NUI MAYNOOTH

Ollscoil na hÉireann Má Nuad

DEPARTMENT OF CHEMISTRY

QUALITY REVIEW 2001

PEER REVIEW REPORT 2001

Quality Improvement and Quality Assurance

Quality Review

Department of Chemistry, NUI Maynooth

Introduction

The review team consisted of: Dr. W. J. Smyth, President, NUI Maynooth; Dr. D. Redmond, Registrar, NUI Maynooth; Professor K. B. Nolan, Head of the Department of Chemistry and Dean of Research, Royal College of Surgeons in Ireland; Professor D. Cunningham, Department of Chemistry, NUI Galway.

The compilation of this report follows a visit by the review team to the Department of Chemistry (7^{th} – 9^{th} March 2001), during which meetings took place with individual academic and technical staff members, student representatives, and the Head of the Department of Chemistry. Well in advance of the visit, the external assessors were each provided with a copy of the self-assessment report compiled by staff of the Department. This report, which is very comprehensive, follows the format of 'Guidelines for a Quality Review Exercise' drafted by the Quality Promotions Unit, NUIM a copy of which was also made available to the external assessors prior to their visit to the Department. Before the visit, the external assessors had a morning meeting to discuss the report and to agree on a strategy for the visit.

The visit to NUIM followed the following format:

2 An informal meeting with the President and Registrar, during which the terms of reference of the exercise were clarified.

2 Following this, an informal reception attended by all academic and technical staff and research students.

3 An exhaustive tour of the research and teaching facilities of the Chemistry Department conducted by the Head of Department. During this tour informal discussions took place with technical staff and research students on issues which included the preparation and running of practical sessions, safety considerations, availability and state of equipment, views of research students on their projects and on the adequacy of resources.

4 An interview of at least 30 minutes duration with each academic staff member (excluding one who was attending an Enterprise Ireland meeting on the days in question) and with representatives of the technical staff. In these interviews, considerable emphasis was placed on the problems of declining student numbers in chemistry and its impact on the future of the Department.

5 A meeting of 90 minutes duration with a panel of students representing all undergraduate and postgraduate years.

6 An examination of supplementary lecture notes, practical manuals, examination papers and questionnaires, all of which were made available for inspection.
7 Preparation of a preliminary report prior to departure.
8 A final meeting with the President and Registrar to discuss highlights of the findings.

This report will focus on the following areas:

9 Courses; design, content and organisation.
9.3 Communication.
9.4 Support services.
9.5 Research.
2.5 Staff development and External relationships.
9.6 Future of the Department
9.7 Conclusion

2.1 Courses; Design, Content and Organisation

Currently, the Department offers three programs in chemistry leading to three degree options viz. the three year programme leading to the B.Sc. degree (general) and two four year degree programmes leading to the single and double honours degrees in chemistry. The B.Sc. (general) programme is to be discontinued. The Department also offers a three-year programme for biotechnology students.
The course aims and objectives are clearly described in the internal Quality Assessment document. The stated main objective of the first year course which was 'to ensure that students are brought to a good understanding of all the topics on the honours Leaving Certificate course' does not do the Department justice as the course delivered is well beyond the scope and level of detail of the Leaving Certificate. The honours degree courses in Chemistry, as a result of rigorous periodical inspection, are recognised as professional qualifications for membership of The Royal Society of Chemistry, UK, The Institute of Chemistry of Ireland, and The American Chemical Society. The professional titles of Eur. Chem. (European Chemist) and C. Chem. (Chartered Chemist of the Royal Society of Chemistry) are also available to honours graduates.

In the current year the number taking chemistry at all levels is 345 but there has been a sharp and continual decline from the comparable number of 450 in the year 1997 –1998.

The following comments derive from examination of the Quality Assessment report of the Department, observations from the visit to the Department and students' comments.

The course is of a very high standard, a fact borne out by the accreditations and recognitions of the chemistry degrees by learned chemical societies. That this is so is due to the excellence and commitment of the academic and technical staff and to the excellent atmosphere of cooperation existing within the Department.

