

A report on Pharmacy undergraduate research projects: Experiences of the University of Auckland

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Abstract

The School of Pharmacy at the University of Auckland has included a research dissertation course within the final year of its four-year Bachelor of Pharmacy undergraduate degree. A key feature of the course is that students undertake a research project in groups of 4–6 members. Particular attention has been paid to the quality of the research projects undertaken by the students, to the support and supervision provided and to the assessment strategy. In respect of the latter assessment of group and individual performance is measured against a generic set of criteria and the main assessments are carried out by an academic staff member who is independent of the project to ensure objectivity as far as is possible. In terms of student performance, student and external examiner feedback and publications and presentations arising from the course it has been a success.

Keywords: *Course design, group project, pharmacy, pharmacy education, research, undergraduate*

Introduction

The University of Auckland is New Zealand's largest university. In 2004, it was announced that the University had achieved the highest quality score in the Performance Based Research Fund review and had the largest share of A-rated researchers in New Zealand (Tertiary Education Commission, 2003). In 2000, the University introduced its undergraduate Bachelor of Pharmacy degree. In developing the content of this degree it was agreed that all students should engage in a research project within their final year of studies. Such engagement was seen to be essential for them to adequately understand the nature and importance of research within both pharmacy practice and pharmaceutical science and also to provide both encouragement and a foundation for their future involvement in research activity.

Each year of the BPharm degree at the University of Auckland contains courses whose total points value is 14 points. Within the final year, the undergraduate research course, Pharmacy 405—Research Dissertation, carries four of these points reflecting its level of

importance within the final year of studies. The BPharm degree is awarded with Honours and this level of contribution towards the final year studies is consistent with Honours degrees in New Zealand which are required to have at least 25% of the final year devoted to a research course. Students are expected to devote an average of some 10 h each week on the project during the two 15 week semesters and their achievement in the Research Dissertation course has a significant impact on their Honours classification. The nominal student workload of 300 h places the course midway among similar courses in Great Britain which are reported to occupy between 175 and 450 h (Sie, Bates, Aggarwal, & Borja-Lopetegi, 2003).

To ensure the success of this course particular care has been taken to address its aims and objectives, the quality of the research topics, the level of support and supervision provided to the students and the assessment strategy for the course.

Being a final year course, the Research Dissertation was first presented in 2003 and is now in its third year of implementation.

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Group project

A key feature of the Research Dissertation course is that the students undertake it as members of a group of 4–6 students under the supervision of a member, or members, of the academic staff. This is different from the situation in Europe and Great Britain where the European Union (European Communities Council Directive, 1985) and the Royal Pharmaceutical Society (2002) have a requirement for a “personally directed research project” within pharmacy undergraduate degrees.

While recognising the need for undergraduate students to develop research skills, the School also recognised the need to enhance their ability to work as members of a research team, to recognise other person’s skills and abilities and to be able to form effective working relationships with peers. Indeed very little research is now undertaken on an individual basis; most research activity, undertaken in collaboration with other persons, requires the development of effective team-working skills. The School also recognised that many students would have particular expertise and interest in key aspects of the research process, such as computer skills, and analytical skills that they could bring to the group project. These aspects could be both enhanced and shared with other members of the group. In addition, the School was concerned at the workload imposed on academic staff in supervising a large number of projects.

Its decision to have group-based projects thereby addressed the development of these further skills and limited the supervisory workload. The impact of research projects on academic staff workload has been addressed at the University of Manchester School of

Pharmacy and Pharmaceutical Sciences by the appointment of part-time research staff to support the students and staff (Morris & Sharif, 2004). To date, the Auckland School has been able to accommodate the Research Dissertation course workload without this additional expenditure.

The decision to have a small group of students working on a research project was also seen to help ensure that a sufficient body of data would be obtained for subsequent analysis, discussion and conclusion of the research project.

Course aims and objectives

The course aims and objectives (Figure 1) reflect the School’s intention that the course should develop an understanding of the nature and importance of research, provide a foundation for future research activity and enhance the students’ ability to work as members of a team and to present research findings. Furthermore, it is the School’s intention that the quality of the research is such that the students’ findings can lead to publications in refereed journals and/or conference presentations.

