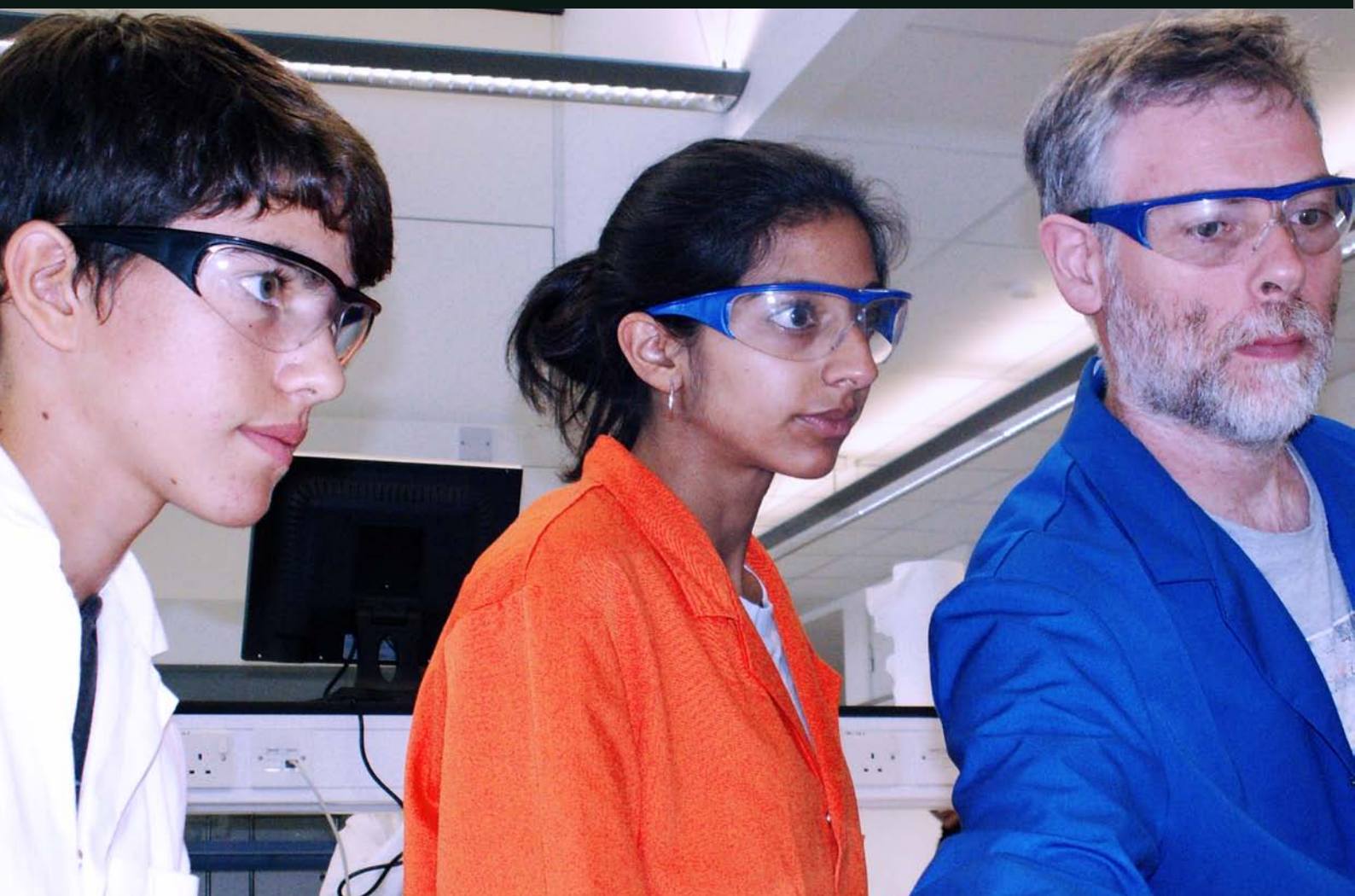


Bristol ChemLabS

A Centre for Excellence in Teaching and Learning

Annual Report 2008-09



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1. Introduction

Nick Norman

Bristol ChemLabS is now four years old and much has happened in the past year since the third Annual Report was prepared (all previous Reports and other publications are available at <http://www.ChemLabS.bris.ac.uk/Publications>). There is one more year of HEFCE funding remaining until the formal end of the five-year CETL Programme (March 31, 2010) and a Final Report will be expected by HEFCE during the summer of 2010; a draft version will be presented to the Advisory Board Meeting in March/April 2010. However, all that is Bristol ChemLabS will continue beyond this time and into the foreseeable future. Excellence in all aspects of laboratory teaching and learning is central to the undergraduate experience in the School of Chemistry and the continuing delivery of this experience is the overarching aim of Bristol ChemLabS. There are many challenges ahead, some of which are addressed in this Report, but the expectation is that the Management and Advisory Boards and the executive team charged with delivering the ChemLabS aims and objectives will continue in their work. What follows in this introduction is a summary of the major events and achievements of the last year; more detail is provided in the subsequent Sections.

From a Teaching and Learning perspective, the Dynamic Laboratory Manual (DLM) is now established in all of the undergraduate teaching laboratories in the School of Chemistry and has been, by any measure, a great success. Moreover, its impact now extends beyond the immediate laboratory environment, incorporating links to lecture, tutorial and workshop material, as well as distance learning courses and past exam questions. A more detailed account of all the teaching and learning activities of the last year is provided in Section 2 of this Report, and the results of work to evaluate the effectiveness of the DLM and of what takes place in the teaching laboratories in general is presented in Section 3. There is much common ground between evaluation strategies for the ChemLabS and AIMS CETLs and this is addressed here as well.

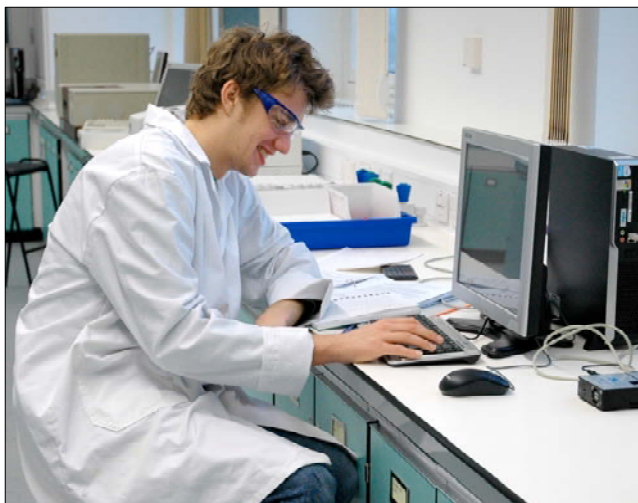
Part of HEFCE's requirement for all CETLs is that 'best practice' developed during the programme is disseminated broadly amongst HEIs. With the DLM now in place for all undergraduate laboratories and with several cohorts of students having had the ChemLabS experience for at least one full academic year, the time to start this dissemination is now. Accordingly, the first Bristol ChemLabS Dissemination Conference will take place on 02 April this year in the School of Chemistry at Bristol. All aspects of ChemLabS activities will be covered with presentations from ChemLabS staff and students on the overall vision, teaching and learning, assessment, IT, evaluation, laboratory refurbishment, outreach and sustainability. Invitations have been extended widely within the University of Bristol and to chemistry departments in other UK HEIs as well as to stakeholders in industry and other academic disciplines. Details can be found at <http://www.ChemLabS.bris.ac.uk/ChemLabS-Conference.pdf>.

With regard to other disciplines, in the last year Bristol ChemLabS has worked closely with the Department of Biochemistry in Bristol on the development of a Biochemistry DLM for first year Biochemistry students. This has been facilitated by a successful bid to the Joint Information Systems Committee (JISC) for funding over two years to develop eBioLabS, which comprises a team led by Dr Gus Cameron in the Department of Biochemistry but with a substantial ChemLabS input. The team will work with Learning Science Ltd (the company with which ChemLabS has worked to develop the DLM) to realise the Biochemistry DLM, with a planned introduction taking place in October 2009. A second JISC bid is currently being prepared which will see the DLM concept move in to other areas in the Biosciences and Medicine, a development which has attracted considerable positive attention from the HEA Centre for Biosciences and AstraZeneca (a report published by the HEA, AZ and the BBSRC in June 2008 entitled '1st Year Practicals; Their Role in Developing Future Bioscientists' includes a contribution about the ChemLabS DLM, see <http://www.bioscience.heacademy.ac.uk/ftp/reports/pracworkshopreport.pdf>). In order to facilitate this dissemination process, Dr Gus Cameron has been appointed as the next Bristol ChemLabS University Teacher Fellow, taking over from Dr Russell Cox.

Laboratory teaching and learning is supported in a multitude of ways by the DLM, which now includes video, virtual instruments and equipment, e-assessment, safety training, and online background material. Whilst now fully operational, there is much that remains to be done to improve and add value to the resource which already exists. A key area for future development will be the online background material, particularly that which relates to the spectroscopic and analytical techniques which lie behind many of the laboratory experiments. Some of this material exists already but the potential to expand this into a truly exceptional online teaching and learning resource is one that ChemLabS is determined to realise. In this regard, it was with considerable enthusiasm that news of the successful Bristol bids to the EPSRC for Doctoral Training Centres in Chemical Synthesis and Functional Nanoscience were received in December 2008. Both Centres have funds to extend the DLM concept into Postgraduate training, which will include both specific and more

general topics, one of the latter being online background material to support spectroscopic and analytical methods. The DLM is an ideal vehicle to deliver teaching and learning in this area and the resources afforded by the DTCs will see the DLM develop to embrace Postgraduate training but in a way which provides a seamless resource of benefit to both undergraduates and postgraduates. ChemLabS is exploring the possibility of an industrial collaboration to help with this development.

In addition to the tangible benefits to undergraduates (and soon, postgraduates), Bristol ChemLabS has what can justifiably be described as a 'world class' Outreach programme. A measure of just how extensive and successful this has been and continues to be is immediately clear from the Outreach Report in Section 4. In particular, the School Teacher Fellow concept pioneered at Bristol has now been widely taken up by other departments around the Country (both in chemistry and in other disciplines) and has been seen as one of the most successful parts of the HEFCE-funded Chemistry for our Future (CfoF, <http://www.rsc.org/Education/CFOF/>) programme run by the Royal Society of Chemistry.* In fact, Bristol ChemLabS has



played an important part in CfoF not just in terms of the Teacher Fellow concept and implementation but also in the 'Widening Access to University Laboratory Facilities' strand which sees University laboratories used by groups from schools at times when undergraduates are not present. Bristol ChemLabS has a very extensive programme of such events (<http://www.ChemLabS.bris.ac.uk/outreach/>) which has made a real difference to the schools involved; quantitative data on the effectiveness of all Outreach activities is currently being compiled by the Outreach Team with the aid of a full time Masters student dedicated to this task. In addition to CfoF, ChemLabS Outreach works closely with the University of Bristol's Widening Participation Office and Centre for Public Engagement and it is hoped that all of the positive outcomes, particularly those associated with CfoF, will carry forward into the activities of the new HEFCE-funded National STEM Centre to be hosted by the University of Birmingham; ChemLabS expects to play an important role in the Centre's activities.

Sustainability of all ChemLabS activities is crucial beyond the five-year HEFCE funding period. Whilst many activities will continue to be funded by the School of Chemistry (as part of its responsibility to deliver the best possible undergraduate degree programmes), others will require outside sources of funding (more details of which are given in Section 5). In summary however, these include financially sustainable Outreach, fundraising from industry and philanthropic giving (particularly from alumni) as part of the University of Bristol's Centenary Campaign (Bristol ChemLabS is one of the twenty or so projects associated with the Campaign), and commercial activity including industrial training courses and sales of the A-Level DLM as well as the undergraduate DLM. An overall financial statement in terms of the HEFCE funding is presented in Appendix 4 and a more specific comment relating to the goal of achieving sustainable Outreach is given in Section 4. ChemLabS continues to be successful in obtaining financial support from industry and alumni although the challenges resulting from the current economic climate cannot be underestimated. Commercial activity continues to grow; ChemLabS ran the second GSK industrial placement student training course in September 2008 (a booking has been made for 2009), and the A-Level DLM has now been launched and sales have been made.

In conclusion, Bristol ChemLabS continues to grow and develop. There are challenges to be met, not least in terms of financial sustainability, but there is much reason for optimism. That Bristol ChemLabS is, and must remain, a Centre for Excellence in Teaching and Learning in substance as well as in title is essential to the current and future well being of the School of Chemistry and crucial to the School continuing to be seen as one of the very best environments for undergraduate chemistry both in the UK and worldwide.

* See also, Evaluation of Chemistry for Our Future, NFER report on the first year of the evaluation (2007-2008), Pippa Lord, Suzanne Straw, Iain Springate, Jenny Harland and Ruth Hart, October 2008.

2. Teaching & Learning

Paul Wyatt

Hardware

The hardware has now operated for a complete year. Although great use is made of the interactive white boards (using the projector), the decision to obtain the Hitachi boards was clearly the right decision. These boards may also be written on using ordinary whiteboard pens and they are used extensively in this way. Less use is made of wireless handheld devices than was originally predicted. Most demonstrators prefer to make notes with a piece of paper and transfer these to the database later.

Generally equipment has stood up extremely well to the demands placed upon it. The HPLC, GC and GCMS equipment has been used by some 500 students and continues to function well. The top quality laboratory furniture has also stood up very well to continuous use. The high throughput of students has, however, taken its toll on some of the less robust equipment.

Bootcamp

The post-exam Bootcamp session for first year students ran very much better in June 2008 than it did in June 2007. Informed by the June 2007 experience, the experiments had been revised. A 'DLM-lite' experience was introduced for the Bootcamp this year which contained safety tests and scripts and directed students to useful resources in the second year DLM. There had been plans to revise Bootcamp again for June 2009, but given the success of this year's session, it will be run in the same format.

The comments from students in their questionnaires were overwhelmingly positive. Many students commented on how the experiments were more complicated and challenging and that they enjoyed this and enjoyed learning new techniques. They also liked the fact that experiments tied into lectures they had had – the Grignard reaction was noted here more than once. The 'carrot experiment' was singled out several times as being interesting.

Here are some student comments from 'Bootcamp' questionnaires:

Do you feel that you learn practical chemistry better by working in lab all day for several days in a row instead of small blocks every week?

'Absolutely! Can't emphasise that enough. Also a whole day is much better than 3 hours', 'Definitely – Get much more adept and used to being in the lab'

What are your views on feedback (verbal or written) you have received on your work?

'Yes I think verbal feedback is much better. I can ask if I don't understand something'

What would you say was the most positive thing about the labs over the last two weeks?

