

PERIODIC REVIEW OF CHEMISTRY

Reviewing programmes delivered by the Department of Chemistry in the School of Chemistry, Food and Pharmacy

INTRODUCTION

1. An internal review of programmes in Chemistry was held on 12 and 13 December 2019. The members of the Panel were:
 - Professor Amanda Callaghan, Professor of Invertebrate Zoology: School of Biological Sciences (*Chair*)
 - Dr David Chappell, Enhanced Oil Recovery Chemist: BP (*external member, industry*)
 - Dr Lorraine Gibson, Senior Teaching Fellow: University of Strathclyde (*external member, subject specialist*)
 - Dr Katherine Haxton, Senior Lecturer in Chemistry: Keele University (*external member, subject specialist*)
 - Dr David Marshall, Departmental Director of Teaching and Learning: School of Politics, Economics and International Relations (*internal member*)
 - Dr Karen Poulter, School Director of Teaching and Learning: School of Mathematical, Physical and Computational Sciences (*internal member*)
 - Alex Hayward, BA Business and Management, Henley Business School (*student member*)
 - Richard Sandford, Senior Quality Support Officer: Centre for Quality Support and Development (*Secretary*)
2. The Panel met the following:
 - Dr John McKendrick (Head of Department)
 - Dr David Nutt (Director of Teaching and Learning)
 - Dan Grant (School Director of Teaching and Learning)
 - Dr Geoff Brown (Department Director of Academic Tutoring)
 - Dr Fred Davis (Examinations Officer)
 - Professor Ann Chippindale (Department Director of Outreach)
 - Dr Joanne Elliott (Employability Officer)
 - Dr Jenny Eyley (Undergraduate Admissions Tutor)
 - Dr Peiyi Li (International Support Tutor)
 - Dr Chris Smith (Erasmus and Study Abroad Co-ordinator and Industrial Placements Officer)
 - Dr Paz Vaqueiro (Director of Postgraduate Studies, Postgraduate Admissions)
 - Dr Roger Bennett (Part 3 Year Tutor)
 - Professor Rainer Cramer (Head of Mass Spectrometry and Proteomics)
 - Dr Elizabeth Munday (Teaching Fellow in Organic Chemistry)
 - Dr Andrew Russell (Lecturer in Organic Chemistry)

Periodic Review of Chemistry – Professor Amanda Callaghan and Richard Sandford

- Rhian Walker (Programme Manager)
 - Charlotte Rowland (Senior Programme Administrator)
 - Joan Sutherland (Programme Administrator)
 - Professor David Thornthwaite (Chair of the Industrial Advisory Board)
3. The Panel met students who represented the following degree programmes (including students from the Nanjing University of Science and Technology (NUIST) studying on the BSc Applied Chemistry as part of the NUIST-Reading Academy agreement):
 - BSc Applied Chemistry
 - BSc Chemistry
 - MChem Chemistry
 - MChem Chemistry with a Year in Industry/Research
 - BSc Applied Chemistry
 - MSc Chemical Research
 4. The Panel met recent graduates from the BSc Chemistry, MChem Chemistry, MChem Chemistry with a Year in Industry and MSc Chemical Research.

GENERAL OBSERVATIONS

5. The Review Panel met with a range of staff from across the Department, and senior leadership from the Department. The Panel found the resources provided invaluable in their review of the Department's activities. The Panel welcomed the opportunity to tour the extensive facilities which were available to all students. The Panel extends its thanks to the Department for its hospitality.
6. The Panel was pleased to meet and question current undergraduate and postgraduate taught students. They found the students to be passionate advocates of the Department. The Panel wishes to express its thanks to these students, and to the students who contributed to the Student Submission, for their valuable input into the Review.
7. The Panel met with recent alumni and found them to be both a credit to, and enthusiastic advocates of, the Department. The Panel wish to thank them for their valuable input. The Panel also met with the Chair of the Industrial Advisory Board (IAB), who explained the Board's work and outlined the role it plays in supporting the study of Chemistry at Reading. The Panel was grateful for the insights provided during their discussions with alumni and the Chair of the IAB and thanks them for their generous engagement with the process.

Committee structures

8. Overall, the Panel was satisfied that the committee structures in place were appropriate and effective for the quality management and enhancement of the programmes.
9. The Panel noted that, although the Department had previously benefitted from a Department Teaching and Learning Committee, which provided an informal forum for staff to discuss matters relating to teaching and learning, this committee had disbanded. This is unfortunate since the committee supplemented the work undertaken by the Departmental Teaching Section groups, which provide a forum for staff in particular sub-disciplines (Organic Chemistry, Inorganic Chemistry etc) to discuss key issues and themes and share best practice. The Panel felt that the removal of the Teaching and Learning Committee was disappointing, especially as this means that the Department no longer has a platform to share knowledge and expertise across sub-disciplines, focus on strategic teaching and learning priorities and in the Panel's view this has led to a concomitant diminution of the Teaching and Learning culture compared with the previous Periodic Review.

10. There is evidence of excellent practice in the setting up of the Industrial Advisory Board and their focus on curriculum design, graduate and professional skills required by employers and efforts to try to maintain and build on links with industry.

