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Interactive e-learning in pharmacology to enhance student competency in faculty of medicine UII

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Original Article

ABSTRACT

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Background: E-learning provides an opportunity for students to improve their knowledge by promoting self-directed learning. The aim of this e-learning is to encourage pharmacology active learning among undergraduate students in Faculty of Medicine UII.

Objective: The aim of the study is to assess the effectiveness of the e-learning module in pharmacology, and the acceptability and student's perception about the interactive e-learning module in pharmacology.

Methods: This was an observational study, conducted on all medical student in Gastrointestinal module (Module 1) and Endocrine module (Module 2). Students were encouraged to register in website. By administrator approval, student can access to quiz. Another menus in the website after quiz are lectures, videos and semi-animated based CAL (computer assisted learning). Learning achievement were assessed based on module exam in pharmacology section. Feedback questionnaire were distributed to all medical student at the end of module.

Results: The student's access rate for e-learning module quiz in Module 1 is 100% and 35,48% in Module 2. In Module 1 about 75% questions have DMR value >75%. This value are increased than last year (54,5%) In Module 2, 30% questions have DMR value >75%. This value also increased than last year (0%). All students (100%) stated that e-learning in pharmacology modules are usefull. 78% stated that the website are informative and 74% admitted the material easy to access, 89,02% agreed that e-learning increase student's motivation.

Conclusion: Curriculum innovation as e-learning modules considerably was effective enhance student achivement in pharmacology. This innovation also well perceived among the student. All students agrreed that e-learning module were usefull

Latar Belakang: *E-learning memberikan kesempatan bagi siswa untuk meningkatkan pengetahuan mereka dengan mempromosikan pembelajaran mandiri. Tujuan dari e-learning adalah untuk mendorong belajar aktif farmakologi kalangan mahasiswa di Fakultas Kedokteran UII.*

Tujuan: *Menilai efektivitas modul e-learning dalam farmakologi, dan akseptabilitas dan persepsi siswa tentang interaktif modul e-learning dalam farmakologi.*

Metode: *Penelitian ini merupakan penelitian observasional, dilakukan pada semua mahasiswa kedokteran di Gastrointestinal modul (Modul 1) dan modul endokrin (Modul 2). Siswa didorong untuk mendaftar di situs. Dengan persetujuan administrator, mahasiswa dapat mengakses kuis. menu lain di situs setelah kuis yang kuliah, video dan semi-animated berdasarkan CAL (komputer dibantu belajar). prestasi belajar yang*

dinilai berdasarkan ujian modul dalam bagian farmakologi. Umpan balik kuesioner dibagikan kepada semua mahasiswa kedokteran di akhir modul.

Hasil: *Tingkat akses siswa untuk e-learning kuis modul dalam Modul 1 adalah 100% dan 35,48% dalam Modul 2. Dalam Modul 1 sekitar 75% pertanyaan memiliki nilai DMR> 75%. Nilai ini meningkat dari tahun lalu (54,5%) Dalam Modul 2, 30% pertanyaan memiliki nilai DMR> 75%. Nilai ini juga meningkat dibandingkan tahun lalu (0%). Semua siswa (100%) menyatakan bahwa e-learning di modul farmakologi adalah berguna. 78% menyatakan bahwa situs web yang informatif dan 74% mengaku mudah untuk mengakses materi, 89,02% setuju bahwa e-learning meningkatkan motivasi.*

Kesimpulan: *Kurikulum inovasi sebagai e-learning modul jauh efektif meningkatkan prestasi siswa dalam farmakologi. Inovasi ini juga baik dirasakan di kalangan siswa. Semua siswa setuju bahwa e-learning modul yang berguna.*

INTRODUCTION

Pharmacology is preclinical discipline in medical education curriculum, but pharmacology itself distinctly different from the other preclinical or clinical discipline in knowledge base as well as learning instructions. Pharmacology exists in series with other pre-clinical subject (e.g., Anatomy, Biochemistry and Physiology) and in parallel with other para-clinical subject (e.g., Pathology, Microbiology and Community Medicine). Those arrangement makes learning of pharmacology become difficult and deficient with regard to its therapeutic relevance and clinical application.[1] Since 2011, medical curriculum in Faculty of medicine UII has been using Problem based learning (PBL) system as a platform in which pharmacology is one integrated component in a holistic approach to medical education. Despite theoretically, PBL system should enhance student's basic and clinical comprehension about pharmacology, but in actual condition student's achievement decline significantly. Various studies also found that drug prescribing competency were minimum among the students.[2]

