University of Strathclyde: School of Pharmacy

Pharmacy Practice Three Online Prescription Simulation Tool

A REAP project case study June 2006

About the class:

Pharmacy Practice Three is a third year class of approximately 240 domestic and overseas students. The class is taught as two cohorts: domestic and European union students are taught during two traditional semesters and an additional cohort of collaborative programme students from Malaysia are taught in semester three (summer semester). Pharmacy Practice Three is the main competency-based evaluation of dispensing practice in the 610 credit Master of Pharmacy (MPharm) degree at the University of Strathclyde. The class is designed to develop and evaluate students' ability to dispense pharmaceuticals against a range of prescription types. The class includes a series of exercises in which students are required to ensure that each prescription is legal, check doses, ensure that prescriptions are clinically appropriate for the patient, allocate legal categories where required and ultimately dispense a product to the 'patient'.

Students currently receive their only practice in engaging with prescriptions and dispensing products during two lab sessions each week. Lab sessions focus on a number of different types of prescriptions throughout the year, starting from basic NHS prescriptions, then controlled drugs, special prescriptions (including the limited list), dentist and nurse prescriptions, private prescriptions and interactions. Students also have to address issues related to emergency supplies at the request of the doctor or patient and with poisons. At the start of each lab the type of prescription or order is introduced by the tutor and students are reminded of the laws that may govern this supply (they are referred back to the second year class Pharmacy Practice Two, where this is covered).

Lab sessions are delivered in duplicate with around sixty students in each lab and are three hours long. Six staff members, who are all practising pharmacists, work with approximately ten students who are seated around a 'pod' of computer terminals and printers for creating pharmaceutical labels. Students are encouraged to work independently through as many examples of facsimile prescriptions as possible provided in the class lab book, using appropriate reference guides owned by students or available in the lab. During lab sessions, students have the opportunity to use approximately four to six examples of the type of prescription being covered that week to identify, label and dispense drugs from the laboratory store, although due to time restrictions they are likely to receive tutor feedback on only two or three examples.

During semester one, lab sessions and tutorials are linked. Lab sessions take place on Mondays and Tuesdays and a linked tutorial designed as a 'consolidation' session takes place on the following Monday. In semester two, class lectures are linked to the "Responding to Symptoms" labs which do not involve dispensing prescriptions but are related to counter prescribing (i.e. the patient receives advice on appropriate medication for their symptoms directly from the pharmacist rather than via their GP or other healthcare professional).

As each student works through an example prescription they are encouraged to approach their assigned member of staff to discuss any problems with the legality and appropriateness of the prescription before they dispense the item and counsel the tutor who plays the role of the patient in each interaction. Typical errors include failure to check a dose, failure to recognise an interaction between two or more drugs or a failure to register drugs requiring statutory notification. The student receives individual feedback on all aspects of the dispensing process from the tutor and the prescription is marked according to a standard grid in the student lab book. Students are marked on their professional behaviour and attitude as well as on the accuracy of dispensing. As a consequence, the lab is labour intensive and one-

to-one feedback opportunities are necessarily limited as each tutor works with approximately ten students.

Over the course of lab sessions students are encouraged to develop their own checking procedure for prescriptions. There is no one correct way to check a prescription and students benefit from developing their own methodology which is developed into a written checking procedure that is unique to each student without the input of staff members.

The class is assessed by two, two hour class tests and a three hour examination, during which students must dispense four or five prescriptions accurately. Each student begins the assessment with 100% and marks are deducted for errors, with a threshold of 50% constituting a pass mark. Critical errors such as dispensing an illegal prescription or an overdose result in an automatic fail and can lead to students receiving very low marks. This class has a higher failure rate than that of other classes (32% failed on their first attempt in 2004 and 29% in 2005). As students are required to pass this class to obtain the MPharm degree, those who fail are required to re-sit the examination until they reach the required standard. In both 2004 and 2005 16% of students failed at their second attempt and were permitted to carry the class into their final year of study.