'Being asked questions in labs and then going through them so you actually understand what's happening rather than just following instructions'

'They were more fun. We didn't have big gaps so I don't feel that any time is wasted'

'I enjoyed the wide range of new techniques and they were difficult enough to be challenging but not confusing'

'The beer tastes better when you have earned it + learning to use Schlenk line and gas chromatography'

One comment that came out was that students enjoyed the social aspect of the lab. Discussion has begun with the student chemical society, Fusion, to arrange a social event on the final day of the labs.

Level 2

Although last year (07/08) was the first full year of Level 2, this year (08/09) is the first full year of Level 2 with students who have also had a full year of Level 1 in the new labs.

The students this year are very much better prepared than those last year and approached the lab with a more positive attitude. This attitude was evident even during the Bootcamp period. The 07/08 second year cohort had developed a disappointing attitude in the areas of plagiarism, attendance and safety and were a lesson in how much responsibility can be given to a large group of students. The 08/09 group is larger but a 'firm hand' from the outset has proven to be the right approach.

The laboratory is currently beyond capacity and this has a serious impact on the timetable. The lab capacity is 192 and runs with a twenty-four week by four student cycle (on each of two days per week). Staff were very keen to avoid giving students time off as part of the rota to accommodate the extra students (currently there are 213 students). Two experiments with lower fumecupboard demand were introduced – one which dovetails computer and practical with two groups running simultaneously (who swap over halfway through the day) and another entirely computer-based experiment which uses no fume cupboard space. Despite these efforts it has also become necessary to include time off for students in the rota.

Level 2 Techniques Course

Some new areas of this course were a great success. The new Spartan-based Molecular Modelling element elicited unsolicited praise from undergraduate students for the high quality of the demonstrating. This year the Scientific Writing element featured a lecture to introduce ideas for the workshop and students were given extensive notes and examples on how to write up their full reports. This year, the Databases and Datamining element ran earlier in the year, while the Analysing Experimental Data element was dealt with separately (rather than being subsumed across a selection of experiments).

Level 3

Although this worked well overall in 07/08, in-lab marking was very challenging for demonstrators. Even with more detailed information, the complexity and variety of experiments at Level 3 make the Level 2 model difficult to apply. It was clear that assessment at Level 3 needed to be rethought. The full report writing also had some problems largely due to: (i) the time taken for staff to hand back marked scripts and (ii) students leaving a lot of writing up to the last minute. In the event, students were asked only to write five full reports (originally there were to be six) and were given the option to resubmit one of these reports if they so wished – this was in response to some students maintaining they had had no feedback even by the time they were due to submit their third report and were thus disadvantaged.

A major improvement to Level 3 was made this year by the appointment of Dr Nick Walker to the position of Level 3 Laboratory Manager (Teaching Fellow). Nick's dedicated management has led to a much smoother-running class this year. It is hoped that this position will continue in the next academic year.

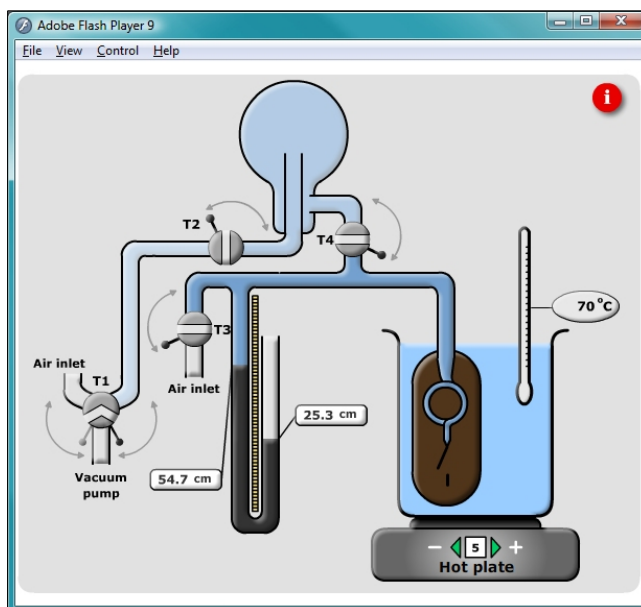
Students had difficulties (in 07/08) adjusting to what is expected of a Level 3 student (over a Level 2 student). Students this year at Level 3 (08/09) were given an introductory laboratory-workshop which explained what is expected at Level 3 and highlighted the difference between Level 3 and Level 2. It explored the services available, made clear the need to check data at the time of the laboratory and, in particular, explained what 'doing your own' COSHH assessments really means. Initial feedback from students has indicated that this workshop was appreciated. Marking of scripts has not been an issue this year although the expectations from the 'short reports' should probably be reviewed.

New equipment for new experiments for October 2009 has been ordered and most has arrived. The teaching-dedicated 400 MHz NMR machine has been put to good use. Students have run, for example, their own 2D experiments and, because this is a multinuclear machine, their own ^{31}P NMR spectra.

Challenges at Level 3 have included the European Erasmus students. These students had to undertake the Level 3 lab because the Level 2 laboratory was full. The Erasmus students are not adequately prepared for the challenges of the Level 3 laboratory and have performed badly.

Level 3 DLM

The Level 3 DLM is now in operation and features a host of new simulations and videos of more advanced techniques. There are no experiment-specific simulations. Additions to the Techniques Manual include microanalysis, a video of flash chromatography and an interactive NMR simulation (where students may build their own molecules and see the NMR spectrum that would result). Assessment for Level 3 students is by staff. A given member of staff should have the same experiment to mark for the whole year.



1E DLM

The 1E DLM is now in place. The 1E course is a first year service course run by the School of Chemistry for students in other departments without A-Level chemistry. Its Techniques Manual is based largely on the A-Level DLM.

Evaluation

As part of the evaluation of ChemLabS (see Section 3), the ChemLabS external evaluator, Dr Stuart Warren, from the University of Cambridge, spent a whole week in the School of Chemistry in November. During this time he attended the teaching laboratories of first, second and third year students where he talked with students, postgraduate demonstrators, and academic and technical staff. He witnessed an outreach practical (extracting caffeine) with Year 12 students and also spent an hour in the company of eight second year students whom he quizzed about their experiences in the laboratories in a focus group session. At the end of the week he had generated extensive notes. Here are a few quotes from Dr Warren's report (which is available in full as Appendix 3 to this Annual Report).

General

The most obvious point to an outside observer is the purposeful air and committed attitude of the students at all three levels. The labs were full and there was a buzz of expectancy and enthusiasm at each level. The students knew what they were doing and were deeply involved in it. This is a great contrast with my observations at Cambridge. No student at Bristol, when asked what (s)he was doing, replied 'I'm down to here on page 2.' One student in the first year said 'I'm refluxing 2.5 grams of tin with 2.5 grams of iodine in dichloromethane'. On further questioning, without my supplying any information, she improved this to 'I'm oxidising tin to tin(IV) with iodine.' Astonishing!

About the First Year

Comments from students: one said that it was hard at first but 'now it's great fun' and that she felt she understood what she was doing. Another said that the lab was good and that he had got better with experience. He felt he didn't really understand all the chemistry but he did come to the feedback sessions before the class.

About the Second Year

How do you feel the balance is between the course's aims and practice? 'Pretty good'. One said that the labs were even better than they'd expected and it was amazing how much skill they had gained in one year. I prompted them about the confidence I had observed in the lab. They immediately said this was due to the pre-labs and the instructions in the books kept in the assigned cupboards.

About the Third Year

The most impressive thing to me was the adult attitude of the students to making a step forward into significantly more advanced work. They were not put out by the difficulty and were confident because of the well planned development. One student said he had found the course very difficult to start with but expected a similar growth in understanding and competence to what he had experience at level 2.

Dissemination Conference

A one-day conference about innovation in laboratory-based teaching which will serve to disseminate the Bristol ChemLabS experience to a wider audience will be held in the School of Chemistry in Bristol on 02 April 2008 (for full details, see <http://www.chemlabs.bris.ac.uk/ChemLabS-Conference.pdf>). This will be an opportunity to engage:

- Other chemistry departments in HEIs in the UK
- Other departments in the University of Bristol
- Other related departments (in neither chemistry nor Bristol) with an interest in laboratory teaching (e.g. Chemical Engineering).

A full report on the outcomes of this conference will be presented in the next Annual Report.

3. Evaluation & Education Research

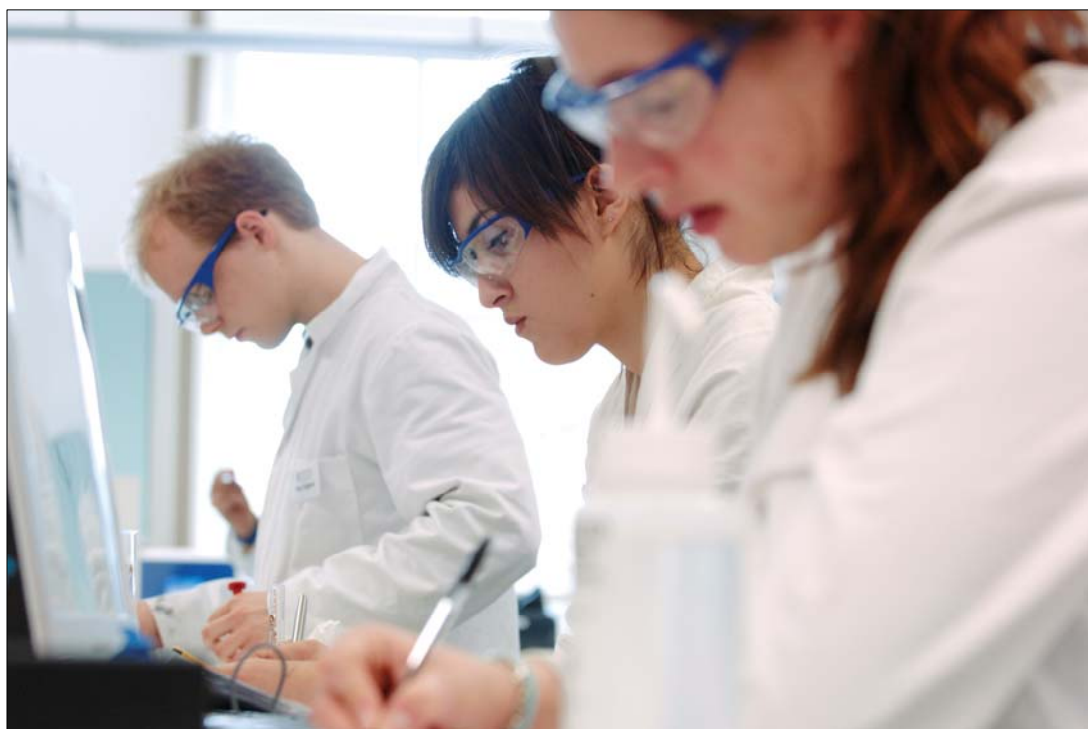
David Smith

Evaluation of all activities plays an essential role in the continued development of the Bristol ChemLabS project. Central to the joint evaluation strategy developed by both the Bristol ChemLabS and AIMS CETLs in consultation with the University of Bristol Education Support Unit is the use of student questionnaires and focus groups. These methods have continued to provide useful information and feedback that informs the overall evaluation process. Some specific examples of student feedback have been given in Section 2 in relation to the Bootcamp sessions, and feedback, both formal and informal, informs the annual reviews of the teaching laboratories which take place at the end of each academic year and which form part of the overall School of Chemistry Annual Programme Review required by the University as part of quality assurance measures. A fuller account of the outcomes of evaluation in general will be presented in the final report next year. Other approaches have, however, also been successfully adopted in the past year.

As noted in the previous section, in November, Dr Stuart Warren from the Department of Chemistry at the University of Cambridge and External Academic Evaluator for Bristol ChemLabS, spent a week in the School of Chemistry reviewing educational aspects of the project. The visit provided a timely opportunity to consider the impact of the project on student learning and teaching. The review covered both the broad educational strategy and the detailed way in which the project had been implemented. Dr Warren spent time in laboratory classes for each year group, meeting undergraduate students and talking to postgraduate demonstrators and members of staff. He also met with a focus group of Level 2 students in order to explore certain themes in more detail. A full report of Dr Warren's findings is available as Appendix 3.

In relation to outreach activities, Amanda Shaw, a recent psychology graduate from the University of Sheffield, has recently started a year-long MSc project funded by Bristol ChemLabS to evaluate the outreach impact data that has already been gathered and to explore outreach appraisal in a scientific way. The work will be built upon research performed by both Alison Rivett and Joy Tuah as part of their MSc SURE studies referred to in Section 5. The results of this research will help to support future funding applications to organisations who seek evidence of the effectiveness of outreach.

Finally, an independent evaluation of the Discover LabSkills initiative using the A-Level Dynamic Laboratory Manual is also underway. The project, which seeks to place copies of the AS LabSkills Dynamic Laboratory Manual with PGCE students at universities across the UK this year and next year, forms part of the Discover Chemistry project that is funded by Pfizer. The evaluation is being conducted independently by the National Foundation for Educational Research (NFER) and will focus on the impact of the resource on the trainee teachers. It will, nevertheless, undoubtedly provide useful information about the impact of the LabSkills Dynamic Laboratory Manual on the secondary students who use the resource.



4. Outreach

Tim Harrison and Dudley Shallcross

The level of outreach activity continues to expand thanks in part to Dr Linda Sellou (Bristol), sponsored by the 'Widening Access to University Laboratory Facilities' project within CfoF. Linda is not only home-grown outreach talent, she is also sufficiently skilled to have won the University's Public Engagement Award announced just before Christmas. Full details of all outreach activities, past, present and future can be found at <http://www.ChemLabS.bris.ac.uk/outreach/>.

International Outreach

South Africa

Following the delivery of invited lectures at Rhodes University contemporaneous with SciFest Africa 2008, a major outreach collaboration is now taking place. In July 2008, Professor Mike Davies-Coleman, Head of Chemistry at Rhodes University (Grahamstown, Eastern Cape) visited Bristol ChemLabS during a summer school held in July. Four postgraduates and a lecturer then spent a week in Bristol in September 2008 to look at outreach practices. In October, Linda Sellou and Preeti Kaur spent two weeks in Grahamstown working with postgraduates and staff to deliver outreach to township schools. Tim Harrison and Dudley Shallcross will be working at Rhodes in March delivering teacher training and working in additional township schools whilst also giving lectures at SciFest Africa 2009.



Tim and Dudley will also be visiting a township school in Cape Town on behalf of Airbus.

