...enhancing the student experience in chemistry, physics and astronomy within the university sector

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Wavelength

In this issue:

Wavelength is the newsletter of the Higher Education Academy Physical Sciences Centre. It is issued twice yearly in Spring and Autumn.

The newsletter is free of charge to academics in UK higher education institutions. The material is also published electronically on our web site. Subscriptions are available for those outside the UKHE sector who wish to receive the paper version. Contact the Centre for details.

Academy update

Literature reviews published
In 2005, the Academy awarded funding for reviews of literature on topics relevant to higher education policy and practice. The reviews highlight evidence-informed approaches to policy and practice. The full reports have now been published and executive summaries of four reviews, which can be downloaded from www.heacademy.ac.uk/4880.htm.

The reviews cover:

- The undergraduate experience of blended learning: Rhona Sharpe, Oxford Brookes University
- The role and effectiveness of reflective practices in programmes for new academic staff: Dr Peter Khan, University of Manchester
- The first-year experience: Professor Lee Harvey, Sheffield Hallam University, and Sue Drew, Centre for Research and Evaluation and Division of Education and Humanities
- The impact of working context and support on the postgraduate research student learning experience: Diane Leonard, Institute of Education, University of London, and Janet Metcalfe, UK GRAD Programme.

New publication on the CAMEL project
A new publication about the CAMEL project (Collaborative Approaches to the Management of E-Learning) is available from the Joint Information Systems Committee (JISC). CAMEL, led by JISC infoNet in partnership with the Academy and the Association for Learning Technology (ALT), set out to explore how institutions who were making good use of e-learning and collaborating in regional lifelong learning partnerships might be able to learn from each other.

JISC will also be producing a CD-ROM toolkit for anybody wanting to start up this kind of network. Copies of the publication (and pre-orders for the forthcoming CD-ROM) can be requested free of charge from www.jiscinfonet.ac.uk/publications.

New role for Academy's Deputy Chief Executive
Professor Cliff Allan, Deputy Chief Executive of the Higher Education Academy, will be taking up the post of Deputy Vice Chancellor (Development) at the University of Teesside at the end of February 2007.

'Cliff has made an outstanding contribution to the Academy since its establishment in 2004, and prior to that as Programme Director at the Learning and Teaching Support Network (LTSN),' commented Professor Paul Ramsden, Chief Executive of the Academy. ' We wish him every success for the future.'

The Academy will be appointing a replacement Deputy Chief Executive as soon as possible.

Adapted from Higher Education Academy Updates (www.heacademy.ac.uk/news/updates.htm).
or from Higher Education Academy News (www.heacademy.ac.uk/) ■

The Journey of an Idea: Part 2

When Thomas Edison described genius as "99% perspiration and 1% inspiration" he may well have been describing entrepreneurship also. This is because most of the effort in successful entrepreneurship appears after a good idea has been identified. The 'perspiration' of entrepreneurship is in completing the 'Journey of an Idea' after its inception to a viable entity in the marketplace. This involves a great deal of procedural work, patience and tenacity. There is a wealth of readily available resources to help with the procedural aspects of entrepreneurship and any high street bank will happily supply these materials for free.

on the Osborn-Parnes model will be described in the context of entrepreneurship. It is equally applicable to meeting open-ended challenges in individual or group work such as final year projects or post-graduate research. The three steps of the process are shown in figure 1.

In keeping with the Osborn-Parnes framework at each stage there are two steps defined as 'Diverge' and 'Converge' and these refer to the dominant mode of thinking that is applied. Divergent thinking appears first and this aims to find variety and originality at whatever stage in the process it is being applied. Convergent

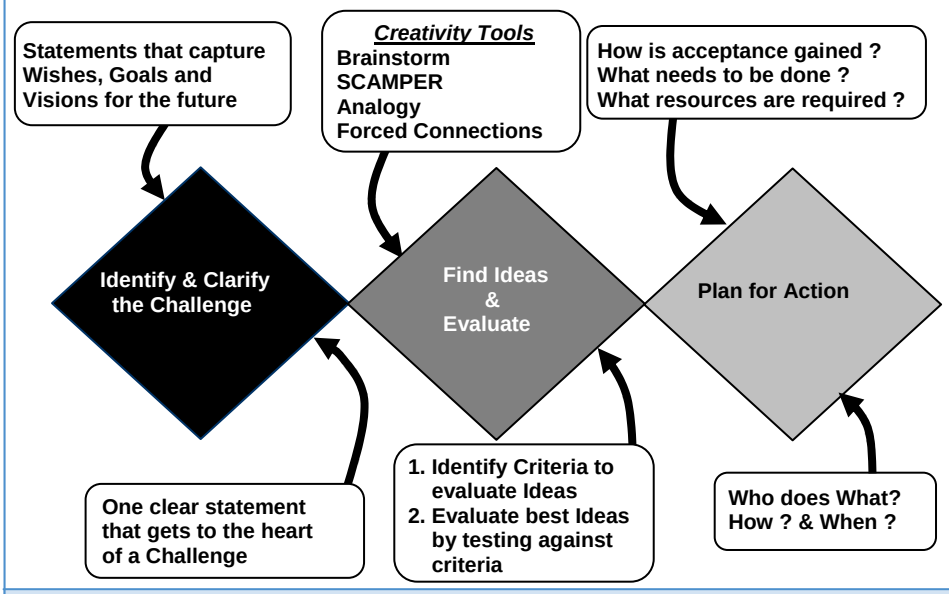

Fig 1: A simplified model for tackling Open-Ended Challenges

The 'inspiration' for entrepreneurship however is a different matter and it is the nurturing of the creative aspects of entrepreneurship that presents the most important challenge to higher education. In retrospect an inspired idea that becomes a business may appear to be a small part of the big picture but arriving at new ideas is no trivial exercise. For this reason in this second article on Entrepreneurship the emphasis is on exploring how good ideas can be found and shaped in preparation for a new business venture.

In the absence of genius, a framework for seeking and developing entrepreneurial ideas is indispensable. One such framework - the Osborn-Parnes Creative Problem Solving (CPS) process - was described in the first part of this article. This is a tried and tested framework for seeking creative solutions to a range of problems. Here a simplified process based

thinking on the other hand is concerned with decision making and selection of the outcomes from the Divergent activity and is always carried out separately from it.

When Alex Osborn and Sid Parnes developed their model they identified methods and guidelines for the two modes of thought as summarised below.

Divergent Thinking:
If a small group of people are working together to find ideas the best method is to elect one person to write the ideas on a flipchart. When ideas are being gathered they should be written as stated and not edited in any way by the writer. The guidelines are:

1. Defer Judgement: Many ideas never see the light of day due to the ever present tendency of other people to judge their worth prematurely.