Drivers for change:

Pharmacy Practice Three is perceived as a particularly demanding class by both staff and students. The class is a critical component of student's development as a professional pharmacist and the rigorous assessment procedure required is daunting for many students. In some cases, this may be the first examination that students fail in their university career. As the class is so closely identified with professional practice, this has a negative impact on the morale of third year students entering the final year of the course and repeated re-sits required by some students failing the class during third year can have a disruptive impact on their final year studies.

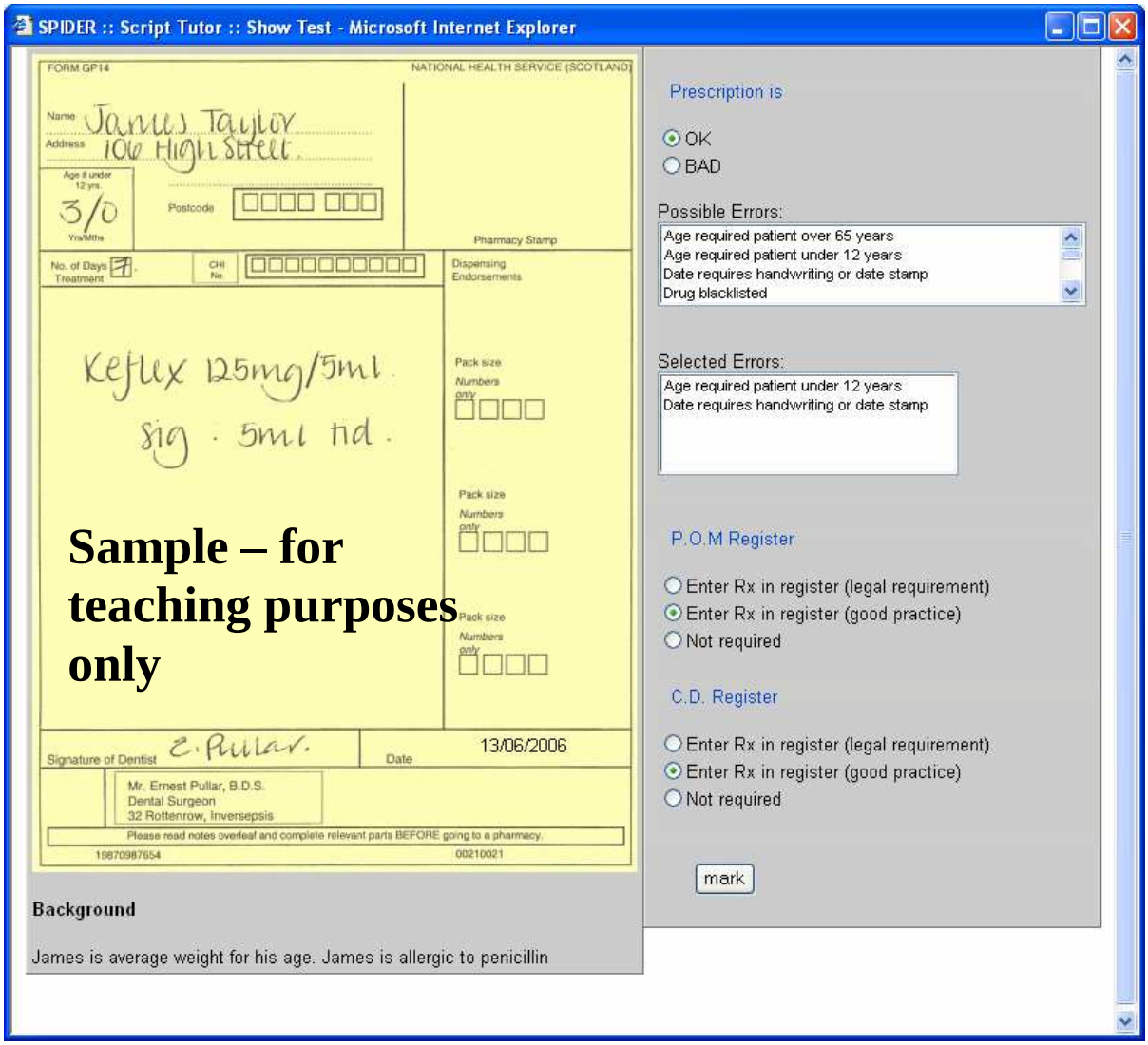
Existing timetabled laboratory sessions offer limited opportunities for students to practice their dispensing skills and obtain one-to-one feedback from tutors. This is an intensive and time-consuming activity which can limit exposure to prescriptions in timetabled sessions. Although the class schedule includes a number of hours allocated to private study, students working by themselves have little or no opportunity to engage with real prescriptions, other than studying the class notes and this lack of opportunity for private study has resulted in student criticism of the course design. Teaching staff recognise that more opportunities for students to practice dispensing have the potential to improve the pass rate, but it is not possible to provide increased one-to-one feedback opportunities during tutorials because of limitations on staff and student time and on course scheduling.

