

Poster Session 2 – Pharmacy Education

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Optimisation of assessment and feedback in large-group practicals

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Learning by doing is one of the most effective and powerful forms of education because various senses are used. Indeed as an old Chinese proverb reminds us: "Tell me and I forget. Show me and I remember. Involve me and I understand". There is no doubt that practical classes play a pivotal role in the understanding and application of pharmaceutical sciences. However, for learning to be effectively supported within practical classes there must be an opportunity for both practice and feedback, so to allow us to make and learn from our mistakes. Indeed, it has been recognised in Johnstone's information process model for learning (Fry et al 1999), that applying new knowledge and gaining feedback allows data to be processed and stored in the long-term memory with feedback (e.g., via tutor-student or student-student interaction) confirming or improving student understanding and confidence, or both. The aim of this active research was to optimise the first-year pharmaceutical practical classes so that we are able to provide effective and efficient assessment of large student groups within practical classes thus promoting enhanced learning through the establishment of effective and immediate feedback within the practical classes thereby creating a more effective learning environment. Practical classes were conducted in student cohorts of up to 40 with a staff/student ratio of ~1:10. Nine practical work schedules, covering a range of pharmaceutical topics (e.g. "Adsorption from Solution") were developed such that both the practical and data manipulation/interpretation elements of the class could be completed within each three-hour class. Schedules were formatted so that assessment of the work could be cumulatively marked as the student progressed through their work. This aimed to promote both effective and timely personalised feedback to students during the class and aimed to ensure student learning progressed toward the stimulated learning outcomes such as ability to construct an adsorption isotherm from collected experimental data. To assess the acquisition of practical skills, students were also marked on their manual competency during the practicals. Student perception of this assessment model was collected via an anonymous feedback questionnaire. Overall response, obtained from 139 completed questionnaires, towards the new assessment strategy was positive with 90% of students agreeing or strongly agreeing that having a member of staff available during the write-up of the practical was useful. Similarly a large proportion of the students agreed or strongly agreed that completing the practical write-up in the class and getting their work assessed immediately on completion was useful for their learning (61% and 79%, respectively). The introduction of a practical competency mark within the practical assessment was also positively received with 73% of the group agreeing or strongly agreeing with this strategy. Under our new assessment strategy, students will also be required to undertake a written examination based on the practical learning objectives. Student performance in this examination will be monitored and correlated with their competency measured via the continuously assessed practical component to investigate if this new assessment strategy enables students to achieve specific learning outcomes.

Fry, H., et al (1999) *A handbook for teaching and learning in Higher Education – enhancing academic practice*. Kogan Page Limited, London

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Indicators suggesting the need for additional learning activities relating to sunscreens in the MPharm degree at the University of Brighton

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Due to the changing climate conditions in the UK it has been estimated that there will be around 5000 additional cases of skin cancer per year (Diffey 2004). Therefore, it is likely that, in the future, the pharmacist may have an increasingly important role in advising the general public on the correct type and use of sunscreens to help prevent this. Recent studies have found that pharmacists demonstrate low levels of personal sun protection behaviour (Souvignier et al 1996) and that the behaviour of junior doctors was no different to that of the general public with respect to sun awareness and use of sunscreens (Darling &

Ibbotson 2002). In this study, we were interested to determine whether pharmacy students reflected the same low levels of personal protection as their qualified equivalents. In addition, a group of students studying non-health care-related subjects (computing and information systems) were included in the study to determine if behaviour was different depending on which degree subject was being studied. The study was carried out by the distribution and collection of questionnaires during lectures to students. The questionnaire consisted of 10 questions relating to sunscreens uses: strength of sunscreen (SPF type), habits of reapplication of sunscreens, economic considerations, skin type, environmental factors and how often the sunscreens were replaced. The questionnaire was approved by the University of Brighton ethics committee, all data collections were anonymous and students completing the questionnaire were advised that completion was strictly optional. Only one year of pharmacy students (final year) and one year of non-pharmacy students were surveyed in this initial survey at the University of Brighton. The response rate was above 80% in both cases. Chi-square tests were used to test for any statistical differences between the responses of pharmacy students and non-pharmacy students and between the two sexes. The results showed no statistical difference between the two student groups, with only 53% of pharmacy students and 42% of non-pharmacy students using sunscreens. In both groups approximately 60% of female students used sunscreens. These results suggest that all students, regardless of the subject studied, are not employing sufficient sun protection and this agrees with the findings that qualified health care professionals, doctors and pharmacists also under-utilise sun protection. This would suggest that there is insufficient emphasis in the undergraduate programme regarding sun awareness. In response to these results, the new validated MPharm degree has incorporated additional learning activities relating to sunscreens and it is anticipated that this survey will be repeated later, and the results compared to determine whether increasing the course content on sun awareness influences relevant behaviour in the pharmacy student population.

