IFBLS' Guidelines regarding Core Competence and Core Curriculum

Adopted 2012

Guidelines for Core Competence for Biomedical Laboratory Scientist/Biomedical Scientists describe the core set of competences expected of a Biomedical Laboratory Scientist/Biomedical Scientist.
Guidelines for Core Curriculum define a core set of theories expected from the education of a Biomedical Laboratory Scientist/Biomedical Scientist.
The Core Competence and Core Curriculum are mutually dependent.

IFBLS recommends using the Bologna Declaration (1) as a frame of reference for levels of academic education.

Terms and abbreviations

Core Competence
A Core Competence is a knowledge, skill, or ability that contributes to successful completion of a task.
A Core Competence is the ability to perform the activities within an occupation or function to the standard expected in employment.

Core Curriculum
A Core Curriculum is, in this context, defined as a curriculum considered mandatory or central to all students studying to become a Biomedical Laboratory Scientist/Biomedical Scientist.

The Bologna Declaration describes three levels of academic education: Bachelor, Master, and Doctoral degrees.

ECTS - European Credit and Accumulation System (2) is a standard for transparent comparison of curriculum and workload of a course. ECTS is the most recognized standard for assessing and comparing courses and their workload. 47 countries are currently using the ECTS standard and the Bologna Declaration. The ECTS users guide defines 60 ECTS to be attached to the workload of a full-time year of formal learning (academic year) and the associated learning outcomes. In most cases, student workload ranges from 1,500 to 1,800 hours for an academic year, whereby one credit corresponds to 25 to 30 hours of work. (3)

Introduction

Biomedical Laboratory Scientist (BLS)/Biomedical Scientist (BS) are a young profession compared to several of the other health professions. There are differences between countries/regions regarding:

- Basic education
- Access to continuing professional development
- Access to further education
- Acknowledgment as a profession
- Regulation such as legislation and authorization
- Existence of professional body and unions/professional associations
- Ethical guidelines
- Number of BLS' in the workforce compared to the population and community's need

For several years there has been a discussion among the members of IFBLS about the need for an international recommendation on Core Curriculum for Biomedical Laboratory Scientist (BLS)/ Biomedical Scientist (BS), resulting in these guidelines.

It is a goal for IFBLS to reach an international harmonization of the Core Curriculum. Consensus on an international Core Curriculum will raise the education globally and develop the profession to a higher academic level and thereby take higher responsibility for the development of the science. An IFBLS Core Curriculum description should be a tool to benchmark each country or state's Biomedical Laboratory Science/Biomedical Science education.

The recommendations and content of the Core Curriculum and Core Competence are based on discussions in IFBLS meetings since 2006, as well as the survey conducted in 2009 and 2010 among IFBLS members and non-members (4). It is also based on the recommendations from the IFBLS Student Forum presented at the General Assembly of Delegates GADs in 2008 and 2010 (5).

It is highly recommended that IFBLS member associations and their government responsible for Core Competence and Core Curriculum adopt the guidelines and statements drawn up in this document.

IFBLS shall use these guidelines and statements in collaboration with WHO and other organizations.

Policy statement and principles for IFBLS Guidelines for Core Competence and Core Curriculum

Core Competence

IFBLS Definition of Core Competence for Biomedical Laboratory Scientist/Biomedical Scientists

The Biomedical Laboratory Scientist/Biomedical Scientist is in the crossroads between the health disciplines and a deep understanding of technology for diagnostic purposes.

The Biomedical Laboratory Scientist/Biomedical Scientist education and training make the profession unique compared to other professions in the medical laboratory in terms of: knowledge within quality assurance, evaluation of pre-analytical conditions and assessment and validation of medical laboratory analysis.

The Core Competences for Biomedical Laboratory Scientist/Biomedical Scientists include a thorough understanding of the fundamentals of biomedical processes and the process of medical decision-making. This includes: development of methods, implementation of new methods, quality assurance of biomedical analysis, the analytical process from when an analyte is ordered, and the sample collection through to the validation and presentation of the result.

