

# Staff and student perceptions of Pharmacy final year research projects

HELEN VOSPER<sup>1\*</sup>

<sup>1</sup>*School of Pharmacy, The Robert Gordon University, Schoolhill, Aberdeen, UK*

## Abstract

Undergraduate pharmacy education is undergoing reform, largely driven by changes in the role of the pharmacist. One area of the curriculum coming under particular scrutiny is the final year research project. It has been suggested that such projects should perhaps play a lesser role in undergraduate education because research is not part of the working remit of most pharmacists. If, as a School of Pharmacy, we are to make an informed contribution to any debate, we must be clear about the role the project currently plays, both within our own institution and at a wider level. This project uses a questionnaire-based approach to investigate the MPharm project provision at The Robert Gordon University, Aberdeen, and demonstrates that the grade achieved in this module has a strong positive influence on final degree classification. Furthermore, both staff and students believe that it offers valuable training in both a professional and educational context.

**Keywords:** *Undergraduate research, final year project, pharmacy education*

## Introduction

Pharmacy undergraduate education has recently undergone radical change, and the restructuring of the course to the MPharm has significantly 'raised the stakes' in terms of the levels of achievement that students must demonstrate on completion of their course (Sie *et al.*, 2003).

The final year research project is not exclusive to Pharmacy. Most undergraduate degree programmes have such a provision. Several reasons are cited for this, not least its efficacy in measuring achievement of higher level educational outcomes (Cartwright, 2000). This is particularly important in integrated undergraduate Masters courses, where students must demonstrate achievement at 'M' Level as defined by the National Qualifications Framework. Mottram and Rowe (2005) suggest that, in the light of these requirements, the final year research project is not only valuable, but key to the assessment process. Another reason for the continued inclusion of such experiences is their

contribution to peer-reviewed research output (Qamar uz Zaman, 2004), and this may be particularly important in institutions that have low numbers of postgraduate research students. The pedagogical benefits offered by such research projects are certainly upheld by the European Advisory Committee on Pharmaceutical Training, with the recommendation that "each student should carry out a personally directed research project covering about 3-6 months duration under the supervision of the academic staff and present a paper or dissertation on the project." (Jesson and Wilson, 2004). This has been incorporated into the specifications that the Royal Pharmaceutical Society of Great Britain lays down for projects as part of the accreditation (RPSGB, 2002).

In addition to the above benefits, there are also suggestions in the literature that the grades obtained in research project modules enhance the overall final grade (although there is little evidence to back this up), and if this is the case, students are likely to perceive the project module as a particularly

\*Correspondence: H. Vosper, School of Pharmacy, The Robert Gordon University, Schoolhill, Aberdeen, AB10 1FR, UK. Tel: 01224 262503. Fax: 01224 262555. Email: h.vosper@rgu.ac.uk

valuable opportunity (Wilson *et al.*, 2005). Furthermore, previous studies concerning undergraduate Pharmacy assessment suggest that, because of their perception of the importance of the project, students feel very strongly about the extent to which they can exercise choice with regard to research area, and about the training they receive to equip them for the research experience.

The upgrade to 'M' level has not been the only influence on Pharmacy education. The RPSGB's 'Fit for the Future' programme is providing the context for a review of the current course, with a view to fundamental change (The Pharmacy Education and Development Reference Group). At the heart of this change is the relationship between academic study and the skills and competencies required in the workplace. One concern of the Society is that graduates have merely demonstrated academic achievement, not clinical competence. In future, the emphasis will be placed on the development of clinical competencies, eliciting the contention that perhaps the research element of the final year is no longer required, if simply because most pharmacists do not engage in research (Gard 2006). Possibly, the project may become a casualty of any change to the curriculum. Such a step would be controversial, especially in light of the report of the Mays Taskforce on Pharmacy Practice Research, which highlights the aim that 100% of pharmacists should be research users (Jesson and Wilson, 2004). We must be sure that any decision regarding the project is made for the right reasons and, furthermore, be clear about the role the project occupies within individual Pharmacy degree programmes, allowing institutions to make an informed contribution to discussion regarding the future of research experiences for undergraduate students.