Programme design

11. Overall, the Panel found the programmes to be coherent and the core topics within the curricula to be of notable breadth and scope. The programmes follow the traditional streams of chemistry (inorganic, organic, physical etc). Section meetings are held on a regular basis to facilitate the dissemination of course information and updates between staff on changes within the Section **[good practice a]**. Analytical chemistry is taught by staff from across the streams and laboratory practical sessions are also used to deliver key analytical skills and concepts.
12. The Panel noted that the Department considers its programmes to align well with academic principles described in the Curriculum Framework, however, the programme aims and learning outcomes have not yet been formally reviewed using the Curriculum Framework, although the process had begun. Nevertheless, they are aligned with the QAA Subject Benchmark Statement for Chemistry and accreditation from the Royal Society of Chemistry.
13. The Panel noted that professional accreditation had been attained for the appropriate programmes and that adjustments to the programme design had been made in response to feedback received during that process. Such changes included increasing attendance in laboratory sessions to meet the Royal Society of Chemistry's requirement for 300 and 400 hours for the BSc and MChem programmes respectively.
14. The Panel found that programme aims are outlined in Programme Handbooks, but that the learning outcomes are not clearly signposted to students (as evidenced in reviewing documentation and conversations with students). Whilst some of the module descriptions contain details of learning outcomes, this was found to be variable in presentation and detail. The Panel recommends that students and staff are engaged in the ongoing review of Learning Outcomes and Assessment Criteria to ensure that they are constructively aligned and communicated clearly to students **[advisable recommendation c]**.
15. The Panel considered programme design in the context of the ongoing review of learning outcomes and assessment criteria, feedback and assessment methods. The Panel felt that the Chemical Concepts and Skills modules were useful to students, but students did not fully understand the aims and goals of these modules (see also 36 and 71 below). The Panel felt that a curriculum map would be beneficial for the students in order to help them to understand how the programmes deliver in terms of technical skills and broader competencies and how the modules fit together **[advisable recommendation d]** (see also 40 below).
16. The Panel expressed some concerns about the method of module changes whereby small changes are discussed in informal Departmental teaching group meetings. The dissolution of the Department Teaching and Learning Committee in 2016 means that such changes do not receive wider consideration. With anticipated changes precipitated by the findings of the Curriculum Review, the Panel recommends that a formal group is convened to consider and implement changes (see also 76 below).
17. The portfolio of undergraduate and postgraduate programmes is currently being revised with a loss of several programmes and introduction of new programmes, including BSc Pharmaceutical Chemistry, recommended by the 2016 Chemistry Project. The Panel noted that the review was taking place at a time when the course offerings were in a state of flux (with the introduction of new programmes and teaching out of others) and further changes expected to result from the Curriculum Review. The Panel felt that the recent changes lacked a sense of strategic direction and that it would be prudent to create a Programme Development Group to implement the

outcomes from the Curriculum Review and develop a strategic vision relating to Teaching and Learning **[advisable recommendation e]** (see also 76 below).

18. The Panel noted that the MSc Chemical Research programme includes the requirements for participants to undertake a series of training activities under the Postgraduate Chemistry Research Methods and Skills module (CHMRMS). As well as in-house training sessions, the module relies upon sessions delivered by the Graduate School. Students reported that they had encountered difficulties in enrolling on the sessions run by the Graduate School, with priority being given to PhD researchers. The Panel recommends that the Graduate School works with the Chemistry Department to find ways to give greater priority to the MSc Chemical Research students thereby improving access to places on the Reading Research Development Programme **[advisable recommendation r (University)]**.
19. The Panel commends the extent to which programmes afford opportunities for students to learn about current research in their disciplines. Many of the departmental staff are internationally renowned in their research field, which informs lecture content and practical sessions.

Assessment and feedback

20. The Panel noted that External Examiners' Reports verified that the standards achieved by learners met the expectations for the awards, as measured against the relevant Subject Benchmark Statement and the Framework for Higher Education Qualifications. The Panel noted that the School reflects on the feedback received from External Examiners. The Department's undergraduate programmes are accredited by the Royal Society of Chemistry (RSC) (see also 12 above).
21. The Panel saw and heard evidence that External Examiners were adjusting student classifications, and in one case a mark, based on extenuating circumstances being reported by staff in the Programme Examiners' Meeting. This is not consistent with the University's current policy on Extenuating Circumstances, which no longer allows such practice to happen. To ensure that all students are being treated equitably, the Department must comply with the University policy on Extenuating Circumstances **[necessary recommendation a]**.
22. The Panel was pleased to note that there is formative as well as summative assessment. The Panel commends the Department on its splitting of one laboratory assignment into two components for 2019/20, in order to allow students to reflect on the feedback they received for the first component and in the laboratory classes when they resubmit for the second component. The Panel also noted the wide variety of assessment types used, although the students that the Panel spoke with felt that the programme was very exam-focused.
23. The Panel noted the Department's frustration with their NSS scores for marking criteria but thought that there was more that the Department could do to engage students with understanding their assessment criteria. The Panel encourages the Department to continue with its recently introduced task of engaging students in peer review of formative coursework using the assessment criteria ahead of a summative submission (see also 31 below).
24. The Panel reviewed samples of student work and noted that, in some cases, the standard and variety of types of feedback was excellent. The Panel found that the English Language for Chemists module (CH3ENG), which was designed to support students from NUIST, was exemplary in terms of feedback provided and in the clarity of marking criteria provided to students **[good practice b]**.
25. The Panel also found examples of poor feedback (e.g. few comments written, comments not explicitly aligned to assessment criteria nor sufficiently justifying the mark given) and found these concerns echoed by students. The Panel concluded that the quality of feedback across modules