Research topics

In designing the course, it was agreed that key criteria for the project would be that it addressed a research question and that sufficient data could be obtained for meaningful analysis in the time allowed for the course. Literature-based surveys were not acceptable. Furthermore, it was agreed that the research topics would encompass areas of pharmacy practice and

At the end of the course students will be able to:

- demonstrate an awareness of the need for research
- formulate a research question
- demonstrate an understanding of the ethical issues in respect of research studies
- conduct effective literature searches
- critically evaluate literature and published research
- identify appropriate research methodologies
- effectively carry out a research project in pharmacy practice or pharmaceutical science as a member of a small team of researchers
- present pertinent in-depth discussion of research findings and draw relevant conclusions
- effectively present research findings, both in writing and orally, and to defend those findings

Figure 1. Course objectives.

pharmaceutical science. Topics would therefore include some that were laboratory-based, some that were clinical-based and some that were survey-based. Some projects would involve quantitative approaches, others would involve qualitative approaches and some would involve both approaches.

One of the major difficulties schools face in presenting a research project course is that of ensuring an acceptable level of equivalence between the various projects undertaken by the students. Before introducing the course consideration was given to encouraging and allowing students to bring forward their own research projects. However, this was seen to raise a number of potential problems—not least that many of their suggestions would need to be refined by staff within a very tight time-frame. All projects have therefore been determined by staff. This has included a number that have been determined in conjunction with hospital pharmacy departments in the Auckland hospitals. In 2006, to help ensure the suitability and equivalence of the projects, all of the project proposals were considered by members of the School's Research Committee before publication to the students.

Allocation of research projects and formation of project groups

It is the School's intention that, as far as is possible, students would engage in a project they perceived to be of particular interest and, if they so requested, to work with students of their choice.

In presenting a topic, staff have been required to produce a statement of the project's aims and objectives, brief background notes, an indication of the proposed methodology and up to three key references. This document has then been made available to the students in the first teaching week of the final year. During a 2 h session, each project supervisor has spoken to his or her research project and answered any immediate questions posed by the students.

In the following few days, students have then completed a 'preference form' indicating their first three preferences. In addition, they have been able to state on the form the names of other students with whom they would wish to work.

Despite a wide variation in the level of interest shown in individual projects, the students' wishes have been largely met. In most cases, students have been allocated to their first or second preference. Where the allocation has been to a third preference this has never-the-less ensured that the students are working with other students of their choice.

In 2005, seventeen projects were presented to the 85 final year students. One project elicited a very low level of interest and 16 projects are being undertaken with student groups ranging from 4 to 6 members. The 16 projects are listed in Figure 2.

Support and supervision

When introducing the Research Dissertation course in 2003, the School recognised the need to lay down clear guidance to both the students and the research project supervisors. The students have therefore been provided with a four-page guidance document at the beginning of the course that includes the course aims and objectives, guidance on workload, recommended deadlines and assessment. The guidance on deadlines (Figure 3) is seen to be of particular importance and is repeated at intervals during the two semesters. This content has been revised and improved over the past 3 years in response to student feedback and our experience.

A series of lectures, in the first 6 weeks of the academic year, has been introduced over the past 3 years in support of the course and our experience has confirmed their benefit. In 2005, these initial lectures have addressed the nature of research, ethical approval, the Maori perspective on research, time management, team building and statistics. Subsequent lectures have addressed report writing and poster presentation. In addition, specific SPSS training has been given to those students whose projects required such analysis. This range of supporting lectures is very similar to those at the University of Manchester's School of Pharmacy and Pharmaceutical Sciences (Morris & Sharif, 2004).

Supervision is critical to the success of research projects. Staff members are encouraged to put forward, and supervise, a research project with another member of staff. In the case of projects linked with hospital pharmacy departments, the co-supervisor will be drawn from that department. The supervisors' role is seen to be one of ensuring that the students enjoy the course and meet the course objectives. Wherever possible, all decisions will be made by the members of the student group. It is agreed that the students should not be functioning as research assistants for the supervisors. However, it is inevitable that some student groups may need more guidance than others in the completion of their project.

The level of supervision has been widely discussed among the academic staff and an agreed set of guidelines in respect of supervision has been prepared and is circulated to supervisors at the outset of the course. This three-page guidance document includes an outline of the supervisor's role throughout the project, recommended deadlines and the assessment process.