The journey of an Idea: Entrepreneurship in the Physical Sciences

Kevin Byron received his doctorate in applied physics from the University of Hull and after graduation spent some twenty five years in research in the telecommunications industry. During this period he published over fifty patents and a similar number of technical publications. He was also an honorary visiting lecturer at the University of Glasgow and Visiting research fellow at the University of Salford.

In 2001 he was awarded a Research Fellowship with The National Endowment for Science, Technology and the Arts (NESTA) in the UK for studies of creativity in science education. After completing the fellowship he established Etc (Education & training in creativity) - a private consultancy delivering lectures and workshops on many aspects of creativity and critical thinking to a variety of educational institutions and businesses. His clients have included the East of England Development Agency, The UK Centre for Integrated Photonics, Dixons, The CASS Business School and The Royal Institution. He is currently working with UK universities developing teaching resources on creativity and entrepreneurship. Kevin is a Fellow of the Institute of Physics and a visiting fellow of the Higher Education Academy Physical Sciences Centre, based at the University of Hull.

Kevin Byron
(kevin.byron@ntlworld.com)

The Journey of an Idea: Part 2

2. Allow repetition: New ideas often appear by association and depending where an idea is in a list can determine the associations made with it. By allowing repetition new associations can be made.
3. Include the obvious: Although divergent thinking aims to find new ideas sometimes the most elegant and original ideas can be staring us in the face.
4. Go for quantity: The more ideas that are listed the more new associations and combinations will be found.

tendency to select ideas that have most emotional impact which are not necessarily the ones that will be most workable. Without a framework to work ideas through these exciting but less viable ideas cannot often be easily identified until later in the process and after effort has been expended unnecessarily.

Whilst the CPS process can be used to find creative solutions to a variety of challenges here the focus is on how it may be applied in nurturing entrepreneurship skills.

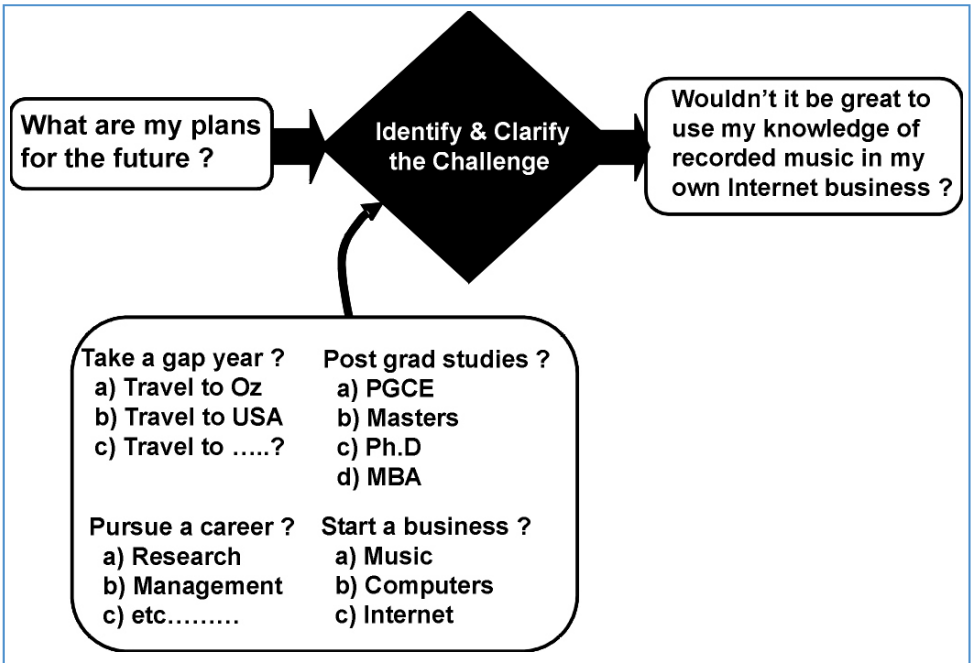

Fig 2: The first stage of the simplified CPS process

divergent thinking can sometimes lead to ideas that are not relevant to the challenge as stated

Convergent Thinking:
Here the main aim is to select the best idea or ideas from the list and this can be achieved in a number of ways. One simple way is to have everyone vote for their top three selections and add up the scores. If there is a tie then the process is repeated until the most popular idea is identified. During this phase decisiveness is important and it is also worth checking the ideas against the original objective as divergent thinking can sometimes lead to ideas that are not relevant to the challenge as stated.

In a sense the Osborn-Parnes process and the more concise version described here represent how we think intuitively. But having a more tangible framework around this unconscious process ensures that ideas are recorded and analytically examined and that they can be validated by other people. It also inhibits the

To illustrate the process we assume an undergraduate is reaching the end of their final year and is wondering what to do next. We start with the first divergent stage of the CPS process in fig 1.

In answer to the open-ended question 'What are my plans for the future ?' the range of options the student might come up with are shown in fig 2.

When the options are not so clear, a series of questions are asked and the answers expressed in the form of a list of challenges. Some of the questions that one might ask are:

What would you like to accomplish ?
What idea would you like to work on ?
What is the next research topic ?
What relationship would you like to improve ?

The Journey of an Idea: Part 2

What areas would you like to improve upon ?
What do you wish you had more time for ?
What are your unfulfilled goals ?
What changes would you like to introduce ?
What takes too long ?
What is wasted ?
What is too complicated ?
Where is there inefficiency ?
What would you like to organise better ?

have arrived at an entrepreneurial challenge: "Wouldn't it be great to use my knowledge of recorded music in my own Internet business ? (incidentally if any of the other options had been selected the rest of the process can be just as effective for finding the best solution and how to put it into action.)

The next stage in the process for this example is shown in Fig 3.

