

Explaining the teaching process of general medicine basic sciences: Designing an educational model

شرح العملية التدريسية لعلوم الطب العام الأساسية: تصميم نموذج تعليمي

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Background: This study aims to explain the process of teaching the essential medical sciences stage and designing an educational model.

Methods: The research method is mixed. In the qualitative part, the Delphi method has been used. The statistical sample in the qualitative section was 20 medicine specialists. The indicators extracted from the research literature were sent to the experts for the qualitative model survey. In the quantitative part, the survey method has been selected. The quantitative questionnaire as a research tool has included the implementation, implementation and evaluation of the qualitative model, which had 15 questions designed and distributed in a statistical sample.

Results: According to the qualitative results, the design of medical education was based on the ADDIE (Analyze, Design, Develop, Implement, and Evaluate) model including the themes of analysis, design, preparation and development, implementation and implementation and evaluation. Also, the quantitative results of the research showed that the level of student's satisfaction with the medical education program designed for the stage of the basic science is higher than average. To obtain credit in the qualitative stage, long-term involvement and review by the participants have been used. For validity or validation in the quantitative phase, the validity of confirmatory factor analysis was used.

Conclusion: Designing a basic medical education program increases the ease of students' learning abilities. Improving the educational program, enhancing the fields of education, linking basic and clinical sciences, increasing the participation of faculty members, and increasing the accountability of educational groups were the main results of this study.

Keywords: Curriculum, Education, Medical, Models, Educational

الخلفية: تهدف هذه الدراسة إلى شرح عملية تدريس مرحلة العلوم الطبية الأساسية: تصميم نموذج تعليمي.

الأساليب: أسلوب البحث مختلط. في الجزء النوعي، تم استخدام دلفي. وبلغت العينة الإحصائية في القسم النوعي ٢٠ متخصصاً في الطب. تم إرسال المؤشرات المستخرجة من الأدبيات البحثية إلى الخبراء لإجراء مسح النموذج النوعي. في الجزء الكمي، تم اختيار طريقة المسح. وقد اشتمل الاستبيان الكمي كأداة بحثية على تطبيق وتنفيذ وتقييم النموذج النوعي الذي يتكون من ١٥ سؤالاً تم تصميمها وتوزيعها في عينة إحصائية.

النتائج: بناءً على النتائج النوعية، يعتمد تصميم التعليم الطبي على نموذج ADDIE الذي يتضمن محاور التحليل والتصميم والإعداد والتطوير والتنفيذ والتقييم. كما أظهرت النتائج الكمية للبحث أن مستوى رضا الطالب عن برنامج التعليم الطبي المصمم لمرحلة العلوم الأساسية أعلى من المتوسط. للحصول على ائتمان في المرحلة النوعية، تم استخدام المشاركة طويلة المدى والمراجعة من قبل المشاركين. للتحقق من صحة أو التحقق في المرحلة الكمية، تم استخدام صحة تحليل عامل التأكيد.

الخلاصة: تصميم برنامج تعليم الطب الأساسي يزيد من سهولة التعلم لدى الطلاب. كانت النتائج الرئيسية لهذه الدراسة تحسين البرنامج التعليمي، تعزيز مجالات التعليم، ربط العلوم الأساسية والإكلينيكية، ازدياد مشاركة أعضاء هيئة التدريس وازدياد الاستجابة للاستقلالية في المجموعات التعليمية.

الكلمات المفتاحية: منهج، تعليم، طب، نماذج، تربوي

تبیین فرایند تدریس علوم پایه پزشکی عمومی: طراحی یک مدل آموزشی

بنیادی طبی علوم کی وضاحت: تعلیمی ماڈل ڈیزائن کرنا

زمینه و هدف: هدف از این مطالعه تبیین روند آموزش مرحله علوم پایه پزشکی و طراحی یک مدل آموزشی است.

