Postgraduate Curriculum Design *of* Medical Digital Library

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Abstract

Background: Information and communication technology has led to the emergence of a new generation of libraries known as digital library, which requires skilled and trained personnel to provide services to the users. An iindependent curriculum has been designed and implemented in the developed countries to train librarians, but medical librarians in Iran do not receive proper training to provide services in digital libraries.

Methods: This descriptive study is applied in terms of objective. In this paper, a medical digital library program was designed to meet the requirements of medical librarians with a qualitative approach (comparative method and Delphi technique).

Results: The content of the graduate curriculum of digital libraries in Spain, Sweden, USA as well as the international joint program of the Italy, Norway and Estonia were studied using adaptive George Brady method. The selected courses from these programs as well as expert opinions in this field were reviewed and ranked by academic staff of medical library and information science in Iran.

Conclusion: Finally, a medical digital library program was designed inspired by curriculum elements in the mentioned countries and comments from faculty members of medical digital library. The results of this study can be helpful for curriculum developers at Ministry of Health and Medical Education of Iran.

Keywords: Digital Library, Curriculum, Medical Librarian, Delphi, Digital Library Curriculum, Iran

1. Introduction

The development rate of technology in today's society is so high that it has affected all the organizations and their fundaments. As an organization like others, library has not been far from the impact of information technology (1). In 1960s, intellectuals and theorists like LickLeader in their writings have noted modern libraries that are different with currently available libraries due to the high level of technology, processing structure and access to information. The role and function of libraries has been questioned with the rapid development of Worldwide Web, a resource that is much

broader than the library with easy to reach data, the popularity of which is on the rise. In the meantime, digital libraries have also found a place on the web (2). Digital libraries have created new ways to store, organize and have access to information on the web (3). The number of digital libraries globally launched each year is rising and on the other hand, the number of traditional jobs of librarian and information science is declining (2). As the most important factor to advance the objectives of digital libraries and as an intermediary between users and digital materials, digital librarian in digital libraries can provide services by relying on theoretical library science and benefiting from digital capacities on the ground.

Therefore, an important step in this regard is the design of appropriate training programs to prepare librarians for such a work space. Digital library training has been on the agenda of librarian and computer science faculties in Europe, United States and other developed countries since two decades ago (2), and independent programs have been designed to teach this concept to the students of library and information science and computer science. In Iran, an independent program called Digital Library Management was approved in the Ministry of Science, Research and Technology (MSRT) in 2012 to teach this concept. By dedicating a specific major to teach this concept, MSRT is in a better situation in this respect compared to the Ministry of Health and Medical Education (MOHME). There is an urgent need to revise the content and syllabus of Medical Library and Information Science curriculum since it has not been updated (5).

There are only two optional digital library courses in the syllabus of the graduate program of library and medical information, which is not taught to students by many departments and has been replaced with optional courses with no independent major to teach digital library. The current curriculum of medical library and information science in Iran does not cover the required skills for medical librarians in the digital environment, and it seems that the graduate students lack the ability to play a role in the digital medical environment as anticipated. The need for formal training to enhance the capabilities and skills of librarians (particularly at graduate level) in order to participate in medical digital libraries and provide appropriate services should be addressed concomitant with the increase in digital medical environments in Iran. The aim of this study is to evaluate the curricula of digital libraries in USA, Spain, Sweden as well as the joint international program of three countries (Italy, Norway and Estonia) and to design a graduate curriculum for digital library of medicine according to expert opinions.

The search of researcher in databases showed that in addition to digital library major in education centers, numerous studies have been conducted abroad to identify the necessary skills for librarians in digital environments as the precise explanation of these skill predisposes to favorable conditions for training. In fact, it can be stated that the training for digital libraries has started in the developed countries since the emergence of this concept (2). Universal survey of Spink & Cool (1999) has reported 20 institutions teaching this concept in library, information science and computer science faculties world over and the researchers have suggested an independent education program for digital library in order to train the specialists (6). Yan (2004) stated that teaching the concept of digital libraries was developing in North America and European countries and reported 60 education centers for training in digital library (7).

