Pharmacy **2014**, *2*, 65-73; doi:10.3390/pharmacy2010065

OPEN ACCESS

pharmacy

ISSN 2226-4787

www.mdpi.com/journal/pharmacy

Article

Group Project—Learning Research and Generic Skills for Life beyond University

Sabine Wilkens * and Joe Tucci

Department of Pharmacy and Applied Science, La Trobe University, PO Box 199, Bendigo VIC 3552, Australia; E-Mail: j.tucci@latrobe.edu.au

* Author to whom correspondence should be addressed; E-Mail: s.wilkens@latrobe.edu.au; Tel.: +61-3-5444-7370; Fax: +61-3-5444-7878.

Received: 20 December 2013; in revised form: 4 February2014 / Accepted: 8 February 2014 / Published: 13 February 2014

Abstract: Although research is usually not a goal of Pharmacy students, learning about the research processes is important, as graduates' development and confidence in professional counseling will depend on critically interpreting the literature about new therapies. In addition to research skills, many universities are now placing more emphasis on assessable graduate attributes. In an increasingly competitive job market, writing, critical thinking, speaking, leadership and teamwork skills are all essential, as they prepare students for the workforce, especially in regional and remote locations. However their teaching and assessment can be a challenge to embed in content rich subjects. "Group Project" is an elective subject in the final semester of the Bachelor of Pharmacy degree at La Trobe University in Bendigo, Australia. Key features include: self-selection of the project and participating group members, supervision of small student groups, interview-style presentations, weekly reflections on progress and group processes, as well as peer evaluation of group members. Three case studies are discussed to illustrate students' introduction to research within the support of the group and with guidance from their supervisor. In our experience, supervisor engagement played a large role in students rating the subject highly and their subsequent enthusiasm for research.

Keywords: group work; graduate attributes; pharmacy education; research

---

1. Introduction

Pharmacy students are often focused on the practice side of their career preparation, and shortly before finishing their degree are keen to have as much experience in the practice of Pharmacy as possible. In the final year of their course, most students have developed specific interests and strengths in the various areas of pharmacy. However, in a content-rich course such as pharmacy, little choice is given to students to increase their knowledge in specialized topics, and/or to improve their understanding in areas in which they feel less prepared, including leadership and other generic skills, which play an ever increasing role in the professional workforce [1,2]. This is even more important in regional and remote practice as professionals more often have to be multi-skilled and act as agents of change in less-well resourced settings [3]. Ongoing pursuit in research has been identified as a must for modern professional pharmacists, and lack of familiarity and confidence in this area is recognized as one of the barriers to involvement in research as a practitioner [4]. Hancox and Shaw [5] mention the requirement of some pharmacy courses to have individual research tuition, however for several reasons, including the increased need for team work experience of graduates, the fact that research nowadays is largely conducted in teams, as well as staff workload issues, pharmacy courses such as those at the University of Auckland, and La Trobe University have opted for group projects as part of their final year Pharmacy degree.

The "Group Project" (PHA4GP), which is an elective subject in the Pharmacy course at La Trobe University, Bendigo, can serve students in several ways. Students can specialize in an area of their interest and importantly, get some experience at independent research with the support of a group, facilitated by an experienced academic. In addition, students display the mastering of many graduate attributes, which will make them potentially more attractive to future employers. Such integration of teaching and research has been shown to enhance undergraduate learning in pharmacy [6] and other professional degrees like engineering [7]. "Group Project" can thus be used to introduce the complexities of biomedical research, something students need to understand if they are to interpret the literature in their life-long learning as professional pharmacists. At the same time, it helps to improve information literacy, writing and teamwork and in many cases, leadership skills—and therefore prepares students better for life beyond the university. The structure of the subject PHA4GP "Group Project" is deliberately organized to allow for these outcomes to be realized.

2. Structure of PHA4GP "Group Project"

Before the start of semester, students are asked to list six preferences from a project list (assembled from staff proposals) and if interested, nominate any fellow students with whom they want to work. Research projects may be quantitative or qualitative, centered around pharmacy practice, laboratory work, or based on reviews of current literature. The priority in project allocations is that most students should get their first or second choice of topic, with staff load being second and friendship groups the third priority. This process is very similar to the one from the University of Auckland Pharmacy course [5].