Darling, M., Ibbotson, S. H. (2002) *Clin. Exp. Dermatol.* **27**: 442–444

Diffey, B. (2004) *Phys. Med. Biol.* **49**: R1–R11

Souvignier, S. T., Meyer, J. A., Eckhardt, L. (1996) *J. Clin. Pharm. Ther.* **21**: 399–406

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Is mathematical confidence linked to performance in a basic mathematics test?

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The expansion of higher education in the 1980s and the subsequent increase in student numbers has created greater variation in cohorts of students entering university. Entry requirements are more relaxed and students with lower A-level qualifications or alternative qualifications are routinely accepted onto M. Pharm. degree courses within the UK. Maths is a key component within the pharmacy degree programme and a good understanding of basic mathematics is essential. This study investigates the link between student confidence in performing mathematical operations and student ability. A multiple choice mathematical ability test that also examined previous mathematical qualifications and mathematical confidence was distributed to 120 first year undergraduate pharmacy students. Students were required to state whether they held an A level or equivalent in mathematics as well as to rank their confidence in performing key skills including; simple operations, manipulating logs, manipulating powers, converting units, rearranging equations and concentrations. A short multiple-choice test was then administered that evaluated their ability in performing these key skills. The responses were divided into two groups; group 1 have an A level or equivalent in maths and group 2 have a minimum of a GCSE or equivalent in mathematics. Tables 1 and 2 show how confidence was affected by previous mathematical qualifications; each student ranked their confidence in performing various functions from 5 to 0 with 5 being the most confident and 0 being not at all confident (Table 1). The students' ability to perform key functions was assessed and is demonstrated in Table 2; the average score of those students possessing an A level is compared with that of those students without. As expected these results demonstrate that students with an A level in mathematics perform better in a multiple choice test compared with those students who only have a formal mathematics qualification at GCSE level or equivalent. In addition students that have A-level mathematics were more confident in performing the mathematical skills listed compared with non A-level students. Student confidence in performing a mathematical operation can not be used to directly predict students' ability; both groups indicated that they were most confident in performing simple operations yet the results from the multiple choice quiz indicated that both groups had low ability in this skill.

Table 1 Confidence of student groups

Key skills	Mean confidence	
	Group 1	Group 2
Priority of operations	4.9	4.5
Manipulation of powers	3.9	2.9
Manipulations of logs	3.5	2.5
Conversion of units	4.3	3.7
Rearranging equations	4.7	3.1
Concentrations	3.9	3.7

Table 2 Ability of student groups

Key skills	% Correct responses	
	Group 1	Group 2
Priority of operations	66.1	54.6
Manipulation of powers	81.3	69.6
Manipulations of logs	68.4	41.7
Conversion of units	80.4	68.2
Rearranging equations	84.0	65.0
Concentrations	52.9	42.5

175**How do the MPharm degree and pharmacy experience complement each other? Views of students**

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Pharmacy experience during vacations, or at other times such as at weekends during the academic year, undertaken while studying for an MPharm degree has been identified as being advantageous as it provides students with the opportunity to develop and apply their knowledge in a practice environment in the presence of patients (Rothmann et al 1998). Others (Rees et al 1996) reported the outcomes of structured community pharmacy placement training. The aim of this study was to explore the views of MPharm students at one school of pharmacy on how they perceived the degree and pharmacy experience complemented each other. A focus group was conducted consisting of six MPharm students with hospital, industry and community pharmacy vacation experience. The group generated themes of topical relevance to the cohort being studied, which were incorporated into a self-complete questionnaire. Following piloting, the final questionnaire was distributed to the 92 students in the third year of a four-year MPharm degree. Replies were received from 69 students (75% response). All students had undertaken some experience, 91% in community pharmacy, 51% in hospital and 49% in both sectors. In total 96% agreed that pharmacy experience was essential while undertaking a pharmacy degree — 61% agreed strongly with this view. In response to the statement “When you see things in practice you remember it more than learning from a hand-out”, 96% agreed or agreed strongly. Students were asked if they were confident when performing pharmaceutical calculations when in practice and 60% agreed but 30% disagreed that this was the case. The remainder had no opinion. Ninety-three per cent disagreed or disagreed strongly that they had not learnt anything new from their experience. Thirty per cent of respondents disagreed that their experience had helped with examination preparation but 36% stated it had helped them; the other third had no opinion either way. Subjects were given a number of options to explore which aspects of their course had been helped by their experience and 78% stated interpreting and dispensing prescriptions, 86% indicated responding to symptoms and 19% stated formulation of extemporaneous products. Students were asked how easy it was to obtain the pharmacy experience they had wanted and 42 students (61%) said it was ‘easy’, 20% said it was ‘not easy’ and the remainder were unsure. The findings of this study indicate that the students found pharmacy experience helpful. Although the response rate was considered accepted at seventy-five per cent, it is not known if those who had not responded had not found such experience useful or indeed whether they had had any such experience and hence this may be a limitation. Further research with such students and with students from all schools of pharmacy might help in terms of maximising the potential benefits of how the course and any pharmacy experience might further complement each other. It is not known how the significant increase in number of places available to study pharmacy at university will affect

the number or quality of experiential learning for pharmacy students out with the formal degree.

