Y Pwyllgor Menter a Busnes

Lleoliad:
Ystafell Bwyllgora 3 - y Senedd

Dyddiad:
Dydd Mercher, 14 Mai 2014

Amser:
09.15

Cynulliad Cenedlaethol Cymru
National Assembly for Wales

I gael rhagor o wybodaeth, cysylltwch a:
Siân Phipps
Committee Clerk
029 2089 8582
Pwyllgor.Menter@cymru.gov.uk

Agenda

Cyfarfod preifat cyn y prif gyfarfod (09.15-09.30)

Cyfarfod cyhoeddus ffurfiol (09.30)

1 Cyflwyniadau, ymddiheuriadau a dirprwyon

Dogfennau atodol:

2 Ymchwiliad dilynol i Sgiliau Gwyddoniaeth, Technoleg, Peirianneg a Mathemateg (STEM) (sesiwn 1) (09.30-10.15) (Tudalennau 1 - 9)

Tystion:

Dr Anita Shaw, Dirprwy Brif Swyddog Gweithredol, Techniquest
Yr Athro Niels Jacob, Pennaeth yr Adran Fathemateg, Prifysgol Abertawe, Sefydliad Gwyddorau Cyfrifiadurol a Mathemategol Cymru
Jane Richmond, Pennaeth Dysgu a Dehongli, Gardd Fotaneg Genedlaethol Cymru

Dogfennau atodol:
Brif Ymchwil EBC(4)-13-14 (p.1) - Techniquest EBC(4)-13-14 (p.2) - Prifysgol Caerdydd, Sefydliad Gwyddorau Cyfrifiadurol a Mathemategol Cymru

Egwyl (10.15-10.25)

3 Ymchwiliad dilynol i Sgiliau Gwyddoniaeth, Technoleg, Peirianneg a Mathemateg (STEM) (sesiwn 2) (10.25-11.10) (Tudalennau 10 - 15)

Tystion:
Joy Kent, Prif Weithredwr, Chwarae Teg
Emma Richards, Rheolydd Datblygu Prosiect- Addysg, Chwarae Teg
Alice Gray, Llysgennad STEM

Dogfennau atodol:
EBC(4)-13-14 (p.3) - Chwarae Teg

Egwyl (11.10-11.20)

4 Ymchwiliad dilynol i Sgiliau Gwyddoniaeth, Technoleg, Peirianneg a Mathemateg (STEM) (sesiwn 3) (11.20-12.05) (Tudalennau 16 - 18)

Tystion:
Donna Griffiths, Rheolwr Strategaeth Sgiliau Cymru, CITB

Dogfennau atodol:
EBC(4)-13-14 (p.4) - CITB

5 Papurau i'w nodi (Tudalennau 19 - 20)

Dogfennau atodol:
Cofnodion y cyfarfod blaenoroll EBC(4)-13-14 (p.5) - Llythyr gan Weinidog yr Economi, Gwyddoniaeth a Thrafnidiaeth ynghylch yr ymchwil i gostau parcio ceir EBC(4)-13-14 (p.6) - Llythyr gan Weinidog yr Economi, Gwyddoniaeth a

Thrafnidiaeth ynghylch patrymau teithio yn ne-ddwyrain Cymru

Ôl-drafodaeth breifat (12.05-12.25)

National Assembly for Wales Consultation

Follow-up inquiry into Science, Technology, Engineering and Mathematics (STEM) Skills

Response from Techniquest

Techniquest is an educational charity based in Cardiff with a Wales-wide mission to engage people in science and motivate them to learn more. It operates a busy science centre in Cardiff Bay, provides a major schools' outreach service to all areas of Wales and employs experts in all aspects of STEM enrichment to achieve this. Techniquest is well respected internationally, and provides consultancy and other services to a range of countries world-wide.

In 2013/14 Techniquest reached 338,000 people with high quality 'live' STEM enrichment experiences. Of these, some 175,000 were Welsh school-age children and 50% were girls. Services are provided in every unitary authority of Wales, and are targeted on disadvantaged areas where possible.

Techniquest welcomes the opportunity to respond to the National Assembly for Wales' consultation on STEM skills, and comments here in relation to the terms of reference.

What impact has the Welsh Government's strategy *Science for Wales* and Delivery Plan had on STEM skills in Wales?

For this question, Techniquest will comment specifically on the section within the *Science for Wales* agenda and delivery plan that most closely aligns to its mission: Increasing the science and engineering talent pool.

Techniquest has noted the specific actions outlined in section 5.4 relating to the promotion of STEM, and the progress on these actions outlined in the *Delivering Science for Wales 2012-13 annual report*[1]. With regard to actions 1, 2 and 4:

1. *We will develop our STEM strategy, building on a survey of existing activity to engage and develop children and young people and increase the proportion of the cohort studying sciences and pursuing STEM-related careers, including more girls and women*

The National Science Academy (NSA) appointed Dateb Ltd to map STEM enrichment activities in Wales. Techniquest has not seen the final report but sent its comments on the draft final report in April 2012 to the NSA. In summary, Techniquest viewed the analysis as incomplete, with no clear definition of the term 'activity', no information about of the quality or impact of activities and minimal information about gaps in provision in terms of geography and content.

Techniquest recommends that the analysis is carried out again, and if necessary updated, to provide a full picture of the STEM enrichment activities in Wales.

Other important facets of this work will be the monitoring and evaluation of these activities.

At present, there is no facility for monitoring Wales-wide work in this area. Techniquest's vision is to reach every school-aged student once per year, and 7-11 year olds three times

[1] *Delivering Science for Wales 2012-13. Annual report on our strategic agenda for science and*

per year, which will amount to over 750,000 enrichment engagements per year. It would be useful if information about the uptake of this activity plus that of other enrichment providers could be collected on a central database showing individual students' interactions. This would help to identify those who have not engaged and help target and prioritise intervention, as well as identify any geographical or subject areas that are not covered by enrichment activity.

With respect to evaluation, organisations use a range of methods to measure the effectiveness of their work. Many organisations, including Techniquest, use the Generic Learning Outcomes, which measure affective rather than cognitive learning, including knowledge and understanding, skills, attitudes and values, enjoyment, inspiration and progression[2].

The measurement of the impact of science enrichment activity is a long-term goal of many enrichment providers. AHRC funded Techniquest and Salford University a three-year PhD to study the long-term impact of Techniquest's secondary programmes.

Techniquest works closely on evaluation with a range of practitioners and academics, and a number of studies have been completed world-wide that represent an increasingly strong body of evidence of the effectiveness of STEM enrichment activity. However, more remains to be done.

More recently, the Wellcome Trust has announced a new funding stream to improve the knowledge base and practice of science enrichment activities, called Science Learning+[3]. Techniquest recommends that the NSA looks into how a Welsh bid to this fund could support some of its strategy; Techniquest would be keen to work with the NSA on this.

Regarding the development of a STEM enrichment strategy, Techniquest has been invited to a meeting in mid-May 2014 by the NSA (date to be confirmed) to contribute to this.

As part of this development, Techniquest recommends that the NSA also seeks input from partners with whom science enrichment experts routinely work, including universities and STEM industry. These partners are key to the success of STEM enrichment, offering advice and expert STEM knowledge, and supporting enrichment initiatives as mentors or role models. With support from these partners, any resulting STEM enrichment strategy will have adherents from the whole STEM community in Wales, not just those who develop and deliver STEM enrichment activity directly.