روش: روش تحقیق این مطالعه آمیخته است. در قسمت کیفی از روش دلفی استفاده شده است. نمونه آماری ٢٠ پزشک عمومی بودند که به طور هدفمند انتخاب شدند. جهت نظرسنجی طبق تکنیک دلفی شاخص های مستخرج از ادبیات تحقیق جهت خبرگان ارسال گردید. در قسمت کمی، روش پیمایشی انتخاب شد. پرسشنامه به عنوان ابزار تحقیق شامل بخش های پیاده سازی، اجرا و ارزیابی مدل کیفی بود که ١٥ سؤال طراحی شده و در نمونه آماری توزیع گردید. نمونه آماری، ١٥٧ دانشجوی مرحله ورودی علوم پایه در اکتبر ٢٠١٨ دانشگاه علوم پزشکی مشهد بود که با استفاده از روش نمونه گیری تصادفی ساده انتخاب شدند. رضایت آنها از طراحی آموزشی اجرا شده نیز سنجیده شد. جهت اخذ تأمین اعتبار در مرحله کیفی از درگیری طولانی مدت و بازبینی توسط مشارکت کنندگان استفاده شد. جهت روایی و اعتبارسنجی در مرحله کمی، از روایی تحلیل عاملی تأییدی استفاده شد.

یافته ها: با توجه به نتایج کیفی، طراحی آموزش پزشکی بر اساس مدل ADDIE، شامل مضامین تجزیه و تحلیل، طراحی، تهیه و توسعه، اجرا و ارزیابی است. نتایج کمی تحقیق نشان داد که میزان رضایت دانشجو از برنامه آموزش پزشکی طراحی شده برای مرحله علوم پایه بالاتر از حد متوسط (مطلوب) است.

نتیجه گیری: طراحی یک برنامه آموزش پزشکی پایه، سهولت یادگیری دانشجویان را افزایش می دهد. بهبود برنامه آموزشی، تقویت زمینه های آموزشی، پیوند علوم پایه و بالینی، افزایش مشارکت اعضای هیئت علمی و افزایش پاسخگویی گروه های آموزشی از نتایج اصلی این مطالعه بود.

واژه های کلیدی: برنامه درسی، آموزش، پزشکی، مدل، آموزشی

بیک گروانڈ: اس مطالعے کا مقصد بنیادی طبی علوم کے تدریس کی وضاحت کرنا اور ایک تعلیمی ماڈل ڈیزائن کرنا ہے۔

طریقہ: اس مطالعے کا تحقیقی طریقہ مخلوط ہے۔ معیار کے حصے میں، ڈیلفی طریقہ استعمال کیا گیا ہے۔ شماریاتی نمونہ ٢٠ جنرل پریکٹیشنرز پر مشتمل تھا جنہیں جان بوجھ کر منتخب کیا گیا تھا۔ ڈیلفی تکنیک کے مطابق سروے کے لیے تحقیقی لٹریچر سے اخذ کیے گئے اشارات ماہرین کو بھیجے گئے۔ منتخب حصے میں، سروے کا طریقہ منتخب کیا گیا تھا

ایک تحقیقی ٹول کے طور پر سوالنامے میں کوالٹیٹیو ماڈل کا نفاذ، نفاذ اور تشخیص شامل تھا کہ ١٥ سوالات کو شماریاتی نمونے میں ڈیزائن اور تقسیم کیا گیا تھا۔ شماریاتی نمونے میں مشہد یونیورسٹی آف میڈیکل سائنسز کے اکتوبر ٢٠١٨ میں بنیادی سائنس کے داخلے کے مرحلے کے ١٥٧ طلباء شامل تھے جن کا انتخاب سادہ سے نمونہ طور طریقے سے کیا گیا تھا۔ لاگو تعلیمی ڈیزائن کے ساتھ ان کا اطمینان بھی ناپا گیا۔ کوالٹی ایشورنس حاصل کرنے کے لیے شرکاء کی طرف سے طویل مدتی مصروفیت اور جائزہ کا استعمال کیا گیا۔ مقداری مرحلے میں درستگی یا توثیق کے لیے، تصدیقی کا استعمال کیا گیا۔