was variable and there is need to develop, as part of the Curriculum Review process, some guidance on the provision of good feedback, and to monitor the quality of feedback provided to students **[advisable recommendation f]**.

26. The Panel noted that only brief feedback was given on final year projects and felt that more structured feedback would be appropriate. Given that assessment is for learning, students should have some opportunity to learn from project feedback. This is particularly true if students plan to continue their studies.
27. The Panel reviewed the Department's NSS results. The most recent NSS scores indicated that there was still work to be done in respect to the promptness and quality of feedback, particularly in its timeliness (with a score of 57.1% on the timeliness of feedback (NSS Q10)). Indeed, The Panel noted that the Department's NSS results for the timeliness of feedback (Q10) have been lower than the University figure for the past three years. The Department also scored poorly on the clarity of marking criteria (60.7% for NSS Q8) and the helpfulness of comments received (67.86% for NSS Q11).
28. The Panel also considered the University data on 15-day turnaround for marked coursework and noted that only 67% of work was returned on time. Both students and staff informed the Panel that there had been delays in returning marked laboratory reports. Although these assessments were officially exempted from the requirement to return feedback within 15 days, there were instances where feedback was returned up to four months after the work was handed in.
29. The Panel was pleased to note that the Department was taking a number of steps to address the late return of feedback on laboratory reports. The Department has developed its own policy for the timely return of feedback on pieces of work officially exempted from the 15-day requirements. Under their local policy, staff will have to return such work within 25 working days. The Panel recommends that the Department monitors compliance and follows-up on instances of non-compliance with this new requirement **[advisable recommendation g]**.
30. The Panel was informed that a small proportion staff had undertaken work to replace some laboratory reports with other assessment modes. These alternative assessment modes were designed to help students develop their employability skills, and they had received positive feedback from students **[good practice c]**.
31. However, this good practice was not widespread and laboratory reports remain a popular form of assessment amongst staff. The Panel recommends that the Department considers expanding the use of alternative assessment modes that could replace some laboratory reports. This would help facilitate the swift return of feedback and also support the development of additional skills for the students **[advisable recommendation h]**.

QUALITY OF LEARNING OPPORTUNITIES OFFERED BY THE PROGRAMMES

Teaching and learning

32. The Panel saw and heard evidence that Peer Review is carried out amongst some staff, but that engagement in this activity is low across the Department. The Department currently does not have a clear mechanism for sharing good practice identified as part of the Peer Review process, or more generally. There are multiple demands on staff time and some staff do not prioritise teaching and learning enhancement activities. The Panel concluded that it would be beneficial for the Department to take steps to raise the importance of Teaching and Learning and to support staff, including (but not limited to) ensuring that staff engage in the peer review process,

developing ways to share good practice, finding ways to explicitly discuss teaching and learning development goals in PDRs and the re-introduction of a formal committee to review teaching and learning in the Department **[advisable recommendation i]** (see also 9 above and 77-80 below).

33. The Panel also felt that for these enhancements to take root and grow, Teaching and learning would need to be adequately supported and championed by Department and School management **[advisable recommendation j]**.
34. The Panel was pleased to note the practice of allocating new staff a mentor, and the availability of a mentor for all staff on request.
35. The Panel commends the fact that the undergraduate final year Research Projects continue to provide students with the experience of being involved in research that reflects their future career opportunities and enhances their learning experiences. The Panel was pleased to note that students have the opportunity to contribute to the Open Source Malaria Project in a final year group project in organic chemistry.
36. The Panel saw evidence that, as well as traditional lectures, students engage in laboratory work and in the development of transferable skills. Students reported that the laboratory sessions were well designed, and that they enjoyed having a whole day in the laboratory. With regard to the Chemical Concepts & Skills modules, they recognised that it was helpful to develop skills, but they would benefit from the development of a range of different transferable skills rather than focusing on one activity. Alternatively, the students asked if the skills developed could be embedded across the programme instead, and the module be replaced with a further option (see also 71 below).
37. The Panel identified individuals engaged in excellent teaching and learning practices within the Department, with good NSS scores in this area (achieving 81.4% satisfaction on the NSS section on Teaching on my course). Students reported that they participated in positive learning experiences and valued the quality of teaching provided by staff, and that the teaching was informed by the research interests of staff. The students that the Panel met reported some variability in teaching quality but confirmed that there were some pockets of excellence **[good practice d]**.
38. Students reported that some staff formatted their slides well, and some staff provide excellent reading lists. There is some inconsistency with lecturing material though, particularly if someone is teaching a course for the first time and the previous person has left.
39. The students were keen for lecture capture to be in place across the board. They highlighted their positive experience of the Physical Chemistry module which is run as flipped learning. The students thought it was good to have podcasts and interactive workshops, highlighting YouTube and podcasts as well as flipped learning. The Panel also noted from the documentation the many other examples of the use of technology in teaching and learning by the Department, such as card readers and randomly generated questions in Blackboard tests **[good practice e]**.
40. The Panel could not see evidence of how the Department took steps to align its teaching and learning, and specifically its assessment, with the learning outcomes of the programmes. Curriculum Framework activities are ongoing, and the Panel recognises that implementing the outcomes of the work completed so far is likely to address this issue. Specifically, the Panel recommends that the Department produces a map of assessment modes, developed professional skills and graduate attributes to ensure that they align with the desired programme and graduate outcomes. **[advisable recommendation d]** (see also 15 above).
41. The Panel commends the Department on its support for students arriving from NUIST on the BSc Applied Chemistry programme, specifically the English Language and Health & Safety & Professional Skills modules, and a pre-sessional laboratory course (see also 24 above).

