



# Association of Teachers and Lecturers

## **ATL Response to “Success through STEM” the draft Government STEM Strategy**

“Helping to empower future generations through science, technology, engineering and Mathematics to grow a dynamic, innovative economy.”

Association of Teachers and Lecturers  
16 West Bank Drive  
Belfast  
BT3 9LA  
[www.atl.org.uk](http://www.atl.org.uk)  
Tel: 028 9032 7990

## **ATL Response to “Success through STEM” the draft Government STEM Strategy**

“Helping to empower future generations through science, technology, engineering and Mathematics to grow a dynamic, innovative economy.

**1. Introduction:** Representing over 160,000 members, the Association of Teachers and Lecturers is the UK’s third largest education union – with a broad membership encompassing educational professionals from early years right through to further education.

ATL is pleased to respond to the D.E.L. consultation on STEM, and does so from the perspective of a trade union for Teachers and Lecturers which has a professional interest in education policy in the round. ATL has welcomed the broad thrust of the Costello Report and, in particular, an Entitlement Framework which will enrich the opportunities for young people to chose from a broader range of potential vocational learning pathways.

**2. In summary:** In summary, ATL would

- Question the efficacy of a STEM emphasis on “supply side” solutions and a general obsession with graduate skills.
- Urges DEL to put more emphasis on Level 3 as an end in itself, and urges consideration of “licence to practice” within productive priority sectors to give Apprenticeships and other Level 3 awards real currency.
- Urges DE to lower Pupil teacher ratios in practical STEM subject classes to a maximum of 1:18
- Urges DE to consider the proposal of the Northern Ireland Teachers Council for a pilot “guaranteed year scheme” for newly qualified teachers (similar to the ‘McCrone’ scheme in Scotland) with the potential to focus this scheme on STEM subjects.
- Would welcome the Northern Ireland Executive setting out a robust Industrial strategy with emphasis on selective support for manufacturing and export, as well as a deepening of the “Priority Sectors” within the associated Skills Strategy and urges DEL to take account of the atrophy of work based skills transfer by companies themselves.

**3. ATL General Views** ATL, within previous consultation responses (The Skills Strategy, Higher Education Review) has expressed concerns about the merits of following a “50% Access” to Higher Education policy, in particular regard to the skewing effects on the “bottom 50%”. Recent research <sup>(1)</sup> has suggested:

- The link between further education expansion and higher productivity is not proven – this is likewise the case with increasing STEM supply;
- Graduate courses are an inefficient means of meeting demand for the substantial number of jobs with vocational requirements below degree level;

- Too many UK and NI workplaces are locked into low skilled, hierarchically controlled, low autonomy cultures with task discretion sharply decreasing, particularly for professional “knowledge” workers!
- In many sectors, notably service sectors, graduates occupy jobs that do not require or use their skills. The 2<sup>nd</sup> Skills Survey (2, Felstead et al) reported that only 13.4% of the UK labour force felt they required and were using a degree level qualification in their current job;
- In some regions graduate supply massively outstrips demand for graduate labour, with a remarkable concentration of graduates in the public sector.,
- The dearth of appropriately qualified people available and willing to enter craft and technician posts has begun to concern sectors such as Engineering, Construction and the Motor trade.

ATL considers that the critical STEM need is for quality vocational and work based opportunities at Level 3 and Level 4 (or at technician and associate professional level) The need for increased achievement at level 3 should be seen as a potential end in itself, rather than as a mere staging post towards progression to Higher Education. Policy makers pressing for a 50%+ access rate to Higher Education fail to take account of the likely consequences of the policy. If ever more people at Level 3 opt to undertake degree study within Higher Education, how and by whom are the substantial number of craft, technician and associate professional jobs that require a Level 3 qualification to be filled? The principal STEM gap is at Level 3.

**STEM “Vocational Routes” and the “low skill equilibrium”** ATL has supported moves towards a broader Entitlement Framework of study areas being made available to young people, and supports the increased focus on providing balanced ‘general’ and ‘applied’ options.

The means by which Northern Ireland achieves the desired outcome of “*different routes of equal value*” is more difficult. It unquestionably requires the end outcome of a vocational route (say, for instance, within an apprenticeship) to be of value in career and remuneration terms. This is recognised by the Draft Government STEM Strategy. **This, however, will require wider labour market intervention - and consideration of ‘licence to practice’, industrial regulation and other issues which cut across the ‘flexible’ labour market, and voluntarist vocational education and training models currently favoured by the NI and UK governments.**

The Higher Education route is chosen by parents for good reasons. Graduates earn more! Graduates have more chance of getting any given job than non graduates, whether their degree is relevant or not. Equally, general educational qualifications at GCSE (Level 2) or “A” level (Level 3) will tend to earn people significantly more in the labour market than equivalent vocational qualifications at Level 2 or 3. The general character of the economy (services and public sector driven, dominated by non productive Financial services and Banking) makes for an absence of good “front loaded” VET (Vocational Education Training) with a place in a skilled occupational area, allowing trainees or apprentices to gain a ‘licence to practice’. This means, in effect,

that we are asking our children to 'second guess' the labour market in making study choices, no less in STEM areas than in other occupational areas. Young people, if they get good advice, make a '*gestimate*' about what occupation they might like to do, what the rewards are and what might be worth investing time in initial training in. It is, for young people in their formative years, a gamble of some significance.