نتائج: معیاری نتائج کے مطابق، ADDIE ماڈل پر مبنی طبی تعلیم کے ڈیزائن میں تجزیہ، ڈیزائن، تیاری اور ترقی، نفاذ اور تشخیص کے موضوعات شامل ہیں۔ تحقیق کے مقداری نتائج نے ظاہر کیا کہ بنیادی سائنس کے مرحلے کے لیے وضع کردہ میڈیکل ایجوکیشن پروگرام کے ساتھ طالب علم کا اطمینان متوسط سے زیادہ ہے (مطلوبہ)۔

نتیجہ: طبی تعلیم کے بنیادی پروگرام کو ڈیزائن کرنے سے طلباء کے لیے سیکھنے میں اضافہ ہوتا ہے۔ تعلیمی پروگرام کو بہتر بنانا، تعلیمی شعبوں کو مضبوط بنانا، بنیادی اور طبی علوم کو جوڑنا، فیکلٹی میربان کی میں اضافہ اور تعلیمی گروپوں کی ردعمل میں اضافہ اس تحقیق کے اہم نتائج تھے۔

مطلوبہ الفاظ: نصاب، تعلیم، طب، ماڈل، تعلیمی

INTRODUCTION

Planning medical education is based on skills (1). Therefore, educators in the field of medical sciences must prepare their students to play an influential role in health services. But it is important to remember that gaining the necessary competence to perform clinical skills requires training in a proper context. During their studies, medical students acquire skills in the educational opportunities gained in the curriculum to perform their daily clinical tasks. Learning goals are considered a measure of university success (2).

Educational design is the prediction of methods and the selection of educational materials in specific circumstances. Educational design is a complex process and should be tailored to the student's needs, readiness, teacher skills, resources, and expectations of health care (3).

Educational design as one of the educational subdivisions is next to producing educational materials, implementation, management, and evaluation of educational programs. It is an essential aspect of any curriculum, and medical education is no exception to this rule. It can be said that considering effective educational design, Effectiveness is a necessary key to a successful curriculum (4).

Educational design is derived from the theories of learning behaviorism, cognitionism and constructivism. Educational design patterns have also emerged from the combination of the mentioned educational theories (5).

More than 30 years after developing the doctoral program in medical professions, Iranian medical schools have undergone extensive quantitative and qualitative changes.

Among the changes in the structure of the medical school, the growth of the number of medical schools, the diversity of postgraduate courses, knowledge development, changes in information technology, ease of access to up-to-date knowledge, changes in knowledge acquisition and skill approaches in the third millennium have been included (6). Today, diversification, rapid environmental change, and increasing uncertainty have increased the importance of assets such as human capital (7).

In recent years, the management of medical education programs has been of particular importance. Since the complexities of educational programs, interdisciplinary or integrated teaching, limited educational resources, rapid changes in medical education and medicine, and finally, the increasing demand for accountability are among the areas that increase the importance of research in medical education, the need for systematic management to manage these situations is one of the solutions facing any new training program. The field of medicine in the general doctoral program is the basis of all specialized branches of medicine. Therefore, acquiring the skills expected in this course is necessary to provide proper services of general practitioners to the community.

The importance of this research becomes more obvious when updating the national medical education program based on national and international standards is considered as one of the priorities of medical universities, especially leading universities. Due to the shortcomings of the general medicine training program, the Ministry of Health has

changed the schedule. Therefore, Mashhad University of Medical Sciences, as a leading university, has synchronized the changes with the program of the Ministry of Health. According to the mentioned cases, one of the primary missions of this university is to implement the national general medicine program in the best and most possible way.

In the national program, all general medicine courses were reviewed and based on the opinions of the curriculum committees of each university, the general medicine program was performed (8).

So, the present study needed an educational redesign to implement the basic medical sciences program according to the mentioned cases.

For this purpose, after studying the educational design models, since the ADDIE ("ADDIE" stands for Analyze, Design, Develop, Implement, and Evaluate) educational design model is the closest model to health and medicine, it was tried to examine whether a native model for medical universities can be designed based on this model including all components and dimensions?