Rees, J., et al (1996) *Int. J. Pharm. Pract.* **6**: 30–37Rothman, J., et al (1998) *Int. J. Pharm. Pract.* **4**: 171–174**176****Does the MPharm degree prepare students for the pre-registration year? The student view**

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Currently there is a lack of published information regarding the opinions and experiences of MPharm graduates in the UK, although views of graduates following a Bachelors pharmacy education have been reported (Mudhar et al 1996). The aim of this paper is to describe the findings of an exploratory study undertaken of the graduates of one UK School of Pharmacy. Two focus groups comprising recent graduates from three schools of pharmacy were conducted to identify and explore how recent graduates felt the degree had prepared them for professional training. Transcripts were coded and emergent themes were subsequently used to produce a postal survey. The questionnaire was sent to 83 graduates of one school of pharmacy who were working in the UK in 2002, after they had completed 6–8 months training. Responses were anonymised and so all pre-registration graduates were sent a reminder two weeks later. Respondents were asked to indicate their agreement or otherwise with a number of statements. A total of 49 responses were received (59%), 27 from hospital (55% of responses), 21 from community (43%) and one reply from a student undertaking a joint industry–hospital programme. The generic skills developed at university that were considered to have been useful as part of their training by the graduates included communication (n=32), problem solving (n=33) and time management (n=18). Over three-quarters were confident that they had a working knowledge of formulation for preparing extemporaneous products, although a minority disagreed (n=9). Although pharmaceutical calculations are covered in a number of modules in each of the four years of the programme, 71% of students indicated they wished that even more emphasis be placed in this area. More than two-thirds of graduates agreed or agreed strongly that the syllabus contains too many topics that bear little relevance to the pre-registration year. Twenty per cent expressed disagreement with the statement ‘There was too much organic/medicinal chemistry in the MPharm degree’ whereas 35% agreed and 27% agreed strongly. In response to a discussion in one focus group, two students thought the degree was mainly orientated towards community rather than hospital. The questionnaire identified that 73% disagreed with that view. A further 14% had no opinion either way. When asked ‘If I had the chance again I would still choose to study pharmacy’, 88% agreed or agreed strongly with equal proportions disagreeing or having no opinion (6%). A pleasing finding was that with 4–6 months until qualification and after over four years of study, nearly 90% of respondents would still choose to read pharmacy at university if they had the opportunity again. An interesting finding was that over 70% of students would wish that further emphasis is placed on calculations in the MPharm degree. This may be due to the tragic death of an infant as a result of an overdose of chloroform (as peppermint water) which occurred while this cohort of students was undertaking formulation and dispensing modules (Anon 2000). A satisfactory response was achieved although, as with all surveys, one cannot extrapolate findings of respondents to those who choose not to respond. The response rate may be due at least in part to the timing and topical relevance of the questionnaire.

Anon (2000) *Pharm. J.* **264**: 360Mudhar, M., et al (1996) *Int. J. Pharm. Pract.* **4**: 59–64**177****MPharm graduates: what are the views of pre-registration tutors?**

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In 2000 the role of universities in preparing pharmacy students for the pre-registration training year was raised (Ward et al 2000). In 2002 it was decided to survey pre-registration tutors of MPharm graduates from one school of pharmacy to explore their opinions and experiences of recent graduates on two main points,