There is also risk also on the STEM employer side. The employer is unlikely to take the risk of significant investment in front loaded skill formation if they can't get the rewards at the other side. Will the trained worker be pinched by a competitor, for instance? This is one reason why employers tend to focus on the narrow task and job specific training – skills that are non transferable. Very often when employers talk about "skills", they're really talking about "work discipline" and "attitudes". And, without intervention to mediate the risk, it is perfectly rational for employers to adopt a minimalist approach. This is what has produced the low skill equilibrium in the economy that we now experience.

Without some form of real value, **real currency**, licence or reward, it will be very difficult to attract candidates to invest time in rigorous skill formation, or to defer earnings without planned, front loaded investment and an end reward. The alternative outcome is for young people in the "Bottom 50%" to '*second guess*' the labour market. The high level of economic inactivity in Northern Ireland can, at least partly, be explained by a black economy on the service side, as well as by displacement from unemployment to disability type benefits. In short, STEM Vocational routes, and vocational qualifications require real currency.

However, Government should think hard about the effect of its policies on institutional instability. Funding methodologies within Colleges in particular vary from year to year in a manner that makes medium term planning difficult. The provision of funding on a programme, or 'initiative' basis, on a competitive basis and on the basis of "*outcomes, not institutions*" is a poor way of strengthening institutions in the long run. Market mechanisms within education are poorly developed and policy should recognize that a market based education provision can only succeed in a limited range of areas where consumer demand is well formed and sophisticated, where there is choice between competent providers with well known educational outcomes. Students at the lower end are unsophisticated consumers and suppliers, in many cases, have been destabilised by this market orientation in education.

It should be borne in mind that institutions require stable policies and stable resources to respond over a period of time. A "micro targeting" and "naming and shaming" approach has led to widespread demoralization. There has been an enormous amount of policy churn to the extent that initiatives and schemes are rarely in place for long enough to be properly evaluated. Initiative fatigue has undermined the enthusiasm of those required to implement new schemes.

## 4. Consultation Questions

### 4.1 Do you believe that the activities already taken and those articulated in this Strategy will address these recommendations? If not, what else needs to be done?

The Government review is encouraging in that the strategy accepts that declining STEM enrolments have now reversed and that the proportions of STEM students in Further and Higher Education are higher in Northern Ireland than in Britain.

Also encouraging is that the Government response is accepting that the supply of skills do not, *per se*, improve economic productivity or competitiveness. It accepts that the Northern Ireland economy runs on a “*low skilled equilibrium*” and that economic growth and job creation drives skill levels, not the other way about! “*..the issue is not so much the potential supply of people with skills in STEM but rather the low employment returns on STEM....*” So far, so good.

However the recommendations listed for Action, whilst laudable, are timid.

The elephant in the room, at a time of crisis in the UK's predominant sector, banking and finance, is the absence of a robust Industrial Strategy, focussed on creating productive jobs, with increasing selective intervention to support manufacturing - recognizing the reality of ‘peak oil’ production and climate change, the need to increasing green energy supply and move to a sustainable productive and socially useful development forms and away from previously dominant speculative finance.

The measures required will, however, require wider labour market intervention - and consideration of ‘licence to practice’, industrial regulation and other issues which cut across the ‘flexible’ labour market, and voluntarist vocational education models currently favoured by the NI and UK governments.

### 4.2 Given the pressures on public finances which actions do you believe will make the most difference and should be priority?

ATL welcomes the various ‘supply side’ initiatives and, as a teachers and lecturers association would welcome the opportunity to discuss further measures such as “***Stimulating interest in, and enthusiasm for, STEM***”. Of the measures considered useful would be:

- the revised curriculum, providing greater freedom for teachers to explore STEM related learning with pupils in an interesting and innovative way;
- Entitlement framework, providing greater breadth and balance to young people at 14 and above;
- Promotional activities, including BT Young Scientist, Sentinus Young Innovators and Irish Science Olympiads;

- Improving teaching and learning in STEM related areas, including the agreed programmes of professional development muted to be in place by 2012;
- The College STEM Initiative (CSI);

That said, ATL have less faith in measures such as:

- Specialist schools: which ATL sees as part of a failed “marketisation” experiment in education, promoting fund bidding wars and inter-school competition, rather than rational collaboration;
- The STEM Truck (mobile laboratory) which we see as an expensive (if impressive) gimmick unlikely to be justifiable in Value for Money terms.