Student admission, retention, progression and attainment

42. The Panel confirmed that there are appropriate and effective arrangements for admission in accordance with the University's Admissions Policy as well as induction into higher education during Welcome Week, which gives students an introduction to teaching and learning at the University.
43. The Panel noted issues relating to the specialised requirements for recruitment to the MSc Chemical Research (including the need for applicants to submit a research proposal). The PGT Programme Director faced challenges in performing the function of PGT Admissions. Previously, the processing of applications had been undertaken by a dedicated Administrative member of staff and that post-PAS they had been re-allocated to the Graduate School. During a grace period, they had continued to provide administrative support, but this had since ended. The Panel felt that the University and Department should review admissions procedures for the MSc Chemical Research **[advisable recommendation s (University)]**.
44. The Panel noted that, over the past three years, overall undergraduate enrolment to the programmes has fallen. At the same time, there has been a large drop in applications. Although the percentage of Conditional Firm offers has increased from 17% in 2014/15 to 23% in 2018/19, the percentage of student enrolments has remained static. The Department feels that this fall in applications and failure to convert is, in part, due to changes in the admissions process which has seen activities centralised. The Panel felt that a lack of strategic vision for outreach and recruitment activities might also have an impact on recruitment. As such, the Department should engage proactively with the Admissions and Marketing teams in order to find ways to address the issues around conversion and find ways to ensure that recruitment and outreach activities align with a clearly articulated strategic vision for their programmes and also with University initiatives **[desirable recommendation l]**.
45. The Panel identified poor recruitment to the Postgraduate Diploma in Chemical Research, with only five applicants between 2015/16 and 2018/19 and no subsequent enrolments. The Department noted that they regarded the programme as an exit award for students unable to complete MSc Chemical Research and had assumed that they had to also have it open for applicants. The Panel recommends that the Department considers the future of the award, and specifically whether the programme should be retained as an exit-only award and removed from promotion for direct-entry **[desirable recommendation m]**.
46. The Panel heard positive reports from students about how their experiences of Open and Visit days played a significant part in their decision to study at Reading. The students mentioned the inclusion of careers information (see also 70 below), clear communications about the support (including maths tuition) they will receive depending on their personal context and particularly the personal touch provided by staff and students, which all contributed to a positive experience for prospective students **[good practice f]**.
47. The Panel noted that the proportion of finalists achieving 1st class degrees in the 2016/7 academic session was significantly above the University's but comparable to the sector (the Department achieved 34% versus the University's average of 26% and 35% across the sector). This was despite a similar progression rate of 75% between years two and three. This raised questions amongst the Panel and External Examiners relating to marking in the final year and particularly student research projects, which comprise a high proportion of the Part 3 mark. One of the External Examiners felt that "the overall distribution of classifications across the programmes looks top-heavy and is at the upper end of what you would normally hope for".
48. External Examiners suggested that the marking scheme for the research project suffered from very high marks provided by supervisors. The Panel would therefore encourage the Department

to revisit the marking scheme and adjust weightings accordingly and/or provide better training for academic staff (see also 61 below).

49. Recruitment onto the Science Foundation Year had been strong but translated into low progression into the degree. The pass rate (40%) of Foundation students is below the University average and student evaluations are not strong, suggesting that students found modules to be difficult or uninteresting (module evaluation scores for CH0CHE were poor regarding ability of staff in explaining things and making the subject interesting). Part 1-2 transition for Science Foundation students was significantly below the norm. The Panel was pleased to note that the School will be monitoring student performance closely through the Academic Tutor system.
50. The Panel was satisfied that student progression was appropriate to the stated aims of the programmes and consistent with the attainment of intended learning outcomes. The Panel found no issues with BAME student progression.
51. The Panel noted the positive outcomes for students on the NUIST programmes and the fact that many of these students stay on in the UK, and at Reading, to undertake postgraduate qualifications. The Panel agreed that the programmes had been carefully designed, and that the design and support for the NUIST students (both integrated into programme design and separate from it) had led to positive outcomes for many graduates from the programme **[good practice g]** (see also 24 and 41 above).
52. The Panel felt that the large numbers of undergraduate students choosing to pursue postgraduate qualifications in the Department was a testament to the strong sense of community that staff had fostered **[good practice h]**.

