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# A Comprehensive Benchmark To meet Standards of National and International Academic Accreditation (AA) and Quality Assurance (QA) for Biomedical Engineering Study Programs

Case Study: Department of Applied Medical Sciences (AMS) at  
Community College – King Saud University

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**Abstract**—This study presents the experience of the Department of Applied Medical Sciences (AMS) - Riyadh Community College - King Saud University in its way to achieve the international accreditation standards to ensure quality. The study is based on a three years experience (2008-2010). The following will be clarified:

- The list of criteria adopted by AMS to ensure quality.
- The procedures adopted by AMS to apply accreditation standards to ensure quality of outputs.

The study followed the iterative descriptive approach in analyzing the topics. The results show the procedures how the standards were applied to ensure the quality of outputs by meeting the requirements in all aspects, national and international, especially of the internationally recognized organization Council on Occupational Education COE, by which the AMS was then accredited in June 2010. A four year development strategic plan is set for the department to ensure consistent quality and improvement standards. By reviewing the literature of former experiences of Arab and international bodies for accreditation and quality assurance, the study concluded a list of accreditation criteria and indicators of quality assurance, as well as indicators to ensure the quality of the university environment. The achieved number of accreditation and quality assurance standards are presented from both national and international organizations and were found to be:

- 25 accreditation standards leading to
- 245 indicators, and
- 41 indicators for QA, and
- 29 indicators for the QA of the university environment.

The study recommended the need to activate the academic accreditation and assessment of academic

programs periodically internally and externally. Furthermore, similar departments of applied medical sciences should adopt the presented accreditation and quality assurance principles. In addition those departments are asked to put a strategic plan that meets their needs and goals.

**Keywords** — Applied Medical Sciences; Biomedical Engineering; Benchmark; Accreditation standards; Quality assurance

## I. INTRODUCTION

Comparative studies in the field of quality assurance showed that there is a variation in the priorities of the systems and assessment methods. In Britain, for example, the evaluation systems to ensure quality give priority to assess the quality of teaching, research, etc. In the United States of America, priority is given to evaluate the performance and efficiency and the organization's ability to achieve its purposes. On the other hand, in Japan, the issue of evaluation to ensure quality is built on the expense of numerical indicators, for example the ratios of students to professors [1] [2].

However, there are two main aspects to enter the field of quality assurance. Each aspect describes the ways and types of quality assurance. The first aspect is known as internal quality, and focuses on values, principles and basic ideas that constitute the core of higher education: the search for truth and for knowledge. This portal gives priority to the production of knowledge and student learning. It is believed that this entrance is the essence of quality in academic quality. The second aspect is known as external quality which describes the ability of institutions of higher education to meet the changing needs of society [1]. In other words, the ability of institutions of higher education to deliver the goals of the

study programs to the graduates satisfying the society as the first beneficiary of the existence of such institutions [3].

As a consequence of the phenomena of globalization and the open economic policy and global competitiveness of companies and international institutions, it becomes a must for institutions and service organizations to focus on applying the concepts of quality and excellence to ensure quality of its output and improve its overall performance. Institutions of higher education worldwide, should pay more attention to its quality of educational services, as they face growing demand from local markets in many disciplines to provide them with graduates who are able to satisfy their needs effectively and efficiently [4] [5].

The quality of services provided by institutions of higher education through their application of the criteria for institutional and program accreditation is reflected on the performance of graduates and their quality in the labor market. It also affects the perception of the society and employers in the way they evaluate the institution and its alumni. The adopted academic program represents the basis for evaluating the quality of educational services of the foundation. It translates the goals and learning outcomes which in terms is reflected in the performance and excellence of graduates in the future.

In the last five years, King Saud University in Saudi Arabia adopted the goal to ensure its quality of education as a whole and that of its academic programs in particular. One of the successful examples is that of the department of Applied Medical Sciences presented by the section of medical engineering at the Community College. Since the establishment of the department in 2004 it applied the criteria for institutional and program accreditation. This was reflected on its academic program, laboratories, training, staff and community services and finally the achievement of the international accreditation in 2010. In this article a list of comprehensive criteria adopted by the department to ensure quality and its impact on the quality of graduates is presented.