To consolidate working relationships between STEM enrichment specialists and STEM specialists in universities and industry, strong links between the Department for Education and Skills and the Department for Economy, Science and Transport will be important. The development of the STEM enrichment strategy, which will be led by the Department of Economy, Science and Transport (through NSA) would benefit from strategic support from DfES.

2. *Set direction and coordinate STEM activities through the NSA, including appointment of an NSA-STEM Coordinator*

Techniquest is not aware of the appointment of an NSA-STEM Coordinator, though the NSA's recent grant round (to end in March 2015) set guidelines that show its initial priorities for Wales. Again, the completion of the STEM mapping exercise will be informative in helping to set direction.

4. *Examine ways to raise the standard of science and maths teaching….including how improved or specialist teaching can be encouraged…through initial and through Continuous Professional Development (CPD)…to provide effective learning for all pupils, including those who want to study sciences as single A levels*

[2] http://www.inspiringlearningforall.gov.uk/toolstemplates/genericlearning
[3] http://www.wellcome.ac.uk/Funding/Public-engagement/Funding-schemes/Science-Learning/index.htm

NAfW recommended in its 2011 report into the STEM agenda that the Welsh Government, through Estyn should research *why science in primary schools may be experiencing a decline*[4]. With regard to teacher support, Estyn's report[5] recommended that local authorities should provide primary and secondary schools with more opportunities for CPD on science teaching and learning, and that primary schools should provide training for teachers with weak science subject knowledge.

It is difficult to see how this action can be achieved given that the provision for science CPD in Wales has reduced in recent years due to changes in the main organisations that provided this form of teacher support: the local education authorities (LEAs) and the General Teaching Council for Wales (GTCW).

The number of Science Advisors in the 22 LEAs of Wales has been reducing over a number of years, and in the academic year 2012/2013 this role ceased to exist. LEAs now work through four regional consortia, whose main remit is school improvement. System Leaders visit schools to challenge and support them on standards, in line with Welsh Government priorities, including literacy, numeracy and the reduction of the impact of poverty on attainment. It seems that science has reduced in priority in the last few years, especially at Key Stage 4. At this key stage, greater emphasis is placed on mathematics and language, with the main performance indicator being the *Threshold Level 2 inclusive of English or Welsh and mathematics*. Consequently, System Leaders do not routinely support science teachers in the teaching of the subject.

Techniquest would be interested to know how many teachers have accessed science CPD since September 2013, particularly in the light of the decline in science teaching identified by NAfW (footnote 2) and corroborated by Estyn (footnote 3).

GTCW no longer funds or runs CPD in Wales.

Techniquest runs science CPD for primary and secondary teachers across Wales on behalf of the National Science Learning Centre[6], offering over 500 fully-funded teacher-days per year. Whilst well-received, these reach a small number of science teachers in Wales.

On another note, the Welsh Government has been consulting on Key Stage 4 performance measures[7]. It notes that there has been a sharp increase in the number of students not taking science GCSE and that in England proportionally 50% more students take triple science than in Wales. This makes the case stronger still for focused and prioritised science CPD for teachers. The consultation looked at which measures should be used at Key Stage 4 in relation to qualifications. It will be important for science education in Wales that whatever is chosen as the main indicator (threshold measures or capped points scores), it should include science alongside mathematics and a language. The elevation of science as one of the subjects to be counted in this way would be important for raising the profile of science within a school and, ultimately, helping to increase the 'science and engineering talent pool'.

What progress has been made in addressing the issues identified in the Enterprise and Learning Committee's 2011 inquiry into the STEM agenda?

Techniquest would like to comment on the Welsh Government's response to recommendations 6, 10 and 12[8]

Recommendation 6
We recommend that the Chief Scientific Advisor, through the NSA, should evaluate initiatives aimed at addressing negative perceptions and gender stereotypes of STEM

[4] *The science, technology, engineering and mathematics (STEM) agenda*. Enterprise and Learning Committee, National Assembly for Wales (January 2011)
[5] *Science in key stages 2 and 3*. Estyn (June 2013)
[6] https://www.sciencelearningcentres.org.uk/consortia/national
[7] Key Stage 4 performance measures: stakeholder survey, Welsh Government (March 2014)
[8] http://www.assemblywales.org/bus-home/bus-third-assembly/bus-guide-docs-pub/bus-business-documents/bus-business-documents-doc-laid.htm?act=dis&id=212251&ds=3/2011

subjects and should promote good practice within the school system, starting at the earliest possible age.

In 2013/2014 Techniquest worked with Chwarae Teg with funding from Welsh Government to ensure that all its programmes and exhibits do not favour or exclude any gender. In addition, it is currently developing videos and associated hands-on activities for Key Stage 4 students (14 – 16 years old) as part of its *Getting Girls into Physics* project. This initiative, run in partnership with the Institute of Physics, aims to address the deficit in number of girls who choose to study physics[9], by highlighting the many and varied roles carried out by women in physics. Techniquest is keen to support the CSA in this work.

In addressing this recommendation, it will also be important for the NSA to work with parents. A recent 5-year study by Kings College London[10] showed that being aware of a variety of jobs available in STEM, either because parents of other known adults are employed in the STEM sector, greatly increases the likelihood of young people aspiring to pursue a career in science themselves.

Finally, in relation to this recommendation, it should be noted that the *Science for Wales* policy document contains photographs of eight named scientists in its pages (not including the CSA), and of these just one is female.

Recommendation 10
We recommend that the WG should publish a CPD plan for teachers in Wales……aimed at improving in-service training and updating STEM teachers and heads of departments, not only to enhance STEM teachers' subject knowledge but also their understanding of how to teach specific subject topics up to GSCE at least.

In its response the Welsh Government states it wants to focus 'on the national priorities of literacy, numeracy and tackling priorities set out in the School Development Plan'.

Techniquest is concerned that if science CPD is not referred to specifically as a priority by Welsh Government, then it may not be addressed given the competing and, rightly, important areas that are identified as priority at present. This is of particular concern given Wales' poor performance in the PISA tests for Science in 2009, and the imminence of the next test in 2015.[11]

Recommendation 12
We recommend that the WG should contract the EBPs (Careers Wales) to develop strategic partnerships between schools and industry in order to increase the opportunities for teachers and lecturer placements…with STEM employers as part of teachers' CPD.

Techniquest suggests that this is another area in which it is imperative that DfES and DEST work together closely.

Techniquest
2 May 2014

[9] *It's Different for Girls,* Institute of Physics (2012)
[10] http://www.kcl.ac.uk/sspp/departments/education/research/aspires/ASPIRES-final-report-December-2013.pdf
[11] http://www.oecd.org/pisa/keyfindings/pisa2009keyfindings.htm

Wales Institute of Mathematical and Computational Sciences

Sefydliad Gwyddorau Mathemategol a Chyfrifiannol Cymru

The National Assembly for Wales' **Enterprise and Business Committee** follow-up Inquiry into Science, Technology, Engineering and Mathematics (STEM) Skills

Written Submission from Wales Institute of Mathematical and Computational Sciences

Background

The Wales Institute of Mathematical and Computational Sciences (WIMCS) was given WG approval in October 2006, and £5 million financial support by HEFCW. Originally a collaborative partnership of the Universities of Aberystwyth, Bangor, Cardiff, Swansea, it now also includes the University of South Wales. The proposal advised that:

The formation of The Wales Institute of Mathematical and Computational Sciences (WIMCS) will bring together individuals and groups in mathematical and computational sciences in Wales to provide the critical mass of high quality researchers who will achieve international recognition for mathematical research excellence. The aim of the Institute is to enhance the standing of mathematics and computation in Wales, to foster links with industry, commerce and business, to generate substantial research funding and to provide a forum for education and public awareness of the mathematical sciences. Furthermore, it will provide the foundation for a mathematical sciences base to support inter-disciplinary research projects.