Learning environment and student support

53. The Panel was satisfied that the Department has the appropriate staff expertise and physical resources required to support effective teaching and delivery of the programmes. The Panel found that NSS results indicated that students agreed that staff were good at explaining things (NSS Q1 scoring 87.5%) and were available to students (NSS Q12 scoring 91.1%).
54. The Panel was satisfied that students were happy with course-specific resources, with a score of 94.6% for NSS Q20, despite issues with an ageing building.
55. The generally tired state of the building and teaching laboratories was highlighted by the 2014 Periodic Review and the Panel was pleased to note that the teaching laboratories have benefitted from significant refurbishment in the intervening years. However, the Panel noted that the Department is unable to compete with the level of investments in state-of-the-art chemistry teaching facilities that have taken place at other institutions. In speaking with the students, it was apparent to the Panel that they are happy with facilities, although this was not one of the reasons they chose to study Chemistry at Reading.
56. The Panel felt that the refurbishment of the laboratories was a significant and important development. The physical environment is being further enhanced through the provision of, and planned refurbishment of, a student room, which should form a valuable asset to the Department. Communal spaces have already benefitted from refurbishment, with attractive murals provided by students in Typography **[good practice i]**.
57. The Panel found that the Department fosters a strong sense of community between staff and students as indicated by the NSS scores and the high number of students who move to further study within the Department. The Panel felt that the academic support system works well with evidence of strong mentoring of students by staff **[good practice j]**.
58. The Panel noted that staff are generally available to their students, in part because of the large amount of laboratory work involved in the programmes. This availability extends throughout the

student journey, with staff providing positive encouragement and support throughout the applications process (including open and visit days (see also 46 above)) and beyond graduation **[good practice k]**.

59. Indeed, the Panel was impressed with the level of contact with supervisors as experienced by students on the MSc Chemical Research. The Panel heard that these students benefitted from a truly 'open door' policy and met regularly with their supervisors (often on a daily basis) **[good practice l]**.
60. The Panel was pleased to note that, through final year projects, the Department allows students to have direct experience of modern, research grade, analytical instrumentation as appropriate to their projects. This is a valuable experience for the students and should be continued.
61. The Panel found some inconsistency in the support for students undertaking research projects. Support for such students, at both undergraduate and postgraduate level, should be consistent and with guidance, providing suitable clarity on the roles of supervisors, students, and other members of the laboratories in which the students may work. The Panel felt that staff who do not have the benefit of research groups, but nonetheless supervise MSc Chemical Research students, should have adequate support in supervising their students. Meetings between students and supervisors should be documented in a formal manner and clear mechanisms for reporting any areas of concern to the Module Convenor (or Programme Director) should be developed **[desirable recommendation n]**.
62. The Panel noted that attainment in Part 2 is used to determine the type of final year research project (individual or team) that can be undertaken by students on some programmes. The threshold (either a level to aspire to, or whether there is a fixed number of individual projects) should be made clear to students early in Part 2 so that they fully understand the academic requirements. This includes the students coming in through the NUIST route. The individual projects are seen as prestigious by students and are available to all MChem and BSc students with higher grades, generally those more likely to pursue higher degrees or research careers. Project supervision appears to be split between teaching-focused staff (more likely to supervise group projects) and research-focused staff (more likely to supervise MChem projects and BSc individual projects). The Panel advises that care should be taken to ensure an equitable split of supervisory activities whilst retaining adequate student choice.

Employability

63. The Panel was particularly impressed with the setting up of the Chemistry Department's Industrial Advisory Board (IAB) since the last Periodic Review, as it demonstrates a concerted effort to make the Department activities, including its programmes, as relevant as possible. The Panel noted that modifications to the curricula have already been made based on recommendations from the IAB, such as the inclusion of materials on Intellectual Property and Computational Chemistry. Furthermore, such close and regular engagement with industry will likely generate future benefits of research project funding (supporting PGT projects), placements, summer projects and/or internship opportunities, and general improvement of the employment prospects for students. The IAB has already been instrumental in helping identify placement opportunities at Unilever, BP Castrol and CEMAS. The Panel felt that the IAB had played in key role in supporting curriculum design, in helping identify the skills required by employers and in building meaningful links with industrial partners **[good practice m]**.
64. The Panel commends the engagement exhibited by current members of the IAB and suggests that the Department considers how it might widen the membership. The Panel felt that it would be beneficial to investigate broader participation from areas of industry not yet represented and to extend membership to include student representatives and careers champions. It was felt

that this would help broaden focus and help to offset any potential departures (through retirement or other commitments) from the IAB **[desirable recommendation o]**.