France

Initially as a request from Linda Sellou, an outreach team of Tim Harrison, Dudley Shallcross, Linda Sellou and French Science and Engineering Ambassador (SEA) Adele Laurain worked in four schools (one primary, one secondary and two high schools) in two days in the suburbs of northern Paris. A total of 320 students were engaged through hands-on practical work and lecture-demonstrations. Thanks to Linda the British Council (France) sponsored the event. It has now been arranged with the British Council to repeat the exercise, this time in Marseille, in March 2009. Both are effectively a British Council-sponsored 'Aimhigher exercise' on behalf of the French Ministry of Education.

Malaysia

Tim Harrison and Linda Sellou were invited to give a total of five hours of seminars at Malaysia's national university, Universiti Kebangsaan Malaysia, for science and educational academics and postgraduates from universities in the region. Tim Harrison has been invited back to lead a series of workshops with school students, having trained local postgraduates to deliver them, and to give demonstration lectures at the departments' open week in late September 2009.

Romania

In September Dudley Shallcross took part in a televised science panel debate on climate change in Bucharest. The event, part of the 'Beautiful Science' series, was sponsored by the British Council.

Spain

In July Bristol ChemLabS was delighted to welcome Teresa Climent, Head Chemistry Technician from the University of Valencia, to observe (and participate in) outreach including summers schools. Tim Harrison has been invited to give a lecture on the DLM and outreach in March and to give A Pollutant's Tale to local school students there. A local school, Cambridge House School in Valencia, is also considering attending a Bristol chemistry summer school.

A group of students from the Colegio de San Francisco de Paula in Santa Ángela de la Cruz, Spain came for a short summer school visit in September.

Italy

A Spring Science School is running in March 2009 as a collaboration between Bristol ChemLabS and AIMS for 20 students from Milan.

Singapore

In November, Bristol ChemLabS, in association with Assistant Professor Chuah Gaik Khuan of the National University of Singapore (NUS), again ran a Chemistry Winter School for 215 Singaporean students aged 11 to 18. Tim Harrison, Linda Sellou and two postgraduates went to Singapore to work with Singaporean postgraduates in a series of two- and one-day 'winter schools'. Academic staff from NUS and five postgraduates delivered practical work and lectures developed at Bristol. A third winter school will be held in December 2009.

Singaporean school students are expected to come to Bristol ChemLabS for summer schools in July 2009.

Turkey

Following the visit to Bristol ChemLabS in February last year of a delegation of four Turkish academics and a representative of the Turkish Ministry of Education (<http://www.bristol.ac.uk/news/2008/5819.html>), Tim Harrison and Dudley Shallcross have been invited to give lectures on outreach in a number of Turkish HEIs in October 2009. Another outcome from this visit has been the development of a Turkish 'outreach lorry' modelled on the AIMS/ChemLabS lorry.

Slovenia

The EU funding sought for a joint project with universities in Slovenia and Poland developing the use of an expensive version of UV-visible spectrometers in technical grade and undergraduate work was successful. Bristol ChemLabS is currently working on potential outreach applications of this equipment on a two year project which started in November.

India

The follow on visit to work with Professor Sarkar of the Indian Association for the Cultivation of Science (IACS) in Calcutta scheduled for December 2008 was postponed until November 2009, when Tim Harrison and Professor Tim Gallagher will travel to India.

Ireland

Bristol ChemLabS continues to work with Trinity College Dublin to deliver two-centre summer schools. This year a second summer school has been added due to demand.

Malta

Tim Harrison and Dudley Shallcross will return to Malta from 24 April to Sunday 03 May 2009 to deliver another week-long series of lecture-demonstrations and teacher training working with both church and state schools. Chris Schembri, Head of Maltese church schools for Science and Doreen Mizzi, Head of Chemistry, visited in July and September to look at university-school links with the intention of developing these in Malta.

Twenty-one Post 16 students and two staff from Malta joined the Bristol-Trinity College Dublin Summer School in July. This will be repeated in June 2009. A second Maltese school is also expected to come to Bristol for yet another summer school in July.

Brunei Darussalam

Jauyah (Joy) Tuah, a Bruneian mature student (and chemistry teacher) completed her masters through the MSc SURE course with a dissertation on aspects of Bristol ChemLabS outreach. Several chapters are considered to be 'the text book' on the use of mixed methods of evaluation by the Graduate School of Education. Joy is hoping to gain funding to return to study for a PhD in outreach appraisal.

Tim Harrison and Linda Sellou visited with the Ministry of Education in November and gave a two hour seminar on outreach to all Brunei's Heads of Science. Meetings were also held with the chemistry department in the University of Brunei Darussalam and the British Council.

In May 2009 Tim Harrison will go to Brunei to deliver 15 lecture-demonstrations to a total of 6000 school students and their teachers at the university.

Jersey

Following the joint Bristol ChemLabS and AIMS week-long outreach engagement in March-April 2008, the Jersey Education Department have requested a second Science Week in March 2010.

Australia

Tim Harrison will extend his family holiday in Queensland to work with the Australian Chemical Society to deliver lecture-demonstrations in Far North Queensland in late August.

Domestic Outreach

Primary Schools

'Primary Science Visits' and primary 'Science Days' hosted by secondary schools using Bristol ChemLabS to run them continue apace. Dr Alison Rivett, Primary Outreach Consultant, has taken over the organisation of primary science days within the immediate area. Repeat bookings are still common. Events have also been delivered in Kent and bookings have been made for Cornwall and Yorkshire.

Two primary conferences have now been held for around 200 gifted and talented (Years 5 & 6) pupils with their teachers or parents. These were once more organised in conjunction with an officer from Bristol Child Services. The next conference should be in April this year.

Plans are underway to train postgraduates from other departments to work in primary schools. Chem@rt 2009 has commenced, which is now entirely web-based and freely available anywhere. Chem@rt 2008 was even used in South Africa.

Professor Gallagher recently lifted the embargo on primary students being allowed in the laboratories and practical activities for primary students in the department are therefore now being planned.



Secondary Schools – External Work

Performances of 'A Pollutant's Tale' in all its formats easily average 15 per month. Schools are increasingly keen to host these lectures for multiple performances up to five per day! An additional lecture-demonstration has also been developed.

Bristol ChemLabS' ability to take trained and experienced postgraduates out for "mobile schools' conferences" continues to be in demand.

Secondary Schools – Internal Work

The Schools Laboratory Programme of ChemLabS outreach continues to work at full effective capacity with current technical staffing levels. It is typical to have 40 to 80 students at a time with a maximum of 120 Year 7s achieved in 2008.

Work continues with the Triple Science Network (TSN) in the promotion of separate sciences at GCSE by delivering Aspiration-Raising Days for Year 9 and Year 10 students and for some teacher training.

The use of the electronic voting system equipment in some workshops and in summer school quizzes to obtain feedback will help inform future outreach activity.

A two day summer school for Year 12 students considering studying chemistry degrees somewhere in the UK was piloted successfully. This idea is to be taken up by both Southampton and Nottingham in 2009.

The five or six secondary Schools' Conferences continue to be well supported both by academic staff and school students with over 1300 in attendance per year.

There were 560 A-Level students taking part in 18 half-day spectroscopy tours in the Autumn term 2008. This is by far the biggest event of its type in the UK as evidenced by HEI websites (a paper is in preparation).

A second lecture-demonstration on kinetics is being planned for a launch in the summer of 2009. Lecture-demonstrations are increasingly in demand and schools are covering at least basic costs.



Working with AIMS

Bristol ChemLabS continues to liaise closely with AIMS on joint outreach planning and activities.

Working with the Wider Community

A ChemLabS experience day for Alumni was held on a Saturday in September 2008 and involved workshops and lecture-demonstrations for both parents and their children.

Dudley Shallcross continues to develop workshops for visually impaired adults – the topic for 2008 was aspects of medical science. In 2009 the topic will be climate change.

ChemLabS continues to support both the RSC School Teacher Fellows (STFs) and those at Southampton and Warwick.

Dudley Shallcross and Tim Harrison will be giving another public lecture-demonstration at the Cheltenham Science Festival this year and a series of seven public lectures at SciFest Africa 2009.

There has been close liaison with Manchester University Earth Sciences to share outreach expertise in primary workshops and lecture-demonstrations.

Bristol ChemLabS, together with other academics from the School of Chemistry, have taken part in several sessions of teacher CPD.

Finance

All Outreach events that use the teaching laboratories are costed and paid for, either by the attendees themselves or through grants (e.g. TSN). A charge at some level is made for all activities and, with the exception of the salary of the STF, financial sustainability has already been achieved. Through a mixture of grants, training programmes, summer schools, sponsorship and monies from DLM products, it is expected that full financial sustainability, including the salary of the STF, is achievable.

A general grant application to EPSRC has been submitted and the outcome from the panel is awaited. Separate applications to Wellcome to cover various aspects of outreach are in preparation and will be submitted before April 2009. The intention is to apply to EPSRC at each round of their Public Understanding of Science (PUS) scheme.

A scheme is also being put in place whereby any research grant submitted to RCUK will contain a small amount for outreach.

A very welcome additional grant from CfoF has also been forthcoming to support the Open Laboratory Programme.

ChemLabS is working with the Science Learning Centres on an initiative to train non-chemistry science teachers to be able to teach A-Level chemistry after a forty-day course spread over the academic year. In addition joint bids have been set up for a Science Diploma Hub and also to provide updates for school teachers.

Two EU grants in collaboration with Turkey and Slovenia are online and over the Christmas period an invitation has been received to be part of a 17 country ~€4M science education grant application to the EU. If successful, Bristol ChemLabS will play a pivotal role in the outreach element, communication and in hosting the final conference.

Publications

Articles on outreach and for schools continue to be written and published. There are also at least eight in preparation or awaiting publication. A webpage listing those published, including those produced with postgraduates, may be found on <http://www.chemlabs.bris.ac.uk/Publications>.

Media

A considerable number of the events are covered by a variety of media, from schools' websites to magazines, newspapers, radio and television (see Appendix 2: Publicity). This promotes all of Bristol University sciences, not just chemistry.

Evaluation

It is known from feedback obtained from teachers from all types of school, and from students of all ages, that the outreach work being undertaken by Bristol ChemLabS is having an impact. External evaluation in the form of Stuart Warren's Report (Appendix 3) has highlighted the outreach strand of the CETL project and Professor John Holman referred to the work being done as "*the jewel in the crown of the UK CETLs*". The copying of the STF scheme by the RSC and others is also testament to the work being done in outreach. The approaches by international HEIs to engage in joint outreach, to visit to discuss outreach and grant-writing for projects including outreach is evidence that what is being done is considered to have an impact. In addition to this anecdotal evidence, Bristol ChemLabS has two additional pieces of research underway. Firstly Amanda Shaw is currently studying for an MSc based on outreach appraisal, and secondly, Dr Alison Rivett is completing her MSc SURE dissertation on Outreach Appraising Methods. These both continue on from the work done by Joy Tuah last year.

Acknowledgments

Thanks, as always, go to the large numbers of postgraduates, academic staff, technicians, postdocs, secretarial staff and porters that make all this level of outreach run efficiently.



5. Financial Support & Commercial Activities

Nick Norman

Financial Support

The two agreements for financial support to date with Shimadzu UK and Sigma-Aldrich, who have pledged £50,000 and £25,000 respectively over a five-year period, continue, and discussions with several other companies are ongoing. An in-kind gift of chemicals from Johnson Matthey Plc for some of the teaching laboratory experiments is worth approximately £5,000 pa.

A number of gifts from Alumni have also been received including both regular donations and more occasional larger gifts. In total, since January 2003, gifts which have been received to date amount to approximately £83,000, with a further £26,000 pledged. Much of this has been donated or pledged since 2007, when a proactive strategy of asking for alumni support for ChemLabS was initiated. Both of these values include gift aid but do not include extra funds available through the government gift match scheme.

Commercial Activities

In September 2008, a training course was run for 44 industrial placement students from GSK (Stevenage and Harlow) for which the full economic cost was recovered in the price charged along with £7,000 "profit", which was counted against a GSK sponsorship/financial support target. At this time, a booking has been made to run a similar course for summer 2009.

Plans are being discussed to offer similar training courses to other companies.

A contract was signed in March 2008 between the University of Bristol (acting for Bristol ChemLabS) and Learning Science Ltd (the Company which has developed the Dynamic Laboratory Manual, DLM) to develop and market to schools an A-Level version of the DLM with Learning Science responsible for development, marketing, sales and after sales service and Bristol ChemLabS, primarily through the Outreach Team, providing content, acting as consultants and making available the resources of their CHEMneT schools network. A Steering Committee chaired by the ChemLabS Chief Executive and comprising the ChemLabS Outreach Team, the ChemLabS Chief Financial Officer, a representative from the University of Bristol's RED (Research & Enterprise Development), and members of Learning Science including the Project Manager, meets approximately once a month, receives a report from the Project Manager and considers other matters which have arisen since the previous meeting. The initial product, marketed as LabSkills (<http://www.labskills.co.uk/>), supports the practical component of AS-Level Chemistry for all the major A-Level exam boards and was launched in July 2008. The A2 version is expected to be ready in April 2009 as an upgrade to those who have already purchased the AS version and coincident with the launch of the A2 upgrade will be the combined full A-Level version. The product is available to schools as a CD to run on the school's VLE (it will run on any of the VLEs currently used by schools). An initial introductory price for the AS version was set at £299 rising to the full price of £499 in September 2008. The A2 upgrade will sell at £200 and the full A-Level version at £699.

A Memorandum of Understanding was also put in place in April 2008 in relation to future developments involving overseas sales, a potential chemistry GCSE DLM and possible future A-Level DLMs for other sciences.

Current sales as of 06 March 2009 are 78, giving a total income of £24,107 to date (excluding VAT). The contract between the UoB and Learning Science allocates 2/3 of sales income to Learning Science and 1/3 to Bristol ChemLabS with an initial sales income of £40,000, £30,000 and £20,000 going to Learning Science in years 1, 2 and 3 to cover estimated development costs. Thereafter all revenue is split 2/3:1/3

A specific arrangement has been agreed with the exam board Edexcel whereby they have agreed to endorse the product and assist with marketing in schools which teach to the Edexcel syllabus. Edexcel will receive a 2.5% commission for sales to schools taking their syllabus, and in these circumstances, the LabSkills product will carry the Edexcel logo.

As part of the marketing process, an arrangement has been entered into with the Discover Chemistry initiative administered by the Royal Society of Chemistry and funded by Pfizer in which chemistry PGCE students for this and the next academic year will be given a free copy of LabSkills to use during their course and in their placement school. The software will cease to work after the end of their course but it is hoped that schools will be sufficiently impressed with the product to wish to purchase a school copy. This arrangement, known as Discover LabSkills, was formally launched in February 2009 and has attracted considerable press coverage (see Appendix 2). Discover Chemistry is administering this activity and covering all the costs, including those associated with an NFER evaluation of the LabSkills product.