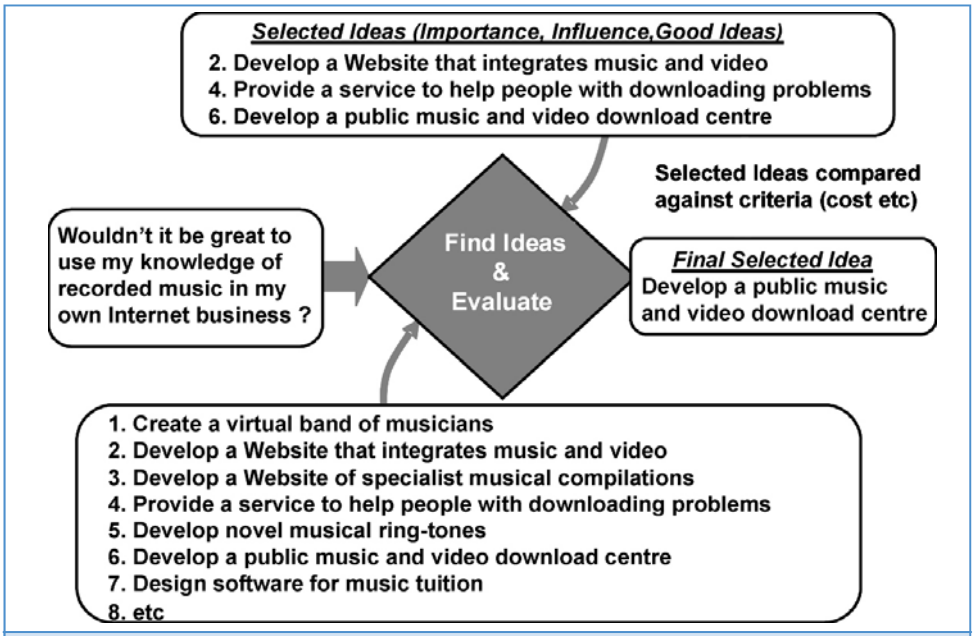

Fig 3: The Second Stage in the simplified CPS process

Other tools may be used in order to get to the heart of a challenge and these include 'Abstraction' - repeatedly asking why ?- in answer to a challenge and re-framing the answer in terms of a new challenge. This technique was discussed in part 1 of this article. Another technique is to identify key words in the challenge statements and replace them with associated words. This can often result in a new statement that more clearly expresses the challenge. Sometimes this may be a combination of statements in the list as in this example.

Returning to Fig 2. After listing a number of options using the aforementioned tools the next stage is convergence to find the one challenge that is most important. This is identified by using the following criteria:
'How Important is this challenge to you?'
'How much Influence do you have over this challenge ?
'How much does this challenge need new Ideas ?'

By iteratively testing all options against these criteria the list should be reduced down to one challenge and in this case we

The Divergent part of this stage in the process is where the most original thinking needs to be carried out and a number of tools are available to help find as many ideas as possible. The simplest tool commonly known as brainstorming consists of simply listing immediate associations with the selected challenge. This does not always lead to really novel ideas so other tools such as SCAMPER, Forced Connections and Analogy are used to access more imaginative ideas. It is not in the scope of this article to describe all these other tools but the reader is referred to the website:
www.innovationtools.com/
for more details of similar tools.

The SCAMPER tool however is particularly powerful for idea-finding in businesses relating to science and technology so this is described in more detail here.
SCAMPER is an acronym for a variety of transformations that can be applied to the challenge in order to shift perspective on it. SCAMPER was developed by Bob Eberle who worked with Osborn and Parnes in the USA.

Box 1

SCAMPER: Examples from Science & technology

SUBSTITUTE: Most technological revolutions come about through substitutions of materials and techniques eg Stone substituted for Iron in early technologies, water power substituted for steam power, valves for transistors, copper cable for optical fibre etc.

COMBINE: All inventions are combinations of existing ideas eg In the 15th century Gutenberg's printing press combined the wine press mechanism with a coin punch. The Dyson cyclone vacuum cleaner combined an industrial process with a domestic device and Bayliss's wind-up radio combined a clockwork dynamo with a radio.

ADAPT: Nature is the greatest inventor and by natural selection variations in species have arisen through adaptation to different environments. Variations in the design of inventions are often adapted to different markets eg Cars - 4WD, sports, saloon, MPV, Executive etc. The Magnetron was adapted for cookery with the microwave oven after the heating effect of microwaves was discovered whilst being deployed in Radar.

Continued in Box 2

The Journey of an Idea: Part 2

Each transformation is prefaced by asking 'What if ?' In the following examples the inspiration for the ideas are not consciously attributable to the application of a tool such as SCAMPER. There is no doubt however that there are intuitive rules of thumb that lead to these transformations and some of these are described by the SCAMPER tool. In situations where inspiration is not forthcoming through intuitive processes one can use the SCAMPER tool to re-ignite the imagination to find new ideas (see Box 1/2).

For each element of the SCAMPER tool there are a series of prompts that help with its use for example with Substitute we might have:
What can be substituted ?
Other processes ?
What can be changed ?
Another place ?
Another way of doing this ?
etc

Returning to Fig 3 after as many ideas as possible have been listed using the various idea-finding tools, the next stage is convergence again.

In this stage of the process there are two steps necessary in order to arrive at the one solution that goes forward to implementation. In the first stage the ideas are tested against the earlier criteria of Importance, Influence and new Ideas, and the list reduced down to the 3-5 top ideas. (This process is much more effective when the decisions are made by a small team rather than an individual.) The second step is to rate these ideas against more specific and stringent criteria and here a table is used such as shown in fig 4.

The criteria might be originality, cost, safety, practicality etc and each idea is given a score for each criterion. To further differentiate the ideas a weighting can be put on the criteria in terms of their importance. Using this technique it soon becomes clear which idea should go forward, which ideas should be rejected and which ones should go on hold. Interestingly the winning idea is often not the one that the individual or group feel most excited about.

Selected Ideas	Criterion 1	Criterion 2	Criterion 3	Criterion 4	Criterion 5	Total	Pass	Hold
1.								
2.								
3.								
4.								
5.								

Score selected Ideas: 1 (Low Value,) 2, 3, 4 (High Value.)

Fig 4: Table for Identifying the best Ideas

Once the best idea has been identified for the new business (which in the example above was: 'Develop a public music and video download centre') we move to the final stage in the CPS process shown in fig 5.

In the divergent part of this final stage we identify all the basic requirements for starting a business eg Business plan, Patent applications, Market research, etc. At this stage these are simply identified and then in the final convergent step decisions are made about how ? when ? and by whom ? they will be used.

If there are intellectual property rights (IPR) associated with the business idea such as a patent or registered design the most important initial step is to begin the process for securing the IPR. The essential information on how to do this can be found at: www.patent.gov.uk/

Box 2

MODIFY (Magnify/Minify): Alastair Pilkington magnified the phenomenon arising from surface tension of flat oil drops floating on water. He SUBSTITUTED the materials for liquid glass floating on liquid tin and this was how float glass was inspired. Micro-technology is a scaled down (minified) version of life-sized technology.

PUT TO OTHER USES: Velcro was invented by George De Mestral when the attachment mechanism of cockleburrs was put to another use (after SUBSTITUTION for another material.) Bio-mimetics is a scientific specialisation that aims to mimic nature for finding novel engineering solutions (eg composite materials).

ELIMINATE: Moore's law aims to eliminate space on silicon chips by increasing the density of active silicon elements on the substrate. Wireless technologies eliminate cords or wires.

REVERSE: By creating artificial opals (closely packed silica spheres) and in-filling the gaps then dissolving the spheres we are left with an inverted Opal. This has potential application for photonic circuits (Circuits using light instead of electricity).

The Journey of an Idea: Part 2

Most businesses require external funding so the next step involves writing a business plan. However before this some basic questions need to answered about the new business idea and each of these will require some considerable thought and research. These questions include:

1. What exactly is the product or service that is to be offered ?
2. Will there be a sufficient market need for this new product or service ?
3. What is the status of the competition with this product or service ?
4. Is this an expanding market ?
5. Does the idea look economically viable ?
6. How is the product or service going to be marketed ?