Ref 1. What impact has the Welsh Government's strategy *Science for Wales* and Delivery Plan had on science, technology, engineering and mathematics (STEM) skills in Wales?

As part of the strategy of Science for Wales the NSA was set up and WIMCS is one of the hub members.

Part of the original WIMCS remit was to:

Establish Outreach activities aimed to enhance the interaction between the universities and the schools to help invigorate the study of mathematical and computational sciences and other disciplines.

Examples of our work are:

1. WIMCS initiated a Spring Term Programme of Maths Masterclasses at Swansea for Year 9s in 2010. These have now become an annual event.

2. WIMCS has provided financial support to similar Masterclasses at the Universities of Bangor and South Wales.

3. WIMCS supported a Maths Club at Aberystwyth University.

4. WIMCS secured EPSRC funding against competition for two Maths Roadshows (£140k). Its main partner was, and is, Science Made Simple, Cardiff.

5. WIMCS initiated in 2010 the Further Maths Support Programme Wales funded by the WG (initially £440k for the period 2010-13). The pilot started in South West Wales and has since been expanded to North West Wales and RCT and parts of Cardiff area. It supports schools and teachers as well as individual pupils at schools and colleges who have insufficient access to staff in all or some of Further Maths modules. It also provides enrichment for KS4 and Post 16 students in Mathematics. The Programme in Wales works closely with the similar initiative in England.
http://www.furthermaths.org.uk/?page=wales

See also http://www.wimcs.ac.uk/outreach.html

WIMCS has applied for NSA Grant Funding and has been successful three times.

1) NSA Funding to provide CPD training for secondary teachers in Maths, Physics and Chemistry. Its partners were the Institute of Physics and the Royal Society of Chemistry.

2) NSA Funding to take its 'Maths Apps' Careers Roadshow to 24 secondary schools in 2013. Approximately 7000 students from years 7 to 9 saw the show.

3) NSA Funding to take the Maths Apps Roadshow to a further 32 secondary schools in 2014.

WIMCS believes that there is a clear need to engage with students in the years prior to GCSEs to encourage them in the take up of STEM subjects. The challenge has been underscored by the relatively poor PISA results in Wales particularly in Maths. The positive feedback received encourages us to believe that these activities have and are having an impact.

We would also like to add that Swansea has more than trebled its mathematics UG-intake from 2003/04 to 2008/09. Without the additional posts coming through WIMCS it would not have been able to deal with such an increase, and perhaps it should be observed that a 'Science for Wales' policy began before the appointment of Prof. John Harries.

Ref 2 a) The adequacy of provision of STEM skills in schools, further education colleges, higher education and work-based learning (including apprenticeships)

In 2011/12 WIMCS managed the Wales hub (c£1m) in the £21M 3 year UK wide HE STEM programme run by Birmingham on behalf of HEFCE and HEFCW to enhance the skills and knowledge base of the workforce in these areas. The WIMCS Outreach Coordinator Alison Braddock was appointed HE STEM Regional Director Wales and coordinated the Wales element. WIMCS Professor Ken Morgan, Swansea University and others also played significant roles in the project.
http://www.hestem.ac.uk/partners/wales

The Project has now ended but it is believed to have made considerable impact in these areas:

- Making graduates more effective in terms of the skills they bring to employers
- Making employers better appreciate the value our graduates can offer
- Using HEI expertise to up-skill better the existing workforce
- Making the transition from school to university as effective as possible

It is our belief that that the impact should continue to be monitored within the 'Science for Wales' strategy. It may well be cost effective to sustain and continue some of the sub projects.

Ref 2 b) Value for money from the additional funding to support and promote STEM skills and whether the current supply of STEM skills is meeting the needs of the Welsh labour market

WIMCS is not in a position to assess Ref 2(b) but believes strongly that STEM skills must continue to be supported and promoted within Wales.

Ref 2 c) The supply of education professionals able to teach STEM subjects and the impact of Initial Teacher Training Grants and the Graduate Teacher Programme on recruiting STEM teachers and education professionals

WIMCS would like to comment on the possible shortage of secondary school teachers with the skills required to teach Further Maths. Although the take up of Maths at A Level is broadly similar in England and Wales, it is 25% lower in Further Maths.

Maths	2013	England	Wales
	Male	13.8	13.8
	Female	7.5	7.6
	Overall	10.4	10.4
Further Maths 2013			
	Male	2.6	1.8
	Female	0.9	0.7
	Overall	1.7	1.2

http://www.jcq.org.uk/examination-results/a-levels/a-as-and-aea-results-summer-2013

Factors contributing to the shortfall may be a lack of suitably skilled teachers and the level of encouragement given to students wishing to take Further Maths which is recognised as being a relatively 'difficult' A Level Choice. WIMCS staff presented their views to the WG on the importance of up-skilling teachers in Further Mathematics. As a consequence limited CPD in Further Mathematics supported by the WG will be offered in the pilot area from September 2014.

WIMCS staff have also presented the view at meetings attended by WG officials that the WG should not be encouraging schools and colleges to pressurise students wanting to take Further Maths to also take the Welsh Baccalaureate. Further Maths is often taken as a fourth A level (in combination with Maths, Physics and Chemistry) and taking the Welsh Baccalaureate as a fifth is a big ask!

Ref 2 d) The effectiveness of education and business links between education institutions and STEM employers.

Part of WIMCS's remit is to foster links.

WIMCS would point to the following initiatives it has nurtured:

1. HMC2 – The Health Modelling Centre Cymru was set up to provide an access route to mathematical and computational modelling expertise for health professionals to help solve clinical, epidemiological and health service delivery problems. http://hmc2.cf.ac.uk/about.html

2. MSc courses in MSc in Operational Research and Applied Statistics/ MSc in Operational Research, Applied Statistics and Risk at Cardiff. These qualifications include placements in industry, business and the public sector.

WIMCS believes that both provide valuable means for the skills of mathematicians to be accessed by the wider community, and that if, as part of the Grand Challenge of Life Sciences and Health, resources were channelled into and through HMC2 where appropriate, greater engagement to the benefit of both the mathematics and life sciences community would result.

3. At Aberystwyth, three large European FP7 projects (HYDROFRAC, PARM2 and INTERCER2) in the Marie Curie Industry Academy Partnerships and Pathways Scheme have supported several secondments of PhD students to the industry for periods of up to 6 months, as well as a stream of researcher exchanges between academics and industrialists. This is having a clear benefit to STEM areas (particularly applied mathematics and engineering) in Wales.

Ref 3. Whether any progress has been made on addressing negative perceptions and gender stereotypes of STEM and promoting good practice to encourage women to acquire STEM skills and to follow STEM related careers.

WIMCS is conscious of the need to encourage women. Wherever possible it tries to have women speakers as well as men, and in its Outreach work makes a conscious effort to promote female role models.

