Embedded Selforganizing Systems

Evaluation and its Analysis of Study Course: Pharmacology

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***Abstract*—This paper describes self-evaluation and its analysis on study course "Pharmacology" of program "Pharmaceutical" at Mongolian University of Pharmaceutical Sciences (MUPS). The study course "Pharmacology" is one of mandatory study course in "Pharmacology" program. The course teaching and learning hours consists of 48 hours lectures and 96 hours seminars lessons. The study direction "Pharmaceutical" established in 2005 and till 2022 more than 1997 students graduated degree in this program. This study program received accreditation certificates in 2014 and 2021. Lecturers who teach same courses in this study program first time done self-evaluation on their teaching course. For evaluation process applied structure-oriented evaluation (SURE) model. Data collected by google form and processed by the SURE online tool.**

Keywords— Pharmacology, SURE model, evaluation, program evaluation, self-evaluation.

I. Introduction

Pharmacology – Derived from the Greek words Pharmacon – medicine, Logos – doctrine, study. In other words, it means teaching about medicine. The pharmacology course was first included in the official curriculum for medical and pharmaceutical students in the 1949/1950 academic year when an independent department was established at the Faculty of Human Medicine of MNU. Deputy doctor and associate professor A.A. Nikulin, who was invited from the Soviet Union, worked as the head of the department, and Tserendorji Lamjav, the first pharmacologist of Mongolia was apprenticed to him and became one of the first Mongolian teachers [1]. The University of Pharmaceutical Sciences was established in 2000 under the name "Monos" College, and in 2004 it was expanded to "Monos" Institute. In 2015, it was renamed as "The University of Pharmaceutical Sciences".

Since 2000, the "Pharmacology" curriculum has been updated every year since the Pharmacy field introduction, and the 3rd year students of the Pharmacy department attend the courses which included in the curriculum. In 2019, the department of "Pharmacology and Clinical Pharmacy" was established, and the "Pharmacology" course is taught to pharmacy students. The teachers of the department, B. Monkhdelger, M.Sc., MD, C. Lkhagvasuren, M.Sc., and B. Purev, M.Sc. as well as they are supervising the research work [2]. The Department of "Pharmacology and Clinical Pharmacology" teaches prescriptions, pharmacology, and clinical pharmacology according to the approved curriculum for undergraduate 5th year students and postgraduate courses at the Mongolian University of Pharmaceutical Sciences. A follow-up survey is conducted on graduates every year and the employment rate of graduates is 95-98% [3].

II. Research Methodology

A program evaluation is a complex process where included many interested groups with different expectations from evaluation process [4, 5]. There are various evaluation methods and models applied for local or international accreditation systems, but not all fit to university properties and special purposes [6] [7]. Every accreditation system counts highly self-evaluation and its analysis on assessing programs or courses. Dur to this reason this self-evaluation process is done. In this self-evaluation process involved lecturers who teach same courses in study program "Pharmaceutical".

A. Aim of evaluation

Main aim of this self-evaluation is to figure out key issues of teaching course "Pharmacology". To reach this aim need to measure:

- Knowledge which received after course
- Skills which obtained after course

- Attitudes which settled down to student after course

B. Evaluation methodology

For evaluation process applies structure-oriented evaluation model [8]. The structure-oriented evaluation model is quite new model which developed by Mongolian scholar in Germany. The MUPS lecturers willing to support development of the SURE model and working as team with author of this model for self-evaluation of teaching course "Pharmacology". Biggest advantage of the SURE model is clear logical structure for evaluation design and inner data processing in the model [9].

C. Study course "Pharmacology"

For evaluation process applies structure-oriented evaluation mod.

Mongolian University of Pharmaceutical Sciences has been operating in the field of pharmacy since 2000 and has been accredited twice by the Pharmacy program. "Pharmacology" course is a professional course that studies the classification, pharmacokinetics, pharmacodynamics, indications for use, method of use, dosage, possible side effects and contraindications of drugs used for the treatment, prevention, and diagnosis of any disease. Undergraduate students are required to study a total of 6 credit hours of courses, and the course content is aimed at providing students with essential theoretical and methodological knowledge, skills, and attitudes in the field of the program. After the student has successfully studied the content of the course, the acquired knowledge, skills, attitudes or learning outcomes of the curriculum will be the basis for achieving the goals of the pharmacy program.