In addition, ATL would propose two modest measures:

- 1) That Pupil Teacher Ratios in Science and Technology classes be reduced, with a maximum ratio to 1:18 in classes, reflecting that Science classes are practically based and require smaller numbers to encourage depth of learning;
- 2) That the proposal of the Northern Ireland Teachers Council for a pilot “guaranteed year” for newly qualified teachers (similar to the ‘McCrone’ scheme in Scotland) be agreed and focussed on STEM subjects.

However, ATL agrees that the STEM subjects are best promoted by industrial and economic demand, notably the availability of well paid employment in STEM related sectors, the image of the sectors, career pathways, job security and the potential cost of training.

Highlighting opportunities and scholarships available, better networking and communications, and enhanced role for Sector Skills Councils will all help in this regard – but none of these ‘soft’ measures will be any substitute for a proper industrial Strategy and an interventionist approach aimed at backing and promoting those economic sectors where Northern Ireland stands a reasonable chance of competing in export and global terms.

The inhibitors here are political, rather than educational or promotional. After 30 years with a neo-liberal or Hayek-ian economic orthodoxy shared by all major British political parties, and even with the collapse in confidence in a “*socially useless*” (in the estimation of Lord Adair Turner, Chair of the Financial Services Agency) speculative, global financial system from 2007 onwards, there remains a reluctance of policy makers to intervene with ‘markets’

ATL, like the UK’s Business Secretary, Vince Cable, understands that markets often fail, and often act irrationally, and tend towards monopoly. We would prefer an approach more akin to that of the former Secretary of State for Industry, Michael Heseltine, after his appointment as President of the Board of Trade in 1992, promising to intervene “*before breakfast, dinner and tea*” to help companies, jobs and growth.

As such, a robust **Industrial Strategy** and planned programme to support and stimulate STEM jobs in “winning sectors” is the one action we would recommend. Such a strategy could borrow on the work of the “Green New Deal”<sup>(3)</sup> and the work of the local Northern Ireland New Green Deal Group led

by John Woods and involving a collaboration of business interests, trade unions and the voluntary sector. The extensive academic research undertaken by SKOPE (see Notes) will provide rational underpinning of the need to support economic growth as a means to moving the United Kingdom away from a low skills equilibrium.

## References

- (1) Keep E and Mayhew K, The Economic and Distributional Implications of current policies on Higher Education, SKOPE paper, ESRC (Oxford, Warwick) 2004
- (2) Skills at Work, Alan Felstead, Duncan Gallie, Francis Green, Ying Zhou, ERSC Centre on Skills Knowledge and Organisational Performance (SKOPE) 2007 ISBN-978-0-9555799-0-5
- (3) A Green New Deal: Joined up policies to solve the triple crunch of the credit crisis, climate change and high oil prices. New Economics Foundation 3 Jonathan Street, London [www.neweconomics.org](http://www.neweconomics.org) ISBN 978-1-904882-35-0

**NOTES:** SKOPE, Skills Knowledge and Organisational Performance is an ESRC fund research centre, based in Oxford and Cardiff Universities, which has pioneered work in the relationships between competitiveness, economic growth, skills, and vocational education systems. SKOPE publish to longitudinal study "Skills at Work 1986-2006"

## Extract from 2009 ATL Policy submission on teaching Science

### **Early Years**

ATL believes that providing the best science education for young people starts in the earliest years of learning, in the early years foundation stage and throughout the primary curriculum. There is much evidence of the similarity between the ways in which young children make sense of the world and the processes of science. (See for example Andrew Meltzoff et al *The Scientist in the Crib: Minds, Brains, and How Children Learn*.) The early years and primary curriculum should build on these processes, rather than turning children off science with a focus on facts and figures.

There is also plenty of evidence that young children learn best through play. This is not to suggest that play should be structured in such a way as to try to “teach” scientific (or any other) concepts, but certain aspects of play could lay the foundations, often subconsciously, for these concepts. It is about enabling children, through their own self-directed play, to explore the world around them and to form their own hypotheses and questions. The importance of a rich and well-resourced environment, both indoors and outside needs to be emphasised, as well as the need for practitioners to have a good understanding of how to support and develop children’s play so that they can help children to understand scientific concepts and processes at their own pace.