The course content, while reflecting the strengths of the Department, extends well beyond personal research interests to provide a breath of chemistry which is highly commendable. We suggest however that the course would benefit from some reorganisation. Some examples are:

10 the organic chemistry course seems to be distributed over the years on the basis of families of compounds as they appear in textbooks. As a result, the chemistry of aromatic compounds, even the structure of benzene and the concept of aromaticity, is not dealt with until the third year by which time students majoring in other areas who require some knowledge of this topic may have discontinued the subject. It is much more usual to have an introduction to aromatic compounds as early as first year and to develop the concepts and related chemistry progressively in subsequent years,

(ii) whilst structure determination by spectroscopic techniques is adequately addressed, there is no specific course on structure determination by diffraction techniques as would be expected in a modern chemistry course,

(iii) although the Department provides three years of chemistry teaching to biotechnology students, there does not appear to be any courses on biological chemistry (bio-organic or bio-inorganic) until the fourth year of the single or double honours degree. As this is such an important area of modern chemistry, an earlier introduction would be advantageous to all students, in particular those going on to specialise in the biological sciences.

The students' comments which were frank and vocal and which elaborated on the Quality Assessment report are appropriately addressed at this point. Major points arising from the 90 minute meeting are as follows:

(a) Students clearly are very happy with the Chemistry Department environment and greatly appreciate the efforts of the staff at teaching and research levels.

(b) Students find staff extremely friendly and approachable and communication channels are perceived as being excellent.

(c) First year students strongly felt the need for 'remedial tutorials' for those who had not taken Chemistry previously,

(d) The transition from first to second year is perceived as being daunting and is instrumental in deflecting students away from the subject subsequently. It was felt that tutorials in the second year would go a long way towards alleviating the situation. Despite these comments, students do not consider the second year course content as being excessive.

(e) There is insufficient guidance to first and second years regarding choice of subjects which would determine their subsequent course selection and specialisation.

(f) A timetable of lectures is urgently required as is available for biology courses. The absence of this means that students are often unaware of the topic or, even in some cases, the area of chemistry (i.e. Organic, Inorganic or Physical) to be covered in a lecture prior to the event. This particularly applied to 2nd, 3rd and 4th year students.

(g) Final year students expressed a desire for courses to be taught in blocks.

(h) Aims and objectives of each course should be provided in advance so that students would appreciate the reasons for studying the particular courses.

(i) Prior to each practical class, a brief statement on the relationship between the practical content and the lecture material would be very helpful.

11 At least some tutorials should be dedicated to the presentation of model examination questions and answers.

12 It is perceived that there are insufficient handouts given in lectures, particularly those with diagrams discussed in the lectures. This is particularly relevant in the light of the scarcity of chemistry textbooks in the library.

13 There was severe criticism of the lack of study areas, especially approaching examinations.

14 Students should be helped with work placements during the summer vacation and more invited lectures from people in industry would be welcome.

15 The amount of time spent on the 4th year project should be much more clearly defined and better guidelines on expectations are needed. Some students spend too much time on their projects because of lack of awareness of what is expected.

Whilst many of these comments are valid and in some cases can readily be addressed, it must be recognised that the academic staff already have onerous duties such as particularly heavy teaching loads (due to the small department size), and heavy supervision workloads in relation to postgraduate students etc. and given these constraints some of the requests may not realistically be addressed imminently. The heavy workloads of technical staff, which in many cases exceed their terms and conditions of employment, also became obvious during the visit. Although the students perceive the need for additional handouts, it must be pointed out that the handout material which is currently provided is generally of excellent quality. Furthermore the web-based tutorial system which was developed by the staff (the first Chemistry Department in Ireland to introduce such a system) and which is continually being improved in the light of experience, may well address some of the concerns raised in relation to tutorials. A further hindrance to student participation and learning is the fact that many have part-time jobs and/or live significant distances from the University.

The idea of having advanced practical sessions in conjunction with and in a different area from the project in fourth year is commendable since it avoids restrictions due to specialisation which usually occurs within a project area.

It is noteworthy that despite the decline in the quality of students enrolling in Science and taking chemistry in first year courses, the Department is maintaining a healthy pass-rate in all examinations and attrition rates are relatively low. This reflects strongly on the quality of teaching and the commitment of staff.

2.2. Communication

In general, communication within the Department as expressed by the staff is very good albeit based on daily informal meetings. Students also feel that communication channels are excellent. Despite this satisfactory state of affairs, it would be advisable that more formal communication take place by means of departmental meetings involving all academic and technical staff (or technical staff representative); there is one formal meeting per term but this is insufficient and does not involve the technical staff. Formal communication would ensure more structured division of responsibilities, a problem alluded to in the staff questionnaire.

2.3 Support services

Teaching accommodation is of good quality, conveniently located and seems to be adequate. . Office accommodation for staff is excellent. Laboratories are spacious, provide pleasant working environments and match the best available in Irish Universities. Laboratories are meticulously clean and equipment well maintained. Safety procedures which are under the ambit of the Department are of a high standard and are properly enforced. It is regrettable that the hazards associated with the solvent store as highlighted in the Quality Assessment report were not dealt with more expeditiously by the University, although it now appears that the situation is being rectified.