Project allocations and group compositions are revealed in the first session in week one of the semester. From then on, the groups meet regularly with their supervisor throughout the semester at a

time mutually convenient for both. These meetings with the group's supervisor, which occur at least once a week, are a compulsory component of "Group Project", but other meetings with the supervisor or other experts as well as additional group meetings may be organized by groups on a needs basis. In the first few weeks of semester, there are a small number of structured lectures and workshops that aim to develop literacy retrieval skills and other graduate attributes like writing, critical thinking and group work.

Two group presentations are given during the semester. These must be delivered in the form of a mock interview to a funding body, an employer or chief researcher. Members of the group apply for the "job" (*i.e*., their project) at the beginning of semester, and at the end of semester, they explain their findings to a critical audience (e.g., the funding organization, or their employer). Students within the group must play the roles in the scenario, while the whole class and supervisors of all groups are encouraged to ask questions at the end of the presentation.

At the start of the semester, students are also informed about a set pathway for any problems encountered with low- or non-contributing members; this can ultimately lead to expulsion of a group member and provides some assurance to those students who are prejudiced against group work due to negative experiences in other subjects. At the end of the semester, all students are required to evaluate each group member (including themselves) with respect to their contribution to the overall project (performance, organization and leadership skills, *etc*.) and this peer-review score forms part of the overall assessment. Every student in PHA4GP has to submit a weekly reflection to the subject coordinator and this is assessed on the degree of analytical thought about their work and their group's dynamics. This serves to encourage students to reflect on their personal development, their progress towards meeting their research goal, and any processes that are occurring within the group. It also helps to identify what strategies are working well and where hurdles are encountered. As well as benefitting the student, the reflections are also a valuable tool to keep the subject coordinator informed about each group's progress and any emerging technical or personality issues. The final group report forms the largest piece of assessment in the subject. These reports are marked according to a common rubric, which enables examiners to take into account the number of students in the group and the nature of the project.

Projects that have been undertaken over the last five years are largely dictated by staff interest and expertise. Topic areas have ranged widely, for example, analytical experiments determining the nutritional content of walnuts or active ingredients in chamomile, qualitative studies surveying pharmacists or pharmacy students for their opinions on various matters, evaluating health-related "apps" for mobile phones, or various literature reviews in specialist pharmacy areas like pain medication, bush medicine, *etc*. Three case studies, one dealing with cancer research, another with a review of treatment for hypothyroidism, and a third investigating whether paracetamol or ibuprofen is preferable for children's pain are explained in more detail below. In the subsequent section, several ingredients for success and student satisfaction evident from these projects are highlighted.

3. Three Case Studies

In the project entitled, *Is there evidence to treat subclinical hypothyroidism in specific populations?* (case study A), a group of students undertook a systematic literature review in an area where a

pharmacist may be required to counsel patients in their professional life. Students investigated various risk groups and whether there were any current guidelines on treating hypothyroidism in these. In this context, different complexities of the condition emerged in various sub-groups of the population and students had to look at the literature critically in order to separate out the valid evidence for treatment or non-treatment in these groups. Students in this project, had to sift through a large number of published articles, by using a rigorous set of criteria for inclusion or exclusion in their review. The main finding was that clinical hypothyroidism in pregnant women, elderly people and those suffering from specific medical conditions should be treated to minimize risks and increase quality of life, while in other sub-groups (e.g., young children and women with fertility issues), there was no strong evidence for treatment of sub-clinical hypothyroidism.

In another project, *Clinical Progression: Why do many promising anti-cancer compounds fail to progress to human trials?* (case study B), students identified over a thousand records of compounds or therapies that had been published in a single 12 month period (2001). A period ten years prior to the date of the study was chosen, to give sufficient time to "track" the literature forward, in order to investigate the fate of the compounds/therapies. By thus studying the literature and attempting to contact authors directly, group members tried to identify and categorize why so many promising cancer trials were abandoned. A database containing all publications that met certain criteria was set up by the supervisor on the university's Learning Management System, and a semi-automated system made categorization easier and more efficient. Insufficient efficacy, progression of other related compounds and lack of funding were found to be key reasons, with the latter being the most significant. This case study touched on many realistic complexities of research, including support for expensive research, patent issues, difficulties involved in organizing trials of a promising agent, and it made more apparent to the students the authentic reasons for the progress (or lack of) in cancer research.