Tree weech (2005) reported four independent digital library training in Illinois, Rutgers, Indiana and Syracuse in USA (8). Bowden, Villar and Zabuk (2005) in their study concluded that more than 60 educational institutions are considering digital libraries in their curricula (9). Clegg & Ma Brien (2006) have mentioned 47 authenticated institutions that consider digital library training in the United States (10). Bakeri (2009) has reported independent courses in eight Asian countries to teach digital library concepts (11) and Macevičiūtė (2010) reported three independent programs to teach digital library and compared them with each other (12). Tammaro (2013) has mentioned and compared five training programs (13). Zaman & Vanders (2016) stated that the digital library education in European countries should be increased (14). In Iran, the first department of library and information science was established in 1966 and analysis of such programs has shown the low flexibility of them. An important problem of librarian departments in Iran has been delayed changes in response to transforming society

demands and academic faculty members have attempted to revise their courses in terms of structure and content. Evaluation of the directives of MSRT and MOHME showed only two optional courses for teaching this concept among the courses required for library and medical information students, which are not taught to the students by several faculties and other optional courses are taught instead (2) that cannot meet the needs of librarians for their role in the digital environment. In 2012, MSRT approved a major named management of digital library to train students providing services in digital libraries and University of Tehran and Razavi University of Islamic Sciences have admitted students to this major.

2. Method

In this paper, a qualitative approach as well as Delphi and George Brady techniques were used to design a medical digital library program.

1. The first phase of the study was conducted by George Brady method. Georg Brady believed that educational phenomena should be based on deliberated programs and plans. According to this pattern, first the required information on countries are collected from resources and interpreted, then classified and finally their differences and similarities evaluated and compared. In comparative study of education, George Brady method has four steps of description, interpretation, juxtaposition and comparison (15). In this study, after searching the Internet and finding graduate curricula of digital library in Spain, Sweden, USA as well as international joint program of three countries (Italy, Norway and Estonia), a comparative study was done using the four mentioned steps. These countries were selected due to diversity of their education systems and full access to their courses.