Stereotyping can start early, and the mathematical sciences in particular need to consciously strive to make themselves attractive as career paths for women from early school years rather than when it is already too late.

NB It may be of interest that there is a relatively new commercial campaigning organisation that operates in UK under the name Little Miss Geek to make careers in technology and video games more accessible and appealing to women http://en.wikipedia.org/wiki/Little_Miss_Geek

Ref 4. What progress has been made on learning STEM skills through Welsh medium education and training?

WIMCS would point to:

a) The help from Coleg Cymraeg Cenedlaethol in establishing Welsh-medium teaching posts at Aberystwyth, Cardiff and Swansea. This has helped in the recruitment of high quality students from Wales who might otherwise have gone elsewhere. This is a major initiative which has proved to be an unqualified success.

b) The work of Dr Tudur Davies of Aberystwyth University's Institute of Mathematics, Physics and Computer Science in translating into Welsh 'Facts and Formulae' leaflets. The project was supported by both the Coleg Cymraeg Cenedlaethol and the MathCentre, and has been published at http://www.mathcentre.ac.uk/resources/uploaded/ff2ystadegaethweb5.pdf
NB MathCentre is a project offering students free resources to support the transition from school mathematics to university mathematics in a range of disciplines across the United Kingdom.

c) Dr K. Evans and Prof. N. Jacob (Swansea) have written in the Welsh language a textbook on Calculus (about 360 pages with a Welsh - English vocabulary list and more than 140 solved problems) which covers the first year at University as well as the final years at school. Such a book does not exist, and is much needed. The manuscript is ready for publication, and has already been successfully used in the mathematics education of Welsh speaking engineering students in Swansea. Additionally a complete set of lecture notes for Elementary Geometry in the Welsh language has been produced in Swansea.

Eitem 3

Ymateb i ymchwiliad dilynol y Pwyllgor Menter a Busnes i:

Sgiliau Gwyddoniaeth, Technoleg, Peirianneg a Mathemateg (STEM)

Ebrill 2014

Mae Chwarae Teg yn bodoli er mwyn gwireddu ein gweledigaeth o Gymru sy'n wlad lle mae menywod yn cyflawni ac yn ffynnu. Rydym yn gwneud hyn drwy gydweithio â menywod i ehangu eu gorwelion a meithrin hyder a sgiliau; ac yn cydweithio â chyflogwyr i greu gweithleoedd modern llwyddiannus drwy ddefnyddio cyfraniad pawb; a chydweithio â dylanwadwyr, addysgwyr a phenderfynwyr i greu cymdeithas sy'n gwerthfawrogi a chefnogi menywod ac sy'n rhoi manteision cyfartal iddynt.

Mae gwaith ymchwil yn dangos nad yw menywod yn cael eu cynrychioli'n ddigonol mewn diwydiannau STEM; yn aml, ychydig iawn o fenywod sydd ar fyrddau cwmnïau FTSE STEM, mae nifer sylweddol o fenywod nad ydynt yn defnyddio'u cymwysterau STEM yn eu gyrfaoedd ac mae merched ifanc yn llai tebygol o fod â hyder yn eu gallu yn y pynciau hyn. Credwn y gallai cydweithio â'r menywod hyn helpu i leihau'r bwlch ymddangosiadol rhwng y rhywiau mewn pynciau STEM a gwella rhagolygon economaidd diwydiannau STEM, drwy ddefnyddio adnodd menywod ym meysydd STEM. Rydym yn croesawu'r cyfle i gyfrannu at yr ymchwiliad hwn a byddem yn awyddus i gydweithio â'r pwyllgor a Llywodraeth Cymru er mwyn bwrw iddi gyda'n hargymhellion.

Prif bwyntiau

1. Nid yw menywod yn cael eu cynrychioli'n ddigonol mewn diwydiannau STEM a byddai ymyriadau cynnar wedi'u targedu ar oedran cynnar yn helpu i leihau'r bwlch rhwng dynion a menywod.
2. Mae'n bwysig bod gan fodelau rôl benywaidd o ddiwydiannau STEM ran weithgar yn y gwaith o ymgysylltu ac addysgu ym meysydd STEM, er mwyn helpu i annog merched i gyflawni eu llawn botensial a dilyn gyrfaoedd mewn diwydiannau STEM yn ddirwystr.

3. Mae'n hanfodol sicrhau bod strwythurau ar gael er mwyn helpu rhieni sy'n gweithio neu gynhalwyr sy'n dilyn gyrfaoedd STEM er mwyn sicrhau hirhoedledd eu gyrfaoedd a chreu amgylchedd gweithio mwy hyblyg sy'n fwy ystyriol o deuluoedd.

Cwestiynau'r Ymgynghoriad

1. Pa effaith y mae strategaeth Llywodraeth Cymru *Gwyddoniaeth i Gymru* a'r Cynllun Cyflenwi wedi'i gael ar sgiliau gwyddoniaeth, technoleg, peirianneg a mathemateg (STEM) yng Nghymru?

1.1. Mae buddsoddiadau Llywodraeth Cymru i'r cynllun *Cynyddu'r Gronfa Dalentau mewn Gwyddoniaeth a Pheirianneg* drwy brosiectau ymgysylltu STEM yn amhrisiadwy gan annog pobl ifanc i ymgysylltu â gwyddoniaeth. Mae'r prosiectau ymgysylltu sydd ar gael gan Techniquest fel rhan o'r Academi Wyddoniaeth Genedlaethol a'u rhaglenni allgymorth (fel MathCymru) yn hanfodol i wneud pynciau STEM yn hygyrch. Mewn arolwg PISA yn 2012, adroddodd disgyblion eu bod yn teimlo bod y cymorth gan athrawon mathemateg mewn ysgolion yng Nghymru yn uwch na lefel cyfartalog y Sefydliad ar gyfer Cydweithrediad a Datblygiad Economaidd (OECD)[1]. Fodd bynnag, nid yw'r wybodaeth sydd ar gael yn dangos a yw mwy o ferched yn cael eu hannog i astudio pynciau STEM.

1.1. Roedd arolwg PISA 2012 yn dangos bod Cymru wedi sgorio'n sylweddol is na Lloegr, yr Alban a Gogledd Iwerddon ac yn is na lefel gyfartalog yr OECD mewn mathemateg a gwyddoniaeth. Ni chafodd y data sydd ar gael ei ddadgyfuno yn ôl rhyw, mae'n hanfodol monitro cynnydd bechgyn a merched ar wahân, er mwyn sicrhau eu bod yn uniaethu i'r un graddau â phynciau STEM.

Argymhelliad 1: Sicrhau bod data yn cael ei gasglu er mwyn monitro addysg a chyflogaeth STEM. Bydd hyn yn darparu meincnod ac yn sicrhau y gellir monitro cynnydd.

2. Pa gynnydd sydd wedi'i wneud o ran mynd i'r afael â'r materion a nodwyd yn ymchwiliad y Pwyllgor Menter a Dysgu i'r agenda STEM yn 2011?

2.1 Mae'n bwysig bod mentrau yn annog plant i gymryd rhan mewn pynciau STEM o'r Cyfnod Sylfaen ymlaen. Mae prosiectau Ymgysylltu, fel STEM Cymru, yn gweithio er mwyn creu delwedd gadarnhaol o ddiwydiannau STEM i blant. At hynny, mae prosiect STEM Cymru, *Denu Merched i Faes Peirianneg*, yn hanfodol o ran galluogi merched i ddilyn gyrfaoedd ym maes Peirianneg a STEM, diwydiannau sydd â diffyg cynrychiolaeth o blith menywod.