A third project (case study C) was entitled *A review of the efficacy and safety of paracetamol and ibuprofen in the treatment of paediatric pain and fever.* For this study, students completed a systemic review of the literature, in order to attain an evidence-based assessment of this important area of pharmacy practice. The question was very topical, as there had recently been published a study which questioned the long-term safety of paracetamol in children. The group's review concluded that while in most instances paracetamol is the safest and most appropriate treatment for pain and fever in children, ibuprofen may be preferable where there is an inflammatory component. The report was of a high quality, to the extent that two publications resulted from it [8,9].

4. Getting It Right

Some group projects are unsuccessful and leave students disengaged and disenchanted, but many deliver students (and supervising academics) a highly satisfying experience. Over the 10 years that "Group Project" has been running, the following elements have helped to "get it right". Many of these can be controlled, thus making projects less risky and far more enjoyable to teach and to study.

4.1. Self Selection of Topic

If students are spending a whole semester on a topic, this topic needs to be relevant to them in their future career [10]. Giving students their first or second choice can be challenging, especially if certain

topics (or supervisors) are popular, but often topics can be split up and supervision of popular choices can be shared, so that students feel their needs are met. Once the groups have formed, the original topic may need some adjustment, depending on number, interest and expertise amongst group members.

4.2. Nature of the Topic

The nature of the topic must be such that it encourages interdependence of group members and the workload must be such that it can be split up easily and fairly and in a meaningful way. One good example of this is when the literature search returns thousands of articles. Here, each group member gets an allocation of articles for vetting, classifying and information retrieval. Alternatively, group members can be given different keywords or year intervals for their literature searching or split the topics into even-sized subtopics.

In the case studies above, the literature was so vast that a decision was made to confine it to a certain interval, the last 5 years for case study A, and the year 2001 for case study B. Literature-based surveys are not acceptable as research projects at the University of Auckland where group projects extend over two semesters [5]. However, with only one semester available for projects in the pharmacy course at La Trobe University Bendigo, literature based projects have been very successful, while laboratory-based projects less so, due to the amount of time required to train students to use scientific equipment and instrumentation. Despite this, however, occasionally a laboratory-based project is productive and brings satisfaction to the group, but expectations of what can be achieved have to be realistic.

It is very important to set specific parameters for laboratory-based and literature-based projects and that all students contribute to such decisions. Without very firm boundaries, most students will flounder and experience frustration due to uncertainties as to whether their effort will, in the end, be worthwhile.

4.3. Group Spirit and Organization

Although group spirit cannot be wholly controlled, selection of group members (rather than random allocations) can be made with group dynamics as a consideration. For example, a single student is never placed together with a friendship group, nor is a single male student placed in an all-female group and *vice versa*, unless the dynamics are well-known already. In suitable group projects, successfully answering the research question requires the cooperation of members in several ways [11]. These authors discuss the fact that group cooperation is important in achieving group outcomes, such as attaining an answer for the research questions, attaining a good grade, successfully managing the large amount of resources and the various roles required to do so. The progress of the group in attaining the above goals is relatively easily charted by a combination of the weekly meetings with the supervisor and their documented weekly reflections. Some students may be hesitant to talk about leadership or group problems in the meetings, but for many, the reflections are used more openly, giving the supervisor and subject coordinator a good idea of the state of the group in time to act, so that the group can be steered towards a better outcome. In addition, reflections are an important tool in encouraging students to think about their strengths and weaknesses and how to use that knowledge productively [1].

Being interdependent and reliant on each other's contribution in order to achieve a good grade, in theory creates productive groups. In practice however, having a single report produced by a whole group easily sets up conditions where underperformance goes un-penalized [11]. When disharmony

arises due to non-contributing members, highlighting the set procedure for dealing with such members most often settles the grumbling. In the three case studies mentioned above, not all members in the groups had the common goal of attaining a high grade, but their complete interdependence in managing the resources, made the less ambitious members "highly exposed" and accountable to the rest of the group and this gave them enough momentum to perform sufficiently well.