2. The second step of the study was conducted using Delphi method, which is used to "identify" and "screen" the most important decision-making criteria. Therefore, although the Delphi technique is not a multi criteria decision making method, it is used in many cases before the application of such techniques to screen the indicators or reach consensus concerning the importance of decision making criteria (16). The objective in the second stage was to reach consensus on the part of faculty members of Iranian library and information science departments about the selected courses from the mentioned curricula. The courses of choice were in three groups. The first group included common courses from the mentioned curriculum. The second group included the courses that were not shared and were designated as the table of suggested and alternative courses in the questionnaire. The third group of courses was added to the questionnaire according to expert opinions in the field of digital library. The three groups of selected courses were validated by two-round Delphi. Using the elements of graduate programs of digital library in the cited countries as well as courses derived from Delphi method, the medical digital library curriculum was designed.
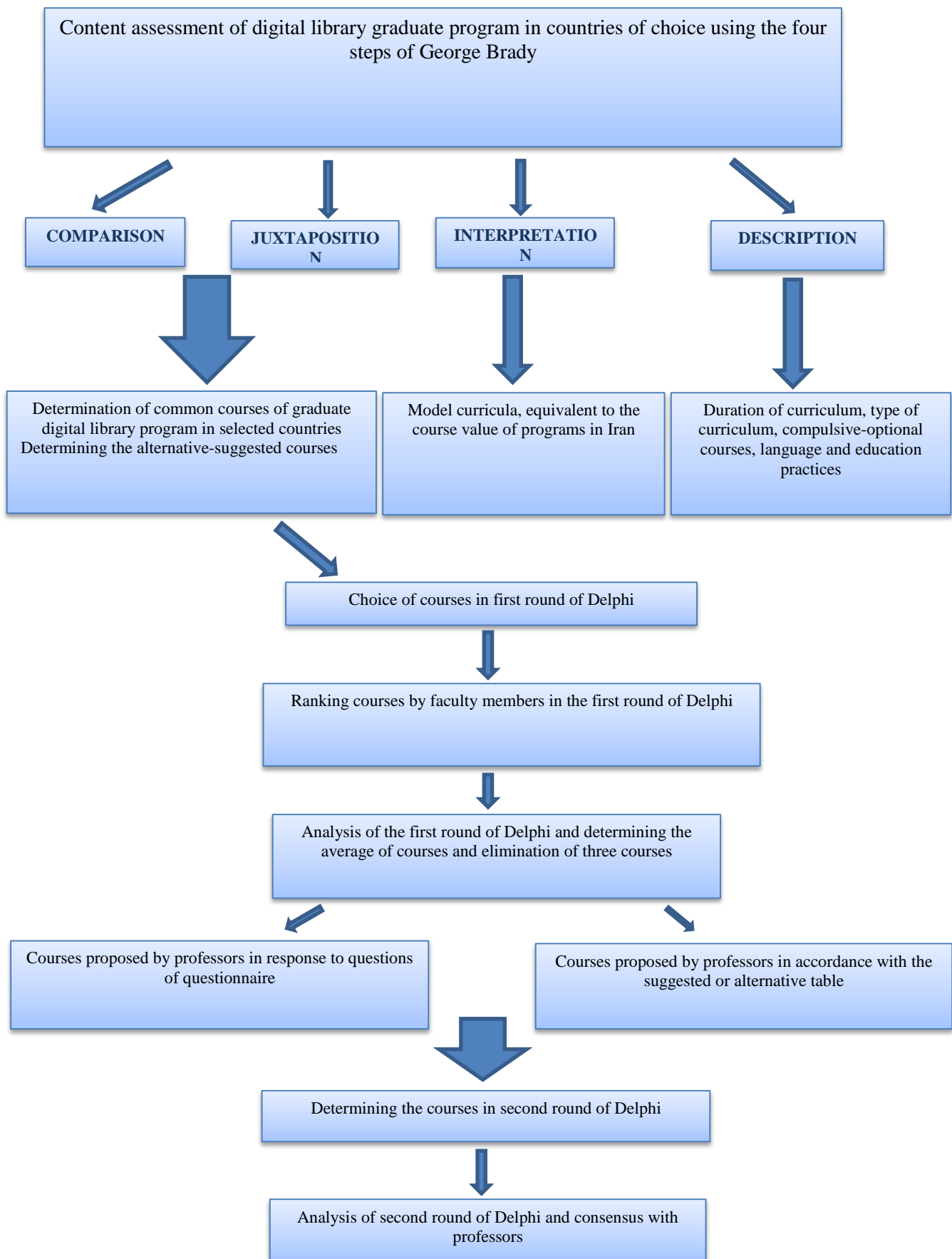
Content assessment of digital library graduate program in countries of choice using the four steps of George Brady

COMPARISON

JUXTAPOSITION

INTERPRETATION

DESCRIPTION

Determination of common courses of graduate digital library program in selected countries Determining the alternative-suggested courses

Model curricula, equivalent to the course value of programs in Iran

Duration of curriculum, type of curriculum, compulsive-optional courses, language and education practices

Choice of courses in first round of Delphi

Ranking courses by faculty members in the first round of Delphi

Analysis of the first round of Delphi and determining the average of courses and elimination of three courses

Courses proposed by professors in response to questions of questionnaire

Courses proposed by professors in accordance with the suggested or alternative table

Determining the courses in second round of Delphi

Analysis of second round of Delphi and consensus with professors

Figure 1. Research Procedure

3. Results

3.1. George Brady technique

What are the appropriate courses to design a medical digital library program? To answer this question, the digital library graduate programs in selected countries were assessed in description, interpretation, juxtaposition and comparison steps. In the description step, the curriculum type and its entire period, obligatory and optional courses, language and learning approach were determined. In the interpretation step, model of curriculum, equivalence of curriculum courses in USA, Sweden, Spain and the international joint program of three countries (Italy, Norway and Estonia) with Iran were identified (Table 1).