Discussions have also taken place with a Bristol alumnus with considerable experience in education software and selling and marketing overseas. The overseas market for LabSkills is expected to be very large and efforts are now underway to sell the product to selected schools in selected countries. An addendum to the UoB/Learning Science contract was signed in December 2008 containing details of how revenue from international sales will be distributed, the main point being that where the sales have arisen from direct ChemLabS action in that country, sales revenue will be split 50:50.

Business Plan

A detailed Business Plan remains under construction which will seek to identify all of the costs associated with the running of Bristol ChemLabS (by which is now meant the entire Teaching Laboratory operation of the School of Chemistry) along fEC lines. This will be based on the 08/09 financial year to ensure that assessment of income and expenditure is realistic and to work out the accounting mechanisms needed. All sources of income will be identified including those noted above, a proportion of student fee income and a proportion of the School of Chemistry HEFCE grant for teaching. A detailed and fully costed Outreach Business Plan is now in an advanced stage of preparation as part of this process.

It is expected that all ChemLabS operations will run under this Business Plan from August 2009 so as to run in parallel with Bristol ChemLabS finances for the final eight months of HEFCE funding.



Appendix 1

Bristol ChemLabS Boards and Working Parties

Bristol ChemLabS Management Board Remit and Membership.

The Bristol ChemLabS Management Board is chaired by the Head of the School of Chemistry and has overall responsibility for all matters relating to the running of Bristol ChemLabS, including oversight of the performance of Bristol ChemLabS against the objectives, deliverables and milestones set out in the original bid. It meets three times a year and receives reports from the Chief Executive, the Director, the Outreach Director and the Manager/Chief Financial Officer.

The Bristol ChemLabS Chief Executive (CE) is responsible to the Bristol ChemLabS Management Board for delivery of its objectives and is responsible for the management of its core staff with the assistance of the Bristol ChemLabS Manager. The CE is a seconded senior member of academic staff in the School of Chemistry (SoC) and is ex officio a member of its senior management and its (most senior) Planning Committee. The CE also leads the external relations of Bristol ChemLabS with the School of Chemistry, the Faculty of Science, the University and its other departments, including the Education Support Unit (ESU), the Graduate School of Education (GSoE) and the Campaigns and Alumni Relations Office (CARO), as well as with a range of external partner organisations working with Bristol ChemLabS, including the Higher Education Academy (HEA) and the Royal Society of Chemistry (RSC). The Bristol ChemLabS Director is a seconded experienced member of staff in the School of Chemistry who leads the development of all educational matters to do with Bristol ChemLabS and is responsible for all matters relating to dissemination of ChemLabS activities. The Bristol ChemLabS Outreach Director is responsible for all matters relating to outreach activities with schools and other organisations. The financial performance of Bristol ChemLabS is overseen by the School of Chemistry through the ChemLabS Manager and Chief Financial Officer (CFO, currently also the SoC Deputy Head) and also by the University Finance Office, and is therefore subject to the robust and established accounting, auditing and monitoring processes of the University.

The Board reports to the University through the Faculty of Science and to HEFCE, the HEA and other stakeholders. The membership of the Board (see below) is largely Bristol-based but includes representation from key external partners, notably the HEA. The membership is designed to include executive and other senior members of Bristol ChemLabS (notably its Chief Executive, Director, Manager/Chief Financial Officer, Outreach Director and Teaching Fellows), together with senior members of the management team of the School of Chemistry (its Head as Chairman of the Board, Directors of Administration, Undergraduate Studies and the Graduate School) and students (undergraduate and postgraduate), as well as key University staff from outside Chemistry (the Faculty Education Director, Director of the ESU, Co-Director of the University's other CETL, GSoE staff).

Membership

| | |
|--|------------------------------|
| Chair: Head of School of Chemistry | Prof T C Gallagher (SoC) |
| Bristol ChemLabS Chief Executive | Prof N C Norman (SoC) |
| Bristol ChemLabS Director | Dr P J Wyatt (SoC) |
| Bristol ChemLabS Outreach Director | Prof D E Shallcross (SoC) |
| Bristol ChemLabS Manager/Chief Financial Officer | Dr D M Smith (SoC) |
| School of Chemistry Director of Administration | Dr J C Jeffery (SoC) |
| School of Chemistry Director of Undergraduate Studies | Dr P J Wyatt (SoC) |
| Bristol ChemLabS University Teacher Fellow | Dr R J Cox (SoC) |
| Bristol ChemLabS School Teacher Fellow | Mr T G Harrison (SoC) |
| Director of Graduate School of Chemistry | Prof A J Orr-Ewing (SoC) |
| Teaching Fellows | Dr T M Obey (SoC) |
| | Dr T J Podesta (SoC) |
| | Dr N R Walker (SoC) |
| Student representatives (from SSLC and GSC) | Miss J Vickery (PG, SoC) |
| | TBA (UG, SoC) |
| Director, University of Bristol Education Support Unit | Ms G Clarke (ESU) |
| Faculty of Science Education Director | Professor J N Noyes (DoEP) |
| Senior representative of Graduate School of Education (GSoE) | Dr S Erduran (GSoE) |
| Representative of HEA Subject Centre in Physical Sciences | Mr P A Chin (HEA) |
| Co-Director of the University of Bristol AIMS CETL | Prof J R Harris (Physiology) |
| Academic Director of e-Learning | Dr J P Davis (DoCE) |

AIMS = Applied and Integrated Medical Sciences, DoCE = Department of Civil Engineering, ESU = Education Support Unit, GSC = Graduate School Committee, GSoE = Graduate School of Education, HEA = Higher Education Academy, PG = postgraduate, SoC = School of Chemistry, DoEP = Department of Experimental Psychology, SoC = School of Chemistry, SSLC = Staff-Student Liaison Committee, UG = undergraduate.

Bristol ChemLabS Advisory Board Remit and Membership.

The Bristol ChemLabS Advisory Board advises the Management Board on strategic matters and reviews the activities of Bristol ChemLabS in annual meetings and through receipt of the Bristol ChemLabS Annual Report prepared by the Chief Executive. The Advisory Board is chaired by the Pro Vice-Chancellor for Education and meets jointly with the Management Board. It is composed of senior members of the University (the Pro Vice-Chancellor for Education, the Dean of the Faculty of Science, the Director of Campaigns and Alumni Relations and the Director of Enterprise), representatives of key stakeholders, senior members of partner organisations and other advisors (see below).

Membership

Pro Vice-Chancellor for Education, University of Bristol
Dean of Faculty of Science, University of Bristol
Director of Campaigns and Alumni Relations, University of Bristol
Director of Enterprise, University of Bristol
Students' Union President, University of Bristol
Royal Society of Chemistry
Society of Chemical Industry
AstraZeneca and School of Chemistry Industrial Advisory Board
Chair of HCUK (Heads of Chemistry UK)
External Academic Evaluator
The Association of the British Pharmaceutical Industry (ABPI)
Alumnus and Managing Director of Jolly Learning Ltd

Prof A E Waterman-Pearson
Prof A G Orpen
Mrs T J Rawlinson
Dr N Bradshaw
Mr T Webb (UBU)
Ms L Steele
Mr A Ladds
Dr D Lathbury
Prof S K Chapman (Edinburgh)
Dr S G Warren (Cambridge)
Mrs S Jones
Mr Christopher Jolly

Membership of the Bristol ChemLabS Laboratory Working Party

Chair: Bristol ChemLabS Director
Bristol ChemLabS Manager
Teaching Fellows

Teaching Laboratory Manager
School of Chemistry Director of Administration
Academic Staff Section Representatives

Dr P J Wyatt (SoC)
Dr D M Smith (SoC)
Dr T M Obey (SoC)
Dr T J Podesta (SoC)
Mr S J Croker (SoC)
Dr J C Jeffery (SoC)
Dr I D Bull (SoC)
Dr C P Butts (SoC)
Dr J P H Charmant (SoC)
Dr R J Cox (SoC)
Professor R P Evershed (SoC)
Dr E M McGarrigle (SoC)
Professor A J Orr-Ewing (SoC)
Dr C A Russell (SoC)
Dr C M Western (SoC)

Membership of the Bristol ChemLabS Evaluation Working Party

Chair: Bristol ChemLabS Manager
Bristol ChemLabS Chief Executive
Senior representative of Graduate School of Education
Director, University of Bristol Education Support Unit

Dr D M Smith (SoC)
Professor N C Norman (SoC)
Dr S Erduran (GSoE)
Ms G Clarke (ESU)

Appendix 2: Bristol ChemLabS Events Log February 2008 to February 2009

Awards

Dissemination

Outreach

Outreach Meetings

Publications

Publicity

Reports and Meetings

Visitors

Table of Acronyms

Awards

| Date | Title | Awarded to |
|------------------|--|--------------------------|
| 31 March 2008 | RSC Education Division HE Teaching Award for 2008 | Paul Wyatt |
| 23 June 2008 | 2008 RSC Tertiary Education Award | Dudley Shallcross |
| 06 January 2009 | School of Chemistry Teaching Prize for 2008 | Tom Podesta and Tim Obey |
| 06 January 2009 | Faculty of Science Award Recognising Support for Teaching and Learning for 2008/09 | Tom Podesta and Tim Obey |
| 06 January 2009 | University's Engagement Award 2008 | Linda Sellou |
| 06 January 2009 | Faculty of Science e-Learning Award 2008 | Colin Western |
| 11 February 2009 | Royal Meteorological Society's Michael Hunt Award for 2008 | Dudley Shallcross |

Dissemination

| Date | Location | Title | Event Description |
|---------------|---------------------------------|--|--|
| 10 March 2008 | Raffles College, Singapore | 'Interweaving curriculum and community' - 1st Raffles international conference on education 2008 | A poster on ChemLabS Outreach presented at this conference |
| 08 April 2008 | Weetwood Hall, Leeds | 'Developing the next generation of research scientists' | Two presentations by David Smith and Tom Podesta: 'Engaging and enthusing students in practical science' and 'The Dynamic Laboratory Manual - an online interactive resource for promoting practical teaching' |
| 21 April 2008 | Rhodes University, South Africa | Chemistry Department, Rhodes University | Presentation on Bristol ChemLabS Outreach by Tim Harrison |
| 29 May 2008 | School of Chemistry | University College London (UCL) | Phone consultation by Paul Wyatt with Dr Chris Blackman of UCL following his request for information on the DLM |
| 04 June 2008 | University of Bristol | Dental Education Committee Meeting | Talk entitled 'The Dept. of Chemistry Dynamic Laboratory Manual' given by Paul Wyatt |
| 09 June 2008 | School of Chemistry | 'E-Learning and educational technologies' | 'The Dynamic Lab Manual: an interactive online resource for use in teaching practical science' presented by Paul Wyatt and David Smith |
| 01 July 2008 | Eltham College, London | Trinity Meeting | Dudley Shallcross was the Keynote Speaker at this meeting of Heads of Chemistry Departments at London Schools |
| 04 July 2008 | School of Chemistry | Convocation Reunion Week-End | Tours of ChemLabS, DLM demonstration and presentation by David Smith |

| Date | Location | Title | Event Description |
|-------------------|------------------------------------|--|--|
| 04 August 2008 | National University of Singapore | 'Teaching chemistry in the knowledge-based economy' | Paul May presented on ChemLabS at this Chemistry Laboratory Teaching & Research workshop |
| 04 August 2008 | Singapore | National University of Singapore (NUS) | Seminars/workshops about ChemLabS by Paul May during his visit between 04 and 11 August |
| 26 September 2008 | School of Chemistry | Chemistry Outreach Presentation to the School of Chemistry | Dudley Shallcross and Tim Harrison gave a presentation on Outreach, including past, present and planned activities, to School of Chemistry students and staff |
| 05 October 2008 | Bozok University, Yozgat, Turkey | 'Modular Mobile Education: Science Experiments' (MOBILIM) | Talks on chemistry outreach and related topics by Tim Harrison and Dudley Shallcross at this 7-day conference on the use of mobile resources for the teaching of practical science. Bristol ChemLabS was involved in this EU funded project earlier in 2007. Whilst in Turkey, they gave lectures at several other universities on this topic. |
| 06 October 2008 | Science Learning Centre South West | South West STEM Conference: KS3 Subjects Working Together | Bristol ChemLabS represented by Alison Rivett at this cross-curricular conference, which considered strategies for teaching and learning, the sharing of resources across Science, Technology, Engineering and Maths (STEM) and explored collaborative professional development opportunities between teachers |

| Date | Location | Title | Event Description |
|------------------|---------------------------------|--|--|
| 17 November 2008 | Brunei Darussalam | Brunei State Schools meetings | Meeting with 45 of the country's Heads of Science Department at Brunei's Ministry of Education following one with the Head of Schools, Head of Primary Education and Head of Secondary Education; 2-hour wide ranging presentation of ChemLabS Outreach by Tim Harrison and Linda Sellou, followed by a question and answer session; AS Chemistry LabSkills software demonstration |
| 19 November 2008 | Universiti Kebangsaan, Malaysia | Workshop and Public Lecture on Chemistry Outreach | 3-hour workshop by Tim Harrison and Linda Sellou for chemists, physicists and educationalists at Malaysia's National University; public lecture on the Bristol ChemLabS Outreach programme and the use of the Dynamic Laboratory Manual to support undergraduate and Post 16 practical work in Chemistry |
| 05 December 2008 | Brussels | The European Chemical Employers Group Working Group Meeting of the Sector Social Dialogue Committee Chemical Industry for 'Education, Training, Lifelong Learning' | Nick Norman gave a presentation on Bristol ChemLabS Outreach |
| 09 December 2008 | Quebec, Canada | Department of Chemistry Faculty, the Faculty of Science and the Department of Education, McGill University | Two-day visit by Russell Cox during which gave presentations about the ChemLabS CETL project. McGill are considering revamping their broader science teaching to take on some of ChemLabS' teaching practical ideas. |

