# Innovation and Construction of Examination Database of Pharmacology

**Jiyue Wen[1], Weizhuo Lu[2], Zhiwu Chen[1],***

[1]Department of Pharmacology, School of Basic Medical Sciences, Anhui Medical University, Hefei, CHINA.
[2]Hefei Technology College, Hefei, CHINA.

## ABSTRACT

**Background:** Pharmacology is one of the cornerstones in medical curricula, besides, examination is an effective way to evaluate the teaching quality and student outcome. **Objectives:** This study was undertaken to demonstrate the examination innovation and construction of online exam questions bank of Pharmacology. **Methods:** The pharmacological exercises compiled previously were attached with standarded parameters and used as main source of online exam questions bank, the multifaceted parameters of questions were determined for easy to construct test paper. We next sought to apply this new established online exam database to the fourth semester students of nursing and the fifth semester students of clinical medicine. **Results:** We successfully established an online exam questions bank of 3000 questions containing single choice, multiple choice and true/false and covering all of knowledge points in syllabus. And then, we successfully formed the exam papers from online questions bank abide by the examination syllabus and applied to the fourth semester students of nursing and fifth semester students of clinical medicine. The exam scores were respectively higher than those of sixth semester students of nursing and the seventh semester students of clinical medicine who used traditional examination method last year. **Conclusion:** These findings indicated that the new established online exam questions bank may better promote the teaching quality and student outcome and lay the foundation for the further implementation of the online exam.

**Key words:** Pharmacology, Exam questions bank database, Exam reform, Clinical medicine, Nursing.

## INTRODUCTION

Pharmacology is one of the important and professional basic courses in medicine and the other medical related majors, for it provides students basic theory and knowledge on rational uses of medicine and disease prevention.[1] Therefore, Pharmacology teaching occurs in various context, such as nursing schools, medical schools, dentistry, schools of pharmacy and veterinary medicine.[2] In addition, pharmacology is also one of the basic curricula in the licensure exam of physician, pharmacist and nurse, etc.[3]

The course's final exam is one of important means to evaluate students' knowledge and teachers' teaching effect.[2,4] While, many students consider that passing the exams are relied on the key knowledge given by their teachers and review near before exam. and neglect the usual study. All of these will most likely lead to a undesirable final score. Furthermore, a fundamental and solid knowledge on generic drug classes and names, pharmacodynamics, pharmacokintics, indications of use, dosages and side effects and the medication-administration process should be remembered by students after pharmacology education and training,[5] in order to pass the course's final exam, meet the requirements of licensure exam and future demand. Therefore, it is imperative to carry out the pharmacology exam reform by construction of online examination

questions bank, which covering all knowledge points of teaching program. Because a scientific ED is an important part of examination reform in pharmacology.[6]

## MATERIALS AND METHODS

### Determination of the types and the standared parameters of every question

#### Determination of the types of questions

As all we know, question types in exam contained subjective and objective questions. Subjective question has been proved by exam that it cannot avoid subjectivity and randomness in the scoring process and cannot cover more knowledge points.[7] On the contrary, objective questions can remarkably avoid the aforementioned shortcomings.[8] Therefore, the single choice, multiple choices and true/false question were chose in this study. In choice questions, there are five alternative answers, containing A, B, C, D and E, there is only one correct answer in the five alternative answers in single choice question and not less than one correct answer in multiple choice question. While, in true-false question, the answer is correct or wrong option.

#### Determination of the characteristics of online exam questions bank

Students' effective and cognitive learning experiences are the center of the educational enterprise.[9] The teacher should be a facilitator rather than an instructor, encouraging and helping students to take more responsibility for their own learning.[2] Besides the excellent content knowledge of pharmacology teacher and their pedagogical expertise, online exam questions that conform to the goals of licensure exam synergize to pharmacology education to go a step further. Thus, the characteristics of online exam questions must comply with the syllabus of licensure exam of physician, pharmacist and nurse, etc.

#### Determination of the standared parameters of questions

According to the exam syllabus, the standared parameters of each exam question were stipulated for facilitated formation of exam papers and online exam in the future. The standared parameters contain teaching requirement, facility value, discrimination and repetitiveness. Among which, teaching requirement contains mastery, familiarity and understanding; facility value includes more difficulty, medium-difficulty, medium-easy and relatively easy; discrimination refers to the ability of question to differ the students' exam score

and contains low, medium-low, medium-high and high; and repetitiveness is evaluated by the times of the same knowledge point presented in different types of questions.

### The compiling process of onlineexamin questions bank of pharmacology

#### Determining the groups of compilers

There are 38 chapters in the teaching catalogue of pharmacology course, containing general introduction, efferent psychotropic drugs, central nervous system drugs, cardiovascular drugs, respiratory and digestive systems drugs, hormones and antimicrobial drugs. At the first step, we planned to prepare 3000 questions which covers all of knowledge points in syllabus. And then, we made a reasonable group of our compilers who participated in edit the online questions.