The background of the research is mentioned below.

Adibi et al. (2016) studied the design and development of endoscopic nursing training program in Iran. The researchers used the Delphi method to agree on the content and endoscopic nursing curriculum. The results showed that there are eight training areas for endoscopic nurse training. Lecture, teamwork and self-learning are derived from learning strategies in research. Practical clinical education is in the form of scientific demonstration, simulation, and education in clinical settings (9).

Zardasht et al. (2017) also conducted a study entitled Explaining the clinical education process in operating room. How the students cope with different environmental conditions and teamwork in the operating room was examined based on the general pattern of educational design (10).

Ghasemi et al. (2017) also conducted a study entitled Educational Design Theory. The results showed that the optimal use of cost, time, practical learning, valid educational evaluation and organizational competition are the advantages of educational design (11).

According to what has been said, there is a research gap in education design more than before. Therefore, the questions of this research are as follows:

- 1-What is the design pattern of primary medical education?
- 2- Is the designed model of basic science medical education valid?
- 3- What is the status of the implemented model of basic science medical education?

METHODS

Researchers have used a mixed research method in this study. In the first stage, to identify the process of teaching primary science students, the Delphi technique method has been used for data extracted from the research literature.

The data were provided to 20 experts using a semi-structured questionnaire, including the dean of the medical school, the deputy director of general medicine, the heads of departments, professors, the head of the education

department, and general medicine experts who were purposefully selected. According to the Delphi process, the quality model, taken from the ADDIE educational design model, was administered to experts. The model included analysis, design, preparation and development, implementation, implementation and evaluation.

According to Rezaeifar and Montazer Ataei (2015), the Delphi method is used to answer questions that cannot be answered by quantitative methods or experimental and analytical studies. The purpose of using the Delphi method is to reach a consensus and agreement of a group in a specific field through several rounds of distribution and collection of questionnaires. The Delphi method is used in different ways (12).

The proper selection of experienced and specialized people in the field of research is one of the steps that are very effective in the quality of answers in the Delphi process. In this regard, first, the selection criteria of individuals must be determined. These indicators should be entirely consistent with the research topic and the model under study. These indicators are: relevant field of study, valuable experiences, book writing and book translation and publishing scientific articles in the field of research, employment in the area related to the research topic. Therefore, the experts of the present research were chosen among professors and managers of the organization in educational design having characteristics such as related education in the field of the mentioned fields and writing books and articles.

Since the organization's managers had the necessary information and expertise in different research, they were able to help this research project as experts.

It should be noted that the number of experts who participated in this study was 20. After completing the questionnaires by experts, the present researchers commented and evaluated the answers. As previously stated, the purpose of this method is to reach a consensus on the

subject of research. After completing the questionnaire twice and modifying and evaluating it, the model has been finalized, and the researchers gained confidence in the scientific validity of their model. The critical point to complete the model was that there was no need for complex statistical work.

Regarding the acceptable percentage in reaching consensus and consensus in the answers, there was no fixed procedure. Usually, the same between 51% and 100% of the answers was considered as the consensus. But the agreement on 75% was more emphasized as the basis of consensus.

After developing a qualitative model, a questionnaire to assess the level of students' satisfaction with the educational design consisted of 15 questions was administered to primary science students. The statistical populations in the quantitative section were all students of the essential sciences entrance stage in February 1996 and October 1997 of Mashhad University of Medical Sciences, is 270 people, of which 157 people were selected by simple random sampling. It should be noted that the participants' satisfaction in the research was in written, informed, and in person. In this research, the long-term involvement and review of participants have been used to obtain credit in the qualitative stage. For validation in the quantitative phase, the validity of confirmatory factor analysis has been used.

RESULTS

Demographic characteristics in the qualitative and quantitative part of this research are shown in Table 1.

What is the design pattern of basic medical education?

