Basic sciences curriculum in medical education

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➤ Abstract

Introduction: Traditional methods are generally used for teaching basic science courses at Shiraz Medical School. Such courses are taught during the first and second years of a seven-year medical program. The goal of this study was to analyze teachers and students' perceptions of basic science teaching in medical education.

Methods: A descriptive cross-sectional study was conducted at the college of medicine of Shiraz University of Medical Sciences.

Results: Regarding the students' viewpoints, 71.4% reported that curriculum content in basic sciences was enough and had good relevance. 59.2% of students believed the objectives of basic sciences curriculum were clear.

Conclusion: The burden of teaching basic sciences ranges from sustaining interest to clinical relevance. It is expected that medical schools will continuously monitor what works and what does not work with their curricula and make the necessary adaptations as required.

Keywords: Curriculum Planning, Basic Sciences, Program Evaluation

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Introduction:

To become a doctor, a person has to study for at least six years after high school. A medical school is usually a faculty of a large university. Its function is to teach a wide variety of sciences and techniques a doctor must know. Medical education is a lifelong process embracing premedical experience, undergraduate education, general clinical training, specialized or vocational training, sub specialized training, and continuing medical education.

The undergraduate medical curriculum consists of two broad phases-basic medical sciences and clinical medicine. Studies in the basic sciences involve learning in detail the normal structure and function of the human body and how these are affected by disease.

Basic sciences are critical in medical education. They are, in fact, the initial steps toward clinical medicine. Effective medical education should be viewed as a continuum. Curriculum development in medical education is a scholarly process (1). It integrates a content area with educational theory and methodology and evaluates its impact. Despite the rapid movement in physicians' roles brought about by social changes, there are little changes in the curricular structure and content of the basic sciences curriculum in medical education.

Traditional medical school curricula required students to absorb theoretic, scientific information in lecture formats for the first two years, using standardized tests to grade the students' ability in basic sciences. In Iran, most of the medical schools still follow the old system of conventional teaching. Students study basic sciences in five semesters and participate in a national comprehensive exam (Comprehensive Basic Sciences Exam).

In such a situation, a revision of basic sciences curriculum is an urgent need. Curriculum evaluation plays an important role in curriculum change. The curriculum needs to be assessed in a general way for its worth (2). A typical question associated with a general assessment of a curriculum's worth is "How satisfied are students and faculty with the curriculum?"(3)

Table 1. Distribution of teachers' viewpoints about curriculum content

Teachers' view	Anatomy		Physiology		Microbiology		Biochemistry	
Curriculum content	Agree N (%)	Disagree N (%)	Agree N (%)	Disagree N (%)	Agree N (%)	Disagree N (%)	Agree N (%)	Disagree N (%)
Enough content	10(100)	0(0)	9(100)	0(0)	9(90)	1(10)	8(100)	0(0)
Good relevance	10(100)	0(0)	9(100)	0(0)	9(90)	1(10)	8(100)	0(0)
Clear objectives	10(100)	0(0)	9(100)	0(0)	9(90)	1(10)	8(100)	0(0)
Good achievement level	10(100)	0(0)	8(88.9)	1(11.1)	7(70)	3(30)	5(62.5)	3(37.5)
Effective program	7(70)	3(30)	8(88.9)	1(11.1)	9(90)	1(10)	8(100)	0(0)
Appropriate time organization	9(90)	1(10)	7(77.8)	2(22.2)	9(90)	1(10)	3(37.5)	5(62.5)

Methods

The purpose of this study was to identify the teachers and students' opinion about different dimensions of basic sciences in medical education.

Because of the importance of basic sciences in medical education, in this study 4 major basic science departments of Shiraz Medical School (Anatomy, Physiology, Microbiology and Biochemistry) were considered.

A descriptive cross-sectional study was conducted at the college of medicine of Shiraz University of Medical Sciences. A qualitative assessment focus group was formed with four heads of basic sciences departments. A two-hour session was held with this group to discuss the important factors that influence teaching of basic sciences. Based on the analysis of the focus group session, an appropriate questionnaire was developed. The self-administered and anonymous questionnaire was distributed to all medical students of the second and third year, (n=112), at the end of basic sciences level before the start of clinical training in 2008. These students were qualified enough to respond the study questions as they had passed almost all or most of the courses of this level. The five point Likert scale was used to measure the students' responses to the items.

The content validity of the questionnaire was checked by 4 educational experts. They reviewed the items and gave their points of view. According to their suggestions, the questionnaire was modified and distributed to 30 students to check the reliability. Cronbach's Alpha was used for this purpose and the reliability was found to be 0.95, (r=0.95). The final and modified questionnaire was distributed to the students and faculty members.