Phase one pilot: January 2006 – June 2006

Since 1998 the School of Pharmacy has developed a bespoke virtual learning environment (VLE), SPIDER. An online tutorial within SPIDER comprising a database of prescriptions was developed with REAP funding by the project team in collaboration with a group of six fourth year MPharm students who had already passed the Pharmacy Practice Three class. An initial set of nine simulated prescriptions, covering a range of prescription types replicating those taught in lab sessions, was piloted by 135 students in the fourth year and subsequently offered as a practice tool during a single laboratory session to third year students yet to sit the Pharmacy Practice Three examination. A further pilot will take place with a group of 120 collaborative programme students during the 2006 summer semester. This tutorial is designed to offer students enhanced opportunities to practice dispensing skills outside existing timetabled lab sessions and to receive feedback on their performance without requiring additional staff input.

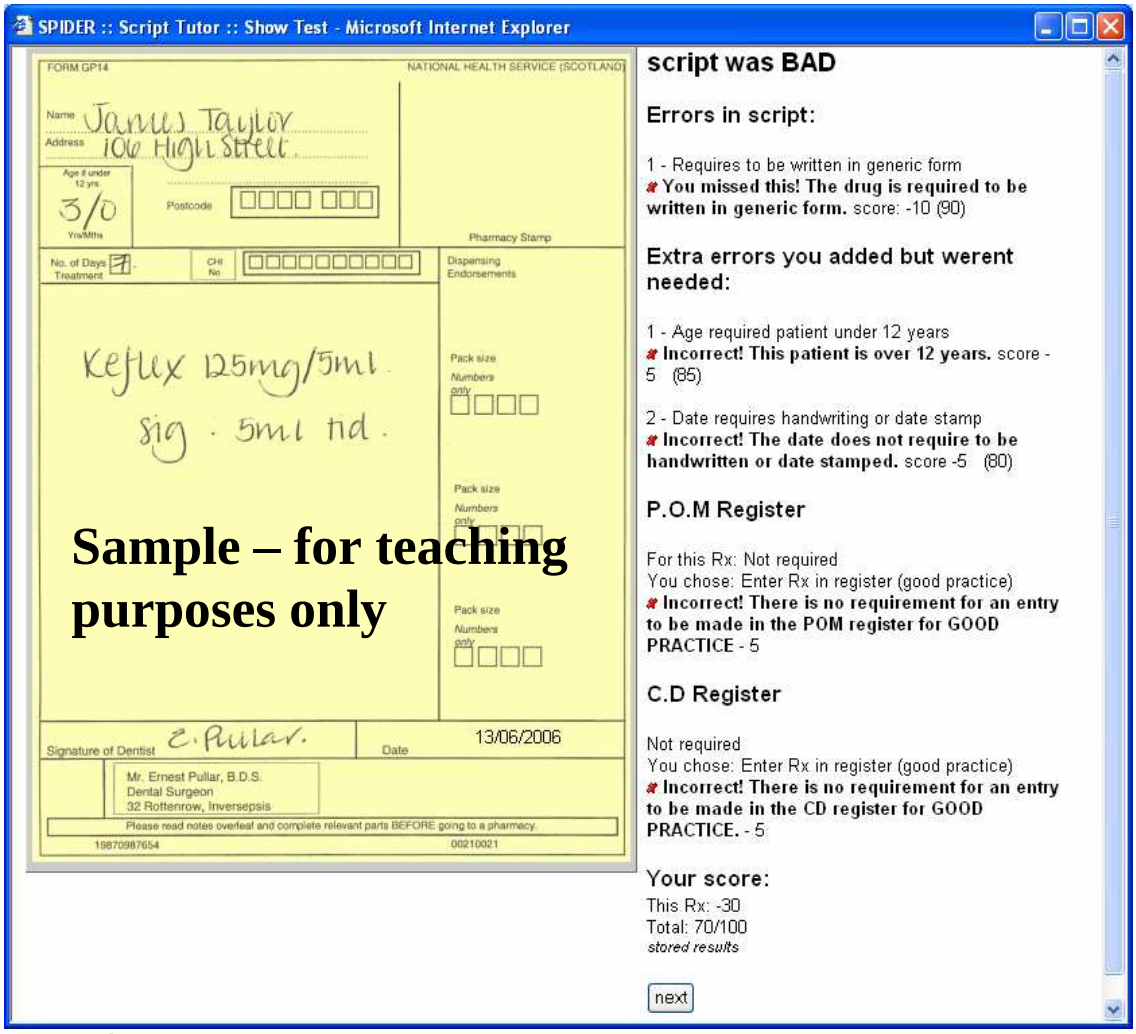
About the technology:

The pilot tutorial includes nine simulated prescriptions, split into three separate tests, which are designed to replicate the visual elements of a real prescription. Prescriptions can be either correct or incorrect and the tutorial includes a series of standard answers and feedback based on the choices that students make. Students are required to replicate the procedures introduced in the lab sessions by stating if each prescription is legal or includes any errors. If students identify any errors in legality or accuracy of a prescription, they have the opportunity to select as many errors as they deem appropriate from a drop-down menu. Errors in the drop down menu include inappropriate dosages, or lack of information about the drug or the patient. In addition, students are asked to state whether the prescription requires registration in either the controlled drug or prescription register for legal or good professional reasons. (See screenshot 1).



Screenshot 1

The tutorial marking system replicates that of the class tests and examination. Students begin the test with a perfect score and lose marks for failing to recognise, or to correctly identify errors, or for citing errors where the prescription is correct. Some errors carry a relatively small penalty (for example, when the student fails to notice that the date or the patient's address has been omitted from the prescription). Failure to recognise an overdose or drugs that may interact with each other will incur a higher penalty which can lead to an automatic fail. When students have submitted their electronic analysis of a prescription they receive a mark and feedback on each individual aspect of their analysis. (See screenshot 2).



Screenshot 2

Evaluation methodology:

All fourth year students were given the opportunity to access the online simulation during a scheduled nine-day trial period in January 2006. The VLE administrator collected data about system accesses and marks received to inform understanding of patterns of use and availability.

Participating students were also asked to complete a questionnaire which included demographic information and questions about the utility of the tutorial. REAP project staff facilitated two further focus groups with groups of six students in May 2006. One of these focus groups included students who had been involved in the original design of the pilot.

This initial evaluation was intended primarily to assess the efficacy of the technology and fourth year students were asked about the ease of use of the online system and its design as well as to reflect on its potential to help future third year students to pass the Pharmacy Practice Three class.

Results:

Over a nine day scheduled trial period, 135 fourth year students (of a possible 212) accessed the programme on 478 occasions. Not all attempts resulted in completion of all the tests and students appeared to repeat tests to maximise their mark. The majority of attempts (62%) were made when the university computer facilities were closed and approximately 15% of students accessed the tutorial between midnight and 6am,reflecting that fact that students are often keen to practice their skills at hours when they would not usually be on campus.