2.2 Adroddodd Estyn fod y mwyafrif o adrannau gwyddoniaeth mewn ysgolion uwchradd yng Nghymru yn cael eu harwain yn effeithiol gan athrawon sy'n frwdfrydig ynglŷn â gwyddoniaeth [1]. Fodd bynnag, dim ond tua hanner arweinwyr ein hysgolion cynradd

[1] Adroddiad Estyn i Gwyddoniaeth yng Nghyfnodau Allweddol 2 a 3 - Mehefin 2013

sydd â gweledigaeth glir ar gyfer datblygu gwyddoniaeth yn eu hysgolion. Felly, mae angen i blant o oedran cynnar gymryd rhan mewn gwyddoniaeth drwy ddefnyddio athrawon arbenigol STEM neu ailhyfforddi athrawon yn y pynciau STEM. At hynny, byddai merched ifanc yn cael budd o ddod i gysylltiad â modelau rôl benywaidd mewn diwydiannau STEM, gan eu helpu i uniaethu â'r pwnc sy'n gallu dangos rhagfarnau ar sail rhyw yn aml iawn.

2.3 Nid yw'r data sydd ar gael yn dangos a yw'r newidiadau sydd wedi'u rhoi ar waith wedi arwain at fwy o ferched ifanc yn dangos diddordeb mewn gwyddoniaeth. Mae ein prosiectau ein hunain, Bwrw iddi gyda Gwyddoniaeth (a ddarparwyd mewn partneriaeth â ContinYou Cymru) a'r cynllun Dechrau'n Deg, rhan o'r prosiect Cenedl Hyblyg), yn awgrymu nad yw gwersi Gwyddoniaeth o ddiddordeb i ferched a dylid gwirio'u hapêl at y rhywiau ymlaen llaw er mwyn sicrhau bod merched a bechgyn yn cymryd rhan i'r un graddau.

Argymhelliad 2: Dylid sicrhau bod apêl deunyddiau dysgu a mentrau ymgysylltu â phynciau STEM i'r rhywiau yn cael ei wirio ymlaen llaw er mwyn sicrhau bod merched a bechgyn yn cymryd rhan i'r un graddau.

3. **Digonolrwydd y ddarpariaeth o sgiliau STEM mewn ysgolion, colegau addysg bellach, sefydliadau addysg uwch a dysgu'n seiliedig ar waith (gan gynnwys prentisiaethau);**

3.1 Ar hyn o bryd, mae menywod yn parhau i beidio â chael eu cynrychioli'n ddigonol mewn gyrfaoedd STEM. Mae'n bwysig sicrhau bod merched yn cael eu hannog i ymroi i bynciau STEM ac i sicrhau eu bod yn ymwybodol o'u potensial i lwyddo yn y meysydd hyn. Mae gwaith ymchwil yn dangos y gall hunanhyder merched yn y pynciau hyn effeithio ar ba mor dda y cyflawnant mewn pynciau STEM, ac mae cyflwyno merched i'r stereoteip na allant lwyddo yn y pynciau hyn[2] yn effeithio ar eu hyder.

3.2 Nid yw menywod yn cael eu cynrychioli'n ddigonol mewn prentisiaethau STEM yn benodol, gan gyfrif am 3% yn unig o brentisiaethau peirianneg[3] er enghraifft.

Argymhelliad 3: Mae angen sicrhau bod mentrau ar waith er mwyn annog mwy o fenywod i astudio pynciau STEM ym maes addysg bellach, addysg uwch a dilyn prentisiaethau STEM.

4. Gwerth am arian o'r cyllid ychwanegol i gefnogi a hyrwyddo sgiliau STEM ac a yw'r cyflenwad presennol o sgiliau STEM yn diwallu anghenion marchnad lafur Cymru;

4.1 Rydym yn croesawu ymrwymiad Llywodraeth Cymru i hyrwyddo sgiliau STEM gan fod diwydiannau STEM yn cael eu hystyried yn hanfodol i'r economi modern ac mae ganddynt botensial mawr o ran twf economaidd i Gymru. Felly mae buddsoddi mewn sgiliau STEM yn amhrisiadwy i economi Cymru yn y dyfodol.

4.2 Mae'r data sydd ar gael ar y cyflenwad a'r galw mewn perthynas ag unigolion sydd â sgiliau STEM yng ngweithlu'r DU yn gyfyngedig ac mae peth amwysedd am y sgiliau

[2] Simpkins, S.D. a Davis-Kean, P.E. (2005). The intersection between self-concepts and values: Links between beliefs and choices in high school. New directions for child and adolescent development. Pg. 31-47
[3] http://www.thedataservice.org.uk/statistics/statisticalfirstrelease/sfr_supplementary_tables/Apprenticeship_sfr_supplementary_tables/

y mae'r diwydiant yn eu dymuno. Y gred yw bod hyn yn arwain at ddiffyg eglurder o ran beth ddylai addysg STEM fod yn ceisio'i gyflawni[6].

4.3 Mae menywod yn parhau i beidio â chael eu cynrychioli'n ddigonol mewn diwydiannau STEM ac felly ni fydd sgiliau menywod yn y pynciau STEM yn cael eu defnyddio'n llawn yn y maes hwn o dwf economaidd posibl. Y gred yw y gallai'r broses o harneisio'r potensial llawn sydd gan fenywod greu twf economaidd.
Felly, mae'n bwysig bod yr holl rywiau'n cael eu targedu'n gyfartal wrth hyrwyddo sgiliau STEM, er mwyn helpu menywod i gael mynediad i yrfa STEM a manteisio'n llawn ar eu potensial.

Argymhelliad 4: Cydweithio â chyflogwyr STEM er mwyn deall bylchau mewn sgiliau a nodi sut y gallant sicrhau bod yr holl sgiliau yn cael eu defnyddio'n llawn.

5. Y cyflenwad o weithwyr addysg proffesiynol a all addysgu pynciau STEM ac effaith Grantiau Hyfforddiant Cychwynnol Athrawon a'r Rhaglen Athrawon Graddedig ar recriwtio athrawon a gweithwyr addysg proffesiynol STEM;

5.1 Ar hyn o bryd, prin yw'r data sydd ar gael ar nifer y graddedigion a ddilynodd bynciau STEM ac sydd, yn ddiweddar, wedi mynd yn athrawon. Mae gwaith ymchwil yn dangos bod prinder athrawon yn y pynciau STEM yn arwain at nifer llai o fyfyrwyr yn astudio pynciau STEM at lefel A[4].

5.2 Mae tystiolaeth anecdotaidd yn awgrymu bod lefelau isel o ymwybyddiaeth o'r rhywiau ymysg athrawon a chynghorwyr gyrfa yn creu rhwystr i ferched sydd am ddilyn galwedigaethau STEM. Felly, rydym yn galw am i'r cwrs Tystysgrif Addysg i Raddedigion, y Radd Meistr mewn Addysg a chymwysterau Gyrfaoedd gynnwys hyfforddiant arbenigol. Dylid sicrhau hefyd fod Datblygiad Proffesiynol Parhaus ar gael ar gyfer y gweithwyr proffesiynol hyn er mwyn ategu'r dysgu a sicrhau ei fod yn cael effaith.