## II. METHODOLOGY AND ACHIEVEMENTS

The methodology for achieving a comprehensive benchmark for QA and AA can be summarized in two main topics:

### *First topic*

The procedures adopted by the department of applied medical sciences and the implementation of the standards of QA and AA to ensure its outcome. This includes the following:

#### *a) Institutional Accreditation and QA assesment*

This is the process of assessment to ensure that the institution fulfills the minimum set of standards of the national and international QA and AA at the institutional level. These standards are then periodically assessed externally (by the accreditation body) and internally (by the quality assurance unit at the institution). The measures include the following points: University Campus, Faculty members, teaching facilities, administrative facilities, laboratories, facilities management, library, admission and registration.

#### *b) Program Accreditation and QA assesment*

This is the process of assessment of each academic program to ensure the fulfillment of the minimum elements of standards of QA and AA at the departmental level. Each standard is accompanied by an impact factor. Academic programs are subject to a periodic follow-up. The comprehensive standards for programs are summarized as follows: Vision, mission, program objectives, learning outcomes, program credit hours, faculty members, department library and database, management and support of equipment, facilities and human resources.

For the implementation and verification of the standards of accreditation and quality assurance in the department a quality assurance steering committee is set up to manage and coordinate between all other execution committees at the department.

#### *c) Strategic Planning*

SWOT analysis has been conducted in order to identify strengths, weaknesses, opportunities and threats to determine how to address potential problems so that the department can draw its roadmap towards quality assurance. Results of the analysis have shown that the internal environment of the college has a number of strengths that characterize the department and must be activated and exploited. On the other hand there are some weaknesses that constrain and influence the efficiency and effectiveness of the department in achieving its goals and mission. The results showed an analysis of the external environment of the department and the existing opportunities that should be taken into consideration to benefit from it to ensure the quality of the departments output. Furthermore, the analysis showed threats which the department has to deal with and try to overcome it.

According to the department's mission and vision and in line with the mission and vision of the college, university and global trends, the department achieved the following strategic objectives (details of each strategic objective can be found on the author's website [27]):

1. Seek an administrative body that efficiently copes with the current quality standards.
2. Work on a mechanism for self-evaluation, persistence, and explore the potential and technical resources available to the department, and determine the requirements for quality assurance in various fields (education - research - community service).
3. Improve the process of preparing graduates through high quality programs in various specialties of the department.
4. Keeping pace with technological developments and employment in various similar areas of composition of the graduate.
5. Development of the capacity of faculty members and academic and administrative leaders in various fields.
6. Conduct research on education methodologies that come up with knowledge about how to improve education and solve educational problems facing the department.
7. Strengthening the concept of community participation.

It is worth mentioning that each strategic goal includes an execution mechanism (procedures), implementation tools, performance indicators, execution unit and budget.

As a result of the execution of the set strategic objectives the following accomplishments are achieved:

**Development of academic programs of the Department:** The students of the nursing and medical equipment program, who are being prepared to work as professionals have demonstrated a good understanding of their curriculum, professional knowledge, skills and attitudes, enabling them to learn and to achieve the desired professional standards.

**Development of the assessment system:** the assessment was set to analyze the information collected about new comers, registered students, alumni and student's performance. Then the data was analyzed to assess the overall status. In accordance improvements are carried on to raise the level and quality of information offered to all parties.

**Improve the field training program:** a training guideline has been set up by the department. This guide includes all execution processes needed to achieve best results out of the training (steps before during and after the training period). Collaboration with training institutions has been extended. The 15 weeks training program has been put by taking all considerations of the institutions and the department into account. To encourage the trainee credit hours has been appointed to the training course in order to give them the chance to improve their GPA. A final practical exam and an oral discussion carried out with a presentation of some case studies are conducted by a committee of the department and the trainers from the training institutions.

**Professional development for faculty members:** this includes research, community service and teaching. Moreover, the assessment of their performance taking in consideration the level of education their students have achieved. Facilitating the collaboration of the department's faculty with counterparts at other institutions as well as encouraging them to participate in workshops and conferences has enhanced their opportunities and widened their knowledge.