#### Determining the work program

Firstly, the teachers edited, checked the questions for their own responsibility and ensured the accuracy of format and standared parameters. Secondly, our compilers, 16 people in total were divided into four groups. And then, proofreading was completed by all of us according to the "three-tier" system, which include inter-group review, group leader review, cross-group review and the final review by head of the teaching and research section (Figure 1). Lastly, all of exam questions were uploaded online examination system by the list of chapters.

#### Form the exam papers

Firstly, we respectively formulated the different exam syllabuses for students according to the curriculum requirements in differents majors. Then, the exam papers for students of fourth semester students of nursing and fifth semeter students of clinical medicine were successively formed from the online questions bank and used for the course's final exam. The numbers of students in score ranges of less than 60, 60 to 65, 66 to 70, 71 to 75, 76 to 80, 81 to 85, 86 to 90, 91 to 95, 96 to 100 were recorded respectively and the percentage of every score range was calculated as follows:

% of score range= numbers of students in correspondent score range/ total numbers of student×100%

Likewise, in this study we followed the same approach to analyze the pharmacological exam scores of students of sixth semester students of nursing and seventh semester students of clinical medicine who used tradiional examination method last year.

## Data analysis

Statistical analyses were performed by Chi-square test[10] to determine the difference of exam scores between the fourth semester students of nursing with sixth semester students of nursing, the fifth semeter students of clinical medicine with seventh semester students of clinical medicine in score ranges of 81 to 85, 86 to 90, 91 to 95, 96 to 100. A value of $p < 0.05$ was considered statistically significant.

## RESULTS

Till now, we have preliminarily established the online exam questions bank, including 3000 objective questions and covering all of knowledge points in syllabus. Also, the course's final exam papers have been successfully formed from online exam questions bank relied on standerd parameters and applied to fourth semester students of nursing ($n$=334) and the fifth semeter students of clinical medicine ($n$=1032). As above described, we recorded and analyzed the the final exam scores of the students who used the online exam questions bank as well as of some students who used traditional examination method. The results showed that the scores of fifth semester students of clinical medicine were generally higher than those of the seventh semester students of clinical medicine ($n$=891) who used traditional examination method last year. As shown in Figure 2A, there were significant difference between the numbers of fifth semester students of clinical medicine with the seventh semester students of clinical medicine in the score ranges of 86-90, 91-95 and 86-100 (Figure 2A, Table 1). Not surprisingly, the numbers of fourth semester students of nursing in score ranges of 81-85, 86-90 and 91-95 was respectively larger than those of sixth semester students of nursing who also used traditional examination method last year (Figure 2B, Table 1). These findings suggested that the new examination method based on online exam questions bank is double-blind to teacher and student and can better reflect the teaching and learning.
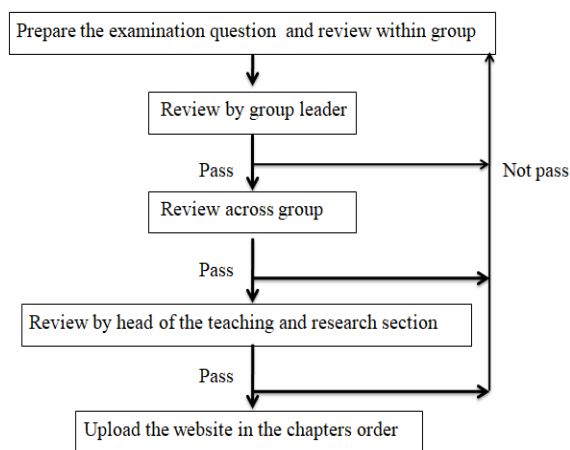
## DISCUSSION

As aforementioned, examination is an important part of curriculum teaching. It provides us feedback on teaching and learning of pharmacology education.[11] In the past, our exam papers were mainly prepared by teachers before examination, the types of questions included noun explanation, exclusive choice, filling in blanks, question and answer and essay questions. In view of the fact that some teachers cannot prepare the examination paper according to the syllabus and there will be some subjectivity and arbitrariness in correcting papers for subjective questions (noun explanation, question and answer and essay questions).[12] Therefore, it is of great significance for us to establish more reasonable online exam questions bank and from which we can form course's final exam papers.
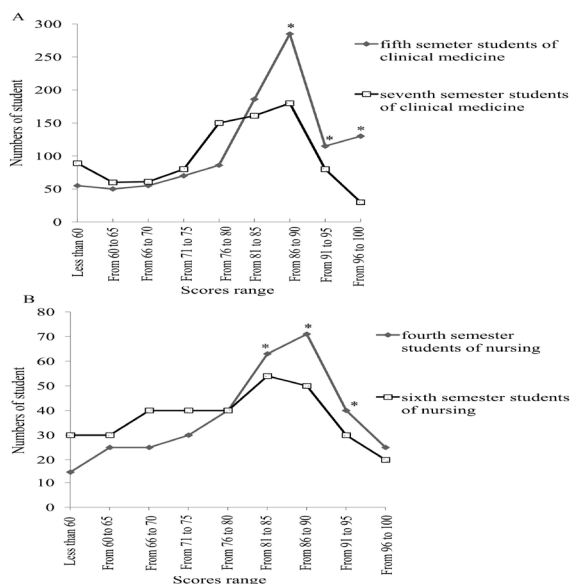
Course's final exam was usually used as an important way to evaluate students' knowledge of the pharmacology, transferation of conceptual pharmacology knowledge and complex-systems thinking to other related topics of medicine.[5] Therefore, online questions bank must cover all of knowledge points of syllabus and include sufficient quantity of questions. Therefore, we prepared complete exam syllabuses before establishment of online questions bank, according to the teaching contents and adequately alternative questions. Of pharmacology course. The pharmacological exercises of exclusive choices compiled by our pharmacological teachers in 2014 used as main part of the online exam questions bank. Besides, we purchased the pharmacological exercises and downloaded some from network. And then, we reviewed and revised these questions systematically, classified them carefully into different chapters to easily upload online exam system and form exam papers.