Selling the idea is not just a matter of having a well written and convincing business plan, but the person and how they communicate the business idea is equally important. Someone who merely quotes facts and figures without displaying their passion and enthusiasm for the idea is unlikely to win the confidence of a backer. A useful guide to this and other aspects of setting up a business can be found at: myphliputil.pearsoncmg.com/student/bp_turban_introec_1/PlanPres.html

Having acquired all the necessary information on the procedures and skills necessary for setting up the particular business in question we arrive at the final convergent step in the CPS process. Here an action plan is drawn up where decisions are made on who does What ? How ? and When ? This plan represents the vision for the business over the next few years. Once that is in place and the background research has been completed, if the idea is still alive and well - the 'Journey of an Idea' will have been transformed into the exciting Journey of a new Entrepreneur. ■

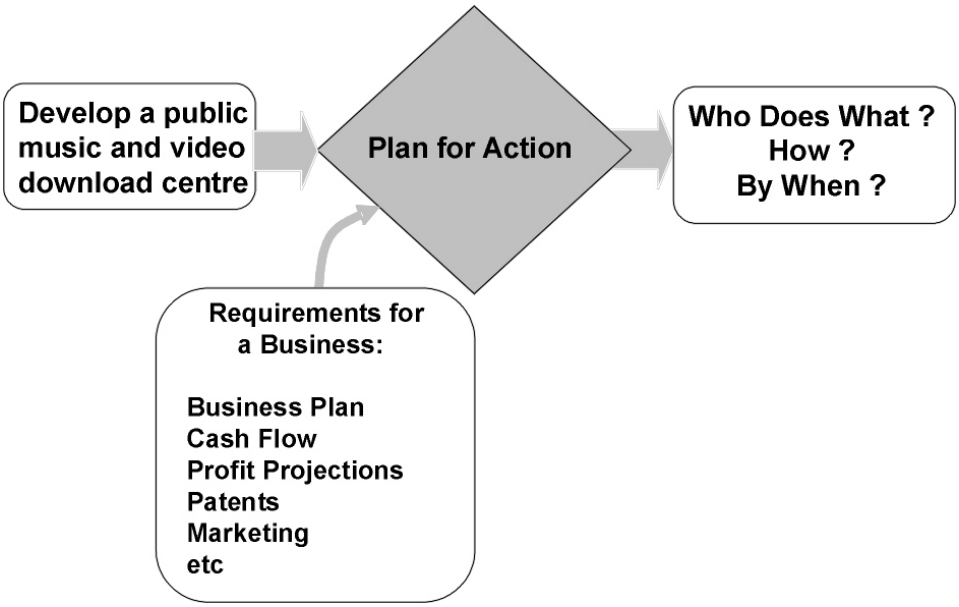

Fig 5: The final stage in the CPS process

Apart from being essential to procure funding, the business plan provides an important opportunity for testing commitment and for focusing on the detail and practicality of the business idea. A template for a business plan can be found at: www.innovateur.co.uk/key.html

The business plan will include cash flows and profit and loss predictions for up to three years and at this stage some expert support from an accountant would be essential.

Once the business plan has been completed the next obstacle is selling the idea to the financial backers. This may be a bank, a venture capital organisation or a business angel and advice and assistance with these different financiers can be found at: www.businesslink.gov.uk

The SCAMPER tool... is particularly powerful for idea-finding in businesses relating to science and technology...

The Second Regional STEM Forum

The Second Regional STEM Forum
Bradford
December 2006

Steve Walker
LTSN Physical Sciences
Chemistry Dept
Liverpool University
Liverpool L69 7ZD
(sk01@liv.ac.uk)

This meeting was held to launch and explain the recently published (October) report announcing the direction of Government policy on future STEM (science, technology, engineering and, mathematics) activities.

It was introduced by John Holman, Director of the National Science Learning Centre at York and the newly-appointed national STEM director.

It was held in the Bradford Centre for Learning Excellence as the NE region (essentially Yorkshire and Humberside) is thought to be well ahead of any other region in STEM organisation and cooperation.

There were some 70 attendees, all drawn from the 'provider' section of the community – there were no teachers, industrialists or students.

The actions from the report are appended.

Holman initiated the meeting and his main points were,

1. Better coordination of STEM activity at local, regional and national level
2. Better coordination of public and non-public initiatives. (It was stated that the government has identified in excess of 470 such initiatives. It was pointed out from the floor that the true figure is probably greater than 2000).
3. Better targeting of government spending accompanied by much tighter and rigorous assessment procedures.

He then spent some time reviewing GCSE and A-level entries and this highlighted the disastrous situation facing Physics. It was pointed out that using these figures did a disservice to Engineering as there were no exams in this subject and there was a similar situation with Computing.

The key aims of the report were,

1. Improve attainment in STEM subjects as measured by assessments at ages 14, 16 and 18.
2. Increase engagement in STEM subjects as measured by numbers opting to study for qualifications at level 3 and above – especially A-levels in Maths, Physics and Chemistry.

There were three levels of attack,

1. *Local Delivery*. Schools access STEM through the Web Portal or local networks based on: specialist schools, SETPOINTS, Secondary National Strategy and Local Authorities.
2. *Regional Coordination*. Using Regional STEM Support Centres, co-located if possible with regional Science Learning Centres and Regional Maths Coordinators and a close relationship with the RDA (Regional Development Agency).
3. *National Coordination*. Using a national STEM centre steered by key stakeholders in public, not-for-profit and private sectors.

He emphasised that Actions 9, 11, 15 and 16 (see below) were the principal prongs of the approach (although the timetable had slipped). Evaluation would use impact measurement and not just number counting. Local Delivery is the key – every school should be within the reach of high quality support.

Comments from the floor and in subsequent discussion sessions:-

1. Although Engineering seems to be missing out (as previously mentioned) and there are many specialist schools with engineering as their principal focus, the majority of head teachers and industrialists place science and maths as the major priorities.
2. Teachers are continually pointing out that there are already too many resources available. Their problem is in knowing what these are and, more importantly, they need to be shown how to use them.
3. Unfortunately there was not a single representative from Industry to defend the resentment at their attitudes – constant carping about standards and misunderstanding the role of education whilst not providing enough jobs, enough interesting jobs or selling them to students.
4. No one has ever stated how many STEM graduates are needed by the country – agreed by Holman (and he has asked the question).
5. The whole report is aimed at the maintained sector, bearing in mind that 23% of all maths and physics entries are from independent schools with 37% of the top grades coming from these (plus 50% of all A grades in Chemistry and 60% of those in French).
6. There is too much coordination, too many regional directors etc. We need more actual delivery of materials not more administrators.
7. It is time for a cultural change. Money, incentives and rewards in teaching are poor and there is a culture of low self-esteem. There is a national sport of teacher-bashing.