65. The Panel noted that the "... with a Year in Industry/Research" versions of the degrees recruited strongly in 2014 (with 36% of straight Chemistry students taking this option), but that this has steadily fallen and in 2018/19 represented less than 10% of the BSc Chemistry cohort. The Panel expressed concern with this trend, given that attainment data shows that placements are closely linked to high attainment. Whilst the uptake of the "...with a Year in Industry/Research" versions of the MChem Chemistry was at 45% last year there were only seven MChem Chemistry students in total (across all versions). The Panel encourages the Department to monitor this trend and consider how marketing of the "...with a Year in Industry/Research" versions might inform their strategic vision for their offering (see also 44 above).
66. The Department demonstrates strong support for students undertaking placements, as evidenced by the high level of available materials and feedback from students on the engagement offered to them. Students on the '...with a Year in Industry/Research' version reported that they felt well supported whilst on their placement, largely because of the design of the module which facilitated distance learning and the availability of staff to answer queries **[good practice n]**.
67. The Panel felt that the already strong employability offer for undergraduate students could be further enhanced during the final year. Students could refresh their interview skills, and help could be provided to grow their awareness and preparedness for securing their desired employment. In order to further this aim, the Department could engage targeted support from the Careers Services, alumni panels, externally led lectures (industry, public bodies and academia) and leverage links via the IAB.
68. The Panel noted that dedicated careers support is available to students, both within the Department and through the Careers Centre. This is supplemented by various initiatives (1-2-1 CV and interview support, Titan project, RED, THRIVE, RIS, UROP), although it is evident that uptake of the various offerings is limited, with only 2-6% of the year groups attending sessions. The Panel was informed that efforts were being made to increase student awareness of careers support by reviewing the careers information on Blackboard sites and embedding career development/experience within existing modules. The careers fairs are better attended; however, the students voiced some dissatisfaction with the lack of representation from employers in the chemical industries at the main campus Careers Fairs.
69. The Department is encouraged to work with the Careers Service to investigate how to improve the employability offering for all students. Stronger links with the Careers Services could be fostered by extending a standing invitation to the Programme Boards or proposed Programme Development Group. The Department should also network with other Schools and Departments to discover how they support the employability of their postgraduate students. This inclusive approach should help ensure that the careers and employability offering is maintained and enhanced **[desirable recommendation p]**.
70. The Panel felt that, from the outset of their studies, students gain invaluable transferable skills. Indeed, the importance of careers and employability is evident at Open and Visit days where the Chair of the IAB is often in attendance in order to highlight the potential skills gained and career paths that can be undertaken.
71. The Panel found that the MChem Industrial Lecture module, and elements of the Chemical Concepts and Skills modules in the first and second years, represented good and innovative practice. Modules such as these are invaluable in promoting independent learning, problem solving, team working, delegation and presentation skills. The use of real-world, scenario-based questions that incorporate applied chemistry is now commonplace in interviews. In speaking with students, the Panel found that they recognised the potential value of the modules. However,

some students expressed a concern that the modules might need a general refresh to ensure that content was relevant and up to date. The Panel felt that the value and relevance of the skills being inculcated could be made clearer to the students **[desirable recommendation q]**.

72. The Panel felt that the Department provides very good opportunities for industrial employer interaction with students through the modules in the MChem Chemistry programme that are delivered by visiting lecturers from industry, national facilities or other universities. The Panel agreed that this exposure to materials designed and delivered by professionals is to be commended **[good practice o]**.
73. Experience of working in industry, whether it be a summer placement, as part of a taught programme or an internship, can significantly enhance a student's employability. The Panel found evidence of numerous, strong industrial connections throughout the Chemistry Department, particularly with companies in the local area, where a number of students have secured placements and employment. This is a credit to the Department. Students that had had a year in industry told the Review Panel that they felt well supported whilst securing and undertaking their placements.

ENHANCEMENT OF QUALITY AND ACADEMIC PROVISION

74. The Panel was pleased to note that many staff in the Department have a teaching qualification. The Department has two Principal Fellow of the Higher Education Academy (HEA), two Senior Fellows of the HEA and eight other members of staff holding some form of recognised teaching qualification. A further 10 members of staff are currently without formally recognised teaching qualifications, although the Panel noted that some of these are in the process of applying for recognition.
75. The Panel noted that the Department had not submitted Annual Quality Assurance Review reports (or Annual Programme Reports) for the MSc Chemical Research. The Department must adhere to the relevant Quality Assurance processes to ensure that they engage in critical reflection on the management and operation of the MSc Chemical Research **[necessary recommendation b]**.
76. The Panel noted that the 2014 Periodic Review highlighted the fact that the Chemistry Education Group provided leadership in teaching and learning in the Department and beyond. The Department also benefitted from a Teaching and Learning Committee which was disbanded in 2016. The Panel felt that the removal of the latter, and the renewed focus of the former on supporting the teaching of Chemistry in the secondary education sector meant that there were limited opportunities for the recognition and sharing of best practice and innovative ideas. This was felt to be particularly problematic as the Department (and School) are currently working on ways to deliver the findings of their Curriculum Review. As such, the Panel felt that it was important that the Department creates a Programme Development Group to oversee the implementation of the outcomes from the Curriculum Review and to develop a strategic vision relating to Teaching and Learning **[advisable recommendation e]** (see also 17 above).
77. Without the Department Teaching and Learning Committee, the Department lacks a fundamental mechanism for recognising and sharing good and innovative practice. As noted elsewhere there are pockets of teaching excellence within the Department, but these are often developed in isolation. The Department needs to find more formal mechanisms to identify and share good practice **[advisable recommendation i(i)]**.
78. In reviewing materials, it was apparent to the Panel that engagement with the University's Peer Review of Teaching processes had been limited to very few members of staff. The Panel heard