The final marks for each test ranged from 10 to 100% and were comparable to marks achieved in the class and degree exams. The majority of marks were lost in the controlled drug prescriptions. The results of the 91 completed questionnaires showed that the students thought that the tutorial was user friendly; helpful in identifying problem areas and that the immediate feedback was useful. This is shown in a typical comment from one student. *"I thought this was a good idea and I think it probably would have helped practice for* … [the class]… *as there aren't many other ways you can revise for it."*

Initial findings from focus groups suggest that participating students found the prescription simulation useful and recognised the potential for an extended tutorial including more example prescriptions:

> *"You might make mistakes in one particular area and you can highlight that and keep repeating it, so you can learn, and then improve."*
>
> "[with more development] *it would be really useful in highlighting your areas of weakness…"*
>
> *"People are always complaining that they don't get enough time to practice checking prescriptions."*

Although some fourth year students were simply relieved to have passed this demanding class, others recognised that continued practice opportunities may be continue to be valuable after they graduate. The online tutorial might be particularly useful during the early years of professional practice, particularly as continuing professional development activities are a requirement of membership of The Royal Pharmaceutical Society of Great Britain.

Students identified a number of limitations in the initial pilot. These included the rigidity of the marking system and feedback comments which do not support the possibility of dispensing acceptable alternatives. Also, an important part of the assessment of this class includes examination of students' ability to interact professionally with patients. This requirement means that the online tutorial cannot support all elements of the dispensing procedure because students also need to develop the skills to interact successfully with prescribers and patients and to receive feedback on this process. Face-to-face practice with teaching staff, often taking the form of role-playing therefore remains an important part of the Pharmacy Practice Three class.

Benefits for students:

Evaluation of the initial pilot version of the software suggests that student access to a fully-developed online prescription tutorial that is linked to lab sessions, tutorials and lectures has the potential to support additional practice and structured feedback opportunities in addition to existing face-to-face interactions with teaching staff. The full version of the tutorial planned for the 2006/07 session will provide the opportunity to engage virtually with classes of medicines that are not available in laboratory sessions (and therefore represented in prescription examples introduced in these sessions) because stock is necessarily limited.

Staff members have recognised that the full implementation (detailed below) planned for the 2006/07 academic session will inevitably increase students' existing workload. However, there has been some concern that students have been unable to utilise existing scheduled

study time due to the lack of practice opportunities. The prescription tutorial should support 'time-on-task' student engagement with dispensing practice and directed learning opportunities.

Early outcomes suggest that more third year students have passed the Pharmacy Practice Three examination on their first attempt this year (22% failed). As third year students had a very limited exposure to the prescription tutorial during a single lab session, this gain may be due to a mild Hawthorne effect as generalised School focus on this class has increased. However, this year students have been able to take their own pro-forma feedback sheet into the exam, which replicates the procedural methodology in the prescription tutorial and is likely to have had some impact on the pass rate.

This academic year, students have also been allowed to develop their own written checking procedure to support their exam activities, based on areas which they think are important and may forget during the exam. This procedure must be submitted to the class co-ordinator before the exam diet commences and is made available in the dispensary during the exam. Each checking procedure is unique and based on the student's experiences and their own identified areas of concern. There is no defined template for this, but the feedback that students receive during laboratory sessions and via the online tutorial will inform their understanding of the processes required to successfully interpret a prescription and to subsequently dispense. Staff members have speculated that exposure to the online prescription tutorial has helped students to codify their understanding of these processes more effectively.

At present, no data have been collected on the quality of pass rates (performance is simply rated as a pass or fail). There is potential for further analysis of existing data to compare performance during the pilot with previous years, which could offer an insight into the impact of the pilot on learning quality. There is some debate about the validity of any analysis because of the complexities inherent in the negative marking system which the department aims to address in advance of further evaluation work.

Benefits for staff:

Although no formal data collection activities have included staff members to date, the implementation group anticipate an improvement in staff morale as student dissatisfaction with the class decreases. Students given the opportunity to practice with the online tutorial should arrive at laboratory and tutorial sessions better informed and better prepared, which is likely to have a positive impact on the quality of subsequent student/tutor interactions.