The Second Regional STEM Forum

8. There must be more access to teachers. There is poor communication with schools. Materials cannot be targeted for specific school requirements.
9. The fun has gone out of science.
10. Portals are not the answer – teachers rarely access the web and, when they do, they use it in a totally different way from us.

There were then several presentations with a couple of items worth noting,

1. There is a new portal that is expected to become the only point-of-access needed by teachers. It combines all the other portals and webs into a seamless and transparent 'front end'. Operated by SEEDA (South East England Development Agency) it is still in its early stages and is not yet being advertised to teachers. It requires registration (I think) and you can access it at www.stemcentres.org.uk
   Despite the overwhelming feeling that another portal is NOT the answer, we were assured that this one IS different. Designed bottom-up by teachers it only has activities – no sales pitches etc. There are no items to download; it is all about people – establishing relationships between provider and teacher.
   Resources can be advertised on this portal by contacting Sally Hall at SEEDA and, in the fullness of time, all the other RDAs.
2. STEM Support Centres are being established with the NE region already up and running effectively. A Quality Sign Posting System is being developed to ensure that the clients have access to 'appropriate and fit for purpose' resources.

There is a new portal that is expected to become the only point-of-access needed by teachers.

Actions

Action 1
A Ministerial High Level Steering Group to set the direction of the national STEM strategy. This will include the joint chairs of the new high level STEM Strategy Group;

Action 2
A new high level STEM Strategy Group (SSG) to join up policy through all phases of STEM education across the DfES, the DTI, other Government Departments and external stakeholders;
The SSG will offer advice and make recommendations to Ministers on national priorities, and support articulation of a coherent national message about the need to increase the take-up of STEM-related initiatives;
The SSG will be jointly chaired by the DfES Directors General for Higher Education and Schools Directorates. Members will include DfES, DTI, HMT (HM Treasury), the TDA (Training and Development Agency), the Royal Society, the Royal Academy of Engineering, the Association for Science Education, the Wellcome Trust, the Gatsby Charitable Foundation and representatives of business;

Action 3
A STEM Advisory Forum to ensure members of the wider STEM community can contribute their views and advice on policy formulation and delivery to the SSG;

Action 4
A newly appointed National STEM Director accountable to the School Science Board for implementation of the STEM programme actions;

Action 5
The DfES School Science Board in co-operation with the Mathematics Board, where there are already strong links, will work with key partners to take forward delivery of the STEM programme actions as an integral part of the *Next Steps* commitments.

Action 6
By October 2006 the Skills Working Group of the UK Science Forum will recommend a suitable individual to represent business stakeholders in the STEM Strategy Group.

Action 7
By December 2006 we will have agreed whether the principal organisations taking co-ordinating roles (the Royal Society, the Royal Academy of Engineering and SETNET - the Science, Engineering, Technology and Mathematics Network) should have a presence in the National Science Learning Centre and the Regional Science Learning Centres, so as to ensure links are maintained between professional development and enhancement activities.

Action 8
By June 2007, working in partnership with the Association for Science Education (ASE), we will have explored the potential for developing the National Science Learning Centre as the 'British Library' of STEM professional development and resources, making available in one place as much of the learned society, national academy and professional institution material as possible, subject to quality assurance and copyright restrictions.

The Second Regional STEM Forum

Action 9
By February 2007 we will have agreed with SETNET, working with the Royal Academy of Engineering (through Technology and Engineering in Schools Strategy, TESS) and the Royal Society (through **S**cience **Co**mmunity Par**t**nership Supporting STEM **E**ducation, SCORE) and others, arrangements to improve co-ordination of the work of stakeholders who contribute to the delivery of opportunities for curriculum enhancement and enrichment. This will also include plans to increase the number of schools, colleges and students which benefit from such activities and support.

Action 10
By June 2007 working with the Wellcome Trust, we will agree with the National and Regional Science Learning Centres and other partners, the potential contribution they could make to professional development activities in engineering and technology.

Action 11
By June 2007 we will have established the potential to develop a national STEM communities portal from the existing Science Learning Centres' web portal and the possibility of providing peer reviews of resources, events, industry contacts, CPD and links and feeds from related sites as well as regional portlets. The Science Learning Centres' web portal is already providing a platform for the National Centre for Excellence in the Teaching of Mathematics.

Action 12
By February 2007 we will have established arrangements for effective collaboration between the National and the Regional Science Learning Centres and the National Centre for Excellence in the Teaching of Mathematics.

Action 13
By June 2007 the School Science Board will have explored best practice emerging from the Royal Academy of Engineering's London Engineering Project on increasing diversity and consider whether this can be replicated for other subject areas to widen participation from underrepresented groups.

Action 14
By February 2007 we will have agreed more effective mechanisms for engaging with the science and engineering communities on issues of education policy, working with the Royal Society and the Royal Academy of Engineering to develop these in consultation with other stakeholders in the science and engineering sectors.

Action 15
By February 2007 working with the National STEM Director, we will explore and agree the role that each of the Regional Science Learning Centres could play, working with other partners, in achieving better co-ordination of professional development for school staff and strategic planning.

Action 16
By March 2007 we will introduce for future evaluation of STEM initiatives standard evaluation systems across DfES and DTI which incorporate longitudinal evaluation and tracking - particularly on impact on progression to post-16 STEM study and higher education - and which will support more effective targeting and use of STEM funding.

Action 17
By July 2007, reflecting advice from the National STEM Director, DfES and DTI will agree, with other funders, on no more than ten national schemes of STEM support for schools (excluding national teacher supply measures) that should receive national funding and endorsement; and on how particular existing schemes and funding streams should be rationalised to fit within this simpler framework, building on those which can contribute most to achieving our objectives at national level. ■

STEM Support Centres are being established... to ensure that... clients have access to 'appropriate and fit for purpose' resources.

Departmental Representatives

Ruth Wellock
Physical Sciences Centre
Chemistry Dept
University of Hull
Hull HU6 7RX
(R.Wellock@hull.ac.uk)

The Physical Sciences Centre provides learning and teaching support for physical sciences departments in Higher Education institutions across the UK. We aim to provide activities, consultancy and resources that meet the needs of the community. Therefore, it is important that this work is informed by the physical sciences community to ensure current needs are met. To help inform our work, we have an established network of Departmental Representatives who help us to identify topics of national importance and have an influence on the Centre's activities.

We strive to have a Departmental Representative in every chemistry, physics, astronomy and forensic science (or related) department across the UK. However, this is an ongoing process due to the inevitable changes in departments such as staff moving on or retiring. Therefore, we are always looking for, and welcome new colleagues to act as the Departmental Representative for their department.

Ruth Wellock, our Academic Coordinator at the Centre, is working to strengthen this network of Representatives. You may be aware that we have recently been updating our mailing list to ensure our information and publications are reaching interested people. This has also involved ensuring that all our Representatives are still interested in working with us.