The study aims were two-fold: firstly, to conduct a retrospective analysis of student project performance to look for evidence to back up the claim that it enhances final degree classification; and secondly, to use a questionnaire-based approach to assess the strengths and weaknesses of the current project provision, with the intention that analysis of the data derived will inform our response to external drives for change, as well as allow us to modify our own approach, ensuring that we achieve best practice in teaching, learning and assessment within the School of Pharmacy at RGU.

## Methods

### Calculating the contribution to final classification

The calculation of the final MPharm degree classification has been subject to change over recent years. From the 2006-7 session onwards, it has been based only on grades obtained in 'M' level modules – a move that brings the MPharm in line with University recommendations. However, for the data presented within this paper (pre-2006-7), final classification was based on 135 credits, 20% of which came from the third year performance, the remainder from the final year. The grade based on all 135 credits (grade including project) was calculated using grade profiling as defined by the University (The Robert Gordon University, 2007). For example, to obtain a Grade 6, at least 50% of the contributing credits must be at Grade 6, 75% at Grade 5 or better and 100% at Grade 4 or better. The project module accounts for 45 of these credits,

so the grade was recalculated taking into account only the other 90 credits (grade without project). The data were entered into SPSS (v13.0) and median grades calculated and compared using Wilcoxon Signed Ranks testing (described below).

### Focus groups and questionnaires

A multi-perspective approach was taken, initially using focus groups, followed by an exploration of key issues using web-based surveys. Three focus groups were drawn from recent graduates of the School of Pharmacy, and one from academic staff. Emails detailing the research, and inviting them to participate in a focus group, were sent to ex-students who graduated in 2006. Of a possible 90, 21 replied and all were included in the focus groups. From the limited demographic data available, the respondents appeared representative of the group: 65% female, 60% from the Republic of Ireland, 10% from overseas, with final degree classifications ranging from Third Class to First Class Honours. For the staff group, sampling was opportunistic, essentially consisting of faculty available during July. This group was not entirely representative in that only one member was from the practice area. Each focus group comprised 6-8 members attending a single meeting of 90 minutes duration, led by a facilitator, using a topic guide to stimulate discussion. Several student participants expressed concerns with recording the sessions, so to minimise the chance of drop-out, it was decided instead to take notes detailing the major issues raised. It is important, therefore, to understand that the results of this phase represent the facilitator's perception of the views, attitudes and beliefs of the participants. Saturation was considered to be the point at which no new issues were raised, and this was reached by the end of the four sessions.

From these groups, the following major themes were identified:

Perception of the contribution of the project to degree classification

Importance of choice with regard to project area

Efficacy of the project in measuring 'M' level outcomes

Value of research output from undergraduate projects

Perception regarding the efficacy of research training for undergraduate students

These themes were used to develop web-based questionnaires, which were produced in WebEditor, pre-tested, amended and distributed in line with best practice (Dillman *et al.*, 1998). Briefly, most questions were posed as statements, accompanied by Likert scale responses consisting of the following options: 'Strongly agree', 'Agree', 'Undecided', 'Disagree', 'Strongly disagree' and 'Not applicable.' Opportunities for free-text responses were also provided, and respondents invited to provide additional relevant information. In addition, the staff questionnaire included questions regarding which 'M' level outcomes they felt students did or did not achieve during the project module. These outcomes were taken directly from the SCQF descriptors (Scottish Credit and Qualifications Framework, 2007) and were presented as drop down menus. Questions were considered by an 'expert panel' (the project module co-

ordinator, an elearning technologist and an educational specialist), before piloting on a sample of nine recent graduates from the School. Following amendments, questionnaires were released through the virtual campus to staff (n=30) and all 90 final year students, before the students began the project module. Non-respondent follow-up was by email.

For students, a second questionnaire was also produced, to explore changes in perception throughout the duration of the module, and this was released to all the original responders after submission of their thesis.