D. Evaluation design

The structure-oriented evaluation model has eight steps for evaluation design.

Step 1. Have to define key goals of evaluation. In this case defined 3 key goals:

- Knowledge from study course after learning
- Skills which should obtain after course
- Attitudes which settle down to students after course

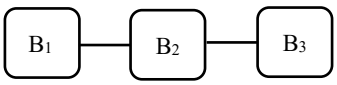

Fig. 1. Logical structure of key goals

Step 2. Have to define sub goals of evaluation. Below listed down sub goals:

- Knowledge from study course after learning
  - Prescribing rules and standards (A_{11});
  - Solid drug form (A_{12});
  - Soft drug form (A_{13});
  - Liquid drug form (A_{14});
  - Injectable drug form (A_{15});
  - Aerosol dosage form (A_{16});
  - Pharmacokinetics (A_{17});
  - Pharmacodynamics (A_{18});
  - Regional anesthetics (A_{19});
  - Diarrhea (A_{110});
  - Absorbable drugs (A_{111});
  - Coating drugs (A_{112});
  - Stimulants (A_{113});
  - Drugs affecting adrenergic synapses (A_{114});
  - Drugs affecting cholinergic synapses (A_{115});
  - Narcotics (A_{116});
  - Sleeping pills (A_{117});
  - Anticonvulsant drugs (A_{118});
  - Medicines affecting mental activity (A_{119});
  - Painkillers (A_{120});
  - Medicines affecting the respiratory system (A_{121}).
- Skills which should obtain after course
  - Writing prescriptions (A_{21});
  - Read prescriptions (A_{22});
  - Analyzing prescription forms (A_{23});
  - Choosing the right way to use medicine (A_{24});
  - Choosing the right medicine and using it in accordance with clinical practice (A_{25});
  - Administering the right medication in the right dose (A_{26});
  - Teamwork (A_{27});
  - Presentation skills (A_{28});
  - Work independently (A_{29});
  - Respond to questions appropriately (A_{210});
  - Counseling (A_{211}).
- Attitudes which settle down to students after course
  - Communicate sincerely and professionally, adjusted to the client's characteristics (A_{31});
  - Do the assignments given by the teacher on time (A_{32});
  - Collaborate with others on similar tasks (A_{33}).

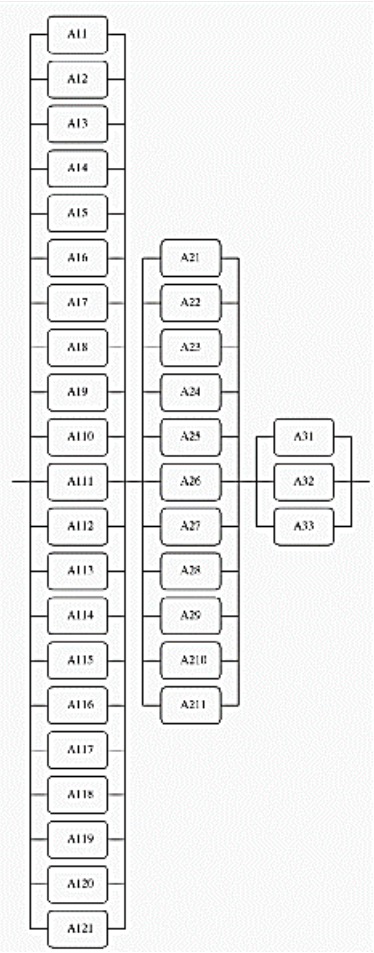

Fig. 2. Logical structures of sub goals

Step 3. Confirmation step for defined key and sib goals. Lecturers who teach course “Pharmacology” all confirmed defined kye goals.

Step 4. Preparation of questions based on sub goals. By the SURE model rule questions which will use for data collection have to create from defined and confirmed sub goals. That means statements as sub goals have to formulate as questions for data collection.

Step 5. Acceptance of prepared questions for data collections. Only checked and accepted questions should apply to data collection. Lecturers who teach course “Pharmacology” all checked the questions and confirmed.

Step 6. Data collection. In this case for data collection applied free online Google form (Fig. 3). The google form is easy to modify and it was main reason of select this form. Data collection run based on volunteer attendance and anonymous mode.