Benefits of being a Departmental Representative

Acting as a Departmental Representative for the Centre is not a time-consuming task, as we fully understand how busy people are. We avoid numerous emails and only send literature directly related to your subject discipline. We ask you to help us to promote our work with your colleagues by, for example, publicising our events and funding opportunities (eg development projects), distributing our publications in your department and providing feedback to the Academy on national developments in teaching and learning as they arise, etc.

There are numerous benefits including:

- Receiving multiple copies of the Centre's publications at no charge
- Being part of a vibrant network of enthusiastic academics
- Receiving a welcome pack including notice board headers
- Travel expenses to our annual Departmental Representatives meeting, which, this year, is to be held on 24th and 25th April 2007, at the Hotel Russell in London
- Having an input into Centre activities from which you can directly benefit
- Calling on the support of expertise provided by the Centre on all teaching and learning matters
- Being able to communicate with fellow academics to share ideas and discuss matters of common interest
- Benefiting from departmental visits, seminars and workshops specifically tailored to your needs
- Being a voice for the physical science community on issues that affect us all

Departmental Representatives Annual Meeting

We hold an annual Departmental Representatives meeting to thank our Representatives for the support and help given. This is an opportunity for the Representatives to find out what activities the Centre has been involved with and provides us with the opportunity to draw upon their expertise in planning future activities. This is an important event for us to ensure we are providing services that address the needs of the communities and ascertain how we can best support the Representatives' network. There is no charge for this meeting for our Representatives and we cover travel costs.
This year this meeting is to be held on 24th and 25th April at the Hotel Russell, London. This will start on the evening of 24th April with a wine reception and dinner, to provide an informal networking opportunity. There will then be a full day meeting on 25th April. There is no charge for this event. To register please see the website, www.physsci.heacademy.ac.uk, or e-mail the Centre, psc@hull.ac.uk.

Get involved, have your say

We are always keen to involve more people in the Departmental Representatives' network, to ensure we cover all of the physical sciences departments in the UK. If you are unsure if your department is currently represented, please contact Ruth Wellock, r.wellock@hull.ac.uk. If you would like more information about being a Representative, or would like to volunteer then please get in touch. We look forward to hearing from you! ■

New website planned for Physical Sciences

Paul Chin
Physical Sciences Centre
Chemistry Dept
University of Hull
Hull HU6 7RX
(p.a.chin@hull.ac.uk)

As part of the ongoing development and natural evolution of central services from our umbrella organisation, the Higher Education Academy, our Centre will be developing a new website early in 2007. When the Centre became part of the new national Higher Education Academy, a new Academy website was created to act as a key access point to all the services, resources and related subject centre websites. However each subject centre website was hosted separately and required local technical expertise. This meant that sometimes resources, links, key contacts etc were not always efficiently linked together.

In light of this fact and informed by an Academy website usability study earlier in the year (further information is given at the Academy site under 'About us' www.heacademy.ac.uk/4796.htm) the Academy has decided to commission an integrated Portal system. The pilot group developed and agreed the portal vision and formed a panel to choose a new shared content management system for web publishing. In July the Portal Pilot Group agreed and procured Interwoven. This is a flexible, modular enterprise content management system (CMS). The CMS is a core tool in the delivery of the portal vision.

The web portal vision also seeks to integrate Integra, the Academy client relationship management (CRM) system, as well as other bespoke databases that presently enhance functionality to Subject Centre websites.

The CMS will provide all the integrated information services behind the new Academy website. As part of the initial pilot there are also seven pilot subject centres, of which our Centre is one, who will become part of the new CMS with the Academy taking responsibility for hosting the website.

The final portal pilot group consists of the following subject centres:

- Academy York (our central organisation)
- Business Management Accountancy and Finance
- Hospitality Leisure, Sport and Tourism
- History Classics and Archaeology
- Information and Computer Sciences
- **Physical sciences**
- Psychology
- Geography, Earth and Environmental Sciences

Changes to our website

In essence, anyone visiting our new website once it is published will only notice a slight change in design layout. Any changes will be informed by the usability studies to make navigation easier for people and for searches to be more efficient to make it easier to find information and resources.

Benefits for users

There will be a number of administrative benefits for the team as a result of the new website but the biggest benefits of our new website will be for users of the site. As well as a more efficiently managed website driven by an internal CMS there will a host of other services available from the website. These include:

- Improved search facilities
- More interactive services such as blogs
- Better web form functionalities (registering for events etc)
- Improved RSS feeds (for active news updates, events etc)
- 'Email to a friend' and email subscription functionality (and similar services)
- Personalisation of website (login feature for customised preferences)

The toolkit approach

Each Subject Centre in the pilot has different levels of in-house technical expertise and web support. Therefore, the Portal Pilot Group developed a two-toolkit approach for the delivery of Subject Centre websites.

Toolkit 1 – Full Service Option

This toolkit has been proposed for Subject Centres who do not have in-house technical expertise and is a full service option where all the technical support for a Subject Centre website will be provided by Academy York. Three of the Pilot Subject Centres are using Toolkit 1 including **Physical Sciences**

The reason our Centre has committed itself to the toolkit 1 option is to free up valuable staff time working on technical development of our site so that resources can be better deployed on other activities.

Project timescales

The first phase of the project (toolkit 1) is due for completion in June 2007 when there will be a formal public launch of the new Academy and participating subject centre websites. Phase two of the Portal pilot will occur in August. However, given the June launch we will be in the process of transferring our existing website content before that, alongside the necessary testing and training issues that are involved. Therefore, our new site may well be up and running before our 'official' launch in June so that users can start enjoying the next site even earlier. ■

WebPA Project

WebPA Project - supporting peer assessment with technology

Paul Chin
Physical Sciences Centre
Chemistry Dept
University of Hull
Hull HU6 7RX
(p.a.chin@hull.ac.uk)

The Centre is pleased to announce a new JISC (Joint Information Systems Committee) e-learning project it is undertaking with partners based at Loughborough University. The project will develop an electronic peer assessment tool which will enable academics to support peer learning and peer assessment activities with students. The lead partner is the Faculty of Engineering at Loughborough and the other consortium partners consist of our Centre (based at Hull), the Engineering Subject Centre (at Loughborough) and the e-Services Integration unit within Academic Services at the University of Hull. The project will make an open source version of an existing online peer moderated marking system, for the assessment of group work, already in use at Loughborough University since 1998. WebPA will also include a number of significant enhancements that will help integrate good practice being developed locally and at the University of Hull.

Peer learning
Peer learning, where students collaborate and provide timely support to each other, offers a number of benefits. Peer learning helps students to share their knowledge with each other in order to reinforce their understanding of a topic, particularly if that topic is conceptually difficult to comprehend. Another benefit is that students collaborate in a non-threatening environment, for example they are more likely to ask a question without embarrassment which they may not do in front of their tutor or in the crowded lecture theatre.