In juxtaposition and comparison steps of George Brady technique, common courses of digital library graduate program in countries of choice were identified (Table 2). From among the common courses, expert and specialist opinions in the field of digital library chose the following courses as prerequisite: digital data security, programming, organization of medical references, specialized language, information technology in healthcare and general medicine. Virtual reference services, digital library management, knowledge of medical databases, digital resources management, digital resources archiving, digital resources cataloging, research seminar, digital library architecture, metadata, resource digitization management, internship and thesis were selected as specialized courses. The following courses were chosen as optional for the first round of Delphi method: analysis and design of medical information systems, electronic education, information and communication, statistics in medical digital library. Finally, ontology, resource conservation, introduction to electronic publishing, data storage and retrieval, knowledge of markup languages, digital document management and social sciences were alternative courses suggested for the first round of Delphi method so that the faculty members be able to replace them with other courses.

Digital Library Graduate programs	International Digital Library Program (Italy, Norway, Estonia) (17)	Sweden University curriculum of Digital Library (18)	Spanish University curriculum of Digital Library (19)	American University curriculum of Digital Library (20)
Course period	2 years	4 years	1 year full time 2-3 year part time	2 years
Course type	Full time	Part time	Full time-part time	Full time
*Design of educational program model (systematic-case study)	Systematic	Systematic	Case study	Case study
Common education methods	(Student-centered) speech-seminar	(Student-centered) speech-seminar	(Student-centered) speech-seminar	(Student-centered) speech-seminar-small groups
Language of education	English	English	Spanish	English
Total courses	120ECTS	120ECTS	60ECTS	60CR
Obligatory courses	90ECTS	75ECTS	54ECTS	54CR
Optional courses	-	-	18ECTS	18CR
Internship	15ECTS	-	-	-
Thesis	30ECTS	45 ECTS	12ECTS	12CR
courses	1.Digital Knowledge Organization 2. Research Methods and Theory of Science 3.Information and Knowledge Management 4.Human Resource Management 5.Users and Usage of Digital Libraries: Quantitative and Qualitative Evaluation 6.Access to Digital Libraries	1.Digital library management (advanced) 2.Users and information activities in digital environments (advanced) 3.Interaction (advanced) 4.Information retrieval for digital libraries (introductory) 5.Technology of digital libraries (introductory) 6.Digitising cultural heritage material 7.Digital library research methods (advanced) 8.Technology of digital libraries (advanced) 9.Information retrieval for digital libraries (advanced)	1.Information Service Management 2.Information Visualization 3.Security of Digital Documents 4.Digitalization and Preservation 5.Mark-up Technologies for Digital Texts 6.Vocabularies and Semantic Schemes for the Web	1.Internship in Library and Information Science 2.Metadata 3.Digital Libraries 4.Cataloging 5.Database Design 6.Human Computer 7.Interaction 8.Web Programming. 9.Information 10.Architecture for the Web 11.Workshop in Library and Information Science 12.Topics in Library and Information Science 13. Indexing 14.Ontologies 15.Semantic Web 16.Information 17.Visualization 18.Information Technology 19.Standardization 20.Digital Humanities

Table 1. Content review of MSc curriculum in selected countries

Table 2. Common courses of digital library graduate program in selected countries

Common courses	
Research method and theory of science. Digital library research method.	(Italy, Norway and Estonia) Sweden
Users and Usage of Digital Libraries: Quantitative and Qualitative Evaluation Technology of digital libraries (introductory). Technology of digital libraries (advance). Users and information activities in digital environments (advanced).	(Italy, Norway and Estonia) Sweden Sweden
Technological Resources in Digital Libraries Technology of digital libraries (advanced). Technologies for managing archives and documents.	Spain Sweden Spain
Digital Knowledge Organization. Metadata Cataloging Ontologies	(Italy, Norway and Estonia) USA
Information and Knowledge Management. Digital library management (advanced). Management and assessment of digital continuity.	(Italy, Norway and Estonia) Sweden Spain
Vocabularies and Semantic Schemes for the Web . Semantic Web.	Sweden USA
Information Visualization. Architecture for the web.	Spain USA
Mark-up Technologies for Digital Text. Digitalizing cultural heritage material.	Spain USA