Step 7. Data processing. Data processing consists of two methods. First one is standard statistical processing and for it used google form functions. Second method is the structure-oriented evaluation model data processing. The online SURE tool is used for second method data processing. Detailed data processing is included in subsection III.

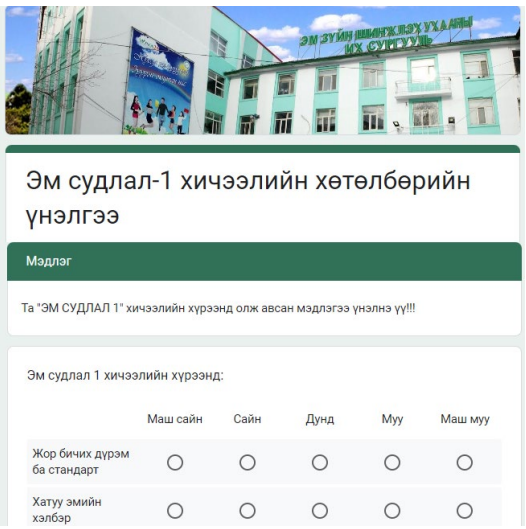

Fig. 3. Data collection form

Step 8. Report. The result of data processing is described in sub section IV. Some further discussion is included in subsection V.

III. Data Processing Methods

There are applied two main methods for data processing of collected data.

A. Statistis data processing

Standardt statistical data processing functions of google form is used for statistical data processing part.

In total 179 students are taking part of online data collection survey. 46.9% or 84 students were from 3rd course, 24.6% or 44 students were from 4rd course, 28.5% or 51 students were from 5rd course. 92.7% were female and 7.3% were male students (Fig. 4).

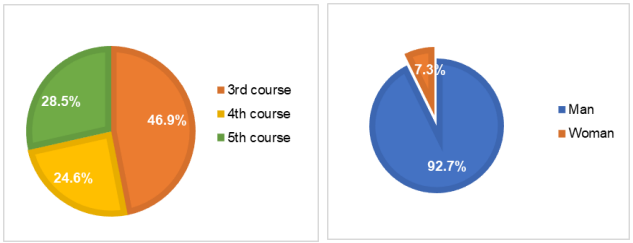

Fig. 4. Statistic data of students

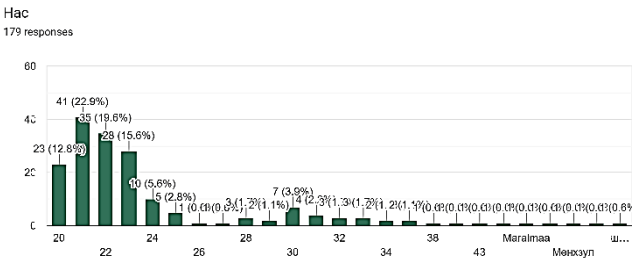

Fig. 5. Statistic information of ages

Students ages were from 21 to 46 (Fig. 5).
Answers to first key goal "Knowledge from study course after learning" received 71 responses as – Very good; 83 responses as – Good; 22 responses as – Middle and 2 responses as – Very bad.
Answers to second key goal "Skills which should obtain after course" received 68 responses as – Very good; 88 responses as – Good; 22 responses as – Middle and 1 response as – Very bad.
Answers to second key goal "Attitudes which settle down to students after course" received 86 responses as – Very good; 78 responses as – Good and 15 responses as – Middle.

B. SURE data processing

Data processing by SURE model done via online tool of the model [10].

Online tool of the SURE model requests to enter collected data in comma separated vector (CSV) format.

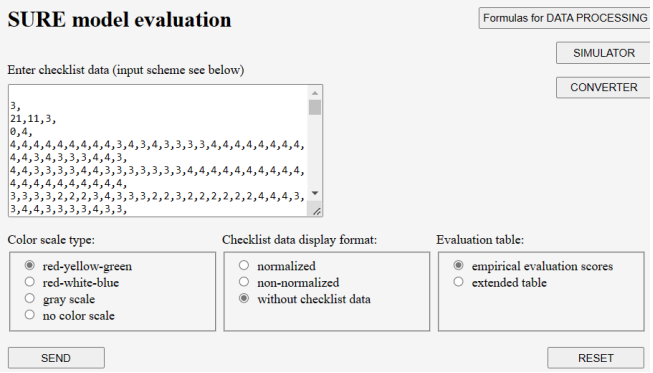

Fig. 6. Online tool of the SURE model

Fig. 6 shows ready data for processing vis online tool. Here 3 in CSV is number of key goals, 21, 11, 3 are noted for number of sub goals. 0, 4 stands for interval scale of collected data measure. Remaining numeric are collected data in CSV.