that the Department intends to address this issue during the current academic year. The Department needs to embed peer review into its quality management and enhancement processes as a supportive mechanism to enhance practice **[advisable recommendation i(ii)]**.

79. The Panel felt that proper reward and recognition of teaching and learning performance could form part of the Department's PDR appraisal process. The Panel felt that the PDR process could afford opportunities to consider staff teaching and learning performance and engagement which would help in the development of a culture within the Department that recognises the importance of teaching and learning activities **[advisable recommendation i(iii)]**.
80. The Panel felt that the steps outlined above (sections 77-79), alongside the possible reintroduction of a dedicated Teaching and Learning Committee, would help deliver a renewed focus on teaching and learning in the Department and help raise its standing amongst academic staff.
81. The Panel recognised that plans have been developed at a School level to enhance the quality of provision across its Departments. These plans had been developed as part of the initial scoping work for the Curriculum Framework Review and changes are already in progress in some areas as a result of this work. The Panel advises that, as part of the Curriculum Review process, the Department develops guidance on the provision of good feedback and develops mechanisms to monitor the quality of feedback provided to students (see also 25 above).
82. The Panel welcomed the fact that the Department had engaged students in the Curriculum Framework Review work. However, the Panel felt that the level of engagement could have been better, with only two finalists having been involved in the initial consultations. The Panel commends the Department's willingness to involve students in the design of new degree programmes and module reviews **[good practice p]** but would encourage them to explore ways to improve and widen the levels of engagement amongst the student body.
83. The Panel found no evidence that the Department made systematic use of mid-modular evaluations and felt that their employment of module evaluation was anomalous to the rest of the University (in that they had not opted to review all modules every year). The Panel encourages the Department to ensure that some form of informal, light touch, mid-module evaluation is undertaken for all modules on an annual basis, and that end of course evaluation is conducted as a matter of course. This will enable the Department to address and resolve any practical and operational issues in-year and apply minor change that could benefit current cohorts, as well as addressing more systemic issues through more fundamental changes benefitting future cohorts.
84. In addition to ensuring that module evaluations take place on a regular basis, the Department should take steps to ensure that the Module Evaluations and accompanying Module Evaluation Commentaries are routinely considered by the appropriate committees and module teams. The Department should also take steps to communicate the outcomes of such consideration to students (via Student-Staff Liaison Committees and other activities) and the Blackboard section for module feedback **[advisable recommendation k]**.

MAIN CHARACTERISTICS OF THE PROGRAMMES UNDER REVIEW

85. The Department is dedicated to supporting their students and has developed a strong sense of community and shared endeavour between staff and students. The Department is dedicated to delivering positive outcomes for their students, as evidenced by their efforts and initiatives to enhance career development and employability skills embedded within the programmes.

86. The Department offers a rich research-informed curriculum. Students are given an excellent grounding in both practical and theoretical skills. Students are afforded opportunities to engage with research activities and hands-on practical applications, which helps prepare them for employment. The programmes are richly informed by current and cutting-edge research.
87. However, the primacy given to research means that the Department lacks a strong and distinctive Teaching and Learning culture, with limited engagement with University and School-wide initiative to develop teaching and learning practices. This lack of engagement with other Schools and Central Services creates vulnerabilities for the student experience and effectiveness of the School. It also creates an over-reliance on a small number of staff to champion teaching and learning excellence and innovation.
88. The Department exhibits an insufficient engagement with standard University Quality Assurance processes and procedures. As such, activities are not sufficiently monitored (or monitoring is not evidenced), deficiencies cannot be identified, and enhancements cannot be implemented. Conversely, good practice is not celebrated and shared across the institution.
89. The Department's extensive facilities and equipment provide excellent support for students' learning. The Department has recently benefitted from refurbished laboratory facilities and the planned enhancements to student spaces will yield further benefits. All of these facilities are open to students and provide them with first-class learning and research opportunities.