4.4. Authenticity of Research

In the three case studies above, students were highly satisfied because their research was original and authentic. Doing authentic research is very engaging for students [11] and ensures more enthusiastic student responses. The finding in case study B, that cancer trials are most often abandoned due to funding problems, may be obvious to supervising academics, but it was a genuine and important outcome for the students in the group.

4.5. Group Composition and Membership Number

Students often like to work in friendship groups and this is taken into consideration when selecting group memberships. In our experience, friendship groups can be enjoyable in practice, but do not necessarily guarantee the most productive outcome. Conflict over standards and work ethics is often harder to deal with amongst friends and this can be detrimental. Optimal group sizes vary, with Colbeck *et al*. [11] reporting between 2 and 16 members as workable sizes, but an ideal number is mostly dependent on the nature of the project and the resources available, including availability of supervisors. The group in case study A was small (only three people). This worked well as members could not disguise their lack of contribution behind that of other students, but it also limited the amount of work that could be covered. In case study B, a mix of students from science and pharmacy made up the group. It was a large group (seven members), but the year 2001 literature alone yielded 1,363 agents/therapies to follow, and thus a smaller group would not have managed this amount of follow-up work. In Bendigo we have found four to six members to be an ideal number for most projects, but depending on the project, permit groups of 3–8 members. Over the years, students have not expressed any great concerns over the variable group sizes, as this is taken into consideration when assessing the group.

4.6. Supervisor's Dedication

Student perception of supervisor dedication was found to be a key ingredient for the success of a project as revealed in conversations with students and feedback through the anonymous standard quality assurance procedures. Perception of varying degrees of support was also a common concern at the University of Auckland pharmacy course [5] and is something that is very difficult to normalize. It is highly project-dependent, but the degree of support needed by students also varies with their preparedness and confidence, as well as with their aspirations and group dynamics. At the La Trobe pharmacy course in Bendigo, student groups that have not worked well often had supervisors who were overcommitted elsewhere and could not spend sufficient quality time with the group early on in the semester. If the initial investment in the group is made, especially in the areas of topic refinement

and limitation and the guiding of students in their dealing with the literature, most groups become independent early, and thus the supervisor's investment results in a successful project. In a larger university with many more projects running, academic workload becomes an issue. A solution reported by Morris and Sharif [12], cited in [5], was adopted by the University of Manchester and involved the employment of part-time staff, dedicated entirely to assist in the management of student research projects. At the La Trobe pharmacy course in Bendigo, current staff inputs have been sufficient to accommodate Group Project supervision. The dedication of the supervisor, however, is not necessarily a predictor of project success, as many students have had (good and bad) experiences in group work, and simply get on with it [11]. This has also been found at La Trobe University in Bendigo.

4.7. Assessment

Assessing group work is a major area of concern for high achieving students as they often feel they are carrying the non-contributing students and are forced to do extra work in order to get a good mark [11]. In some cases, a process to deal with non-contributors may be lacking [5]. At Bendigo, the set series of steps, which can ultimately lead to expulsion of a group member has never been fully implemented, but students possibly feel more secure of their options because of them. It is also re-assuring for them to know, that any action in this regard does not necessarily spell failure in the subject for the expelled student. If reasons for non-contribution to the group effort are deemed genuine by the subject coordinator, an alternative report related to the group topic can be set for assessment, along with the student's continued reflection about the events that led to his/her exclusion. In addition to this (rather extreme step), peer assessment of each group member's contribution to the semester's work is required at the end of semester. This counts for 15% of the final mark. Students are generally rather kind to each other so over the years it has not made a difference of more than one grade to final marks, however the potential is there to highlight poorly performing group members, and this is another important assurance and motivator for students. At the University of Auckland, in addition to a similar peer review procedure, individual interviews by an independent assessor at the end of semester are used to account for individual student performance in the project [5]. This rather intense workload requirement of academics has not been found necessary at La Trobe Bendigo.