Outreach

| date | title | location | audience category | numbers |
|-------------|---|---|---|---------|
| 2008 | | | | |
| 13/02 | 'Fizz, Foam and Flubber', Primary Lecture for North Bristol Schools by Lorelly Wilson | School of Chemistry | G&T Y5 & 6 | 94+ |
| 14/02 | Primary Science Visit | The Croft Primary School, Painswick Gloucestershire | Primary | 140 |
| 15/02 | Chem@rt 2008 launched | School of Chemistry | Primary | n/a |
| 15/02 | Primary Science Visit | Brinkworth Earl Danby School, Wiltshire | KS2 | 85 |
| 20/02 | Why Does Jelly Wobble?' Workshop for Visually Impaired Adults | School of Chemistry | Visually Impaired Adults | 45 |
| 25/02 | 'Perfumes - Smelly Chemistry' Lecture | St Mary's School, Delhi, India | Senior chemistry students & 10 science teachers | 40 |
| 26/02 | Chemistry Lecture Demonstration | QEH Junior School | KS2 | 80 |
| 27/02 | G&T Chemistry Day for the Trowbridge Consortium | School of Chemistry | Y8 & 9 | 90 |
| 04/03 | Primary Science Visit | Robin Hood Primary School, Birmingham | KS1 & 2 | 200 |
| 06/03 | Primary Science Visit | Moss Hall Junior School, Finchley, North London | Y3-6 | 360 |
| 07/03 | Primary Science Visit | St Andrew's CofE Primary School, Totteridge, North London | Y1-6 | 220 |
| 07/03 | Science Week SuperSonicFM Radio Interviews Leicestershire | English Martyrs' School, Leicester | n/a | n/a |
| 08/03 | 'Beautiful Science Debate' | Bucharest, Romania | n/a | n/a |

| date | title | location | audience category | numbers |
|-------------|---|---|--|----------------|
| 10/03 | Chemistry workshops and lectures | St Antony's Leweston School, Sherbourne, Dorset | Y5-13 | 400+ |
| 11/03 | 3 days of activities during National Science and Engineering Week | High Down Junior School, Portishead | Y3-5 | 660 |
| 12/03 | Chemistry for our Future Careers Fair | Paignton Zoo, Devon | Secondary | 100 |
| 12/03 | National Science and Engineering Week 2008 Schools Conference | School of Chemistry | Y8-13 | 196 |
| 13/03 | 'A Pollutant's Tale' | Colyton Grammar School, Devon | Y9 | 120 |
| 13/03 | Mayor's Science Award Ceremony | Southgate School, Enfield | Y10 | 75 |
| 14/03 | 2nd Annual Gifted & Talented Chemistry Workshop | Badminton School, Bristol | G&T Primary | 30 |
| 18/03 | Primary Science Day for feeder schools | Stroud High School | Y4-6 | 86 |
| 20/03 | 'A Pollutant's Tale' | Bristol Grammar School | Y7 | 130 |
| 26/03 | Aspiration-Raising Day for Bristol Schools | School of Chemistry | G&T KS4 and Y9 | 47 |
| 27/03 | Workshops for Visually Impaired Adults | School of Chemistry | Visually impaired students aged between 20 & 80+ with their sight guides | 20 |
| 27/03 | Salters' Festival of Chemistry 2008 | School of Chemistry | Y7-8 | 48 |
| 28/03 | Joint Bristol ChemLabS and AIMS 'Bristol University@Crypt Day' | The Crypt School, Gloucester | Y6-13 | 600 |
| 31/03 | 'A Pollutant's Tale' x 3 | Granville School, Jersey | Y7-11 | 650 |

| date | title | location | audience category | numbers |
|-------------|-------------------------------------|--|--|----------------|
| 31/03 | Primary Science Visit | Jersey College for Girls Preparatory School, St Helier, Jersey | KS2 | 200 |
| 31/03 | Jersey Science Week | Jersey | Primary & Secondary | 1175 |
| 01/04 | 'A Pollutant's Tale' x 4 | Hautlieu School, Jersey | Y10-12 | 360 |
| 01/04 | Primary Science Visit | d'Auvergne School, Jersey | Y1-6 | 146 |
| 02/04 | Primary Science Visit | St John's School, Jersey | Primary | 200 |
| 02/04 | 'A Pollutant's Tale' x 4 | Haute Vallee School, Jersey | Y7-11 | 943 |
| 03/04 | Primary Science Visit | Grouville School, Jersey | Primary | 400 |
| 03/04 | 'A Pollutant's Tale' x 4 | Jersey College for Girls, Jersey | Y7-12 | 440 |
| 04/04 | Primary Science Visit | Mont Nicolle School | Primary | 225 |
| 04/04 | 'A Pollutant's Tale' x 4 | Quennevais School, Jersey | Y7, 8, 9 & 11 | 680 |
| 15/04 | Grignard Synthesis | Thomas Hardye School, Dorset | A-Level Chemists | 20 |
| 16/04 | 'A Pollutant's Tale' x 6 | SciFest Africa 2008, Grahamstown, South Africa | Mainly school students from the city townships in the surrounding region | 1,300 |
| 16/04 | 'Teaching Practical Chemistry' talk | Broadmead, Bristol | Wider Community | 5 |
| 17/04 | Science Cafe | Graeme College, South Africa | Y11 | |
| 22/04 | Primary Science Visit | Sefton Park Junior School, Bristol | KS2 | 240 |

| date | title | location | audience category | numbers |
|-------------|--|---|----------------------------------|----------------|
| 25/04 | Primary Science Visit | Whitchurch Primary School, Whitchurch | KS2 | 110 |
| 29/04 | 'A Pollutant's Tale' x 3 | Dr Challoner's Grammar School, Buckinghamshire | Science College | 280 |
| 30/04 | The RSC Analytical Chemistry Competition South West Heat 2008 | School of Chemistry | Y12 | 24 |
| 01/05 | Analytical Morning for Leckhampton College, Brockworth, Gloucester | School of Chemistry | Post 16 BTEC Analytical Chemists | 7 |
| 02/05 | SEA training | School of Chemistry | PG | |
| 21/05 | Polymer Chemistry Days | School of Chemistry | Y9-11 | 174 |
| 22/05 | Primary Science Visit | Bromley Heath Junior School, Downend, Bristol | Junior | 250 |
| 29/05 | Dudley Shallcross' Inaugural Lecture - 'A Pollutant's Tale' | School of Chemistry | Wider Community | 300 |
| 03/06 | Scanning Electron Microscopy, High Down Junior School, Portishead, Bristol | School of Chemistry | Y5 | 15 |
| 05/06 | Chemical Clocks, Cheltenham Science Festival | Cheltenham, Gloucestershire | KS3 | 168 |
| 07/06 | Tudor Hall Science Festival | Banbury, Oxfordshire | Y7 & 8 | 80 |
| 12/06 | Primary Science Visit | Woodlands Primary School, Gillingham, Kent | Junior | 280 |
| 13/06 | Chem@rt Visit | Manorbrook Primary School, Thornbury, South Gloucestershire | Y6 Literacy group | 40 |
| 16/06 | St Anthony's College & Benalmadena International College - Demonstration lecture on chemistry, maths and physics | Malaga, Spain | Y7-13 | 180 |

| date | title | location | audience category | numbers |
|-------------|---|--|--------------------------|----------------|
| 17/06 | Primary Science Visit | Sir John Colfox School, Bridport, Dorset | Y5 | 50 |
| 18/06 | Lorelly Wilson's 'Fizz, Foam and Flubber' lecture | School of Chemistry | G&T Primary | 50 |
| 23/06 | 'Why Does Jelly Wobble' Workshops | High Down Infants School, Portishead, Bristol | Primary | 180 |
| 23/06 | Primary Science Visit | Eltham College, London | Y7 | 26 |
| 25/06 | Enfield Science and Technology Awards Evening | George Spicer Primary School, Enfield, North London | Primary & Secondary | 250 |
| 25/06 | 'A Pollutant's Tale', Weston Park Primary School, Bristol | School of Chemistry | Primary | 33 |
| 26/06 | Drugs Chemistry Workshop | School of Chemistry | Y12 | 22 |
| 27/06 | Primary Science Visit | St Joseph's Catholic Primary School, Worcester | Primary | 210 |
| 27/06 | Caffeine Extraction, Bristol Grammar School | School of Chemistry | Y12 | 10 |
| 27/06 | Drugs Synthesis Workshop | School of Chemistry | Y12 & 13 | |
| 30/06 | Sutton Trust Summer School | School of Chemistry | Post 16 Science | 20 |
| 30/06 | Third Bristol-Trinity College Dublin (TCD) Summer School | School of Chemistry/TCD | Ages 16 to 18 | 61 |
| 04/07 | Y5 Science & Technology Day | Cotswold School, Gloucs. | Y5 | 30 |
| 07/07 | 'A Pollutant's Tale' | The High School for Girls, Gloucester | Y7 | 180 |
| 08/07 | Y12 University Chemistry Experience Camp | School of Chemistry | Y12 | 20 |
| 08/07 | Chem@rt Visit | Whitchurch Primary, South Bristol | Y5 | 40 |

| date | title | location | audience category | numbers |
|-------------|---|--|-----------------------------|----------------|
| 08/07 | Chem@rt Visit | Wansdyke Primary, South Bristol | Y5 & 6 | 100 |
| 09/07 | 'A Pollutant's Tale' | Castledown Secondary School, Ludgershall, Hampshire | Y7, 8 & 10 | 90 |
| 09/07 | Primary Science Visit | Ashley Down Junior School, Bristol | Primary | 360 |
| 09/07 | Balksbury Infants School, Andover, Hampshire | School of Chemistry | Y1 | 90 |
| 10/07 | ISSP Chemistry Enrichment Day, Cheltenham Ladies College Group | School of Chemistry | G&T Y8 | 48 |
| 16/07 | Salters' Chemistry Camp | School of Chemistry | Y10 | 49 |
| 18/07 | Salters' Chemistry Camp | School of Chemistry | Y10 | 49 |
| 18/07 | 'LIVE Question' | Nailsea School, North Somerset | Secondary | 150 |
| 11/08 | 'Hands-on approach to analytical chemistry for vocational schools II' | School of Chemistry | | |
| 04/09 | Spectroscopy Tours 2008 | School of Chemistry | Post 16 | 428 |
| 08/09 | Chemistry Summer School for Spanish School Students | School of Chemistry | Mixed Ages science students | |
| 09/09 | Primary Science Visit | St Anne's Junior School, Bristol | Y5 & 6 | 180 |
| 13/09 | Bristol Doors Open Day 2008 | School of Chemistry | Wider Community | 330 |
| 17/09 | Primary Science Visit | Central Church of England Junior School, West Sussex | Primary | 100 |
| 19/09 | Churston Grammar School Caffeine Extraction Workshop | School of Chemistry | Y13 | 30 |

| date | title | location | audience category | numbers |
|-------------|---|--|--|----------------|
| 22/09 | 'Climate change: influencing future citizens' | National Science Learning Centre, York | International governmental representatives for education | 100 |
| 24/09 | Y7 Chemistry Day, Colyton Grammar School, Devon | School of Chemistry | Y7 | 120 |
| 25/09 | Y13 Chemistry Day, Cornwall College | School of Chemistry | Y13 | 25 |
| 27/09 | Alumni Family Chemistry Day | School of Chemistry | Wider Community | |
| 29/09 | Kingswood School, Bath | School of Chemistry | Senior Students | 50 |
| 30/09 | Practical Chemistry Workshop | Pontnewydd Primary School, Cwmbran, Wales | Primary | 200 |
| 02/10 | 'Le Conte du Polluant'-' A Pollutant's Tale' | Collège Auguste Delaune, Bobigny, France | Ages 15 to 16 | 100 |
| 02/10 | Primary Science Visit | Ecole Primaire Auguste-Delaune, Bobigny, France | Primary | 60 |
| 03/10 | 'Le Conte du Polluant'-' A Pollutant's Tale' | Lycée Marcelin-Berthelot, Pantin, France | Ages 15 to 16 | 100 |
| 03/10 | 'Le Conte du Polluant'-' A Pollutant's Tale' | Lycée Louise Michel, Bobigny, France | Ages 17 to 18 | 120 |
| 09/10 | SEA Training for Postgraduate Chemists | School of Chemistry | PG | |
| 11/10 | Science workshop | Khanya Maths & Science Club, Grahamstown, South Africa | Ages 11 to 13 | 22 |
| 13/10 | 'A Pollutant's Tale' | Ntsika School, Grahamstown, South Africa | Ages 12 to 14 | 45 |
| 14/10 | 'A Pollutant's Tale' | NV Cewu School, Grahamstown, South Africa | Ages 12 to 14 | 31 |

| date | title | location | audience category | numbers |
|-------------|---|--|--------------------------|----------------|
| 15/10 | Top of the Bench Practical Chemistry Competition | School of Chemistry | Y9-11 | 44 |
| 15/10 | Lecture demonstration | DSG, Grahamstown, South Africa | Ages 12 to 14 | 120 |
| 16/10 | 'A Pollutant's Tale' | TEM Mrwetyana Secondary School, Grahamstown, South Africa | Grade 8 | 80 |
| 16/10 | 'A Pollutant's Tale' | Worle School, Weston-Super-Mare, Somerset | Y10 | 300+ |
| 17/10 | 'A Pollutant's Tale' | Shaw Park Secondary School, Bathurst, South Africa | Y8 & 9 | 20 |
| 20/10 | Primary Science Visit | Blue Coat Primary, Wotton-Under-Edge, Gloucs | Primary | 200 |
| 20/10 | 'A Pollutant's Tale' and workshops for George Dickerson School, Eastern Cape, South Africa | Chemistry Department at Rhodes University in Grahamstown, South Africa | Primary | 100 |
| 21/10 | Chem@rt Presentation | Victoria Primary School, Grahamstown, South Africa | Primary | 25 |
| 21/10 | 'A Pollutant's Tale' and workshops for Grahamstown Primary School, Eastern Cape, South Africa | Chemistry Department at Rhodes University in Grahamstown, South Africa | Primary | 30 |
| 21/10 | Inspiring Chemistry Day | Westleigh High, Wigan | Y10 | 190 |
| 22/10 | Aspiration-Raising Day for Trowbridge & West Wiltshire LSN Triple Science Network | School of Chemistry | Y8 | 90 |
| 22/10 | 'A Pollutant's Tale' | Graeme College, Eastern Cape, South Africa | Ages 12 to 14 | 55 |

| date | title | location | audience category | numbers |
|-------------|---|--|--|----------------|
| 23/10 | 'A Pollutant's Tale' | George Jacques Primary School, Alicedale, Eastern Cape, South Africa | Grade 7 | 28 |
| 23/10 | Chemistry Course for Non-Specialist GCSE Science Teachers | Ralph Allen School, Bath | Non-chemistry teachers | |
| 24/10 | 'A Pollutant's Tale' and workshops for Saint Mary's Primary School, Grahamstown, South Africa | Chemistry Department at Rhodes University in Grahamstown, South Africa | Primary | 35 |
| 25/10 | Workshops on slime and acids | Khanya Maths & Science Club, Albany Museum, Grahamstown, South Africa | Ages 12 to 14 | 25 |
| 29/10 | Regional Chem@rt Winners' Day | Explore-at-Bristol | Primary | 8 |
| 05/11 | Schools' Medical Chemistry Biochemistry Conference | School of Chemistry | Y11-13 and members of the local branch of the RSC and the BA | 296+ |
| 05/11 | Caffeine Extraction Morning | School of Chemistry | A-Level & IB | 20 |
| 05/11 | VIP Summer School | School of Chemistry | Visually impaired students aged between 20 & 80+ with their sight guides | 40 |
| 06/11 | Royal Society of Chemistry Family Evening | School of Chemistry | Wider Community | 45 |
| 06/11 | Climate Change CPD | School of Chemistry | Teachers | 15 |
| 12/11 | Organic Synthesis Day, Thomas Hardy School, Dorset | School of Chemistry | Y12 | 29 |
| 13/11 | 'Chemistry in Action for A-Level Students' Schools' Conference- 'A Chemical Delight' | Institute of Education, University of London | Post 16 | 900 |
| 18/11 | Visit to Maktab Sains Paduka Seri Begawan Sultan | Brunei | Y12 | 30 |