CONCLUSIONS ON INNOVATION AND GOOD PRACTICE

90. The Panel identified the following as representing particularly good practice:
 - a. The use of section meetings to disseminate course information amongst staff. (§11)
 - b. Level of feedback and quality of marking criteria provided for the NUIST English Language module. (§24)
 - c. Work to replace laboratory reports with a variety of assessment methods which help improve employability skills. (§30)
 - d. The pockets of excellent teaching quality. (§37)
 - e. The use of technology in teaching and learning by the Department, including trialling of card readers, Blackboard tests using randomly generated questions, and the use of Youtube, podcasts and flipped learning. (§39)
 - f. The positive experience of prospective students attending Open and Visit days resulting from the personal touch provided by staff and students. (§46)
 - g. The success of the NUIST programme, including the academic attainment of their students and positive destinations. (§51)
 - h. The good sense of community evidenced by the high number of students moving to further study within the Department. (§52)
 - i. The improved laboratory facilities and refurbishment of student spaces. (§56)
 - j. The academic support system works well with evidence of strong mentoring students by staff. (§57)
 - k. The accessibility of staff throughout the student journey. (§58)
 - l. The contact with supervisors as experienced by students on the MSc by Research. (§59)

- m. Setting up of the industrial advisory board and their focus on curriculum design, skills required by employers and efforts to try to maintain and build on links with industry. (§63)
- n. Students on the MChem placement felt well supported and appreciated the structure and design of the module which allowed them to study at distance. (§66)
- o. The industry module that sees professionals deliver materials. (§72)
- p. Student involvement in designing the new degree programme and reviewing modules. (§82)

CONCLUSIONS ON QUALITY AND STANDARDS

91. The Panel has concluded that the quality and standards of the programmes reviewed are appropriate.

CONCLUSIONS ON NEW DEGREE PROGRAMME

92. The Panel received no submissions with regards to new programme proposals.

RECOMMENDATIONS

93. The Panel recommends to the University Programmes Board that the following degree programmes taught by the Department of Chemistry are re-approved to run for a further six years:
- MChem Chemistry
 - MChem Chemistry with a Year in Industry/Research
 - BSc Applied Chemistry
 - BSc Chemistry
 - BSc Chemistry with a Year in Industry/Research
 - BSc Chemistry with Foundation Year
 - BSc Applied Chemistry
 - BSc Pharmaceutical Chemistry
 - BSc Pharmaceutical Chemistry with Foundation Year
 - BSc Pharmaceutical Chemistry with a Year in Industry
 - PGDip Chemical Research
 - MSc Chemical Research
94. The report will categorise any issues as follows, in order of priority:
- Those areas where the Review Team believes it is **necessary** for action to be taken urgently to safeguard the standard of provision;
 - Those areas where it is **advisable** that the issues be addressed as soon as possible.
 - Those areas where it is **desirable** that the issue be addressed over a longer time span.
95. The Panel has made the following recommendations which must be addressed as a condition of re-approval:

The Panel makes the following recommendations to the Department:

Necessary

- a. To properly align external examiner practices with University policy on Extenuating Circumstances. (§21)
- b. To adhere to the relevant QA processes to ensure that the Department reflects critically on the management and operation of the MSc by Research. (§75)

Advisable

- c. Engage students and staff in the ongoing review of Learning Outcomes and Assessment Criteria to ensure that they are constructively aligned and communicated clearly to students. (§14)
- d. Produce a map of assessment modes and skills developed to ensure that they align with the desired programme and graduate outcomes. (§15 & §40)
- e. Create a Programme Development Group to implement outcomes from the Curriculum Review and develop the strategic vision relating to Teaching and Learning. (§17 & §76)
- f. Develop, as part of the Curriculum Review process, some guidance on the provision of good feedback, and monitor the quality of feedback provided to students. (§25)
- g. Monitor compliance and follow-up instances of non-compliance of the new Departmental rule that exempted laboratory reports are returned within 25 working days. (§29)
- h. Consider expanding the use of alternative assessment modes that could replace some laboratory reports in order to facilitate the swift return of feedback and encourage the development of additional skills. (§31)
- i. Work to raise the importance of Teaching and Learning within the Department and to support academic staff by:
 - i. Developing ways to identify and share good practice; (§77)
 - ii. Ensuring staff engage in the Peer Review process; (§78) and
 - iii. Considering ways that the PDR process could consider and recognise teaching and learning performance. (§79)
- j. Ensure that Teaching and Learning is adequately supported and championed by Department and School management. (§33)
- k. Ensure that Module Convenor Commentaries and Module Evaluations are routinely considered by committees and module teams and shared with students. (§84)

Desirable

- l. Ensure that outreach and recruitment activities align with the Department's strategic vision for the programmes and University initiatives and work proactively with the Marketing and Admissions teams. (§44)
- m. To consider the future of the PGDip, given the poor recruitment, and whether it should be an exit-award only. (§45)
- n. Formalise procedures for arranging and documenting MChem Project supervisor meetings and reporting any cases of concern to the Module Convenor. (§61)

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- o. Consider membership of IAB and whether it might be useful to have student representation on the Board and extend the industrial network. (§64)
- p. Foster stronger links with the Careers Service by extending a standing invitation to attend the Programme Board and the proposed Programme Development Group. (§69)
- q. The Chemical Concepts and Skills modules are reviewed, and the value and relevance of the skills being acquired are made clearer to students. (§71)

The Panel makes the following recommendations to the University:

Advisable

- r. Find ways to give greater priority for students on the MSc Chemical Research to access places on the Graduate School's Reading Researcher Development Programme sessions. (§18)
- s. Work with the Department to discuss admissions procedures for the MSc Chemical Research. (§43)