A serious situation exists in the case of library facilities. There are insufficient textbooks available and this should be dealt with urgently. The lack of adequate study facilities, particularly approaching examinations, is a further problem which should also be addressed.

2.4 Research

Research in the Department is of a very high quality and there is obvious synergy between it and the teaching programmes. There is a large output of research publications in high impact journals. The bibliometric analysis quoted in the

Quality Assessment document (Appendix N) is accurate and indicates that the citation impact of researchers in the department is considerably higher than the national average (4.9 vs 3.3 for 1991-95 and 3.6 vs. 2.9 for 1994-98). In a wider context, the outcome is even more impressive. The citation impact for 1991-95 is second only to the top national ranking value of 5.0 (USA). All academic staff members are active in research and the publication output per head (number and quality) is higher than that in any other Irish University Chemistry Department and comparable to the better UK Chemistry Departments. A comparative bibliometric study could certainly confirm this.

Research funding acquired by staff is also impressive, amounting to almost £1M for the period of the review. The main sources of funding are Enterprise Ireland (Forbairt) and EU.

One of the aims of the Department in filling academic posts has been to acquire excellence and breadth of research expertise. Whilst this has been achieved and staff have been encouraged to pursue their own research, it has presented a situation where there is little in the way of collaborative research internally within the Department or with other Departments in the University. This is unfortunate in the current climate of major funding e.g. PRTLI which requires such collaboration and may explain why the Department has not thus far been involved in PRTLI applications despite the excellence of its researchers and its undoubted potential to do so.

The research quality is the departmental flagship and deserves every support as it could easily be a vehicle for attracting more undergraduate students. However, the Department lacks some large items of equipment which are standard in most chemistry departments and such equipment as is available needs to be replaced if the Department is to maintain its excellence.

A further problem is the lack of recruitment of non-NUIM graduates into the research school which therefore relies almost completely on graduates from within. In this respect, the serious decline in numbers studying chemistry as a major subject gives further cause for concern.

2.5 Staff development and external relationships

Although opportunities exist for academic staff to take sabbatical leave, the small size of the department makes this difficult. Judging by the list of conference proceedings (Appendix O) it appears that NUIM chemistry research is well represented at international conferences and that participation is actively encouraged.

It is apparent that opportunities for retraining of technical staff exist and that the staff are encouraged to avail of these but that heavy workloads may preclude them from doing so.

Relationships external to the Department exist at a satisfactory level. Chemistry staff contribute actively to the management of the University. They are also actively involved in refereeing for international journals and in liaisons with secondary schools and industry. Membership of learned societies is what might be expected. It is commendable that the staff and in particular the Principal Technician are so involved in the courses for secondary students from underprivileged backgrounds.

There is a degree of external research collaboration carried out on an individual basis.

2.6 Future of the Department

In order for the Department to remain viable, it is essential that the vacancies created by the two imminent retirements are filled. At least one of these must have an organic chemistry background, otherwise an intolerable burden will fall on the remaining organic staff member.

The internal quality assessment report shows an alarming decrease in student intake to chemistry over the past five years. This is the greatest cause of concern for the Department. Although this is due largely to the declining popularity of the subject in schools, it is compounded by the fact that the Department offers almost identical degree courses as those offered by the larger competitors in the same catchment area.

In order to be more competitive, the Department needs to offer an alternative degree course. An example of such a course would be a degree in Biological Chemistry. A strong recommendation would be that the vacancies arising from the two imminent retirements be filled by appointments at Professorial and lecturer level in the area of biological chemistry. This together with existing expertise in the Chemistry Department as well as the strength which exists in the Biology Department would form a sound basis for the success of such a course.

The proposed development of a modular system within the University is of potential benefit to the Chemistry Department. The Department alone and in collaboration with other departments is in a position to offer a range of attractive modules in selected and popular areas of chemistry e.g. analytical and bioanalytical techniques, biological chemistry etc. This could well have the effect of increasing student numbers specialising in Chemistry.

The introduction of taught MSc courses could also present future possibilities.

Conclusions

The Chemistry Department, NUIM is a vibrant young Department with a very strong research record and a strong commitment to teaching. With appropriate planning it could overcome its present predicament arising from declining student numbers and in future could play an even stronger role in the academic profile of the University. The Quality Evaluation exercise met with the enthusiastic cooperation of the staff who were most welcoming and accommodating. The work of the Quality Promotions Unit, NUIM is highly commendable.

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