Assessment

Throughout the design and implementation of the research dissertation course there has been considerable discussion on the issue of student assessment.

- An investigation into adverse drug reaction monitoring and reporting at Auckland City Hospital
- Mechanical properties of polymer films manufactured from biomaterials
- Pharmacological interventions on two psychiatric intensive care units
- Investigating the mucoadhesive properties of ocular hydrogels using rheological methods
- Investigation of prescribed medicines among older people in residential care - psychotropic medicines and the risk of strokes
- Investigation of prescribed medicines among older people in residential care - the risk of falls associated with medicines
- Water-in-oil microemulsions as delivery systems for model peptide drugs
- The use of guidelines for the management of acute behavioural disturbances - a qualitative study of registrar practice
- Extemporaneously compounded medicines in New Zealand hospitals
- Assessment and improvement of extemporaneously compounded oral liquid preparations from a hospital formulary
- A review of hospital pharmacist interventions: type, significance and impact
- The design and implementation of an adverse event database for warfarin
- Consumer utilisation of community pharmacies for primary health care
- Still Air Box microbial contamination
- Consumers' non-prescription medicine purchasing behaviour in community pharmacies
- Preparation and evaluation of microemulsions as skin delivery systems

Figure 2. Research projects in 2005.

Commencement of semester 1	Month 1
Completion of literature search and determination of methodology	Month 3
End of semester 1	Month 5
Commencement of semester 2	Month 6
Conclusion of data collection	Month 8
Submission of written report	Month 9
Submission of e-poster	Month 9
Poster presentation in lecture theatre	Month 9
Poster presentation in pharmacy practice area	Month 9
Completion of oral examinations	Month 9
End of semester 2	Month 10

Figure 3. Recommended deadlines 2005.

The School recognises that the assessment needs to reflect the course aims and objectives, is consistent across all of the student groups and recognises both the quality of the work undertaken and the individual achievement of each student.

Having accumulated and analysed their research data, each student group is required to produce a written report of some 10,000–15,000 words. This report must include the background to the study, details of the methodology adopted and the results obtained together with a critical discussion of the research findings and the conclusions drawn from the study. References are to be cited in accordance with the School's policy on referencing.

Recognising that poster presentation is a common means of dissemination of research findings students are also required to deliver a poster presentation. The approach adopted is that of the "e-poster". Students are provided with a guidance document in respect of

the preparation of such posters. Their poster is presented on two separate occasions. Firstly, each poster is presented in a lecture theatre setting. Each student group is given 10 min to give an oral presentation of its poster and respond to questions from the audience of its peers, school and faculty staff and visitors. Secondly, each student group simultaneously presents its poster at a computer workstation in the School's pharmacy practice area. School and faculty staff members and visitors circulate among the posters giving students a further opportunity to discuss and defend their research findings.

While the research dissertation course is a group exercise, it is inevitable that some group members will have a greater understanding of the work undertaken and/or have undertaken a greater proportion of the work. The School recognised that the overall assessment needed to reflect this variation between the members of a student group.

In 2003, the first year in which the research dissertation course was run, the written report was marked by the project supervisor(s) and accounted for 50% of the total marks. The lecture theatre poster presentations were marked by all staff and accounted for 10% of the marks. Designated staff members visited each of the poster presentations at the individual stations and awarded up to a further 10% of the marks following discussion of the project with the student members. The final 30% of the marks were awarded by the supervisor(s) following individual oral examinations. This component included an assessment of each student member's contribution to the success of the project.

To help ensure a consistency across all of the student groups marking guides were prepared for all of the assessment procedures. These marking guides identified the specific criteria against which the written report, poster presentation, oral examination and student's contribution to the success of the project should be marked. This approach is not dissimilar to that adopted at the Liverpool John Moores University, School of Pharmacy and Chemistry (Rowe & Mottram, 2003). In addition, all of the written reports were read by the course co-ordinator and the Head of School. Any concerns they had were then discussed with individual supervisors before marks were finalised.

Based on the experience gained in 2003, the assessment strategy has been modified to require an independent assessor to mark the written report, the poster presentation at the individual station and to conduct the oral examination of each member of the student group. The introduction of an independent assessor, a staff member who has played no part in the completion of the project, is intended to ensure a greater level of objectivity to the assessment. It should also widen the general discussion of research interests within the School.