Using SPSS (v 13.0), descriptive analysis was performed and, where appropriate, additional analyses were undertaken. For example, shifts in responses in 'before' and 'after' answers were investigated using the Wilcoxon Signed Rank Test. Simple bivariate analysis, using Spearman Rank Correlations was used to examine possible associations between one variable and another. P values < 0.05 were taken as significant.

**Results**

Response rates for the questionnaires were 52% for students responding to both the before and after questionnaires, and 56% for staff.

Project grade impacts positively on final degree classification.

Figure 1 illustrates final grades for 2005-6. The median grade disregarding the project contribution was 4 (1a), increasing to 5 when the project was included (1b). Wilcoxon Signed Ranks Testing (p< 0.001) revealed this positive contribution to be highly significant. 45 students out of 130 benefited from a positive grade shift, compared with only two students whose overall grade was diminished. Similar results were obtained for the previous session: Once again, the median grade disregarding the project contribution was 4, but inclusion of the project grade increased this to a grade 5 (the p-value of < 0.001 obtained from Wilcoxon Signed Ranks Testing showed that these results were also highly significant). Once again, approximately one-third of students benefited from an increase in grade.

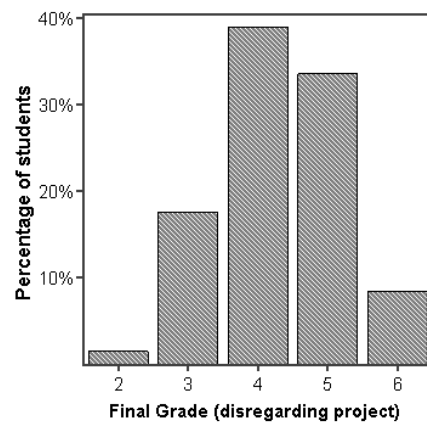
Student perception of the importance of choice in project area

Students believed that the subject area to which they were allocated would significantly impact on their grade, (82% agreeing or strongly agreeing; Figure 2) and they felt strongly about their choice in this matter, with over 90% either disagreeing or strongly disagreeing with the statement that they did not mind to which subject area they were allocated (data not shown).

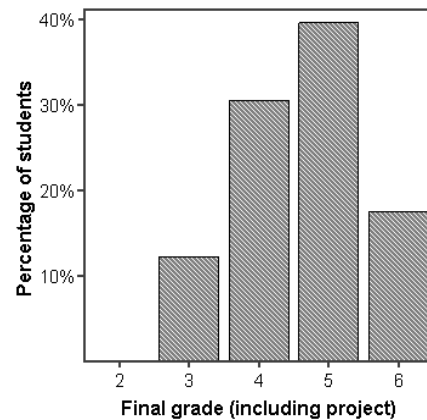
The contribution of undergraduate students to research output

Most staff felt that undergraduate students can and do make valuable contributions to research output. Figure 3a shows frequencies for responses to the statement 'the disadvantages of supporting undergraduate research students outweigh any contribution they make to research output.' 71% disagreed or

Figure 1: The grade awarded for the project module impacts positively on final degree classification



(a)



(b)

The average final grade was calculated, using grade profiling (taking into account the 20: 80% third: fourth year weighting) firstly disregarding the contribution from the project module (1a) and secondly including the project mark (1b). The figure illustrates the results for students graduating in 2006. Statistical analysis indicates median grade without the project to be 4 and median grade including the project contribution to be 5. Wilcoxon Signed Ranks test indicates that this difference is highly significant (p<0.001)

Figure 2: Students perceive project area to be a significant determinant of success in the project module

	Frequency	Valid percentage
Strongly agree	13	28.9
Agree	24	53.3
Undecided	7	15.6
Disagree	1	2.2
Strongly disagree	0	0

The above table shows the frequency of responses to the following statement:

'I believe the subject area to which I have been allocated will have a significant impact on my grade for the module.'