| Table 1: Different percentage of the student numbers in every score range. | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Percentage of the student numbers in every score range (%) | | | | | | | | | |
| | < 60 | 60 -65 | 66 -70 | 71 -75 | 76 -80 | 81 -85 | 86 -90 | 91 -95 | 96 -100 |
| Seventh semester students of clinical medicine | 10 | 6.7 | 6.8 | 9 | 16.8 | 18.1 | 20.2 | 8.9 | 3.4 |
| Fifth students of clinical medicine | 5.3 | 4.8 | 5.3 | 6.8 | 8.3 | 18.0 | 27.6 | 11.1 | 12.6 |
| Sixth semester students of nursing | 8.9 | 9 | 12 | 2 | 11.9 | 16 | 15 | 9 | 6 |
| Fourth semester students of nursing | 4.5 | 7.5 | 7.5 | 9 | 12 | 18.9 | 21.3 | 12 | 7.5 |

**Figure 1: The work program of establishment of examination database.**



**Figure 2: The different numbers of student among scores rang.**

inadequacy of objective questions are not suitable for measuring the ability to clarify problems, solving problems, organizing and integrating ideas and it is difficult to exclude the students' random guesses on answer the questions.[13] Therefore, the online questions bank needed to be further heightened.

## CONCLUSION

In this study, we found that the new established questions bank covered the teaching contents and all the knowledge points of different majors. The online exam questions bank help to further improve the reform of pharmacology exam system and further heighten the pharmacological teaching reform.

## ACKNOWLEDGEMENT

## CONFLICT OF INTEREST

The authors declare no conflict of interests.

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On the basis of those above, we have preliminarily established the online exam questions bank. After one semester's practice in the fourth semester students of nursing and fifth semester students of clinical medicine. We found that the students' scores who used new established exam system were generally higher than those of students who used traditional exam system. Furthermore, there were significant difference between the numbers of student who used new established online exam question with those who used exam method in the score ranges of 86-90, 91-95, 96-100, or 81-85, 86-90, 91-95.

Although the objective questions in exam were more flexible, wider coverage, more accurate and rapid and smaller error in scoring stage than subjective ones. The

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## PICTORIAL ABSTRACT
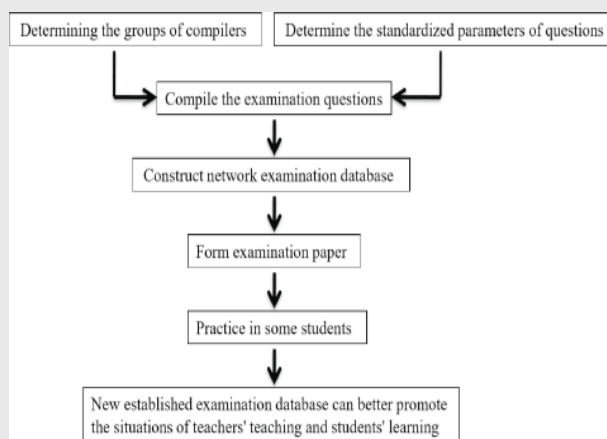


## SUMMARY

This study was undertaken to demonstrate the construction of examination database of pharmacology. We successfully established an online exam quesetions bank, formed examination papers and applied to the some students. The test scores of the students generally higher than those who used traditional examination method last year. These findings indicated that the new established examination database can better promote the situations of teachers' teaching and students' learning.

## About Authors

**Dr. Jiyue Wen,** Anhui Medical University, Hefei, China, having total 18 years of Teaching and Research Experience. She is specialized in the area of Neuropharmacology. Her current research interest focus on the protection of Traditional Chinese Medicine on cerebral ischemia-reperfusion injury. She has been lecturing at the department of Pharmacology for 18 years covering courses in Pharmacology and the foundation of medicine. She has published over 15 research papers in international journals.