The questionnaire was designed to elicit the students and teachers' viewpoints on the entire course, the educational resources, content, examinations, teaching methods and other support services.

All students who had passed the basic sciences programs (112 students) were surveyed to provide feedback on their perceptions of the teaching and learning experiences provided in these departments. The response rate was 100.

The four heads of the departments and all faculty members (n=40) participated in this study.

Table 2. Distribution of teachers' viewpoints about teaching methods

Teachers' view	Anatomy		Biochemistry		Microbiology		Physiology	
Teaching method	Agree N (%)	Disagree N (%)	Agree N (%)	Disagree N (%)	Agree N (%)	Disagree N (%)	Agree N (%)	Disagree N (%)
Appropriate teaching method	7(70)	3(30)	8(88.9)	1(11.1)	5(50)	5(50)	8(100)	0(0)
Appropriate audio-visual aids	8(80)	2(20)	9(100)	0(0)	6(60)	4(40)	8(100)	0(0)
Effective communication	7(70)	3(30)	9(100)	0(0)	7(70)	3(30)	1(12.5)	7(87.5)

Table 3. Distribution of teachers' viewpoints about examinations

Teachers' view	Anatomy		Physiology		Microbiology		Biochemistry	
Examinations	Agree N (%)	Disagree N (%)	Agree N (%)	Disagree N (%)	Agree N (%)	Disagree N (%)	Agree N (%)	Disagree N (%)
Good reflect of course content	4(40)	6(60)	6(66.7)	3(33.9)	6(60)	4(40)	8(100)	0(0)
Emphasis on understanding	3(30)	7(70)	6(66.7)	3(33.9)	6(60)	4(40)	8(100)	0(0)
Appropriate feedback	10(100)	0(0)	6(66.7)	3(33.9)	6(60)	4(40)	6(75)	2(25)

Statistical analysis: Chi square and correlation tests were used to analyze the data. A p-value of <0.05 was considered as statistically significant. The responses of 5-point scale were collapsed into two categories for analysis and better interpretation of data.

Results

The fact that it is students' perceptions of the learning and assessment environment that influence the approach adopted rather than the intentions of curriculum designers or teachers is very important, as these remain hard to predict (4).

In the present study, a questionnaire was administered to 112 students who had almost completed their preclinical training years as well as 40 basic sciences teachers. The students and teachers were asked to provide their perceptions of the basic sciences curriculum (anatomy, physiology, microbiology and biochemistry). Three main issues were considered in this connection.

Content (enough content, relevance, clear objectives and time organization)

Teaching methodology (appropriateness of the teaching methods employed, audio- visual aids and effective communication)

Modes of assessment (reflection of the content, emphasis on understanding and feedback)

Hence the discussion is focused on these 3 issues and how the students and teachers have responded to them.

All faculty members believed that the curriculum content of basic sciences for medical students was enough and had good relevance with clear objectives. Time organization for delivery of the course content was a controversial subject for faculty members and 34.8% of them maintained that time organization was not appropriate. More than 70% of the faculty members believed that they used proper methods for teaching the basic sciences. 63.1% of the faculty members reported that there was good and effective communication between teachers and students in the departments. 66.6% of faculty members believed that examinations were good reflections of the course content and they provided appropriate feedback to students (Tables 1, 2 and 3).

Regarding the students' viewpoints, 71.4% reported that the curriculum content in basic sciences was enough and had good relevance. 59.2% of students believed that the objectives of basic sciences curriculum were clear. Regarding their satisfaction

Table 4. Distribution of students' viewpoints about curriculum content

Students' vew	Anatomy		Physiology		Microbiology		Biochemistry	
Curriculum content	Agree N (%)	Disagree N (%)	Agree N (%)	Disagree N (%)	Agree N (%)	Disagree N (%)	Agree N (%)	Disagree N (%)
Enough content	82(84.6)	15(15.4)	85(87.7)	12(12.3)	69(71.1)	28(28.9)	42(42.3)	55(56.7)
Good relevance	86(88.7)	11(11.3)	79(81.4)	18(18.6)	65(67)	32(33)	46(47.7)	51(52.3)
Clear objectives	67(69.1)	30(30.9)	74(76.3)	23(23.7)	53(54.6)	44(45.4)	36(37.1)	61(62.9)
Good achievement level	60(61.9)	37(38.1)	65(67)	32(33)	48(49.4)	49(50.6)	23(23.7)	74(76.3)
Effective program	81(83.5)	16(16.4)	70(72.2)	27(27.8)	58(59.8)	39(40.2)	39(40.3)	58(59.7)
Appropriate time organization	52(53.6)	45(46.4)	67(69.1)	30(30.9)	60(61.8)	37(38.2)	40(41.2)	57(58.8)