Figure 3: The contribution of undergraduate students to research output

	Frequency	Valid percentage
Strongly agree	0	0
Agree	3	17.6
Undecided	2	11.8
Disagree	11	64.7
Strongly disagree	1	5.9

(a)

	Frequency	Valid percentage
Strongly agree	3	17.6
Agree	4	23.5
Undecided	6	35.3
Disagree	3	17.6
Strongly disagree	1	5.9

(b)

The above figures show the frequency of responses to the following statements:

(a): ‘The disadvantages of supporting undergraduate research students outweigh any contribution they make to research output.’

(b): ‘Work from the undergraduate research projects has directly contributed to peer-reviewed research output.’

The response frequencies for each statement were compared using Spearman Rank analysis, which revealed a very weak negative correlation (-0.127)

strongly disagreed with this. However, only 41% of respondents were able to provide tangible evidence for this in terms of the contribution of such projects to peer-reviewed research output (Figure 3b), and indeed the Spearman rank correlation between the responses to these two statements was weak (-0.127).

The role of the project in assessing ‘M’ level outcomes

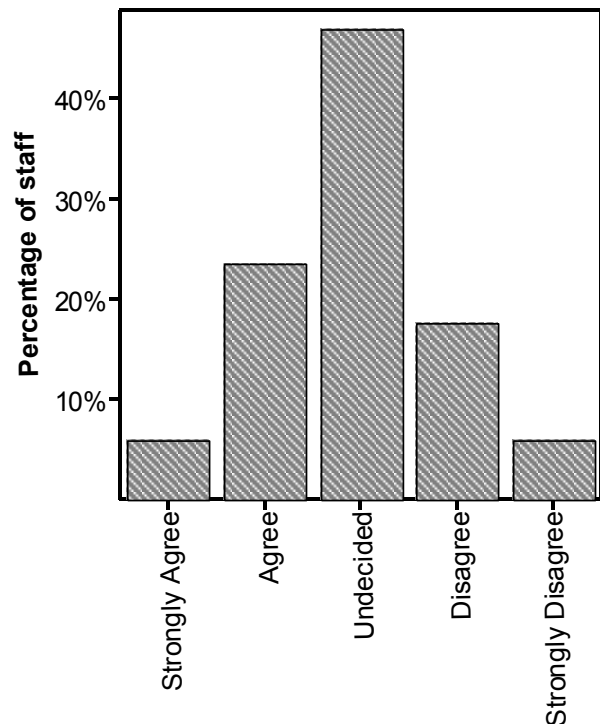
There was considerable uncertainty surrounding the issue of whether or not Masters level outcomes were demonstrated by students. Figure 4a shows frequency tables for staff responses to the following statement:

‘I do not consider the output of the average Fourth Year student to be ‘M’ level.’

The median response was ‘undecided.’

Figure 4b shows a table of ‘M’ level criteria presented as a drop down menu on the staff questionnaire. Respondents were asked to select criteria they felt were typically met during student projects, and the numbers of staff agreeing are shown in the right hand column. The lowest responses were for criteria relating to the demonstration of originality (only 24% of staff agreeing that this was typically met) and conceptual awareness leading to students being able to propose new hypotheses (35% agreeing that this criterion is typically met).

Figure 4: Staff opinion of student performance at Masters level



**I do not consider output to be 'M' level.**

Staff were asked to respond to the statement:

‘I do not consider the output of the average Fourth Year student to be ‘M’ Level (a).’

Criterion	Number (%) respondents agreeing criterion met
Demonstration of a systematic understanding of knowledge, and a critical awareness of current problems, and/or new insights, much of which is at, or informed by, the forefront of their academic discipline, field of study or professional practice	13/17 (76%)
Demonstration of a comprehensive understanding of techniques applicable to their own research or advanced scholarship	10/17 (59%)
Demonstration of originality in the application of knowledge, together with a practical understanding of how established techniques of research and enquiry are used to create and interpret knowledge in the discipline	4/17 (24%)
Conceptual understanding that allows the student to evaluate critically current research and advanced scholarship in the discipline	8/17 (47%)
Conceptual understanding that enables the student to evaluate methodologies and develop critiques of them and, where appropriate, to propose new hypotheses	6/17 (35%)

Is student training in research methods sufficient?