namely had there been noticeable differences between BPharm and MPharm graduates and if the trainees possessed certain competencies at the start of training or if not after some training. A focus group was convened consisting of pharmacists involved in pre-registration training. This group was most useful in that it uncovered a number of themes and issues that were of relevance and interest to those pharmacists registered as tutors with the RPSGB. The themes identified were used to construct a questionnaire consisting of a number of closed- and open-ended questions. Anonymous questionnaires were sent to tutors of 78 trainees, 39 in hospital and 39 in community. Replies were received from 38 tutors (49% response rate), 22 from hospital pharmacists and 16 from community pharmacists. Eleven of the tutors were tutor to a Cardiff graduate plus at least one other graduate from one or more other schools of pharmacy. Interestingly 18 tutors (47%) had no involvement with the selection of their trainee(s), 13 in community and 5 in hospital. Tutors were asked to respond to a number of statements relating to their Welsh School of Pharmacy graduate trainee in week 1 and also after 6 months. The results are shown in Table 1. No tutor indicated that any student had deteriorated between the two time points. Significant proportions of trainees were considered to possess certain competencies in week 1 and of those who did not, the vast majority demonstrated competencies at 6 months. Tutors were asked via an open response question if they had noticed any differences between MPharm graduates and those who graduated with a Bachelor degree (BPharm or BSc) not relating to one school of pharmacy but in general terms. Of the 18 tutors who answered the question, 11 said there was no noticeable difference, 4 indicated greater clinical skills and/or knowledge, 2 stated that being one year older made them more mature in their approach and one tutor commented that MPharm graduates were more prepared in the application of knowledge. This exploratory study has identified that a number of pre-registration graduates possess required competencies at the start of training whereas others do not. Clearly, universities are preparing graduates to start the pre-registration training year and each school reviews its curriculum on a regular basis. Although the authors empathise with others (Ward et al 2000) in terms of asking could universities do more, the degree is there to provide a platform for community, hospital, industry and other branches of pharmacy and the pre-registration year has its part to play in shaping the pharmacists of tomorrow in one or more branches. Further research is clearly warranted and the authors suggest this would be timely.

Table 1 Assessment of pre-registration graduate's ability by tutors^a

	Week 1		6 months	
	Yes	No	Yes	No
Felt comfortable about working independently	12	20	37	0
Confident in identifying own learning needs	14	17	32	0
Competent at developing a process in order to apply clinical knowledge to a pharmaceutical problem	14	21	29	2
Competent at recording evidence	18	15	30	3

^aSome tutors (of the 38) respondents were unsure or did not answer all questions.

Ward, A., et al (2000) *Hosp. Pharm.* 7: 210–213

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A workshop-based approach to using spreadsheets for pharmaceutical problem-solving

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Throughout the Aston MPharm course, students are introduced to numerous mathematical concepts, ranging from the ability to perform simple operations without the use of a calculator, to more advanced equations describing, for example, how the solubility of a drug varies with pH. The use of computers to assist solving more complex equations can remove some of the drudgery of calculations, as well as being a valuable way to save time. A key principle when using computers, however, is that the intellectual knowledge to generate the answer must be provided by the user. Many computer spreadsheet programs are available for problem-solving; Aston MPharm students are introduced to the Microsoft Excel spreadsheet program in a 2nd year pharmaceuticals module, with the aim of enabling students to develop appropriate spreadsheets to solve theoretical or practical problems commonly encountered in pharmaceuticals. Students attend two 3-hour workshops, in which they work through a range of sample pharmaceutical problems. An assessment exercise at the end of the second workshop gauges students' ability to individually devise a spreadsheet, plot a graph and determine specific numerical values to solve a particular pharmaceutical problem. Questionnaires were developed to gain an insight into 2002/2003 2nd year students' self-assessment of their ability to use Excel spreadsheets, both before and after the workshops. Opinions were also sought as to the perceived usefulness of the workshops in relation to the rest of the pharmaceuticals course. In addition, student performance in the assessment exercise provided a useful measure of the effectiveness of the workshops. Student participation in the questionnaire was high, with 86% (n = 121) of the student cohort responding. Responses indicated that students believed their ability to use Excel had improved during the workshops, with more students being confident when generating data (79% vs 56%) and plotting graphs (81% vs 63%) than before the workshops. In terms of practical benefit, considerably more students felt that they would use Excel in the future when solving problems in practical classes than would have done before the course (78% vs 39%). The majority of students (75%) understood the aims of the workshops, and considered that these aims were met (74%). Students generally felt able to ask for help during the workshops (81%), and overall students felt more confident using Excel (79%). Inspection of the assessment exercise results indicated that the majority of students were able to devise a spreadsheet, plot a graph and determine specific numerical values (mean mark $79 \pm 18\%$). Spreadsheets have been used as scientific problem-solving tools in undergraduate courses for some time (Haworth et al 1997). Previous studies have shown that, while Pharmacy undergraduates are generally familiar with word-processing packages, their knowledge of spreadsheet packages is "less than workable" (Chandra & Holt 1996), and that "student training is clearly a requisite" when using this type of resource (Sosabowski et al 2002). This study clearly demonstrates how a workshop-based approach can enable students to confidently and competently develop appropriate spreadsheets to solve theoretical or practical problems commonly encountered in pharmaceuticals.

Chandra, A., Holt, G. A. (1996) *Am. J. Pharm. Educ.* 60: 297–303

Haworth, I. S. et al (1997) *Am. J. Pharm. Educ.* 61: 97–102

Sosabowski, M. H., et al (2002) *Pharm. Educ.* 1: 37–44