| date | title | location | audience category | numbers |
|-------------|---|---|--------------------------|----------------|
| 19/11 | St Johns School, Marlborough | School of Chemistry | A-Level and IB | 23 |
| 19/11 | Workshop on the topic of drugs chemistry | St Johns School, Marlborough, Wiltshire | A-Level & IB Chemists | 23 |
| 21/11 | 'The Chemistry, Physics and Biology of Global Warming' | Crypt School, Gloucester | Y11 | 110 |
| 21/11 | 'Biomolecules Tell Us About How Climate Changed in the Past... and How it Might Change in the Future' | Crypt School, Gloucester | Y12 | 30 |
| 24/11 | Primary Chemistry Winter School | National University of Singapore (NUS), Singapore | Ages 9-11 | 60 |
| 25/11 | Chemistry Winter School for Young Chemists | National University of Singapore (NUS) | Ages 13 to15 | 120 |
| 27/11 | Senior Chemistry Winter School | National University of Singapore (NUS) | Ages 15 to 18 | 32 |
| 01/12 | 'A Pollutant's Tale' Rednock School, Gloucestershire | School of Chemistry | Y10 | 36 |
| 02/12 | Christmas Lectures | Open University, Milton Keynes | Post 16 | 620 |
| 02/12 | Primary Science Visit | Bishop's Road Primary, Bristol | Y6 | 78 |
| 02/12 | 'Chemistry for the Terrified', Public Lecture | School of Chemistry | Wider Community | 50 |
| 03/12 | Caffeine Extraction | Bishops Wordsworth School, Salisbury | Y11 | 32 |
| 03/12 | Schools' Christmas Conference 2008 | School of Chemistry | Y9-11 | 300 |
| 04/12 | Christmas Lecture | Tudor Hall, Banbury, Oxon, Oxfordshire. | Y10-12 | 100 |

| date | title | location | audience category | numbers |
|-------------|--|---|--------------------------|----------------|
| 04/12 | 'A Pollutant's Tale' | The John Bentley School, Calne, Wiltshire | Secondary | 200 |
| 09/12 | 'A Chemical Delight' | Institute of Education, London | Post 16 | 850 |
| 10/12 | Atmospheric Chemistry Presentation, Gordano School, Portishead | School of Chemistry | KS3 G&T | 15 |
| 12/12 | Bristol ChemLabS/Gordano School partnership | School of Chemistry | Secondary | n/a |
| 16/12 | Practical Workshop | Thomas Hardy School, Dorchester, Dorset | Post 16 | 22 |
| 18/12 | Spectroscopy Tours for Post 16 Chemistry Students | School of Chemistry | Post 16 Chemistry | 94 |
| 2009 | | | | |
| 07/01 | TSN/CHeMneT Chemistry Aspiration-Raising Day- Caffeine Extraction | School of Chemistry | Y9 & 10 | 57 |
| 08/01 | TSN/CHeMneT Chemistry Aspiration-Raising Day- Caffeine Extraction | School of Chemistry | Science College | 48 |
| 14/01 | TSN/CHeMneT Chemistry Aspiration-Raising Day- Caffeine Extraction | School of Chemistry | Secondary | 42 |
| 15/01 | 'Gases in the Air' Primary Science Lecture Demonstration | St Bedes, Bristol | Primary | 160 |
| 15/01 | 'A Pollutants Tale' | St Bedes Catholic College, Bristol | Y9 | 180 |
| 16/01 | 'A Pollutant's Tale' | Somervale School, Midsomer Norton (Somerset) | Y10 & 11 | 250 |
| 20/01 | Primary Science Day | Winchcombe School, Gloucestershire | Y6 & 7 | 125 |

| date | title | location | audience category | numbers |
|-------------|--|--|--------------------------|----------------|
| 21/01 | TSN/CHeMneT Chemistry Aspiration-Raising Day-Caffeine Extraction | School of Chemistry | Y9 & 10 | 52 |
| 27/01 | Science and Engineering Ambassador (SEA) Training | School of Chemistry | PG | 20 |
| 03/02 | Primary Science Visit | Begbrook Primary School, Stapleton | Y5 | 60 |
| 11/02 | Triple Science Network Polymer Chemistry Aspiration-Raising Day | School of Chemistry | Y10 | 69 |
| 12/02 | 'Meet the Scientist' (Aimhigher event) | Avonbourne School, Bournemouth, Dorset | Secondary | 100 |
| 12/02 | 'A Pollutant's Tale' x 3 | Sir William Romney School, Tetbury | Y7-9 | 320 |
| 13/02 | 'Meet the Scientist' (Aimhigher event) | Westfield School, Yeovil | Y10 | 200 |
| 16/02 | Y9 Gifted & Talented Future Pathways Challenge (ISSP activity) | Wellington College, Berks | Y9 | 120 |
| 25/02 | Schools' Conference | School of Chemistry | Secondary | 100 |
| 25/02 | Drugs Synthesis Workshop | School of Chemistry | Y11-13 | 16 |
| 25/02 | Joint AIMS & Bristol ChemLabS Visit | Beaminster School, Dorset | Post 16 | 30 |
| 25/02 | Salicylic Acid Workshop | School of Chemistry | Y13 | 15 |
| 26/02 | Bristol LA Primary Science Network Meeting | Science Learning Centre South West | Primary school teachers | 45 |
| 26/02 | 'A Chemical Delight' | Strode College, Street, Somerset | Y11 & Post 16 | 110 |

Outreach Meetings

| Date | Location | Title | Event Description |
|------------------|---------------------------------|--|--|
| 10 February 2008 | School of Chemistry | Modular Mobile Education: Science Experiments (MOBILIM) Visitors from Turkey | Five-day visit of Turkish educators looking at effective outreach in mobile experiments for primary schools |
| 21 April 2008 | Rhodes University, South Africa | Prof Mike Davies-Coleman, Head of Chemistry | Meetings about outreach collaboration during 2008 including the training of some PG chemists from Rhodes with Tim Harrison and Dudley Shallcross |
| 22 April 2008 | Rhodes University, South Africa | Rhodes University Director of Community of Engagement, Mrs Joyce Nduna | Meeting with Tim Harrison and Dudley Shallcross to organise outreach training and joint Rhodes - ChemLabS Outreach events for later in the year |
| 22 April 2008 | Rhodes University, South Africa | Rhodes University Dean of Science, Ric Bernard | Meeting with Tim Harrison and Dudley Shallcross to organise Outreach training and joint Rhodes - ChemLabS outreach events for later in the year |
| 22 April 2008 | School of Chemistry | Mr Brian Wilmott, Director of Scifest Africa | Meeting regarding outreach appraisal |
| 02 May 2008 | School of Chemistry | Dr Garry Doyle, Head of Chemistry, Marlborough College | Meeting with Tim Harrison and Dudley Shallcross to discuss Marlborough College's opportunities for engagement with Bristol ChemLabS Outreach |
| 16 June 2008 | School of Chemistry | Rob Sidaway, LSN consultant allocated to ChemLabS' Triple Science Network | Meeting with Tim Harrison, Dudley Shallcross and Linda Sellou |

| Date | Location | Title | Event Description |
|-----------------|--|---|---|
| 19 June 2008 | National Science Learning Centre, York | Prof John Holman (NSLC) and members of the Chemistry department at the University of York | Meeting about the DLM and ALDLM between Tim Harrison, Dudley Shallcross (ChemLabS), John Eastman, Bill Heslop and Tony Baldwin (Learning Science), Prof John Holman (NSLC) and from the University of York, Head of Chemistry Professor Paul Walton, Undergraduate Admissions Tutor Dr Andrew Parsons and chemistry lecturer and outreach practitioner Dr Annie Hodgson |
| 23 June 2008 | School of Chemistry | Prof David Rice, Reading University | Meeting with Tim Harrison to discuss Reading chemistry looking to up their outreach role |
| 23 June 2008 | School of Chemistry | Nick Short, Merchant Academy, Withywood | Discussion of possible outreach links with the UoB-sponsored school with Tim Harrison |
| 24 July 2008 | Malta | Mr Chris Schembri (Head of Science, Malta Church Schools) and Miss Doreen Mizzi (Head of Chemistry, Malta Church Schools) | Meeting with Tim Harrison to discuss continued outreach liaison and the creation of a science week in Malta in November 2009 |
| 24 July 2008 | University of Malta | Dr Emmanuel Sinagra, Acting Head Of Chemistry, University of Malta | Visit by Tim Harrison to discuss mutual schools' outreach and LabSkills. |
| 06 October 2008 | Science Learning Centre South West | Prof John Holman, Chair of the government's STEM Advisory Forum | Meeting with Dudley Shallcross and Tim Harrison to learn more about the Bristol ChemLabS project |

Publications

| Publication | Author | Title/Description |
|--|---|---|
| 'Science in School' Website, April 2008 | M C Martinez de Castillan (UAS Student) | 'Experimentos circenses para primaria' - Translation into Spanish of the article 'Primary circuses of experiments' by A Griffin, T G Harrison & D E Shallcross published in the Winter 2007 Issue 7 |
| 'Science in School' Website May 2008 | | 'Teatr podstawowych doswiadczen' - Translation into Polish of of the article 'Primary circuses of experiments' by A Griffin, T G Harrison & D E Shallcross published in the Winter 2007 Issue 7 |
| www.ChemistryTeachers.org, May 2008 | L Voûte (UAS Student) | Part of the 'Green Chemistry' teacher's pack published on this RSC website for teachers |
| '1st year practicals: their role in developing future bioscientists' | T J Podesta & D M Smith (co-authors) | A report of a workshop for invited participants organised by the Centre for Bioscience and sponsored by AstraZeneca Pharmaceuticals and the BBSRC, Weetwood Hall, University of Leeds, 7-8 April 2008 |
| 'Science in School' Website July 2008 | L Sellou | 'Sur quoi portent vos recherches? Le dentifrice?' - Translation into French of the article 'You're researching what? Toothpaste?' published in SiS Issue 4 |
| Triple Science News, Autumn 2008 | T G Harrison | 'Aspiration-raising at the University of Bristol's School of Chemistry' |
| Chemistry in Action (magazine for Irish teachers) #86 Winter 2008 | | 'A Chemistry Dynamic Laboratory Manual for Schools' |
| 'Science in School', Winter 2008 Issue 10 | D E Shallcross and T G Harrison | 'Practical demonstrations to augment climate change lessons' |

| Publication | Author | Title/Description |
|--|--|---|
| 'New Directions in the Teaching of Physical Sciences' (published by the Higher Education Academy Physical Sciences Centre) 4, Dec 2008 | T G Harrison, L Hughes, and D E Shallcross | 'Jersey Schools Science Week: An outreach case study' |
| 'Science in School' Website Dec 2008 | D E Shallcross and T G Harrison | 'A three-way collaboration: Ireland, the UK and Malta' |
| 'Science in School' Website Dec 2008 | | 'Spectacol cu experimente în ciclul primar' Translation into Romanian of the article 'Primary circuses of experiments' by A Griffin, T G Harrison & D E Shallcross published in the Winter 2007 Issue 7 |
| EuCheMS Newsletter Feb 2009 | T G Harrison | 'Lectures and lab work: Bristol chemists worked with students' - article about ChemLabS' Outreach in France and Ireland |

Publicity

| Publication | Title/Description |
|---|--|
| CSCB Website | The second TCD-Bristol Summer School was featured on the 'Highlights in 2007...' page |
| Education in Chemistry July 2008 | Article about Paul Wyatt after he received the 2008 RSC Education Division Higher Education Teaching Award |
| University of Bristol News 09 Jan 2008 | 'Chemistry goes to Singapore' |
| Gloucestershire Echo 16 Jan 2008 | Double-page spread about Primary Science Visit hosted by Winchcombe School's science department |
| RSC Policy Bulletin Issue 08 February 2008 | Mention of the use of Bristol undergraduate labs in article about the Chemistry for our Future programme |
| University of Bristol Press Release, 11 Feb 2008 | 'Bristol scientists reach out to help primary schools in Turkey' |
| Dursley Gazette, 14 Feb 2008 | 'Science is way forward in class' - article about 12 February AIMS-ChemLabS visit to Cam Woodfield Junior School |
| University World News, 24 February 2008 | 'Growing engagement with communities' - Article mentions Bristol ChemLabS Outreach |
| Katharine Lady Berkeley's School Newsletter, 2008 | Item about the school's Y11s Aspirational Day at ChemLabS |
| Dorset Echo, 12 March 2008 | 'School science conference is in big demand' - Article about 10 March conference organised by ChemLabS, St Antony's Leweston School (Dorset) and the RSC |
| States of Jersey Education, Sport and Culture Department News Release, March 2008 | Press release about the ChemLabS Jersey Science Week |
| University of Bristol Press Release, 27 March 2008 | 'Chemistry festival for budding young scientists' - about the 2008 Salters' Festival |
| Bristol Evening Post, 28 March 2008 | 'Students are fired with enthusiasm in chemistry' - Article about the 2008 Salters' Festival at Bristol ChemLabS |