In order to answer the first question of the research, it can be said that the design model of basic science medical education includes the themes of analysis, design, preparation and development, implementation and execution. Table 2 shows the results of data analysis of research literature and experts.

Table 1. Demographic characteristics in the qualitative and quantitative part of the research

Quantitative section			Qualitative part		
Gender	Frequency	Frequency (%)	Gender	Frequency	Frequency (%)
man	116	9.73	man	15	75
woman	41	1.26	woman	5	25
total	157	100	total	20	100
Age			Service and education history		
20-30	132	1.84	education	Years of service	Frequency
31-40	25	9.15	PhD in Educational Management	20-25	6
			PhD in Educational Psychology	26-30	3
			PhD in Counseling and Psychology	15-20	2
			PhD in Curriculum Planning	15-20	1
			PhD in Higher Education Management	15-20	2
			PhD in Public Administration	15-20	2
			PhD in Educational Technology	15-20	4

subscale scores of professionalism ($P > 0.05$) in both groups of residents. In comparison of findings between groups who had a personal related study with the group who did not, there was no significant difference ($P > 0.05$) for both studied residents. The residents' "yes" response percentage to the three questions about professionalism has been shown in Figure 1.

Table 2. Results of data analysis from review of research literature and expert opinion		
Theme	The main category	Subcategory
analyze	Objective analysis	Cognitive domain goals
		Emotional goals
		Objectives of the psychomotor domain
	Job Analysis	job description
		Achievement conditions
	Needs assessment	Target-based needs assessment
		Agreement-based needs assessment
	Target group analysis	General Features
		Specialized features
		the budget
	Condition analysis	Infrastructure
		human resources
	Content analysis	Scientific content
		Professional content
		Psychological content
Media analysis	Media alignment with goals	
	Ability to convey messages	
Designing	Design learning conditions	Learning environment
		Teaching strategies
		How to teach
	Educational strategies	Evaluation criteria
		Student-centered
		Problem oriented
	Designing educational transfer methods	Community-oriented
		Master based
		Individual activities
	Select educational media	Group activities
		Visual and audio media
	Selection of educational methods	Multisensory media
		modern methods
	Educational content design	traditional way
		Conceptual content
Process content		
Curriculum	Educational content	
	Lesson Plan	
	Select unit	
		How to present lessons

Table 2. Continued		
Theme	The main category	Subcategory
Preparation and development	Providing media	Producing multisensory media
		Provision of audio-visual media
	Preparation of educational materials	Printed and non-printed
		Light and non-light
		3D educational materials
	Prepare the conditions	Preparing the educational environment
		Audience preparation
	Content organization	Integration of courses
		Scheduling
	Implement the use of media	Determining the value of courses
Use of multisensory media		
Implement and run	Curriculum implementation	Use of audio-visual media
		Floating lessons
	the internship	
	basic lessons	
	basic lessons	
	General lessons	
	Learners' participation	Individual participation
Group participation		
assessment	Educational design evaluation	Continuous evaluation
		Evaluation of educational media
		Evaluation of educational materials
	Teacher evaluation	
	Evaluate learners' performance	Developmental evaluation
		Compression evaluation

Table 3. Fit indicators of confirmatory factor analysis models		
Indicator	Required amount	Values obtained
Df	-	911
X ²	-	3528.829
X ² / df	Less than 3	2.874
GFI	Larger than 0.8	0.870
RMR	Less than 0.09	0.072
CFI	0.9	0.966
RMSEA	Less than 0.08	0.063

Is the designed model of basic science medical education valid?

In order to answer the second research question about model addition, the validity of the research measurement model has been used. Table 3 shows the fit indices of

assessment	Implement and run	Preparation and development	Designing	analyze
Educational design evaluation Evaluate learners' performance	Implement the use of media Curriculum implementation Learners' participation	Providing media Preparation of educational materials Prepare the conditions Content organization	Design learning conditions Educational strategies Designing educational transfer methods Select educational media Educational content design Curriculum Design (Curriculum)	Objective analysis Job Analysis Needs assessment Target group analysis Condition analysis Content analysis Media analysis

Figure 1. Residents' "yes" response to the three questions about professionalism

Table 4. T-test results for students' satisfaction with the integration of basic medical education courses						
95% confidence interval difference		significance level	Statistics value The	Degrees of freedom	Average	Number
The most	The least					
0.2319	0.1060	0.000	5.287	156	3.169	157

In order to answer the third question of the research based on the study of students' satisfaction, the model of t-test was used, the results of which are shown in Table 4.