A commonly-used strategies for teaching pharmacology are lectures, tutorials, laboratory practice, seminars and symposiums.[3] E-learning can be used as one of alternative innovation to enhance student's achievement in pharmacology.[4] E-learning were defined as learning method which use internet technology to deliver the knowledge.[3] Many studies reported that e-learning can be used as an active learning strategy which promotes self-directed learning. This innovative learning also give a big influence to pedagogical and long life learning.[3,5] E-learning were stated as a result of distance education development, which can remove obstacles barrier.[5,6] Another advantages of e-learning are cost effective and teacher time saving.[5]

The development of e-learning modules is one of the most rapidly growing areas of education and training.[7] E-learning products in medical faculty curriculum are important tools, not only to deliver education, but also to improve the quality of services that health professionals provide.[6] E-learning provides an opportunity for students to improve their knowledge by individual choice in the pace and material of learning. E-learning also has a greater interactivity and easy to access. E-learning also gives advantages for teachers by improved distribution of learning content, ease of update, standardization, and tracking of learner activities.[3] Various forms of e-learning tools which have been used are streaming video, multimedia, web-based interactive module, and Moodle in pharmacology, e-learning courses have been developed to improve prescribing skills, delivering concepts in clinical pharmacology and therapeutics, integration of pathophysiology into pharmacology through a web-based e-learning course.[3]

This e-learning project to promote self-directed learning among medical undergraduates in Faculty of Medicine UII. The objectives of this study are to assess the effectiveness of the e-learning module in pharmacology and to assess the acceptability and student's perception about the interactive e-learning module in pharmacology .

METHODS

Study design and participant

This was an action research study, conducted on first year medical student who enter Block

1.7 (Gastrointestinal System) and second year student who enter Block 2.6 (Endocrine system). Students were recruited by registration in pharmacology website. After administrator approval, student can access all menus in the website.

In the website, we provide lecture presentation, videos and semi-animated based CAL (Computer Assisted Learning). Effectiveness of e-learning module in pharmacology were assessed as learning achievement based on block exam mark in pharmacology section. The block exam was conducted at the end of block. Student's acceptability and perception were assessed based on questionnaire.

Material

The material in this research include e-learning material and questionnaire. E-learning material incudes lectures, animated videos, semi-animated based CAL and quiz (see table 1). Questionnaire were distributed to participant at the end of block. Questionnaire consist of 23 polar (yes-no question) and 3 open question.

RESULTS

Student's access rate

The rate of accession in Block 1.7 was 100% and in Block 2.6 was 35,48%. Both lecture and quiz were the most accessed menus in e-learning modules compared than video and semi animated based CAL.

Learning achievement

Learning achievement were analyzed based block exam mark in pharmacology section (approximately pharmacology question was 10% of total question in block exam). This evaluation are based on DMR (Digital Mark Reader) question analysis. We claimed that the e-learning project was effective if more than 75% number of question with Difficulty Index (DI) > 0,75. A question with DI > 0,75 means that question are answered correctly by > 75% students. In Block 1.7 about 75% questions have DI value 0,75. This value are increased than last year (54,5%). In Block 2.6, about 30% questions have DI value > 0,75. This value also increased than last year (0% questions have DI value >75%).

Participants' feedback

Participant's feedback were collected based on questionnaire. About 82 (55,03%) questionnaire in Block 1.7 and 62 (55,85%) in Block 2.6 were returned. All participant (100%) admitted that e-learning in pharmacology were usefull to assist the student in study pharmacology. About 78% students stated that the website content are informative and easy to understand and 74% students stated that website are easy to access, 89,02% stated that e-learning increased student's motivation to study pharmacology and 64% students stated have good internet connection.

Participant suggest some additional menus in pharmacology website for improvement, such as laboratory practice guideline, laboratory practice exam, discussion forum and homework.

DISCUSSION

In this e-learning project, pharmacology website were developed as a resource of e-learning material. E-learning material divided into several menus, such as lectures, videos, CAL, and quizzes. Except the quizzes, all menus can be accessed without registration and prior login. Lectures menu consist of several lecture power points in each learning unit.

The aim of this menu was to encourage participant to prepare their study before the lecture. As we know, Pharmacology has unique caharacteristics. The students need to understand Physiology aspect and Pathophysiology aspect as well before they learn Pharmacology. One of obstacle to introduce drug's mechanism was the student didn't understand Physiology and Pathophysiology fully yet or student already forgot them. We hope that these material can motivate the student not only to study the Pharmacology but also to refresh Physiology and Pathophysiology before the lecture for a better comprehension.