The Research Methods module represents the primary training in research skills theory, and the focus groups suggested concerns. While students enjoyed the module at the time, when they came to the project, they questioned the relevance. Responses from student focus groups indicated that they would prefer an alignment of the project title with Research Methods, while staff indicated that, in addition to the benefits for the student, there is a pedagogical imperative, particularly in Practice projects, where research governance issues effectively divorce the student from arguably the most important part of the project, because the project must be fully defined long before the student is allocated due to the need to consider ethical issues:

“For Practice projects... the preparatory work must be done... during the summer prior to the project starting. For the project to be a better learning experience for the student, then they need to be involved earlier” (staff comment).

Students were therefore asked to respond to the statement ‘The Research Methods course provided me with adequate preparation for undertaking my project,’ in both the ‘before’ and ‘after’ questionnaires.

Figure 5 represents a crosstabulation of response frequency for both questionnaires. Figures in bold along the diagonal represent unchanged responses. The underlined figures reveal shifts of opinion. Above and to the right are those whose views on the Research Methods module improved, while those to the left and below represent a negative shift in attitude. This negative shift is highly significant (p=0.008), confirming concerns raised in the focus groups.

**Discussion**

Key findings

Staff and students believed the project made an important contribution to final grade, and this study indicates that this is indeed true. Such enhancement may reflect the high level of personal engagement required with a research project. Any failure of the project to elicit and assess ‘M’ level outcomes was often seen as resulting from the way in which the project module is currently structured, primarily due to the relatively short exposure of students to the research process.

Contribution to final classification

Although this enhancement is alluded to in the literature (Wilson *et al.*, 2005), there is little evidence to back this up. However, we find that the project contribution significantly raises the overall assessment profile, providing evidence to support these claims. It may simply be that research experiences are particularly effective teaching tools, and one student’s free-text response suggested that students are able to appreciate its value in teaching real-life skills:

“Well I think it depends on what is important.... For me the learning experience is infinitely more important - I know that after I leave university... my grades do not matter.”

This is particularly relevant in light of the ‘Fit for the Future’ reforms – while research may not be part of the typical Pharmacist’s remit, skills taught within the context of the project are exactly those required in the workplace.

Figure 5: The change in student perception with regard to the adequacy of the Research Methods module as preparation for the Project

		The research methods course provided me with adequate preparation for this project				
		SA	A	U	D	SD
With hindsight, the research methods course provided me with adequate preparation for this project	SA	<b>1</b>	0	0	0	0
	A	<u>3</u>	<b>6</b>	<u>3</u>	0	0
	U	<u>1</u>	<u>5</u>	<b>3</b>	<u>1</u>	0
	D	0	<u>1</u>	<u>3</u>	<b>0</b>	0
	SD	0	0	<u>1</u>	<u>1</u>	<b>0</b>

Students were asked in both the ‘before’ and ‘after’ questionnaire to respond to the statement ‘The Research Methods Course provided me with adequate preparation for undertaking my project.’ These responses were compared by means of cross-tabulation. Figures in bold along the diagonal represent students whose opinion had not changed in the second questionnaire. Underlined figures reveal changes of opinion.

### Student choice

Students made it clear that they believed the project area to which they were allocated affects their final grade, and choice was therefore important. However, focus groups suggested that students were perhaps not well-equipped for making such choices. To improve understanding, students should ideally be exposed to more research experiences, but this is not feasible, given the numbers involved. However, research seminars could be incorporated within the early years of the undergraduate programme and 'yearbooks' containing abstracts from the previous final year projects would give further insight into subject areas. Alternatively, we could devise a progressive project system, where the same title is kept for several years, and each successive year's students build on work done in the past (Chang, 2005). It may also be possible to offer mini research projects earlier in the course, and this may encourage students into novel areas. One issue touched on in this study, which we are currently investigating in more detail, is the factors that influence student choice. Previous experience (usually a degree in a relevant area) appeared to be particularly significant. However, the 2006-7 session saw an oversubscription to the Formulation area, driven by a mini-project in the Drug Delivery Systems module. Such schemes may be useful in attracting students into areas in which they are unlikely to have experience, such as Pharmacy Practice.