After press button "SEND" online tool calculates all collected data based on the SURE data processing rules [11]. The online tool computed four different SURE scores (Fig. 7 and Fig. 8):

- General empirical evaluation score
- Empirical evaluation scores of key goals
- Empirical evaluation scores of sub goals
- Empirical evaluation scores of each response

Fig. 7. Calculation results (I)

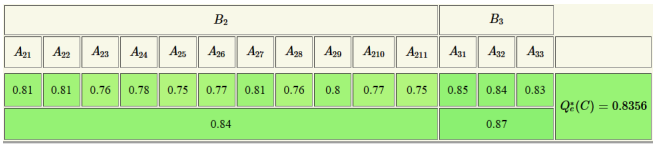

Fig. 8. Calculation results (II)

Fig. 7 shows empirical evaluation scores of key goal - B_1 and empirical evaluation scores of sub goals which work together to reach first key goal.

Fig. 8 shows empirical evaluation scores of key goal B_2 and B_3. Moreover, here included empirical evaluation scores of sub goals which work together to reach second and third key goals.

IV. Results

The Results of statistical processing: A total of 179 students participated in the study, 46.9% (84) of 3rd-year students, 24.6% (44) of 4th-year students, and 28.5% (51) of 5th-year students. 92.7% of the students surveyed were female and 7.3% were male. According to the students' self-evaluation, the attitude to be mastered in the field of pharmacology, 86 students are very good, 78 students are good, 15 students are average, and 77 students are very good, 89 students are good, and 13 students are average when treating properly and sincerely with individual customers' characteristics. When working together with others on the same task, 78 students were very good, 84 students were good, 16 students were average, and 1 student was bad.

Structure-based model scores: The overall rating is 0.83, which is not yet at the top rating (1). In terms of percentage, it is 83% successful. Baseline scores: 0.82, 0.84, and 0.87 are rated as 82%, 84%, and 87% successful, respectively. The lowest rating was given to "Knowledge acquired from the curriculum" or the first main indicator, while the best rating was given to the indicator "Attitude acquired from the curriculum". The evaluations of the sub-indicators ranged from 0.74 to 0.84, which is relatively evenly distributed. When evaluating the overall evaluation of each student, 1 student gave a 0 grade, and 5 students gave a grade below 0.5. Out of 178 students who gave evaluations, 6 students rated the course as bad, which is 3.4% of the total number of students. 68 students gave a rating of 1, the highest possible rating, which is 38.2% of all students surveyed.

V. Conclusions

The "Pharmacology" program (curriculum) was evaluated by the teachers who teach in the program in collaboration with an evaluation expert using a structured evaluation model. It includes:

1. When the students evaluated the knowledge to be acquired in the field of pharmacology, Pharmacodynamics and Regional anesthesia were very well acquired, while most of the other knowledge was evaluated as good. The results of the evaluation showed that the knowledge of hypnotic drugs, drugs affecting choline active synapses, and regional anesthesia was worse than other knowledge.

2. When the students evaluated the skills to be mastered in the field of pharmacology, all 11 skills were rated as good with the highest number whereas the ability to choose the right medicine, to use it in accordance with clinical practice, and to give advice was rated worse than others.

3. When the students self-assessed the attitude to be aquiered in the pharmacology course, adjusted to the customer's characteristics, and the attitude of sincere and well-mannered communication was judged to be very good, and the ability to complete the tasks given by the teacher on time was

judged to be good, while the cooperation with others on similar tasks was evaluated as average.

4. The overall grade of structure-based assessment is 0.83, which is not the maximum score. A total of 9 sub-indicators were evaluated with a score of less than 0.75, confirming that further attention should be paid to the activities measured by that indicator.

Based on the results of the evaluation, pay attention to passing the sub-goals or the knowledge to the student with a poor evaluation. Teachers need to work together to update their teaching methods and find out and correct the reasons for poor evaluations. Therefore, this evaluation should be repeated throughout the season and the results should be processed and the probability of the results should be reviewed.

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