quality teachers in STEM-related subjects by ensuring the provision of STEM-related places in Initial Teacher Education matches the needs of schools in the north of Ireland.
Expand the capacity to respond to critical skills shortages as they arise	• DEL will build upon the existing work being taken forward by the Colleges and Universities through the introduction of a skills brokerage service. • Where appropriate, DEL will consider the introduction of conversion courses similar to the Software Professional Course.