### The achievement of 'M' level outcomes and the contribution of undergraduates to peer-reviewed research output

The results indicated that staff were 'undecided' as to whether or not students achieved 'M' level output. This is perhaps surprising: we have a set of descriptors, used to develop assessment criteria and it should be straightforward to decide if students are meeting these. This can perhaps be answered in a limited way by considering responses to questions regarding which of the Masters criteria respondents believe students achieve, and those which they do not. In the questionnaire, these were presented in the form of drop down menus and, in general it seemed that staff felt students *did* achieve some Masters outcomes, but not others, and this may account for the high numbers of 'undecided' responses to the previous questions. The particular Masters qualities that were frequently considered not to be achieved were those relating to originality and the evaluation of new hypotheses (with only 24 and 35% of respondents agreeing that these criteria are typically met by students during in the project module). In general, free text responses suggested that this was a 'structural' problem, in that students do not begin their project until Final year, but practical considerations – such as the need for ethical approval, as well as staff workload planning – mean that the actual project will have been developed long before the student becomes involved.

The ideal would be exposure to research at all levels of the course, so that students could mature in time to make the best of their Fourth Year project. However, cost implications prevent this, especially when there is little evidence to suggest that undergraduate research makes a significant contribution to peer-reviewed output.

With regard to 'M' level achievement, it is important not to become despondent – this afflicts final year projects in all subjects and institutions. The Undergraduate Learning in

Science Project (ULISP) is a collaborative undertaking between the School of Education and science departments at the University of Leeds. A number of studies have been completed under the umbrella of this project, including the Research Project Study (Ryder, 2004). Essentially this investigation drew up a list of learning outcomes achieved by means of final year research projects. Interestingly, very few students achieved all of the outcomes defined in the descriptors. It seemed individual projects produced equally individual sets of outcomes. However, this is not peculiar to the research project module – it is perhaps just more obvious. In other modules, assessments will cover a number of learning outcomes, and students who pass are unlikely to have demonstrated competence with regard to all these.

### The efficacy of research training for undergraduate Pharmacy students

On the whole, staff and students were critical of the Research Methods module. This was not to do with content (the module typically receives excellent feedback), but more to do with the fact that it is not directly related to the actual research experience, and takes place in the previous academic session. This was relevant in light of the concerns regarding demonstration of 'M' level outcomes: the failure to elicit such outcomes was thought to be because final year projects are 'too little, too late.' Several staff members suggested a compromise: stretching the Project over two years, by restructuring the Research Methods module and aligning it with individual titles. This would address the concern that ethical considerations prevent the student from being fully involved in the design of the project.

By beginning the project in Third Year, we can answer many of the problems without requiring a significant increase in the resources required. Currently, at RGU, we have a 5-week data collection period and, while this may seem very short for an 'M' level project, it is going to be difficult to change this – there simply are not the resources. However, if the student has been involved in planning the project, he or she would be better equipped to make good use of those five weeks.

The existing Research Methods course is highly generic, and there is support for retaining this - some faculty feel that specialisation would deprive the student of a breadth of experience. However, a 'half-way house' could be achieved by dividing the module into two components: the first generic, the second aligned with the final year research project.

Finally, do research experiences lack validity in light of the fact that practising Pharmacists do not generally engage in research? We need to bear in mind academic as well as professional responsibilities: Something has been lost in the attempt to specialise Higher Education. In the past, the degree was seen as a generic training that would be applicable in many professional environments, while the trend today is to offer courses tailored to individual professions. The Boyer Commission (1998) describes this move as '[a move] from loyalty to the campus to loyalty to the profession', and summarises the importance of maintaining a close relationship between teaching and research for the benefit of all:

“[At a research active university] the potential remains for acquiring a wholly matchless education. The research universities possess unparalleled wealth in intellectual power and resources; their challenge is to make their [undergraduate] students sharers of that wealth.”

The Committee strongly endorses undergraduate research as “one of the potentially most rewarding aspects of the undergraduate experience (Husic and Elgren, 2003).”

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