| Publication | Title/Description |
|--|--|
| BBC Radio Jersey, 31 March 2008 | Twenty-minute feature about the Jersey Science Week, interview of some pupils from Jersey College for Girls Preparatory School in St Helier and Mont St Nicolle School during Primary Science Visits and of Alison Rivett. A banana was frozen in liquid nitrogen and smashed live on air. |
| Catholic South West, April 2008 | 'Extreme weather did not defeat the enthusiasm for science...' - Article about 10 March conference organised by ChemLabS, St Antony's Leweston School (Dorset) and the RSC |
| The RSC's ChemNet News, April 2008 | Mention of the July 2008 Y12 Chemistry Experience Camp linking to the ChemLabS website |
| ITV Channel News, 01 April 2008 | Video item about the Jersey Science Week |
| Colyton Grammar School Newsletter | Article about the school's National Science & Engineering Week, which featured 'A Pollutant's Tale' given by Alison Rivett. |
| University of Bristol News 08 April 2008 | 'Science comes alive in Jersey schools' - Report on the Jersey Science Week in the University's News section |
| Jersey Evening Post 10 Jan 2008 | 'Goggle-eyed with amazement' - Article about the Jersey Science Week |
| The BSA's YPP e-newsletter Issue 14 June 2008 | 'KS4 alternative fuels presentations by Badminton School students' |
| High Down Junior School Newsletter no1 | Item about visit to Bristol ChemLabS |
| TSN Website June 2008 | 'Bristol Chem Labs (sic) CHeMneT' - Triple science networks case study |
| Education in Chemistry July 2008 | 'Innovation in the lab earns HE award' - article about Paul Wyatt winning the 2008 RSC Education Division's Higher Education Teaching Award |
| Rhodos, Vol 20 No 4 The Rhodes University Community Newsletter July 2008 | 'Chemistry Outreach Project given wings' - article about the Bristol/Rhodes outreach collaboration |
| University of Bristol News | 'Former students unite ' - article about the 2008 Convocation Reunion Weekend mentioning a visit to ChemLabS |

| Publication | Title/Description |
|---|---|
| The Worcester Standard, 04 July 2008 | 'Science Week Fun and Learning' - article about ChemLabS visit to St Joseph Catholic Primary School |
| University of Bristol News 16 July 2008 | 'Chemistry in action' - article about ChemLabS Summer Schools |
| The Times of Malta, 20 July 2008 | 'Sixth Formers at Chemistry summer camp' - article by Chris Schembri about the Bristol-TCD-Malta summer school |
| Education in Science number 229, Sept 2008 | Full page advert for LabSkills |
| EuCheMS Newsletter, Sept 2008 | Item about the Jersey Science Week |
| University of Bristol Press release, 08 Sept 2008 | 'Bristol scientists reach out to help schools in Africa' |
| Bristol Evening Post, 10 Sept 2008 | 'Classroom lab puts fun into science' - Article about a Primary Science Visit to St Anne's Junior School with visiting South African scientists |
| University of Bristol Press Release 01 Oct 2008 | 'School science lessons given 21st-century boost' - article about LabSkills |
| South Wales Argus 02 Oct 2008 | 'Science lessons go with a bang' - article about Primary Science Visit to Pontnewydd Primary School |
| Science Ouverte's website Oct 2008 | Article about ChemLabS visits to French schools |
| Dursley Gazette, 03 Oct 2008 | 'University experts lend a hand' - article about ChemLabS visit to Pontnewydd Primary School |
| Académie de Créteil website | 'Des chimistes anglais à Bobigny !' - item about the ChemLabS visit to Paris |
| Le Parisien 04 Oct 2008 | 'Un cours de chimie en anglais au lycée' French newspaper article about ChemLabS visit to the Lycée Louise Michel in Bobigny |
| Bonjour Bobigny, 09-15 Oct 2008 | Two-page spread about the ChemLabS visit to schools in Bobigny, France |
| Académie de Créteil's website | Article about ChemLabS visits to French schools |

| Publication | Title/Description |
|--|---|
| Bristol Evening Post 15 Oct 2008 | Article about LabSkills |
| Lycée Louise Michel's website | Article about the ChemLabS visit to the school |
| The British Council's website, Oct 2008 | Paragraph on Bristol ChemLabS Outreach on the Talking Science events page |
| Rhodes University website Oct 2008 | 'Chemistry Department benefits from Scifest Africa' - half of this article dedicated to Dudley Shallcross' and Tim Harrison's contributions |
| Education in Science number 230, Nov 2008 | Full page advert for LabSkills |
| University of Bristol News 04 Nov 2008 | 'Bristol ChemLabS take Chemistry to South African pupils' |
| University of Bristol's 'In the media' web page | 'Bristol takes chemistry to South African pupils' |
| Canal, Le journal de Pantin, number 173, Nov 2008 | Full page on the ChemLabS visit to Pantin |
| Grocott's Mail, 11 Nov 2008 | 'Preeti chemistry' - Interview of Preeti Kaur during a ChemLabS workshop at TEM Mrewtyana Secondary School in South Africa |
| Nonesuch (University of Bristol alumni magazine) Winter 2008 | 'Bristol scientists reach out to help schools in South Africa' |
| ChemComm number 45, 07 December 2008, pages 5857-6060 | 'Fired up about fungi' - Interview of Russell Cox |
| RSC website | 'Discover LabSkills' - page about the ALDLM |
| Education in Chemistry, Jan 2009 | Laboratory skills for AS chemists, online |
| University of Bristol Website, Jan 2009 | Centenary Campaign appeal for ChemLabS |
| Cotswold Journal | 'Pupils learn appliance of science' - article about Primary Science Visit to Winchcombe School |
| Schoolzone Website | Independent review of LabSkills |

| Publication | Title/Description |
|--|--|
| Google News 14 Feb 2009 | "Virtual' experiments aid pupils' - article about LabSkills (from the Press Association) |
| Reactions (Chemistry for our Future newsletter) Issue 5, Spring 2009 | Insert about the 'Discover Chemistry' programme, including section on Discover LabSkills |
| Channel 4 News Science and Technology Website 15 Feb 2009 | "Virtual' experiments aid pupils' - article about LabSkills |
| BBC News Website 15 February 2009 | 'Virtual experiments help pupils' - article about LabSkills |
| MSN News Website 16 February 2009 | "Virtual' experiments aid pupils' - article about LabSkills |
| Teletext 16 Feb 2009 | 'Web experiments for pupils' - article about LabSkills |
| MSN News Feb 2009 | "Virtual' experiments aid pupils' |
| University of Bristol Recent News Highlights Web page 17 Feb 2009 | 'Virtual labs become a reality' - about recent LabSkills coverage |
| University of Bristol Press Release 17 Feb 2009 | 'Virtual labs become a reality' - about LabSkills |
| ATL (Education Union) Website - Education News 18 Feb 2009 | 'Revolutionary teaching tool created for chemistry lessons' - article about LabSkills |
| TimePlan (teaching agency) Website 18 Feb 2009 | "Virtual" teaching tool designed for chemistry lessons' - article about LabSkills |
| University of Bristol News 19 Feb 2009 | 'Chemists awarded top prizes' - article including Dudley Shallcross receiving the Royal Meteorological Society's Michael Hunt Award for 2008 |
| Original Radio (Bristol radio station) | Pre-recorded interview of Nick Norman about LabSkills |

Reports and Meetings

| Date | Location if applicable | Title | Description |
|------------------|-------------------------------|--|--|
| 19 March 2008 | School of Chemistry | Bristol ChemLabS Advisory Board Meeting 3 | |
| 18 April 2008 | | Inspiring the Next Generation of UK Chemists: The Bristol ChemLabS Experience | Report on Outreach submitted to Sir Keith O'Nions |
| 13 June 2008 | School of Chemistry | Bristol ChemLabS Management Board Meeting 6 | |
| 03 December 2008 | School of Chemistry | Bristol ChemLabS Management Board Meeting 7 | |

Visitors

| Date | Visitor(s) | Event Description |
|-------------------|---|--|
| 25 February 2008 | Open University Staff | Nine OU staff from Milton Keynes, the South West and Cardiff visited ChemLabS and received a tour of the labs and a demonstration of the DLM |
| 02 April 2008 | Sarah Johnson, the Jersey Education Department's Learning & Science Coordinator | Observing a Primary Science Visit by Alison Rivett and SEAs |
| 04 April 2008 | Sophie Le Sueur & Andy Gibbs, Jersey Education Department | Observing Alison Rivett's assembly about the different gases in the air, part of a Primary Science Visit |
| 23 September 2008 | Visit from James Sullivan, University College Dublin (UCD) | Requested tour of the labs and meeting with Tom Podesta, Tim Obey, Steve Croker, Nick Norman and David Smith in the context of UCD's undertaking of a process of designing a new building specifically for use in undergraduate teaching |
| 06 October 2008 | John Holman, National STEM Director & director of NSLC | Meeting with Nick Norman, Dudley Shallcross and Tim Harrison about ChemLabS |
| 01 December 2008 | Sarah-Jane Chilcott, Programme Manager for Science City Bristol | Visit with Nick Norman and Dudley Shallcross to discuss public engagement |
| 01 December 2008 | Imperial College London | Visit from Bob Cummins, Faculty Operating Officer, and Roy Burns, Buildings and Infrastructure Office, to Paul Wyatt and Russell Cox as ICL is considering building new chemistry teaching labs |
| 06 January 2009 | Drs Carl Percival & Katherine Harrison, University of Manchester | Visit to Tim Harrison to liaise and learn about outreach |
| 16 January 2009 | Claire Dimond, West of England STEMPOINT | Meeting with Alison Rivett and Linda Sellou |
| 11 February 2009 | Anil Nagalingam & Melanie Washington (RSC) | Meeting with David Smith, Nick Norman, Dudley Shallcross and Tim Gallagher |
| 18 February 2009 | Prof Chris Rapley CBE, Director of the Science Museum | ChemLabS visit with Prof Kathy Sykes |

Table of Acronyms used in Events Log

| | |
|---------|--|
| ABPI | Association of the British Pharmaceutical Industry |
| ALDLM | A-Level Dynamic Laboratory Manual |
| ASE | Association for Science Education |
| BA | British Association for the Advancement of Science |
| BETT | British Educational Training and Technology (BETT) Show |
| CETL | Centre for Excellence in Teaching and Learning |
| CfoF | Chemistry for our Future |
| CHeMneT | The School of Chemistry's secondary school chemistry teachers network |
| CREATE | Centre for Research, Education and Training in Energy |
| CSCB | Centre for Synthesis and Chemical Biology |
| DLM | Dynamic Laboratory Manual |
| EVA | Denmarks Evalueringsinstitut - Danish equivalent of the QAA |
| ISSP | Independent/State School Partnership |
| G&T | Gifted and Talented |
| LLAS | Subject Centre for Languages, Linguistics and Area Studies |
| LTSS | University of Bristol Learning and Teaching Support Unit |
| NERF | National Education Research Forum |
| QAA | Quality Assurance Agency for Higher Education |
| QCA | Qualifications and Curriculum Authority |
| SEAs | Science and Engineering Ambassadors |
| TSN | Triple Science Network |
| TSU | University of Bristol Teaching Support Unit (Now Education Support Unit) |
| UAS | Undergraduate Ambassador Scheme |
| VAM | Valid Analytical Measurement |
| WISE | Women Into Science, Engineering and Construction |

Appendix 3

Bristol ChemLabS Report November 2008

from the External Evaluator Dr Stuart Warren (Cambridge)

BristolChemLabs Report November 2008
from the External Evaluator Dr Stuart Warren (Cambridge)

Background

I spent the week 3rd-7th November at Bristol seeing for myself how the labs in each year 1-3 operated and interviewing members of staff, technical staff, graduate demonstrators and students. I interviewed people at random and had a focus group meeting with eight students from the second year. All interviews (and the focus group) were in the absence of any member of the teaching staff.

This is the first year that students at all three levels have had only the new style lab classes and so they cannot compare them with what went before but only with what they expected. There have naturally been improvements in the years that the first and second year classes have operated. I also saw a group of school children at work in the lab and heard details of the outreach mission.

General Comments

The most obvious point to an outside observer is the purposeful air and committed attitude of the students at all three levels. The labs were full and there was a buzz of expectancy and enthusiasm at each level. The students knew what they were doing and were deeply involved in it. This is a great contrast with my observations at Cambridge. No student at Bristol, when asked what (s)he was doing, replied 'I'm down to here on page 2.' One student in the first year said 'I'm refluxing 2.5 grams of tin with 2.5 grams of iodine in dichloromethane'. On further questioning, without my supplying any information, she improved this to 'I'm oxidising tin to tin(IV) with iodine.' Astonishing!

The DLM (Dynamic Laboratory Manual) is vital to the operation of the labs. Students can find out which experiment they are to do, carry out pre-lab experiments, submit their work, see what marks they have got and retrieve comments on their work from the DLM. They can't check other students' reports. Staff can check on the progress of all students. While I was there, a problem arose with one student who claimed that the work was too difficult. The staff member responsible was able to check that the student had not done practical work, had not attended workshops and had not submitted work and was therefore able to alert the progress officer to the reasons for the problem.

The pre-lab experiments play an exceptionally important role as they require students to carry out the experiment virtually and thereby discover what it is about. This is in part an assessment exercise but its main role is teaching as the students can make disastrous and expensive mistakes on the screen and so avoid them in the lab as well as going into the lab with a proper understanding of what they are to do.

The commitment of the staff at all levels (technical, graduate student demonstrators and academic staff) is total and the results demonstrate how valuable this is. Submission of reports by the students must be completed almost immediately the experiment is finished and feedback to the students follows swiftly. Students routinely discuss experiments and write-ups with demonstrators at all levels: this too is a valuable opportunity for learning.

The classes are run in a strict but fair way that the students appreciate. For example: in the first year, reports must be submitted by midnight on the working day following the experiment and there is a sliding scale of lower marks for late reports. They are warned sternly against plagiarism but the warning is tempered by the observation that 'this does not mean that you cannot discuss your laboratory or other course work with other students.'

The First Year Class

This course contains short experiments in all branches of chemistry and the students do one each week on the afternoon they are allocated. The station and the demonstrator for each experiment remains the same so no student is penalised by having a weak demonstrator all the time. The reports are brief and to the point and the style of the report changes as the term develops. The marks are 20% for the pre-lab work, 60% for the work done in the lab, and 20% for the report.

The demonstrators mark the work and offer comments either on the web or on the reports. Each week the demonstrators are available 15 minutes before the lab starts for any discussion the students want to have about their results. It was suggested to me that this lab was 'over demonstrated'. I'd say it wasn't as the demonstrators were consistently busy but not overwhelmed. There was clearly a relaxed and friendly atmosphere but the student attitude was purposeful throughout. This was the fifth week. The students had settled in and none was standing about waiting to be told what to do. Indeed one demonstrator failed to turn up on time and, when he arrived 20 minutes later, all his students were hard at work.

Comments from staff: 'Last year they were still hard at it at 5.45 but this year they have all gone by 5.' (The lab is supposed to close at 5) This shows clearly how the presentation of the course and the pre-lab work has changed with experience.

Comments from demonstrators: One demonstrator had previous experience elsewhere and felt that the students were more enthusiastic at Bristol and got on with their work well. They felt that they were learning and were happy with the feedback. Another said that he was more flexible in his feedback this year and thought that the class had gone better this year.