Table 5. Distribution of students' viewpoints about teaching methods

Students' view	Anatomy		Physiology		Microbiology		Biochemistry	
	Agree	Disagree	Agree	Disagree	Agree	Disagree	Agree	Disagree
Teaching method	N (%)	N (%)	N (%)	N (%)	N (%)	N (%)	N (%)	N (%)
Appropriate teaching method	70(72.1)	27(27.9)	68(70.1)	29(29.9)	64(66)	33(34)	41(42.3)	56(57.7)
Appropriate audio-visual aids	75(77.3)	22(22.7)	67(69)	30(31)	65(67)	32(33)	48(49.5)	49(50.5)
Effective communication	61(62.8)	36(37.2)	68(70.1)	29(29.9)	62(63.9)	35(36.1)	40(41.2)	57(58.8)

with modes of assessment, only 50.5% of the students reported that they were satisfied with their grades (achievement level) in basic sciences courses.

About 56.4% of the students reported that they were satisfied with time organization for the delivery of the curriculum content.

56.4% of the students agreed that the teaching methods employed were appropriate. More than 59% of the students believed there was effective communication between teachers and students (Tables 4, 5 and 6).

Even though more than 50% of the students believed examinations were good reflections of the curriculum content, they reported that the test items focused more on memorizing rather than understanding (except examinations in the department of physiology). According to Supe (5), the current assessment system frequently fails to assess capabilities beyond knowledge recall.

Based on the teachers' viewpoints, there was a significant and positive correlation between curriculum, examinations and resources. Also the quality of education in basic sciences had a positive correlation with teaching methods and the materials. Likewise, according to the students' viewpoints there was a significant and positive correlation between curriculum, teaching methods, examinations, and the materials in basic sciences education.

Discussion

This study was an effort to find out the opinions of medical students and basic sciences teachers about key elements of teaching the basic sciences subjects in the first two years of medical education.

In Shiraz Medical School, basic sciences curricula are discipline-based. The traditional curriculum is discipline-oriented and each discipline has its own structure (6). In a conventional medical school, curriculum is subject-based and teachers try to achieve the learning objectives through large group lectures, and structured laboratory experiments (7). The purpose of this traditional method is to expose all students to the same knowledge and skills. It seems there are some needs for change. Although lecturing is an essential method to transform new information in large classes, it could be used with other methods to increase students' competence. Because the conventional curriculum is practiced for many years, it is more stable and less expensive in terms of time, effort and cost (8).

The ultimate goal of medical education is to enable the graduate to transfer sets of what has been learnt to wider contexts and to the contexts of challenges of medical practice (9). In traditional medical schools, the first two years of study are dedicated to basic sciences such as anatomy, biochemistry, physiology and microbiology with relatively little patient teaching. The basic sciences of anatomy, physiology and biochemistry have underpinned the teaching of medicine for decades.

This descriptive study has quantified the views of medical students and teachers on the qualitative factors which affect the effectiveness of basic sciences curriculum in medical education. In the last decade,

Table 6. Distribution of students' viewpoints about examinations

Students' view	Anatomy		Physiology		Microbiology		Biochemistry	
	Agree	Disagree	Agree	Disagree	Agree	Disagree	Agree	Disagree
Examinations	N (%)	N (%)	N (%)	N (%)	N (%)	N (%)	N (%)	N (%)
Good reflect of course content	53(54.6)	44(45.4)	67(69)	30(31)	60(61.9)	37(38.1)	41(42.3)	56(57.7)
Emphasis on understanding	39(40.2)	58(59.8)	59(60.8)	38(39.2)	36(37.1)	61(62.9)	31(32)	65(68)
Appropriate feedback	58(59.8)	39(40.2)	66(68)	31(32)	58(59.8)	39(40.2)	41(42.3)	56(57.7)

the medical education in Iran was in crisis. Although the "scientific basis of medicine" was emphasized in the curricula based on the Flexnerian model, this often led to a compartmentalization of preclinical and clinical studies. For over a century, establishment of a solid background of basic sciences knowledge in students has been a primary aim of the medical curriculum (10). There has been an increasing pressure upon medical faculty members to adapt the medical curriculum to new basic sciences knowledge.

In 1940, the "Weiskotten Report" on medical education found dissatisfaction with preclinical education (11).

This analysis of the basic sciences curriculum of four departments showed that the various topics taught at different times/semesters during the two and half years as preclinical training probably make the learning more challenging.

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