In previous discussion about early years science, an ATL member suggested:

*For me, playing with sand is all about the nature of materials. It is of course a solid, and individual grains can often be some of the hardest minerals on the planet. However, let it trickle through your fingers, and it almost feels like a liquid. It will even act like one. Let it turn a waterwheel, it will work just as well as water. What have you got to do to make it more solid; mix it with water! Why does this work? How does water bind the particles together?*

*These are the kind of questions we want children to think about. Of course this might lead them to ask one or two awkward questions themselves later on. In year six, or in the secondary school, when they are told that there are three states of matter; solid, liquid and gas, might they not want to know where jelly fits into this pattern, or treacle, or toothpaste; and doesn’t glass, a solid, still flow even when cold, over many years anyway? **I hope they do ask such questions. It will help them to realize that science is not just about facts and figures, but a subject full of variation, imagination, and wonder.***

Because early years and primary teachers must teach across all areas of learning, it is impossible for all to have the same depth of scientific knowledge as those who have initial degrees in science subjects. It is important that all teachers have enough understanding so that they can, with support from subject co-ordinators, explore children’s interests and experience in order to meet their needs. Teachers need a deep knowledge of scientific concepts and the strategies used to teach them effectively to individual needs. Teachers need not only a knowledge and appreciation of science, but also an understanding of ways in which most children will learn, so that they are equipped with many strategies to help children.

### **Getting excited**

ATL believes that to increase the likelihood of the next generation receiving the best possible science education, both teachers and students need to be excited by what they are learning (and teaching). As science and technology is likely to play an increasingly prominent role in the 21<sup>st</sup> century, it should not be difficult to make the subject area relevant to the lives of young people and their teachers.

The science world needs an exciting and engaging curriculum that leaves room for teachers to learn and to innovate and allows the freedom to adapt quickly to changes in the landscape. It must develop content that is up-to-date and skills that students want to learn rather than being bogged down in thinking about how to pass their next test. There must be an attempt to fill the knowledge gaps of non-specialist teachers and develop their intrigue in the subject. Ultimately, science, like all subjects, needs inspiring teachers to inspire the young people they teach.

### **A local focus**

Integrating schools' science teaching with the local community can provide an excellent opportunity to drive interest in science in schools and ensure science is valued as important and an attractive route post-16.

The encouragement of strong relationships between schools and employers is essential. This would ultimately lead to employers and individual scientists going into schools and colleges and students and teachers visiting workplaces.

ATL believes that careers education that supports participation in learning and raises aspiration can be of benefit to individual young people and society as a whole, as well as a school and its workforce. By working with partners in the community, schools can fill their own knowledge gaps around science careers and learning, provide impartial information and inspire young people to progress in science.

We strongly advocate careers education that has a local flavour, taking advantage of (and seeking to develop new) opportunities with employers as well as signposting education provision. There should be a coherent approach to providing young people with not just advice on, but opportunities to participate in or visit local employers, universities, FE colleges, work-based training providers and so on. The aspiration for careers education should be that this work is not ad hoc or solely in designated spells of work experience but based upon strong partnership working.

In schools, scientists may join teachers in the classroom to play with materials, to excite pupils with concepts and questions, to lead demonstrations, or they may talk to students about their career, the application of their work and how they got to where they are. They may support teachers' development of scientific understanding. Local university students may do similar. In workplaces, students and teachers could make day visits to see the work going on in their area and students could undertake periods of work experience or longer, paid internships in the summer holidays could be developed. Each should be directly linked to what is taught in the classroom. We know that children learn best in relevant, everyday contexts. Making science seem close and real to students is essential – whilst these suggestions will be happening already around the country, the challenge is to encourage widespread practice and ensure relationships are lasting. Efforts should be exerted with employers in science-based industries and not solely prescribed to schools. Gender stereotypes around subject choice and science careers must be challenged. For this to have most impact, for it to be feasible in fact, it is necessary that the demands of the curriculum as it is currently exists are eased, freeing up time for teaching young people the skills they actually need to succeed in life within a light curriculum designed locally.

### ***Supporting education professionals***

Gordon Brown has described world-class teaching performance as “professionals who seek continuous improvement, who teach better lessons tomorrow than they did yesterday because they are learning all the time”. The science world can help ensure teachers are learning about the discipline and can play a role in suggesting ways in which teachers may integrate scientific values and skills across the curriculum.

In the ATL position statement, *New Professionalism*, we state that:

*The teaching profession needs knowledge about the complex and compelling forces that influence daily living in a changing world, including the political, economic, technological, social and environmental, in order to know what pupils need to learn both in the present and for the future.*

Contextualised scientific knowledge needs to be provided to teachers if the desired outcomes of the expert group's work are to be achieved. This must make reference to the world that young people are growing up in and will emerge into following their education. Support from industry in emphasising the importance of thinking and learning skills – which include the scientific skills of investigation, enquiry, analysis and evaluation – will help develop students capable of engaging in science through their education and their life.

### **Conclusion**

In this response we have pointed to the importance of curriculum, pedagogy, and teachers' continuing understanding, confidence and enjoyment of science as particular issues to be

addressed if we are to provide the best science education for children and young people. We believe that these issues must be addressed from the earliest years of education. We would welcome further opportunity to engage with this debate.