Argymhelliad 5: Dylid sicrhau bod ymwybyddiaeth o'r rhywiau yn rhan annatod o'r cwrs TAR, y Radd Meistr mewn Addysg a hyfforddiant proffesiynol y Gwasanaeth Gyrfaoedd er mwyn cynyddu'r ddealltwriaeth o stereoteipio ar sail rhyw ac annog mwy o fenywod i ddilyn cyrsiau STEM[5].

6. Effeithiolrwydd y cysylltiadau addysg a busnes rhwng sefydliadau addysg a chyflogwyr STEM.

6.1 Prin yw'r data sydd ar gael ar y cyflenwad a'r galw mewn perthynas ag unigolion sydd â sgiliau STEM yng ngweithlu'r DU, ac mae hyn wedi arwain at ansicrwydd ynglŷn â'r sgiliau y mae darpar gyflogwyr yn eu dymuno a'r hyn y dylai addysg STEM fod yn ceisio'i gyflawni.

[4] Nath, C. a Border, P. (2013). STEM education for 14-19 year olds.Senedd y DU.
[5] Maniffesto Chwarae Teg (2014). Cymru lle mae Menywod yn Cyflawni ac yn Ffynnu. Caerdydd, Chwarae Teg

Argymhelliad 6: Hybu cysylltiadau cryfach rhwng ysgolion a busnesau lleol, gan ganolbwyntio ar gynnig amrywiaeth ehangach o ddewisiadau i ferched drwy fodelau rôl cadarnhaol a phrofiad gwaith ystyrlon[7].

7.A oes unrhyw gynnydd wedi'i wneud o ran mynd i'r afael â'r safbwyntiau negyddol a'r stereoteip ar sail rhyw sy'n gysylltiedig â STEM a hyrwyddo arfer da i annog menywod i feithrin sgiliau STEM a dilyn gyrfaoedd sy'n gysylltiedig â STEM.

7.1 Mae menywod yn cyfrif am tua 15% o swyddi STEM a thua 42% o fyrddau cwmnïau FTSE STEM. Yn ychwanegol at hynny, mae nifer sylweddol is o raddedigion benywaidd STEM yn mynd ymlaen i weithio mewn swyddi STEM o gymharu â dynion graddedig. Felly, mae angen gwneud rhagor o waith o hyd er mwyn mynd i'r afael â'r bylchau hyn rhwng y rhywiau.

7.2 Nododd prosiect Chwarae Teg a Continu Cymru *Bwrw Iddi Gyda Gwyddoniaeth* pa mor bwysig yw cynnwys merched o oedran ysgol mewn gwyddoniaeth a darparu modelau rôl benywaidd proffesiynol i ddangos eu potensial[6]. Mae hyn yn ategu'r gwaith ymchwil a oedd yn dangos yr effaith gadarnhaol y mae cyflwyno modelau rôl benywaidd yn ei chael ar blant oedran ysgol. Roedd hyn yn newid eu hagwedd tuag at wyddoniaeth a thuag at fenywod mewn diwydiannau hefyd[7].

7.3 Mae gwaith ymchwil yn dangos mai hunanhyder yw'r prif ffactor sy'n cyfrannu at y ffaith bod merched yn dilyn pynciau STEM. Y gred yw bod y stereoteip negyddol sy'n dangos bod merched yn llai medrus mewn pynciau STEM yn gwaethygu eu perfformiad yn y pynciau. Felly, mae'n bwysig mynd i'r afael ag anwiredd y stereoteip hwn, er mwyn sicrhau nad yw merched yn cael eu rhwystro rhag dilyn y pynciau hyn. Roedd prawf Pisa OECD yn dangos bod merched yn tanberfformio mewn Mathemateg yn y mwyafrif o wledydd o gymharu â bechgyn. Fodd bynnag, yn y gwledydd sy'n cynnig mwy o gyfle cyfartal ac adnoddau i ddynion a menywod (fel Gwlad yr Iâ, Norwy a Sweden), mae'r bwlch rhwng y rhywiau mewn pynciau STEM yn gostwng yn sylweddol[8].

7.1 Mae natur diwydiannau STEM yn golygu bod y gwaith yn ymestyn y tu hwnt i oriau swyddfa yn aml ac felly yn creu amgylchedd anhyblyg nad yw'n ystyriol o deuluoedd, gan arwain at anawsterau i weithwyr cyflogedig sydd â theuluoedd (mae'r cyfrifoldebau'n effeithio ar fenywod yn fwy na dynion fel arfer). At hynny, oherwydd natur gyfnewidiol y diwydiannau STEM, gall unrhyw seibiant gyrfa arwain at gael eich gadael ar ôl, ac mae'r broblem hon yn effeithio ar fenywod yn bennaf sy'n gweithio mewn diwydiannau STEM, gan mai menywod sy'n ysgwyddo cyfrifoldebau teuluol gan mwyaf ac mae hyn yn arwain at seibiannau gyrfa. Mae'n bwysig bod strwythurau cymorth ar waith sy'n sicrhau y gellir cael hyblygrwydd a chymorth i rieni sy'n gweithio neu gynhalwyr mewn diwydiannau STEM.

Argymhelliad 7: Mae angen rhoi mentrau ar waith er mwyn annog merched o oedran ifanc i ddilyn Gwyddoniaeth, dylai hyn gynnwys hyrwyddo modelau rôl benywaidd. Mae'n rhaid rhoi strwythurau cymorth ar waith hefyd er mwyn helpu rhieni sy'n gweithio mewn diwydiannau STEM.

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[6] Chwarae Teg (2012) Bwrw iddi gyda Gwyddoniaeth, Caerdydd, Chwarae Teg

[7] Smith, W.S. ac Owen, T. (2006) Effect of women in science career role models on early adolescents' attitude toward scientists and women in science. Journal of Research in Science Teaching, Tud 667-676.

[8] Adroddiad OECD (2014) Are boys and girls equally prepared for life?

Am ragor o wybodaeth gan Chwarae Teg, cysylltwch â:

- Christine O'Byrne – christine.o'byrne@chwaraeteg.com
- 02920 478900 / 07787 295658
- www.chwaraeteg.com

Ymchwiliad dilynol gan y Pwyllgor Menter a Busnes i Sgiliau Gwyddoniaeth, Technoleg, Peirianneg a Mathemateg (STEM):
Ymateb gan CITB Cymru Wales

Mae CITB Cymru Wales yn croesawu'r cyfle i gyflwyno tystiolaeth i ymchwiliad dilynol gan y Pwyllgor Menter a Busnes i Sgiliau Gwyddoniaeth, Technoleg, Peirianneg a Mathemateg (STEM). Mae darpariaeth STEM ddigonol yn hanfodol ar gyfer gosod y seiliau ar gyfer gyrfaoedd yn y sector adeiladu, gan roi cyfle i'r genhedlaeth nesaf o weithwyr adeiladu yng Nghymru symud ymlaen at brentisiaethau a hyfforddiant.