3.2 Delphi method

   In this paper, Delphi method was implemented in two rounds during four months using two questionnaires. The panel members included 45 faculty members of medical library and information sciences from Iran. In the first round, the courses extracted from comparative study, as well as those selected according to expert opinions of digital library were submitted to panel members as questionnaires in Likert scale format. In addition, the members were asked to make suggestions about courses in the questionnaire. In the second round, the old and new factors proposed in the first round were again submitted to panel members to be re-scored. The Delphi method was completed after two rounds as the desired consensus was reached. The questionnaires were submitted to panel members in person and by e-mail. In this study, according to the structure of questionnaire, the mean and median were considered as criteria to reach consensus. The results of two rounds of Delphi method showed that all the courses had mean scores >4 and the panel members reached consensus among each other.

The most important findings of Delphi method are as follows: In the first round of Delphi method, the programming course from prerequisite courses, management of digital resources from specialized-optional courses and information and communication course from specialized-optional courses were eliminated because of an average <4. The social media course replaced the programming course as suggested by seven professors, knowledge of markup languages replaced digital resources management as suggested by nine professors and data storage and retrieval replaced information and communication as suggested by seven professors. Digital information security (average of 4.75) and general medicine (average of 4.5) had the highest and lowest averages among prerequisite courses, respectively.

Digital laboratory architecture (average of 5) and metadata (average 4.01) had the highest and lowest averages among specialized-obligatory courses, respectively, which means that all the experts unanimously chose the "strongly agree" option for digital library architecture course.

Data storage and retrieval (average of 4.67) and statistics in medical digital library (average of 4.22) had the highest and lowest averages among specialized-optional courses, respectively.

The blank form of curriculum was downloaded from website of Education Secretariat of Basic and Specialized Medical and Health Sciences, and the medical digital library form was divided into Tables 3, 4 and 5.

Table 3. Prerequisite courses of medical digital library graduate course

Course code	Course name	Number of units			Education hours			Prerequisite
01	Digital data security	Theoretical	Practical	Sum	Theoretical	Practical	Sum	
02	Social media	2	-	2	34	-	34	
03	**Organization of Medical resources	2	-	2	34	-	34	
04	**specialized language	2	-	2	34	-	34	
05	IT in health and medicine	2	-	2	34	-	34	
06	* General medicine	2	-	2	34	-	34	

The student is obliged to pass a number of or all the prerequisite courses (Table 1) as stated by the respective Department approved by the university council of graduate studies.

* It is compulsory for all BSc graduates of majors other than librarian and medical information to pass this course.

** Passing this course as a prerequisite is obligatory for all the students who have not passed it before.

Table 4. Specialized-obligatory courses of graduate digital medical library curriculum

Course code	Course name	Number of units			Education hours			Prerequisite
07	Digital library architecture	Theoretical	Practical	Sum	Theoretical	Practical	Sum	
08	Digital library management	2	-	2	34	-	34	
09	Cataloging of digital resources	2	-	2	34	-	34	
10	Knowledge of markup languages	1	1	2	34	17	51	
11	Organization of digital resources	1	1	2	34	17	34	
12	Digital resources archiving	1	1	2	34	17	34	
13	Metadata	2	-	2	34	-	34	
14	Knowledge of health information resources	1.5	.5	2	26	17	43	
15	Virtual resource services	2	-	2	34	-	34	
16	Research seminar	1	1	2	34	-	34	
17	Internship	2	-	-			136	
18	Thesis	6						

Table 5. Specialized-optional courses of graduate digital medical library curriculum

Course code	Course name	Number of units			Education hours			Prerequisite
19	Analysis and design of medical information systems	Theoretical	Practical	Sum	Theoretical	Practical	Sum	
20	Electronic education	2	-	2	34	-	34	
21	Data storage and retrieval	2	-	2	34	-	34	
22	Statistics in medical digital library	2	-	2	34	-	34	

The student is required to pass four specialized-optional courses according to the thesis subject, supervisor comment and approval of the department.