Comments from students: One said that it was hard at first but 'now it's great fun' and that she felt she understood what she was doing. Another said that the lab was good and that he had got better with experience. He felt he didn't really understand all the chemistry but he did come to the feedback sessions before the class. Another said the feedback was good but his friends were disappointed at some disorganisation about times. He thought that not enough detailed

instructions were given but that he 'recognised that this was deliberate to encourage independence.'

While I was sitting at a table in the lab making notes, a student came up to me and asked what I was doing. When I explained, he joined in an enthusiastic discussion and was keen that I should realise how excellent the labs and the course were. Unsolicited testimonial?

Second Year Class

The demonstrators ask 'in lab questions' of the students. They have a list of five questions for each experiment but are encouraged to ask their own. Generally if the experiment is outside the demonstrators immediate expertise (s)he will use the suggested questions. This is part of the in-lab assessment. Several students in the focus group (see below) praised the positive effect these questions have on their understanding of the experiments.

Comments from Technical Staff: The students are making good progress this year compared to last year's second year group. Presumably this reflects the training they got in the first year course.

Comments from Staff Demonstrator: One demonstrator had experience of the O***** course as a demonstrator and was very enthusiastic about the Bristol course. In his previous university he had asked not to be paid for demonstrating as the organisation was so poor. At Bristol there was no more than a few minor problems of instructions not understood.

Comments from Demonstrator: The experiments are well designed for learning. He picked out the analysis of cigarette smoke by IR as it explores a scientific technique from first principles.

Comments by Students (See also report on Focus Group). A Chinese student whose English was not great said that she liked the course and found it much easier than level 1 as she had previously done no lab work. Another student particularly liked the in-lab questions as they had helped him to know what he was doing

Second year Focus Group *My comments in italics.*

I had lunch with a group of eight second year students who, after a little prompting, talked freely about what was good and bad. They needed prompting so I asked them some questions:

Did you feel there has been a connection between lectures and labs? More so this year than last. Last year's lab was mainly about getting up to speed and some of the experiments seemed pointless.

How do you feel that the labs help you with your understanding of chemistry as a whole? The report writing helped and the DLM was excellent. Last year they could just 'look at the script' but this year there was 'no hope' unless they understood what was going on. *There followed a rush of comments on these lines:* Having questions in the lab that put you on the spot is good. Most of the demonstrators are really good if you're not sure about something. But some of them have poor English. The first week was not so good as the demonstrators didn't appear to

have had a 'dry run.' The academics are 'lovely' but there are only a few of them. There are problems with timing and you might have to miss lunch as 'half of the mark is the yield'. *This is a misconception that could be rectified.*

How did you feel about the assessment? They were really useful, especially as the staff give real help. One felt that the questions were 'really hard' last year and she couldn't find the answers in textbooks or online so she had to ask and felt she was marked down for 'not knowing'.

Nobody has mentioned the pre-labs so far. They had got harder this year, with only one attempt allowed. They make us think a lot more. One said they took five minutes last year but this year the first one had taken her two and a half hours. The animations were really good and help understanding. They felt they had seen the equipment before. One suggested actual demonstrations might be better than 'photographs.'

Was the main feedback the returned and marked reports? Yes because the lab work is marked only as a percentage on the Web with no comments and it can be frustrating not being able to find out why they got a low mark. (Ask?) Personal tutor helped 'loads.' The demonstrators were a bit variable but all reports annotated and marked by staff were 'very good'.

For the first time, marks allocated to reports increased during the year. Was this helpful? Two said it was good as it took the pressure off early reports but it didn't seem to have made much of an impact. There was some disgruntlement over the lack of guidance for the first report. The wrong template had been supplied and the Report Guidance Lecture' was given the day before the report had to be handed in. They were given a link to a DLM page that didn't have enough info.

How do you feel the balance is between the course's aims and practice? 'Pretty good'. One said that the labs were even better than they'd expected and it was amazing how much skill they had gained in one year. *I prompted them about the confidence I had observed in the lab.* They immediately said this was due to the pre-labs and the instructions in the books kept in the assigned cupboards.

What do you think of the technical staff? Some are amazing, particularly Steve Croker, who also knows the theory and Tom Podesta - when you can get hold of him - one said he had 'saved her experiment'. Some on the other hand are grumpy, sarcastic and mean.

Any final comments? They felt more involved this year, Last year there were only three hours a week and even this year's six hours were not really enough. (*Incredible! Asking for more!*)

Experiments are more relaxed this year so you can take a break while 'something is developing.' Three practical subjects are great as they could make a more informed decision on what they really want to do. Workshops this year useful, especially Organic. One wished there were more as three-weekly interval is a bit long especially if there is no tutorial in the meantime. [This sounds like a comment about the first year tutorial cycle because second year workshops do not have three week intervals.]

Third year Class

A new feature this year, in response to criticism last year, was an explanation of the style of instructions given this year in comparison with those at level 1. An example (ferrocene) was provided of the two styles of instruction. Other features new to the students include: terser instructions, an element of choice among the experiments available, and extensive use of NMR and MS. The most impressive thing to me was the adult attitude of the students to making a step forward into significantly more advanced work, They were not put out by the difficulty and were confident because of the well planned development. One student said he had found the course very difficult to start with but expected a similar growth in understanding and competence to what he had experience at level 2. Another student was not quite so sure but was clearly enjoying herself and was 'hoping' rather than confident that she'd be at home with 'the more professional environment'.

The students have to complete a COSHH form before they can start an experiment, and bring it to a member of staff for discussion and signature. One student did this while I was talking to Nick who told him that he had completed the form for the wrong experiment. The student accepted this gracefully with no complaint. Adult attitude.

Comments by Staff: Impressed by mature way the students approach the more difficult style of experiment. He didn't like the way they resort to Wikipedia. He liked the range of experiments and the provision of challenges that the students can solve.

Comment by Demonstrator: He had demonstrated in all three years and found the students, after a week of uncertainty, to be much more focused and enthusiastic than in levels 1 and 2. My comment: the demonstrators are very active, going round and talking to the students and not just sitting and waiting for questions.

My Impressions: All the students did an introductory experiment (carboxylation of an aryl Grignard reagent) and prompt feedback by Tom Podesta is serious and helpful. After this they have a choice within quite a wide range of experiments. They are not restricted to a particular day but sign in and out when they work. The big advantage of this year's course is the involvement of all (staff, technical staff, demonstrators and students) in the choice, the experimental work and the feedback. Feedback seemed to be prompt and helpful. I should have preferred to see more feedback by staff face-to-face with the students. It could be a problem that staff who demonstrate in year 3 do not necessarily mark the work.

Hardware

The labs are of course superbly equipped. The students are aware that this is so and several praised the design and equipment and clearly understood that this was not usual in British Universities. Things that stand out are the modern style of the exceptionally well designed furniture, adequate provision of diamond IR machines so that useful information can be got quickly even in the first year, and enough fume cupboards for all.

Outreach

I was in the lab with a group of KS4 (14-16 year old) schoolchildren who were isolating caffeine from tea. They were obviously enjoying the experience and were quite excited by the adventure of working in a 'real lab'. I spent a morning with Tim Harrison hearing about the outreach programme. The full scope of this programme was the most surprising revelation of my week in Bristol. Everything they do is over-subscribed. More details are available on CheMneT and the ChemLabs web site.

Outreach in Schools. An A-level version of the DLM is used for visits to schools and is sold to schools for their own use. Some 30,000 school children each year benefit either from a school visit or from a visit to Bristol. The main area is SW England but other areas are increasingly being involved. The Jersey science festival involved 6,000 children on the island during a week's visit with graduate students doing the teaching. In the last year visits have been made to schools in a Paris slum and a South African township as well as Calcutta, Singapore, Brunei and the island of Malta where 90% of the A-level students were involved in 5 days. These activities have led to a roughly 50% increase in pupils taking chemistry A-level in schools affected as well as a similar increase in applicants to read chemistry at Bristol.

The other side to the impact on schools is the impact on Ph.D. students who may find their vocation in teaching. In addition to visits, there are graduate students linked to national training schemes and working in schools. Some 240 such students have gone into teaching on the Science and Engineering Ambassadors (SEAs) Programme in the three years this scheme has been running.

Teacher Training: Science up-date courses take place in Bristol in the vacations. The teachers are not trained in 'how to teach' - they don't want that - but in new developments in the science subjects they teach. An example is the spectroscopy courses run at Bristol for 50 teachers at a time. Course materials are prepared at Bristol for use in schools or for training teachers.

Outreach in Other Universities. This has already started but the main impact will come from the imminent free release of DLM for all chemistry departments in Britain.

The Future

Possible problems when the CETL money runs out (April 2010):

Keeping enthusiasm among staff, technical staff and demonstrators when all is not new.

Essential that the academic staff continue to interact directly with the students.

Important that the course continues to evolve.

Maintaining the level of equipment: there is some hope that the pharmaceutical industry will help to fund the purchase of new equipment and provision for this is built into the plan.

It is very encouraging that the students at all levels this year are full of enthusiasm even though they never saw the 'old' system.

Stuart Warren, Cambridge, November 2008.

Appendix 4

Finance

| Bristol ChemLabS | | Year | | | | | | | | | |
|--|------------------------|---------------------------|--------------|---------------------------|--------------|--------------------------|--------------|---------------------------|--------------|--------------------------|--------------|
| | | 1 | | 2 | | 3 | | 4 | | 5 | |
| | | 01/04/05 - 31/3/06 | | 01/04/06 - 31/3/07 | | 01/04/07- 31/3/08 | | 01/04/08 - 31/3/09 | | 01/04/09- 31/3/10 | |
| | | Budget | Spend | Budget | Spend | Budget | Spend | Budget | Spend | Budget | Spend |
| Staff | | | | | | | | | | | |
| University Teacher Fellow Research Support | Song | 30,000 | 8,638 | 30,000 | 33,240 | 0 | 36,759 | 0 | 10,869 | 0 | |
| School Teacher Fellow Manager | Harrison | 30,000 | 28,399 | 30,000 | 50,470 | 54,500 | 54,982 | 59,706 | 59,706 | 64,140 | |
| Secretary | Smith | 48,000 | 31,619 | 50,500 | 51,716 | 53,130 | 54,538 | 26,898 | 26,898 | 12,200 | |
| Chief Executive Honorarium | Braun | 24,494 | 14,243 | 24,241 | 23,567 | 24,957 | 25,498 | 27,903 | 28,100 | 30,216 | |
| Chief Executive Research Support | Honorarium | 3,000 | 2,796 | 3,105 | 3,942 | 3,214 | 4,108 | 3,326 | 4,558 | 3,443 | |
| Chief Executive Research Support Consumables | Bramham/Mansell | 13,725 | 10,991 | 24,950 | 25,259 | 28,137 | 29,110 | 35,483 | 2,772 | 24,948 | |
| Director Honorarium | Wyatt | 2,000 | 1,902 | 2,070 | 2,129 | 2,142 | 2,295 | 2,217 | 2,529 | 2,295 | |
| Director Research Support | Sharpe | 14,056 | 11,467 | 31,000 | 30,938 | 31,800 | 34,360 | 20,186 | 20,186 | 0 | |
| Director Research Support Consumables | | 2,500 | | 2,500 | | 2,500 | | 1,458 | | 0 | |
| Outreach Director Honorarium | | | | | | | | 2,127 | 2,127 | 2,295 | |
| Outreach Director Research Support | Martin | | | | | | | 0 | 11,112 | 22,488 | |
| Teaching Laboratory Manager | Podesta | 31,200 | 18,839 | 34,100 | 34,710 | 35,791 | 37,261 | 23,908 | 23,908 | 10,044 | |
| Academic Auditor | | 0 | 46 | 1,000 | 0 | 13,000 | 2,773 | 13,000 | | 13,000 | |
| MSc Studentship | Fees and Stipend | | | | | | | 21,200 | 4,170 | 12,510 | |
| MSc Studentship | Consumables and Travel | | | | | | | 600 | | 1,800 | |

Non Staff

| | | | | | | | | | | | |
|------------------------------------|--|---------|---------|---------|---------|---------|---------|---------|---------|--------|--|
| IT development and maintenance | | 119,151 | 119,151 | 156,000 | 140,677 | 255,000 | 252,035 | 143,000 | 139,901 | 0 | |
| IT Infrastructure / misc costs | | 6,130 | 6,130 | 0 | 474 | 0 | 2,357 | 15,000 | | 15,000 | |
| Office/Administration costs (CETL) | | 20,292 | 18,547 | 5,191 | 7,406 | 5,347 | 4,244 | 5,507 | | 5,727 | |
| Outreach | | 25,075 | 24,939 | 30,000 | 35,812 | 30,000 | 36,484 | 30,000 | | 3,000 | |
| Travel/Entertainment | | 0 | 0 | 5,000 | 1,577 | 5,000 | 3,670 | 5,000 | | 5,000 | |
| Audit (Finance Office) | | 2,000 | 2,000 | 2,000 | 2,000 | 2,000 | 2,000 | 2,000 | | 2,000 | |
| Dissemination/Publicity | | 6,551 | 6,527 | 15,000 | 4,054 | 15,000 | 9,335 | 15,000 | | 15,000 | |
| Evaluation | | | | | | | | | | | |

Transfers

| | | | | | | | | | | | |
|-----------------------------|------|--------|--------|--------|--------|--------|--------|--------|--|--------|--|
| Teaching Laboratory Manager | Obey | 9,100 | 9,387 | 9,620 | 9,697 | 9,963 | 9,963 | 10,425 | | 10,789 | |
| Technical staff | | 36,000 | 36,000 | 46,313 | 46,313 | 47,702 | 47,702 | 49,133 | | 50,853 | |
| Laboratory Running Costs | | 15,900 | 15,900 | 15,000 | 15,000 | 20,000 | 20,000 | 26,447 | | 27,373 | |
| Office/Administration Costs | | 5,249 | 5,249 | 3,461 | 3,461 | 3,565 | 3,565 | 3,672 | | 3,801 | |
| Indirect cost | | 97,000 | 97,000 | 0 | 0 | 0 | 0 | 0 | | 0 | |

Contingency

| | | | | | | | | | | | |
|-------------------|--|---------|---------|---------|---------|---------|----------|---------|----------|---------|----------|
| | | | | | | | | | | 0 | |
| Year Budget/Spend | | 541,423 | 469,770 | 521,051 | 522,442 | 642,748 | 673,039 | 543,196 | | 337,921 | |
| Income | | | 500,000 | | 500,000 | | 500,000 | | 500,000 | | 500,000 |
| CF | | | 0 | | 30,230 | | 7,788 | | -165,250 | | -172,341 |
| Running Balance | | | 30,230 | | 7,788 | | -165,250 | | -172,341 | | -10,262 |



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