Pa gynnydd a wnaed yn mynd i'r afael â'r materion a amlygwyd yn yr ymchwiliad dilynol gan y Pwyllgor Menter a Busnes yn 2011 i'r agenda STEM, yn cynnwys:

- **Digonolrwydd darpariaeth sgiliau STEM mewn ysgolion, colegau addysg bellach, addysg uwch a dysgu yn y gweithle (gan gynnwys prentisiaethau);**

  Yr argraff gyffredinol a glywir ar lafar gwlad gan gyflogwyr yw bod gan weithwyr, ac yn enwedig felly weithwyr iau gan gynnwys prentisiaethau, sgiliau llythrennedd a rhifedd isel a heb eu datblygu'n iawn. Mae'n ymddangos fod hynny'n wir yn Lloegr yn ogystal ag yng Nghymru, ac nid yw felly'n fater i Gymru'n unig. Ceir yr un pryder ynghylch graddedigion ynghyd â phobl sy'n ymuno â'r gweithlu ar y lefel is. Mae'n ymddangos fod rhifedd a STEM wedi cael eu rhoi i'r naill ochr wrth i faterion ynghylch Llythrennedd a TGAU Saesneg gael sylw yng Nghymru dros y misoedd diwethaf.

  Yn ystod trafodaethau gyda cholegau Addysg Bellach mae'n amlwg eu bod yn gorfod gwneud cryn dipyn o waith adfer gyda'r myfyrwyr a'r prentisiaid sy'n dod atynt er mwyn iddynt gyrraedd y safon angenrheidiol, sef tua Gradd C TGAU, rhywbeth sy'n gostus o ran amser ac adnoddau. Gellid dweud fod datblygu sgiliau STEM myfyrwyr ôl 16 yn fwy fyth o her gan y bydd gan y dysgwyr brofiad o sawl blwyddyn o fethiant yn yr ysgol uwchradd mewn pynciau fel Mathemateg, ac maent hefyd yn y cyfnod trosiannol rhwng eu harddegau a thyfu'n oedolion a byd gwaith, a'r holl bethau eraill sy'n mynd â'u bryd yn ystod y cyfnod hwnnw.

  O safbwynt meithrin y sgiliau STEM sylfaenol sydd eu hangen ar gyfer Prentisiaethau Adeiladu, sydd yn y bôn yn fater o wneud cyfrifiadau sylfaenol o symiau, cymarebau ac onglau, fe ddylent fod wedi cael eu dysgu a'u hatgyfnerthu erbyn diwedd cyfnod yr ysgol gynradd a'u datblygu a'u cyfoethogi yn ystod y cyfnodau addysg sy'n dilyn. Nid yw'n rhesymol credu fod dysgwyr yn 'colli' sgiliau a ddysgwyd yn ystod y cyfnod addysg uwchradd, ac mae'n wastraffus i gyflogwyr, addysg bellach ac addysg uwch geisio rhoi 'darnau' methiant a ddigwyddodd ynghynt yn y system addysg yn ôl at ei gilydd.

  Mae ysgolion uwchradd ac addysg bellach wedi ac yn parhau i fod yn atebol am eu perfformiad neu ddiffyg perfformiad, ond mae'n ymddangos nad yw ysgolion cynradd, sy'n gyfrifol am sicrhau bod y sgiliau sylfaenol yn datblygu, yn atebol ac nad yw eu gwaith yn destun yr un lefel o graffu o ran pynciau STEM neu ddatblygu sgiliau sylfaenol yn gyffredinol. Cyn y gellir gwneud cynnydd ar y materion hyn, mae'n hanfodol fod llwyddiant y sector cynradd yn cael ei asesu'n drylwyr gan ei bod yn debygol fod lefelau trosiant yn afrealistig, sy'n creu problemau a gwastraff ar hyd y system. Mae'n ymddangos y bu ESTYN yn aneffeithiol yn eu rôl yn craffu'r sector hwn, ac i'r perwyl hwnnw dylid ffurfio tasglu annibynnol dan arweiniad diwydiant er mwyn arwain yr ymchwiliad hwn.

  Ffactor ychwanegol sy'n effeithiol holl gyfnodau'r system addysg yw diffyg gallu STEM ymhlith athrawon a darlithwyr, a chafodd hyn ei gydnabod gan ESTYN mewn adroddiad diweddar ar y Sector Adeiladu yng Nghymru. Mae'n debygol iawn fod y sefyllfa honno'n

bodoli yn y sector cynradd, ac mae'n debygol o gael ei gwaethygu yn sgîl cyflwyno TGAU ychwanegol mewn Mathemateg yn y sector uwchradd, heb ddigon o feddwl na chynllunio o ran faint o athrawon cymwys sydd ar gael ar gyfer addysgu'r cymhwyster ychwanegol. Mae'n debyg mai'r realiti fydd y cymerir athrawon arbenigol a lled arbenigol oddi ar y myfyrwyr gallu is er mwyn addysgu myfyrwyr gallu canolig ac uwch, sy'n golygu y bydd y gefnogaeth i ddarpar brentisiaid yn y garfan academaidd is yn wannach. Mae angen i hyn gael ei gynllunio'n effeithiol.

- **Gwerth am arian o'r arian ychwanegol i gefnogi a hyrwyddo sgiliau STEM ac a yw'r cyflenwad presennol o sgiliau STEM yn diwallu anghenion y farchnad lafur yng Nghymru.**

  Fel y nodwyd mewn rhan arall o'r adroddiad hwn, mae cyflogwyr yn dal i gwyno am ddiffyg sgiliau sylfaenol ymhlith gweithwyr o bob oed. Roedd mentrau fel Sgiliau Sylfaenol yn y Gweithle yn gam cadarnhaol, ond roeddent yn aneffeithiol gan nad oeddent yn gallu helpu masnachwyr sengl, sef asgwrn cefn y diwydiant adeiladu.

  Mae cost gwaith adfer ar gyfer prentisiaid a graddedigion hefyd yn bryder, gan fod hynny'n fwy a mwy drud, a dim ond y cyrff arholi sy'n elwa os yw myfyrwyr yn parhau i orfod ail-wneud cymwysterau y maen nhw'n debygol o'u methu dro ar ôl tro.

- **Cyflenwad o weithwyr addysg proffesiynol i addysgu pynciau STEM ac effaith Grantiau Hyfforddiant Cychwynnol i Athrawon a'r Rhaglen Athrawon Graddedig ar ddenu athrawon STEM a gweithwyr addysg proffesiynol.**

  Er nad yw'n bosib inni gynnig unrhyw sylw penodol ar lwyddiant y mentrau unigol heb ddata ar faint o bobl y llwyddwyd i'w recriwtio ac a aeth yn athrawon, mae'r nodiadau uwchben y sylwadau yn adran gyntaf yr adroddiad hwn yn mynegi pryder am y sefyllfa bresennol yn y sector cynradd ac addysg bellach, ac mae'n awgrymu fod pryderon ychwanegol posib yn y sector uwchradd.

  Mae hwn yn un o ofynion allweddol llwyddo i ddatblygu STEM ar bob lefel. Mae angen mwy o waith gwella sgiliau ac asesu galluoedd ar bob lefel ar gyfer staff presennol, ac yn enwedig felly ar gyfer darlithwyr Crefftau Adeiladu addysg bellach.

- **Effeithiolrwydd y cysylltiadau addysg a busnes rhwng sefydliadau addysg a chyflogwyr STEM.**

  Mae'n ymddangos fod diflaniad Gyrfa Cymru wedi arwain at lai o weithgareddau EBP ac at ddiffyg pwrpas a ffocws clir o gymharu â'u hanterth yn yr 1980au a'r 1990au trwy'r rhwydwaith EBP. Ar y gorau gellir dweud eu bod yn atebol i anghenion ysgolion yn hytrach nac anghenion diwydiant, gyda phwyslais gormodol ar weithgareddau haf diwedd blwyddyn sydd yn gam neu'n gymwys yn cael eu hystyried gan gyflogwyr yn gyfle i athrawon gwblhau tasgau diwedd blwyddyn.