5. Conclusions

Offering student projects is work-intensive for staff and needs meticulous planning to be justifiable from a cost perspective, although their benefits in helping students in their life-long learning journey as a professional health worker is clear. The training of health professionals in research methodology at an undergraduate level may serve as a useful strategy in allowing practitioners the confidence to progress in their chosen profession [4,13]. Obviously, one subject in which a major aim is to introduce students to research is not enough to train a clinical research pharmacist or scientist, but it may be sufficient to demonstrate to students the benefits of research so that they consider research as an alternative or adjunct career to community or hospital pharmacy, something that needs encouraging [2]. These projects also further develop the highly regarded graduate attribute of team work, while encouraging students to do independent work in a less confronting learning situation that offers mutual support. In a complex allied health field, future additional benefits can be gained by running joint

projects amongst various disciplines. Joint projects would be more reflective of future needs and interactions of allied health professionals, especially in geographically isolated areas, and the seeds for the benefits of such productive interactions can be sown in a successful project at undergraduate level.

Acknowledgments

Our thanks go to the supervisors of "Group Project" who have given their student groups a positive experience in this subject.

Author Contributions

Sabine Wilkens is the subject coordinator of PHA4GP and has written the initial draft. Joe Tucci is the course coordinator of Pharmacy at La Trobe University Bendigo. He has provided discussions, suggested changes to the manuscript and has also supervised several groups in this subject.

Conflicts of Interest

The authors declare no conflict of interest.

References

1. Sorenson, T.D.; Traynor, A.P.; Jamke, K.K. A pharmacy course on leadership and leading change. *Am. J. Pharm. Educ.* **2009**, *73*, 23–32.
2. Svensson, C.K.; Ascione, F.J.; Bauman, J.L.; Brueggemeier, R.W.; Letendre, D.E.; Roberts, J.C.; Speedie, M.K. Are we producing innovators and leaders of change or resisters and followers? *Am. J. Pharm. Educ.* **2012**, *76*, doi:10.5688/ajpe767124.
3. Casey, M.M.; Klinger, J.; Moscovice, I. Pharmacy services in rural areas: Is the problem geographic access or financial access? *J. Rural Health* **2002**, *18*, 467–477.
4. Armour, C.; Brillant, M.; Krass, I. Pharmacists' views on involvement in pharmacy practice research: Strategies for facilitating participation. *Pharm. Pract.* **2007**, *5*, 59–66.
5. Hancox, D.; Shaw, J. A report on pharmacy undergraduate research projects: Experiences of the University of Auckland. *Pharm. Educ.* **2006**, *6*, 209–214.
6. Nahata, M.C. A programme to enrich undergraduate education through participation in clinical pharmacy research. *J. Clin. Pharm. Ther.* **1990**, *15*, 221–224.
7. Sabatini, D.A. Teaching and research synergism: The undergraduate research experience. *J. Prof. Issues Eng. Educ. Pract.* **1997**, *123*, 98–102.
8. Tucci, J.; Bandiera, E.; Darwiche, R.; Medos, Z.; Nashed, R.; Trinh, D. Paracetamol and ibuprofen for paediatric pain and fever. *J. Pharm. Pract. Res.* **2009**, *39*, 223–225.
9. Tucci, J.; Bandiera, E.; Darwiche, R.; Medos, Z.; Nashed, R.; Trinh, D. A review of the efficacy and safety of paracetamol and ibuprofen in the treatment of paediatric pain and fever. *Aust. J. Pharm.* **2009**, *90*, 58–63.
10. Sylvia, L.M.; Barr, J.T. *Pharmacy Education: What Matters in Learning and Teaching*; Jones and Bartlett Learning: Sudbury, MA, USA, 2011.

11. Colbeck, C.L.; Campbell, S.E.; Bjorklund, S.A. Grouping in the dark: What college students learn from group projects. *J. High. Educ.* **2000**, *71*, 60–83.
12. Morris, C.; Sharif, S. A new approach to the management of MPharm students research projects. *Pharm. J.* **2004**, *227*, 192–193.
13. Winan, K.S.; Madhavan, S. Some factors influencing undergraduate pharmacy students' perceptions of and attitudes towards research related activities. *Am. J. Pharm. Educ.* **1992**, *56*, 29–35.