4. Discussion &Conclusion

4.1 George Brady technique

Graduate medical digital library programs from USA, Spain, Sweden and the joint international program of three countries (Italy, Norway and Estonia) were assessed by George Brady technique. The results of this study showed that digital library programs in countries of choice had the common goal of teaching librarians to provide services in digital libraries. The joint international digital library program of the three countries (Italy, Norway and Estonia) and the dual American program are advantageous over Sweden and Spain programs due to being shared between the three countries and offering online courses, respectively. The use of Spanish language for education in Digital Library Program of Spain is less advantageous relative to other countries where English is the language of education.

There are more common points between Swedish digital library program with international digital library program in terms of curriculum and common courses, as well as between US Digital Library curriculum with programs of other countries due to structure and dual courses. The results of this round is consistent with those of previous researches. In a comparative study entitled "digital libraries education", Macevičiūtė (2011) compared the perspective of library management in digital library curriculum of International Joint Program of three countries (Italy, Norway and Estonia) with two educational programs of Digital Library and Culture, Information and Communication Sciences in Sweden, which was consistent with our study.

4.2 Delphi technique

As was observed in the results: Specialized courses of digital library such as digital library architecture, digital information security and information storage and retrieval were considered by professors with the highest average and frequency. In a similar study by Naghshineh and Rasouli (2014), the courses resulting from comparative study of advanced digital library certificate in USA and the international joint program of three countries (Italy, Norway and Estonia) have been ranked very appropriate, appropriate and inappropriate. Eight courses that have been ranked as very appropriate to be included in the digital library program are as follows: management of digital library, digital protection, digital modeling, digital library architecture, metadata, information retrieval and digital objects. In this study, the courses were ranked using the five options of Likert scale (strongly disagree, disagree, neutral, agree, and strongly agree).

Among the specialized-obligatory courses, digital library architecture, digital laboratory management, organization of digital resources, archiving digital resources and cataloging had the highest frequency of score 5 (strongly agree), as well as information storage and retrieval, education, electronic education and medical information systems analysis and design from specialized-optional courses. The digital library management and digital library architecture were shared between these two studies with the highest scores but there was difference with regard to other courses.

The courses proposed as prerequisites by faculty members in this research include social media and anatomy. The obligatory-specialized courses include information systems, web and Internet search skills, digital protection, web design and maintenance, legal and social issues of digital library, project management, product marketing, network management, user interface software, as well as interactive software, data storage and retrieval, information and knowledge management and digital library history for specialized-optional courses, which were common with previous studies and can be seen in Table 6.

Table 6. The similarly proposed courses by professors with previous researches

Similar courses in other studies		Courses proposed by professors
Spink &cool ,1990(6) Choi & Rasmussen, 2006(21) Audunson, & Shuva ,2016(14)	Digital library protection	Digital library protection
Spink &cool ,1990(6) Tammaro ,2007(23) Howard,2010(22)	Web design and maintenance	Web design and maintenance
Spink &cool ,1990(6) Choi & Rasmussen, 2006(21) Howard,2010(22) ,2016(14) Audunson, & Shuva	Legal and legislative issues of digital library	Legal and legislative issues of digital library
Choi & Rasmussen, 2006(21)	Project management	Project management
Audunson&, Shuva,2016(14)	The role of digital library in the society	The role of digital library in the society
Choi & Rasmussen, 2009 (24)	Product marketing	Product marketing
Tammaro ,2007(23)	Knowledge of qualitative and quantitative standards	Knowledge of qualitative and quantitative standards
Choi & Rasmussen, 2009 (24)	Information and knowledge management	Information and knowledge management

Finally, Medical Digital Library curriculum was designed inspired by the elements of curricula in the mentioned countries and viewpoints of faculty members. The results of this study can help curriculum developers in MOHME.

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