The School currently view the prescription tool as a positive catalyst for a number of changes to the design of the Pharmacy Practice Three class which may support savings in staff time or other efficiency gains. These plans are in development and more details will be available during the 2006/07 session.

Efficiency/workload benefits:

At this early stage in the implementation, any data about efficiency benefits remains speculative. Funding from the REAP project has supported the development of a databank of 200 prescriptions which will be available from September but there will be scope for individual staff members to add new prescriptions and for existing prescriptions to be amended. Changes in UK legislation or changes to drugs and re-calls mean that existing prescriptions are likely to require regular review and amendments to ensure currency and validity, an activity which will require long-term resources.

It is hoped that the implementation planned for the 2006/07 academic session will significantly enhance student opportunities for feedback on performance without any projected additional burden on staff time.

Critical success factors:

The implementation group recognise that funding and other input from the REAP project was the catalyst for many of the activities in the pilot. Although the School had already identified the problems associated with the Pharmacy Practice Three class and a technological solution had been identified, the REAP project offered a context and structure to activities that otherwise may have been slower to implement.

The School has a long history and experience in implementing technical projects, including the development of their own virtual learning environment SPIDER and a culture of innovative practice in teaching and learning, both factors which have supported this pilot. The School enjoys the support of a dedicated and experienced VLE administrator, Mr Ian Thompson, whose enthusiasm and expertise has been invaluable to the project. The pilot has benefited from unequivocal senior management support and from the energy and commitment of an academic champion, Dr Anne Boyter, who is also member of the Pharmacy Practice Three teaching team. Students involved in designing the initial databank of nine prescriptions commented that the academic champion had demonstrated

> *"such enthusiasm for it that she kinda kept you going, you never felt that you were getting nowhere and you were abandoned".*

Dissemination:

The School has had a poster detailing this pilot accepted for the British Pharmaceutical Conference in September 2006 and REAP funds will support two staff members from the School to attend the conference. The abstract from the conference will be published as conference proceedings in *The International Journal of Pharmacy Practice.* There are plans for a submission to the Schools of Pharmacy Academic Practice Group conference in Easter 2007. A version of this case study may inform a submission to *The Pharmaceutical Journal,* the professional journal for Pharmacists.

Future plans:

The School has used REAP project funding to support Dr Lee Kayne, a community pharmacist who has previously taught on the Pharmacy Practice Three class, to develop a databank of 200 prescriptions which will provide students with practice examples covering all the prescription types covered in the class. These prescriptions will be based as far as possible on examples from Dr Kayne's professional experience and will provide a direct link for students to the realities of pharmacy practice.

During the first semester, third year students will be introduced to structured online tasks incorporating a small subset of prescriptions relating to topics taught in class (these are likely to include NHS prescriptions, controlled drugs. dental prescriptions, veterinary prescriptions, and private prescriptions). Tasks will be compulsory and available to students for two weeks to coincide with tutorials and lab sessions relating to these prescription types.

Students' initial scores and areas identified as problematic will be used by members of the teaching team to inform subsequent tutorials and feedback sessions, ensuring that topics the class have found challenging form the focus of face-to-face interactions. Students will have the opportunity to re-address tutorial prescriptions as many times as they wish after their initial attempt to improve their performance.

The full databank of prescriptions will be made available to students during the second semester as a revision support tool and prescriptions will be tagged to support searching on specific topics of concern or types of prescriptions.

Plans for a supporting message board where students can share difficulties with specific prescriptions and receive feedback from tutors are being discussed, although there are some concerns over the potential impact on tutor's workload.

The School have identified a number of other contexts in which the online prescription tool could be re-purposed, not only in other schools of Pharmacy (there are twenty schools in the UK) but by other healthcare professionals, particularly nursing staff. There are plans to implement the tutorial in another class Clinical Pharmacology and Prescribing, which is delivered jointly to students at both the University of Strathclyde and the University of Glasgow. The School also plans to pilot the tutorial at the other School of Pharmacy in Scotland at Robert Gordon University shortly.