The Core Competences for Biomedical Laboratory Scientist/Biomedical Scientists are built on scientific methods (evidence-based) and the ethics of patient care.

The Biomedical Laboratory Scientist/Biomedical Scientist is an important linkage to healthcare professionals and the public for the use of safe and appropriate diagnostic testing.

Examples of detailed competency related to BLS/BS (6):

Preparation and analysis of biological material
Evaluation of appropriate sample collection procedures
Documentation of receipt of specimens in the laboratory
Evaluation of specimen suitability prior to analysis
Definition of the priority of laboratory requests to arrange the workload
Analysis of specimens using appropriate/relevant techniques
Reading and evaluation of results

Correlation, validation and interpretation of results of investigation using clinical information
Assessment of the validity of data/results against a possible range of outcomes
Interpretation of validated results
Making decisions about reporting results, repeating procedures, consulting senior staff and carrying out further testing within established guidelines

Reporting and issuing laboratory results
Verification of report with sample identification
Use of administrative systems to communicate results
Ensuring critical results are given the correct attention and communicated
Ensuring appropriate storage and disposal of data and reports
Reporting and issuing of therapeutic products e.g. blood products

Maintenance of documentation, equipment and stock
Participation in preparation and revision of manuals and protocols
Preparation and storage of reagents and solutions
Production of diagnostic products – culture media
Participation in the maintenance of laboratory environment and equipment
Coordination of supplies stocks and reagents

Maintenance and promotion of safe working practices
Identification and correction of unsafe work practices and breaches of regulations
Ensuring correct procedures are followed for acquisition, collection, transportation and disposal of biological, toxic and radioactive wastes
Responding appropriately to emergency situations as they occur in the laboratory

Liaison with health workers and others to continuously improve service
Participation in quality improvement activities
Optimization of relationships with suppliers of goods and services
Optimization of relationships with service users
Exchange of information with other healthcare professionals
Promotion of the profile of the profession to the community
Participate in micro-teams around the patient

Participation in education and training of healthcare workers and others
Research of, preparation and delivery of appropriate presentations of laboratory results and knowledge
Participation in interdepartmental and other meetings
Where appropriate, provision of instruction on collection, testing of specimens, interpretation and significance of results
Training of personnel in the operation of instruments and equipment, the performance of methods and quality control procedures and the observation of safety measures in the medical laboratories, including Point of Care Testing in- and outside the laboratories

Participation in research and development activities
Contribute to planning and design of research and development projects
Follow of research/development protocol
Evaluation of results and the need for further experimental work
Preparation and delivery of research/development reports

Demonstration of continuing professional development
Establishment and communication of personal goals in professional development
Maintenance and updating of scientific/technical knowledge and skills
Development of skills relevant to the enhancement of professional growth

Demonstration of professional accountability for biomedical laboratory science practice
Accept responsibility for own actions/omissions
Make independent professional judgments
Comply with the profession's code of ethics
Demonstrate knowledge of contemporary ethical issues affecting biomedical laboratory science
Recognize and respond to own abilities and levels of professional competence

Core Curriculum

It is emphasized that a Core Curriculum is based on learning outcomes. Examples on learning outcomes are presented in Appendix 1.
The prerequisite is that the student is qualified to enter a Bachelor of Science program or equivalent.

IFBLS policy is that the education level for a Biomedical Laboratory Scientist/Biomedical Scientist should at minimum be equivalent of Bachelor of Science (180-240 ECTS points).

Core Curriculum is important in terms of learning outcomes, and the ECTS points suggested provides a framework for the workload for each topic.
The Core Curriculum should ensure that students acquire a level of competence that qualifies for professional work/training for work in medical laboratories. The education shall qualify for acceptance at a Master of Science program, necessary to qualify for a Doctoral candidacy.