Videos in the website were embedded from Youtube (not downloaded), to respect the copyright of video maker. Videos help the student to understand Pathophysiology of the

disease and mechanism of drug action. A better comprehension about mechanism of drug action will enhance student capability to prepare drug of choice. Learning through videos and illustrations were more attractive and easier to understand. Quizzes in each learning unit were applied as self-assessment for students. Bargellini stated that self-assessment helps students to steer themselves during the learning and measure their knowledge[3]

We evaluate participant's acceptability in this project by using website statistic. Prior registration and login to access the quizzes allow us to identify the student's name, registration number, frequency of access and their score whenever quiz attempts. In Block 2.6, the e-learning modules were considerably low accessed. In Block 1.7 which pharmacology department regulation stated that student should get quiz mark greater than 60,00 to take the laboratory exam, the website access in block 1.7 was 100%. Based on questionnaire, we found that both lecture and quiz were the most accessed menus in e-learning modules. Students admitted those menus were beneficial for exam preparation.

Student's achievement were evaluated based on block exam at the end of block. Approximately 10% of total question were Pharmacology questions. The type of questions was multiple choice questions. Based on level of cognitive 80% of question are reasoning type and 20% are recalling type. Learning achievement was measured by determine Difficulty Index (DI) of each pharmacology question. Difficulty Index is one of parameter of question analysis by using Digital Mark Reader (DMR). We claimed that the e-learning project was effective if more than 75% number of question with Difficulty Index (DI) > 0,75. In Block 1.7 about 75% questions have DI value 0,75. This value are increased than last year (54.5%). In Block 2.6, about 30% questions have DI value > 0,75. This value also increased than last year (0% questions have DI value >75%). Based on these data we conclude that E-learning considerably was effective to enhance student achievement in pharmacology.

This innovation also well-perceived among the student. Both in block 1.7 and block 2.6. All participant agreed that e-learning module were usefull. Most of them stated that the website were informative and easy to understand and this learning strategy increase student's motivation.

However, we found a few challenges such as server connectivity. The connectivity is a key of any e-learning project. Most of the participants stated that the server connectivity usually "down' wether website traffic was high. A few students faced difficulty in downloading Power Point presentations and CAL. In the future need a server and connectivity improvement.

However in the implementation phase in the future, we need to improve various factors, such as better IT facilities, better information and promotion deliver to enhance the access rate among the students.[3]

CONCLUSION

Curriculum innovation as e-learning modules considerably was effective enhance student achivement in pharmacology. This innovation also well perceived among the student. All students agrreed that e-learning module were usefull. Most of them stated that the website were informative, and this learning strategy increase student's motivation. But student's access rate still depends on regulation in each module.

Table 1. E- learning material

Module	Lecture	Animated videos	Semi-animated based CAL	Quiz
Block 2.6 (Endocrine system)				
Drug in endocrine system	V	V	-	V
Drug in autonomic nervous system	V	V	-	V
Drug prescribing	V	-	V	-
Block 1.7 (Gastrointestinal System)				
Pharmacokinetic	V	V	V	V
Pharmacodynamic	V	V	-	V

Table 2. Student's access rate in Block 1.7 (Gastrointestinal System) and Block 2.6 (Endocrine system)

	Block 1.7	Block 2.6
Access	100%	35.48%
Lecture	87.80%	30.64%
Video	19. 51%	8%
CAL	17.07%	11.29%
Quiz	100%	29.03%

Table 3. The percentage of the number of questions on each DI (Difficulty index)

Module	DI	Last year (before e-learning) in %	(after e-learning) in %
Block 2.6	DI< 0.4	50	10
	DI 0.4-0.8	50	70
	DI>0.8	0	0
	DI>0.75	0	30
Block 1.7	DI < 0.4	27.3	0
	DI 0.4-0.8	36.3	25
	DI >0.8	36.3	75
	DI >0.75	54.5	75

Table 4. Student's feedback to e-learning modules

Feedback	Student's percentage
Usefull to assist in study pharmacology	100%
Informative and easy to understand	78%
Easy to access	74%
Internet connection	64%
Increase student's motivation	89.02%

Table 5. Student's suggestion about additional menus in pharmacology website

Additional menus	Percentage
Laboratory practice guideline	58.53%
Laboratory practice exam	25.60%
Discussion forum	25.60%
Homework	20.90%

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