  Mae'r dull trochi defaid o gynnig profiad gwaith i bob myfyriwr o fewn cyfnod byr o amser yn ystod tymor yr haf wedi golygu fod llawer o gyflogwyr wedi peidio cymryd rhan mewn cysylltiadau ag ysgolion oherwydd profiadau yn y gorffennol am nifer o resymau.

  Mae cyfle i ddatblygu cysylltiadau cadarnhaol ac ystyrlon gyda diwydiant trwy'r Fagloriaeth Gymreig newydd a'r Heriau sy'n rhan ganolog o'u strwythur.

  Mae cymwysterau lefel 2 a darpar lefel 3 CBAC hefyd yn gyfle i gyflogwyr wneud cyfraniad ystyrlon fel rhan allweddol o'u cynllunio.

A wnaed unrhyw gynnydd ar fynd i'r afael â chanfyddiadau negyddol a stereoteipiau rhyw o STEM a hyrwyddo arfer da er mwyn annog menywod i gaffael sgiliau STEM a dilyn gyrfaoedd sy'n gysylltiedig â STEM.

Mae nifer y dysgwyr mewn Prifysgolion Grŵp Russell yng Nghymru mewn meysydd fel Peirianneg Sifil a Phensaernïaeth yn cynnwys rhaniad bras o 50-50 rhwng dynion a menywod. Nid yw hynny'n golygu mai dysgwyr o Gymru yw'r rhain nac y bydd y dysgwyr hyn yn dewis byw a gweithio yng Nghymru neu weddill gwledydd Prydain ar ôl graddio, gan fod llawer ohonynt yn fyfyrwyr tramor. Mae niferoedd yn weddol gyson oherwydd enw da rhyngwladol y sefydliadau hyn.

Mae'r sefyllfa o ran cyrsiau fel Graddau Sylfaen, cymwysterau HNC a graddau o sefydliadau sydd wedi cael statws prifysgol yn fwy diweddar yn llai calonogol, ac mae meysydd fel Rheolaeth Adeiladu ac ati yn dal i gynnwys mwyasfrif amlwg o fyfyrwyr gwrywaidd.

Cyrsiau Crefft a Thechnegol a Phrentisiaethau sy'n cynnwys y ganran uchaf o ddysgwyr gwrywaidd, a phrentisiaethau sy'n cynnwys y ganran isaf o fenywod yn ymuno trwy'r llwybr hwn. Mae hynny'n wir hefyd o'r Llwybr Peirianneg Sifil a lansiwyd yn ddiweddar ar lefel 3 (technegol), gan na wnaeth unrhyw ddysgwyr benywaidd geisiadau am leoedd yn Ne Ddwyrain Cymru.

Dros y blynyddoedd, mae CITB wedi cynnal nifer o fentrau o brofiad gwaith wedi'i ariannu i fenywod a digwyddiadau gweithredu cadarnhaol, ac mae rhai ohonynt yn parhau hyd heddiw. Yn anffodus, ychydig iawn o effaith mesuradwy o'i gymharu â'r buddsoddiad y gellir ei weld.

Cynlluniwyd cymhwyster lefel 2 CBAC mewn dylunio a phensaernïaeth fydd ar gael o fis Medi 2014 er mwyn rhoi sylw i'r mater hwn.

Pa gynnydd a wnaed ar ddysgu sgiliau STEM trwy addysg a hyfforddiant cyfrwng Cymraeg?

O safbwynt adeiladu ac addysg, cyfyngedig yw'r cynnydd a wnaed o ran darparu addysg trwy gyfrwng y Gymraeg. I raddau helaeth mae hyn yn cael ei effeithio gan nifer o ffactorau, gan gynnwys y galw gan ddysgwyr, argaeledd darlithwyr dwyieithog a materion yn ymwneud ag asesu gwaith dysgwyr a gwaith a chostau ychwanegol a godir gan gyrff dyfarnu. Mae prinder gwirwyr ac arholwyr dwyieithog hefyd yn fater y mae angen rhoi sylw iddo.

Ar nodyn cadarnhaol mae gobaith y bydd datblygu 3 chymwyster maint TGAU i'w cyflwyno mewn ysgolion gyda CBAC yn gymorth i fynd i'r afael â'r mater hwn, gan y gellir cyflwyno'r cymhwyster gan ysgolion cyfrwng Cymraeg sydd â'r staff addysgu. Bydd datblygu cymhwyster lefel 3 sydd gyfwerth â TAG Safon Uwch yn gymorth i symud ymlaen ac i barhau i ddarparu deunyddiau trwy gyfrwng y Gymraeg.

CITB Cymru Wales – Ebrill 2014

Edwina Hart MBE CStJ AC / AM
Gweinidog yr Economi, Gwyddoniaeth a Thrafnidiaeth
Minister for Economy, Science and Transport

Llywodraeth Cymru
Welsh Government

Eich cyf/Your ref:
Ein cyf/Our ref

William Graham AM
Chair Enterprise and Business Committee

06 May 2014

Dear William

The impact of car parking charges on town centres is an issue that has been of concern to Assembly Members. However, there has been little formal research on this matter.

As you will know, the Enterprise and Business Committee in its enquiry into the Regeneration of Town Centres judged that the evidence presented regarding town centre parking was mostly anecdotal. I have therefore decided to commission a small piece of work to research the impact of varying car parking charges on town centre footfall. The research will consider:

- The existing evidence on car parking charges and town centre footfall
- What approaches to charging have been successful and unsuccessful
- The impact of varying charges on different users
- How car parking charges can be used to influence town centre footfall.

I expect case studies to be identified and based on discussions with a range of stakeholders, including businesses and local authorities, and for examples of good practice from outside of Wales to be reflected in the recommendations.

I hope that you will find the outcome of the research useful, and I will write to you again when it is completed.

Bae Caerdydd • Cardiff Bay
Caerdydd • Cardiff
CF99 1NA

English Enquiry Line 0845 010 3300
Llinell Ymholiadau Cymraeg 0845 010 4400
Correspondence.edwina.Hart@Wales.gsi.gov.uk

Edwina Hart MBE CStJ AC / AM
Gweinidog yr Economi, Gwyddoniaeth a Thrafnidiaeth
Minister for Economy, Science and Transport

Llywodraeth Cymru
Welsh Government

Eich cyf/Your ref
Ein cyf/Our ref

William Graham AM
Chair –Enterprise and Business Committee

08 May 2014

Dear William

I would like to update you on survey work that we will be carrying out over the next two months in relation to travel patterns in South East Wales.

We will be collecting data on the origin and destination of trips and the factors that influence those trips. This data is required to maintain our models of travel patterns in Wales.

We will be undertaking road side interviews and traffic counts at approximately 30 locations in and around Newport and Cardiff, postcard surveys at the Severn crossings, email questionnaires to Severn Crossing TAG customers and number plate recognition surveys along and off the M4.

We are liaising with the relevant police forces to ensure that any potential disruption is kept to a minimum.

Bae Caerdydd • Cardiff Bay
Caerdydd • Cardiff
CF99 1NA

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