**Management and resources:** making benefit of the open minded and flexible leadership of the college as well as the budget, personnel, equipment and a variety of sources of knowledge offered by the college, helped to improve the graduates level of education and skills.

#### *Second topic*

List of criteria adopted at the Department of Applied Medical Sciences to ensure quality

A comprehensive list of standards of accreditation and quality assurance indicators has been set up according to the previous studies of experiences of different Arabic publications on accreditation and quality assurance (e.g., Jordanian, Saudi Arabian, Egyptian, Oman, Palestinian and UAE), and experiences of western academic institutions (e.g., British, Scotland, European, Japanese, Australian, New Zealand, and United States of America) in reference [2] and in [4] up to reference [26].

The authors also analyzed the criteria of the Council for occupational education COE (NCATE, P.10) which is accredits programs responsible for preparing professionals in the United States of America. The authors believe that this is a solid set of standards to be considered to ensure quality in the department. After all standards were prepared they yielded to the judgment of national and international experts in quality assurance of higher education. Then, a list of accreditation standards and indicators of quality assurance and indicators to ensure the quality of the department, college and university environment was set. The final list contains 25 aspects of accreditation criteria which cover 245 accreditation standards. The number of indicators of quality assurance was found to be 41 indicators, and the number of indicators to ensure the quality of the university environment was 29 indicators. For the sake of shortness, details of the comprehensive standards and indicators can be found on the website of the author [27]. The following table is a summary of it:

TABLE 1

LIST OF ACCREDITATION CRITERIA AND INDICATORS OF QUALITY ASSURANCE ADOPTED IN THE DEPARTMENT OF APPLIED MEDICAL SCIENCES- COMMUNITY COLLEGE IN RIYADH- KING SAUD UNIVERSITY

No.		Items	%
<b>I: The accreditation standards</b>		245	100
1	Vision, mission, values, goals and strategic plan	6	2.44
2	Administrative structure of the department	10	4.08
3	Academic Accreditation	4	1.63
4	Specialties of the department	9	3.67
5	Study programs	17	6.94
6	Financial and Administrative Affairs	8	3.27
7	Buildings and facilities	12	4.90
8	Admission regulations	12	4.90
9	Academic & Psychological supervision	7	2.86
10	Faculty	21	8.57
11	Professional development for the faculty	15	6.12
12	Offered courses	17	6.94
13	Field training	12	4.90
14	Education & Learning materials	6	2.44
15	Learning resources center	7	2.86
16	Library	12	4.90
17	Activities	12	4.90
18	Postgraduate Programs	10	4.08
19	Scientific Research	5	2.04
20	Assessment of the department's programs	7	2.86
21	Assessment of the teaching staff	7	2.86
22	Assessment of student	13	5.32
23	Assessment of graduates	6	2.44
24	Community Services	7	2.88
25	International Cooperation	3	1.22
<b>II: Indicators of quality assurance:</b>		41	100
<b>III: Index to ensure the quality of the university environment:</b>		29	78%

### III. RECOMMENDATIONS

After a four year success story of the department of applied medical sciences (Medical Engineering section) to achieve the international accreditation and to ensure the quality of education for the students, the following recommendations are introduced:

-Activation of the accreditation process in higher education which helps to govern and assess the quality of education and consequently the knowledge delivered to the students. This in term assures the trust between the academic institution and students, parents, labor market and the community. As a result of the accreditation of academic programs it enables the production of skilled and self confident graduates that are able to compete in the labor market

-Continually assessment of the academic program, internally and externally, in order to improve their services and to cope with technological and scientific progress.

-Continuous evaluation of the output of the educational process. This is to evaluate the outcomes by systematically identifying the knowledge, skills and values that must be acquired by the students.

-Design the curriculum to meet the needs of learners, the labor market. This is achieved through the improvement of objectives and outputs of education and a clear strategy, taking in consideration the criteria and feedback from professional organizations, specialized agencies and bodies and practices.

-Provide opportunities for learners to strengthen their professional knowledge and skills by offering all resources needed to achieve this.

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