According to the test results, the students' statistical number is 5.287 and the level of significance, which is less than 0.05, shows that the students' satisfaction with the integration of courses is significant.

DISCUSSION

According to the research findings, the content of the analysis includes the categories of goal analysis, job analysis, needs assessment, target group analysis, condition analysis and content analysis. Similar to the research results in this category is Amini Nasab (2016) research, who studied educational design goals (13).

The theme of the design included the categories of learning conditions design, educational strategies, design of educational transfer methods, selection of educational media, creation of educational content and curriculum design. In designing educational content, which is one of the essential parts of the educational design process, the present study referred to conceptual content, process content and educational content. Content coherence and acceptability can be a great help to learners. Organizing the scope and its sequence for the duration of a training course does not confuse learners' minds. Also, the selection of course titles, the volume of educational content and the need to start the system in the form of an educational calendar are essential parts of the educational content.

The theme of preparation and development includes content organization. Mashhad University of Medical Sciences has used the integration of courses in educational design in the

content organization department. The integration of courses is to prevent the fragmentation of content and courses. The total number of basic medical sciences units is 79 units, compulsory introductory courses are 46.5 units, specific and basic elective courses are 13.1 units, and general courses are 20 units.

The theme of Implementation and implementation topics includes media use implementation, curriculum implementation, and learner participation. In the implementation of the educational plan, the course of medical genetics in clinical introductions, the study of basic nutrition principles in basic sciences (preferably semester 3), the course of nutrition in diseases are presented in the course of clinical introductions.

Also, offering genetics course before immunology course in basic sciences, offering general pathology course in basic sciences course, offering medical physics course in semester 4 of basic sciences, offering medical pharmacology introductory course worth 1 unit in the last semester of basic sciences as floating courses for learners have been considered.

The theme of evaluation included evaluation of educational design and evaluation of learners' performance.

The results of the quantitative section showed that the new educational design had increased students' learning. The results are consistent with Abdollahi et al. (2016) research, which expressed medical students' views about the role of introductory science courses in achieving the clinical goals of the medical education program of Rafsanjan University of Medical Sciences in 2010. (14).

Also, the research results are similar to those of Adibi et al. (2016), who studied the design and development of

endoscopic nursing training programs in Iran. (9). According to the research results, to improve the effectiveness of the basic sciences medical education program, it is suggested that periodic meetings be held for the educational departments regarding planning for the upcoming semesters and the participation of the relevant groups with the deputy of general medicine. The program and presentation of the results of the program implemented in each semester should be sent to the relevant ministry.

To eliminate possible shortcomings, the results of the implemented program were presented to the students and the students' feedback was received and corrected if necessary. There were also regular meetings with student representatives about the features of the National General Medicine Program and informing students of all changes through cyberspace.

It is suggested that comparative studies be conducted to benefit from the experiences of other countries in terms of educational design and curriculum. It is also recommended that the psychological characteristics of policymakers and educational designers be examined in another study. This research, like other research, has faced limitations. One of the research limitations was the impossibility of matching the responsibility of educational designers with the field of educational sciences and education. The researcher decided to

close the gap in the research literature by examining the models. Also, since the policymakers of educational programs were more active in clinical medicine and they were experts in implementation, they did not help much in the field of design.

Ethical considerations

Ethical issues including plagiarism, informed consent, misconduct, data fabrication and/or falsification, double publication and/or submission, redundancy, etc. have been completely observed by the authors. The ethics committee of Mashhad University of Medical Sciences approved this research, ethics code IR.MUMS.REC.1398.190

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