Peer assessment
Peer assessment, where students give formative or summative feedback to each other offers additional support by getting students to give constructive feedback to each other. Peer assessment offers a range of benefits for students:

- Academic
  - Greater understanding of topic
  - Promotes independent learning (critical thinking)
  - Self reflection
  - Time management
- Social
  - Self confidence
  - Team working skills
  - Communication skills (oral and written)

Potential barriers to adoption
Peer learning and assessment offer a number of benefits to both staff and students. Some of the student benefits have already been mentioned but there are also potential benefits to staff by promoting more student centred learning - students working together take more responsibility for their own educational development. There are also potential time savings and other administrative gains. However, there are also potential barriers to successful adoption of peer learning and assessment:

- Works well with few groups but can be difficult with large cohorts
- Time consuming for curriculum timetable
- Difficult to manage with many groups
- Peer assessment is time consuming to engage with
- Peer assessment is difficult to administer

A technology supported solution
In order to address the issues that may prohibit the adoption of peer learning and peer assessment the WebPA project will provide an electronic tool for academics to support online peer assessment. WebPA will provide a simple tool for automating peer assessment and which will enhance the learning experience for students. The JISC Framework Reference Model for Assessment (FREMA) identified peer assessment as an ideal use case for which services should be developed in the future. A very consistent evidence base for this work was found from the experiences of Loughborough and Hull and directly mirrored by the University of Sydney (with their SPARC tool). The project will therefore also carry out further research and evaluation activities in online self and peer assessment.

Enhancements to the learner experience
The project will enable the existing online peer assessment system to be developed with not only the input of tutors but also, most importantly, the students themselves. The research and evaluation activities will maximise the application's use to enhance flexible delivery and research into the best pedagogical model for use within a variety of contexts. This study will encompass many institutions and subject disciplines to truly reflect the pedagogic diversity of uses for the application. The WebPA tool will enable students to reflect not only on their group's effectiveness and their role within a group - which will enable better team working through formative peer assessment; but also personal reflection for self development through additional routes such as personal development planning.

WebPA Project

The project will develop an electronic peer assessment tool which will enable academics to support peer learning and peer assessment activities with students.

Project outcomes
In summary, the project has aims to:

- Make significant enhancements to the online peer assessment system 'WebPA' based on evidence from pedagogic research undertaken at Loughborough and Hull Universities
- Provide a mature open source peer assessment application
- Create and disseminate models of pedagogic use based on a current literature review, findings from student and tutor evaluations regarding the best practice in terms of formative and summative assessment methodologies

Project Activities:

- Literature review and exploration of pedagogical models to evaluate
- Ongoing updates to existing application based on research and feedback
- Student and Tutor qualitative and quantitative evaluation
- Guides and case studies for wider community
- Support for adoption in at least 2 further institutions

Developments so far
To date the project is well on target for completion in 2008 but WebPA is expected to be available before that. A version of the tool has been produced for trials at Hull and at the time this article goes to print it should have been trialled in several departments. The project team is also currently working with colleagues at Derby University to trial WebPA and needless to say, it is already being used extensively at Loughborough. Outcomes of the success of the our work will be published at various national and international conferences which will be made available from the project website. Further trials are expected in the autumn.

Get involved
If you are interested in peer learning and assessment then visit the project website at:
webpaproject.lboro.ac.uk.

As the project evolves the site will host increasing numbers of resources, links, presentations and other information relating to peer learning and assessment.

If you would like to get involved in the project, whether as an individual; as consideration for departmental wide adoption; or even across your institution we would love to hear from you. The project team can offer full support and guidance so feel free to contact us. ■

Maths for Chemistry Special Interest Group

Ruth Wellock
Physical Sciences Centre
Chemistry Dept
University of Hull
Hull HU6 7RX
(R.Wellock@hull.ac.uk)

Undergraduates are starting higher education courses in the chemical sciences with varying levels of mathematical ability. Some undergraduates do not possess the level of mathematical ability needed for these courses. Consequently, curricula must be designed with this in mind and maths support is invariably provided for all.

The challenges facing staff to ensure all undergraduates attain the required mathematical skills has been recognised by the Faraday Division of the Royal Society of Chemistry. This stimulated a joint meeting held with the Centre in June 2006 at the University of Warwick. This meeting provided those responsible for teaching mathematics to chemistry and related undergraduates to come together to share approaches, resources and concerns.

During the meeting it was discussed how the teaching of mathematics could be supported by the Centre. As a result the group decided to set up a Maths for Chemistry Special Interest Group (SIG). The SIG will give a focus and some funding to facilitate people sharing ideas, resources, getting together etc.

Ruth Wellock, the Academic Coordinator at the Physical Sciences Centre is leading this group. As a result of the meeting, the things that are currently planned for the SIG are to identify a 'common' maths for chemistry syllabus, and thus identify key topics for resource development and also to share multiple choice questions.

Web space has been set up on the Centres website, www.physsci.heacademy.ac.uk/MathsSIG/intro.aspx.

Here you will find information about the SIG, what is currently happening with it and how to join the SIG. A current list of resources for teaching mathematics is also available. These range from resources produced by the Centre, book, software and online resources. Suggestions for additions to the list are welcome, to ensure it is comprehensive, so please feel free to contact Ruth with any information.

Current objectives

Common syllabus
It is hoped to identify a common syllabus for the teaching of maths to undergraduate students from member input. A survey has been carried out to determine what maths topics are currently being taught. Details available on the Centre's website.

Multiple Choice Questions (MCQs)
Members of the SIG are encouraged to share any relevant MCQs they may have to allow a collection of resources to be built up. Please e-mail Ruth with any you may have, and she will make them available.

To join:
The SIG is open to all. A mailing list has been set up to provide a forum for the sharing of experiences, ideas and resources related to the teaching of maths to students in the chemical sciences.

You can join by sending the message: Join mathsforchemistry yourfirstname yourlastname, to jiscmail@jiscmail.ac.uk or by visiting the jiscmail website www.jiscmail.ac.uk/lists/MATHSFORCHEMISTRY.html

The list will be used for communication for the SIG. Therefore, anyone with an interest in this subject is encouraged to sign up to the list so you can keep informed with any developments.

Your input is needed to make this SIG successful. Please let Ruth have any information you which to share, and any ideas for how to take the SIG forward. The next meeting is scheduled for:

Next Meeting
The next meeting for the SIG is planned for Tuesday 5th June in Manchester. ■

Survey of the first-year student experience

Adapted from Higher Education Academy News (www.heacademy.ac.uk/)

by
Roger Gladwin
Physical Sciences Centre
Chemistry Dept
Liverpool University
Liverpool L69 7ZD
(rgladwin@liv.ac.uk)

The first major UK study of students' first-year experiences in higher education has found that over 80% of students found their studies stimulating and over 70% thought the teaching they received was supportive – but nearly 60% were worried about financing their studies and 58% said they had to undertake paid work in order to support themselves while in higher education.