To aid the independent assessor, the supervisors are required to complete a pro-forma outlining the level of support given to the students throughout all parts of their research project. In addition, a supervisor is present to provide comment on a student's performance when the independent assessor conducts the individual oral examinations.

The assessment strategy has also been modified in respect of each student member's contribution to the success of the project. Using a marking guide, each student is required to assess both the ability of his or her colleague to effectively function as a team member and the contribution he or she made to the "cognitive" and "physical" aspects of the project. This component accounts for up to 10% of the marks.

Within the current assessment strategy, 70% of the final marks are "group based"—being derived from the written report and poster presentations—and 30% are "individual-based"—being derived from the oral examination and peer assessment of the individual's contribution to the success of the project (Figure 4).

The moderation process, carried out by the course co-ordinator and Head of School, has been continued and, in addition, the views of the 4th year external examiner have been sought and taken into account in finalising the marks.

In 2003, all students achieved grades between A and B — with 5 students achieving an A grade, 13 an A — , 23 a B + , 11 a B and 1 a B — . Similarly, in 2004 there were 3 students achieving an A grade, 22 an A — , 17 a B + , 21 a B and 4 a B — .

The individual attainment of the course objectives does not appear to have been adversely affected by the decision to use group-based projects in place of the personally directed projects undertaken in Great Britain.

Feedback on the course

In 2003, student feedback was largely derived from an 11-item questionnaire using a 5 point Likert scale. Although the feedback indicated a general level of student satisfaction with the course a number of concerns were evident. In particular it was clear there was a variation in the level of supervision provided by staff members. Some supervisors were seen to be very helpful and supportive giving excellent feedback and

Group-based	70%	Written report	50%
		Poster Presentations	20%
Individual-based	30%	One-on-one viva	20%
		Peer assessment	10%

Figure 4. Assessment.

holding regular meetings with their student groups. In other cases, students felt they were in need of more guidance and support particularly at the beginning of the course. Concerns were also raised in regard to the availability of rooms and computers for usage by the student group and to the need for an introductory set of lectures. There was also a concern with respect to the time-scale for gaining ethics approval when needed for a specific project.

In 2004, a focus group approach to obtaining student feedback was adopted. The student groups were invited to nominate one member of the group to participate in an hour-long focus group conducted by an experienced member of staff who had been largely independent of the course. His report identified issues relating to group dynamics, the course structure and facilities and to supervision. In respect of group dynamics, it was felt that a process should be in place for the mediation of problems that might arise. Furthermore, that care should be taken by all group members and the supervisors to ensure the inclusion of everyone in the project, including the use of English by all members of the group throughout the various formal and informal group meetings. In respect of the course structure there was a perceived need to enhance the support and guidance given in the first few weeks of the course, to further address the facilities available for group meetings and to greater clarity in respect of marking criteria. Finally, in respect of supervision there was a further request for greater consistency in the level of guidance, feedback and support.

Within the examination process for the 4th year of the Bachelor of Pharmacy degree, the external examiner has access to all of the written reports and assessments for the Research Dissertation course. Her report has been very favourable in both 2003 and 2004 and contained a number of further suggestions for the School to consider in respect of the course.

All of this feedback and comment has been widely discussed within the School and, in particular, at an "academic retreat" at the end of 2004. These discussions have led, hopefully, to further improvements in the course, the students' and supervisors' guidance documents and the students' research experience.

Publications and conference presentations

One measure of the success of the Research Dissertation course is that the outcome of its projects should be of a quality that is acceptable for publication in refereed journals or conference presentation. To date there have been seven conference presentations in New Zealand and three in Australia and two journal

publications. One of the presentations received an award for best oral presentation and one poster received an award for best poster.

Future development

The School believes that the Research Dissertation course, and the decision to engage students in a group project, has been successful and that the objectives of the course have been met. However, further examination and development of the course is needed. The student and supervisor guidance documents will benefit from further review and the School should consider the production of a single course manual containing all of the required information and guidance for both students and supervisors. The content of the supporting lecture programme should be reviewed with consideration being given to including some of the material into the course manual. The assessment strategy should also be further considered both in respect of its consistency across the project groups and also in respect of the proportion of group-based and individual-based marks. Finally, since the School intends that the course will provide a foundation for future research study, there is need to determine the future research activity and output of its graduates.

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