The study aimed to find out what aspects of the student experience may affect students' decision to withdraw from their studies – an area that has been under-researched in the UK.

It found that the more students know about their institutions and courses before enrolling, the less likely they are to consider withdrawal.

The study was carried out in 2006 for the Higher Education Academy by Professor Mantz Yorke of Lancaster University and Professor Bernard Longden of Liverpool Hope University. The final report on the first phase of the study was published recently by the Higher Education Academy. Over 7,000 students were surveyed on their experiences of learning, teaching and assessment, and on other aspects of their first-year experience such as travel, finance and social life.

The picture presented by the survey is generally one of a good experience in most aspects of teaching and learning. The responses show that the greater the number of risk factors in a student's experience, the greater the chance that the student will have considered withdrawing from the course. There is evidence of two potentially strong influences likely to make students consider withdrawing: worry over financing their studies and lack of good information about the institution and/or programme that they had entered. While funding was an issue for students of all ages, the survey showed that it was more significant for older students than for younger ones.

The survey found that 40% of those who had little or no prior knowledge of their programme had considered withdrawal, whereas only 25% of their better informed peers had done so. While the vast majority of respondents were coping with the demands of academic study, 56% of those who were having difficulty in coping with academic study had considered withdrawal.

57% said that feedback had helped them in their learning: however, 29% said that feedback on their work had not been prompt.

34% of respondents said that academic work was harder than they expected it to be, and 39% said that they had difficulty in balancing academic and other commitments.

However, 72% were confident that their studies would lead to an appropriate graduate-level job.

The 'free text' responses provided by the students point to the importance of making friendships as a crucial element of a positive higher education experience. Institutions can assist in this process through the approaches they adopt to teaching – for example, by engaging students early on in activities that involve collaboration. Students also commented (favourably and unfavourably) on the quality of their experience in higher education. Perceived quality is likely to become more important in terms of student satisfaction, given that students are more aware of the costs of their higher education.

Paul Ramsden, Chief Executive of the Higher Education Academy, commented: "This survey gives us a very useful insight into what really matters to students, and what might lead to them giving up their studies. We will be using the evidence presented here to inform our work with higher education institutions on developing their strategies for improving the student experience so as to lower the risk of withdrawal."

The next phase of the survey will focus on students who have not returned to their second year and their reasons for withdrawing, and will take place early in 2007. A final report on the whole project will be available from the Academy in Autumn 2007. An important aspect of the project is to see what connections might be made between the Phase 1 and Phase 2 findings.

The full report is available at www.heacademy.ac.uk/FYEsurvey.htm

Adapted from Higher Education Academy News (www.heacademy.ac.uk/). ■

Not reading your own copy of this newsletter?

Then join our mailing list to receive all our publications…

The Physical Sciences Centre produces a range of publications throughout the year, which we distribute to our mailing list. The publications we produce and distribute in paper format include:
Newsletter - Our newsletter, Wavelength, is published twice a year. This contains articles about issues affecting teaching and learning as well as news from the Centre and development projects reports.
Journal - We publish Physical Sciences Educational Reviews, our journal, twice a year. This contains reviews, that we have commissioned, of teaching, learning and assessment resources.
New Directions - This is a newly launched publication which aims to promote and disseminate good teaching and learning practice within the physical sciences. It contains examples of effective practice.
Practice Guides - These are designed to provide practical advice and guidance on issues and topics related to teaching and learning in the physical sciences. Each guide focuses on a particular aspect of higher education and is written by an academic experienced in that field.

All these resources are available on our website or in a paper format. If you would like to receive copies of all our publications, along with news about forthcoming events, please sign up to our mailing list. Details of how to do this can be found on our website, www.physsci.heacademy.ac.uk (under Contact Us), or email us at psc@hull.ac.uk.

Physical Sciences Centre
Department of Chemistry
University of Hull
Hull HU6 7RX

Director:
Prof Tina Overton
Phone: 01482 465453
Administrator:
Liz Pickering
Phone: 01482 465418
Fax: 01482 465418
Email: psc@hull.ac.uk
Web:
www.physsci.heacademy.ac.uk

The Physical Sciences Centre is funded by the Higher Education Academy (www.heacademy.ac.uk) and is part of the Academy's Subject Network. The Centre is supported by the Universities of Hull, Liverpool and Surrey .

Offers to contribute to the newsletter are welcomed. Please contact the Centre.

Student Learning Experience

The Physical Sciences Centre will undertake a review of the student learning experience in our disciplines over the next 12-15 months. Two reviews will be carried out; one for chemistry and one covering physics and astronomy. Each review will produce a report which provide a snap-shot picture of the student learning experience from entry into Higher Education to entry into employment.

We consider this to be a very timely development for the physical sciences especially with the national focus on chemistry and physics as subjects of strategic importance. The increasing need to maintain levels of student recruitment and retention has led to an increase in the level of curriculum development activity and the design of innovative programmes. The level of this activity is likely to increase with the impact of the HEFCE-funded RSC Chemistry for our Future and IOP Stimulating Physics projects. Consequently, there is a need to understand how chemistry and physics are currently taught in Universities and whether innovative teaching and assessment is being "rolled out" from where it has been developed and whether the needs of industry and government agenda are being addressed.

This review will provide academics, curriculum planners, professional bodies and HEIs with an accurate view of academic practice in departments, the trends in the nature of undergraduates entering our courses and in their chosen field of employment. We will attempt to identify trends in pedagogies, identify the main teaching, learning and assessment methodologies being employed and pinpoint good practice in order to raise the quality of the student experience in physical sciences across the UK.

The Reviews will be carried out over a 15-month period from March 2007 to June 2008 and will be steered by a panel of key stakeholders. The Reviews will be carried with collaboration from both the RSC and the IOP. Each Review Panel will have a high profile chairman and 8-10 members drawn from academia, employers, professional and other bodies with some cross-disciplinary representation. The reviews will be supported by two part time consultants, one chemist and one physicist, who will carry out most of the data collection and analysis and will be the main interface with the community.

For these Reviews to be successful and to provide the whole academic physical sciences academic community with useful information we will be relying on cooperation and collaboration from ordinary academics in University departments. We look forward to making contact with many of you in this context.

Events —2007—

- Departmental Representatives Meeting, 24th/25th April, London
- Maths for Chemistry SIG, 5th June, Manchester
- Science Learning and Teaching Conference, 19th/20th June, Keele
- Recent Changes to 16-19 Science Qualifications, 21st June, Keele
- 2nd European Variety in Chemistry Education, 27-30th June, Prague
- Variety in Chemistry Education 2007, 30th/31st August, Leicester
- FORREST Conference 2007, 5th-7th September, Staffordshire University
- Physics Higher Education Conference 2007, 6th/7th September, Dublin
- GIREP-EPEC 2007 Conference: Frontiers of Physics Education, 26th-31st August, Opatija, Croatia

Contact us or visit our web site for details.