Science Topics (approximately 75 ECTS in a 180 ECTS program):

Chemistry
Physics
Mathematics
Statistics
Biochemistry/Biomedical Science
Anatomy and Physiology

Specific Topics (approximately 90 ECTS in a 180 ECTS program):

Molecular Biology
Human Genetics/Medical Genetics
Immunology
Immunohaematology/Transfusion Medicine
Histology/Embryology
General Pathology and Pathophysiology
General Microbiology/Clinical Microbiology
Virology
Parasitology
Pharmacology/Toxicology Forensic
Haematology
Clinical Biochemistry
Clinical Pathology
Clinical Cytology
Analytical Methods (e.g. Immunohistochemistry)

Other topics (approximately 15 ECTS in a 180 ECTS program):

Research Methodology
Epidemiology
Bio Safety
Quality Control/Assurance
Ethics
Human and Social Science
Health Information Systems
Economy and Management
Public Health

Practical training (included in specific topics and science topics):

Hospital Laboratories
Laboratories at a university/university college
Industry
Primary healthcare units

Learning methods

It is necessary with a structured program for the practical training and to include training outside the universities or university colleges. The practical training should be defined as a certain part of the ECTS.
In addition to traditional lectures and self study there is a potential for new methods for presenting material and involvement of students. eLearning, virtual learning, and problem-based learning are novel concepts that may be utilized for further evolving educational

programs.

Authorization/Legislation

To be able to work as a BLS/BS you need to be approved by a public authorization/ certification or its equivalent as a health profession in your respective country or jurisdiction. The member associations shall work with their governments to ensure that the Core Curriculum and education is to a standard that will be internationally recognized.

Many countries have systems for authorization and legislation related to BLS/BS. The IFBLS survey from 2009/2010 shows that 2/3 of the respondents have a system for authorization of BLS/BS. The countries without authorization or legislation should look into examples from other countries to get this implemented in their own association or country. See e.g. systems for certification in Canada (7), and authorization in Norway (8).

Accreditation of education

The members of IFBLS shall work with their governments to ensure that the universities or university collages offer BLS/BS education that is accredited and regularly evaluated to ensure that they adhere to the international standards

Establishing learning outcomes

Learning outcomes describe what a student is expected to demonstrate, understand and know at the end of a course. They express the desired outcome of a course or an entire study in terms of knowledge, skills and attitudes. Several countries, e.g. UK (9), have established or are in the process of establishing learning outcomes for BLS/BS education.

Examples of learning outcomes are given in Appendix 1. As the process continues the IFBLS examples for Learning Outcomes will be implemented in the policy document.
Accreditation of education and learning outcomes are closely linked. The United Kingdom Quality Assurance Agency for Higher Education made a report on Biomedical Science in 2007 (10) linking curriculum - learning outcomes to the role of accreditation and benchmarking of the education. This example can be used as a tool both for the Curriculum and the learning outcome and as a guideline for benchmarking of the education.

References

(1) http://www.ond.vlaanderen.be/hogeronderwijs/bologna/

(2) http://ec.europa.eu/education/lifelong-learning-policy/ects_en.htm

(3) http://ec.europa.eu/education/lifelong-learning-policy/doc/ects/guide_en.pdf

(4) http://ifbls.org/images/ifbls_docs/IFBLS%20Questionnaire%202010.pdf

(5) http://ifbls.org/images/ifbls_docs/IFBLS%20GAD%202008%20Attachment%202%20Student%20report.pdf

(6) http://ifbls.org/images/ifbls_docs/final_Draft_Report_of_the_CC_TF.pdf

(7) http://www.csmls.org/Certification/What-is-Certification.aspx

(8) http://www.safh.no/english/index.html

(9) http://www.ibms.org/go/nm:search?search_query=learning+outcome&search_button=Search

(10) http://www.qaa.ac.uk/Publications/InformationAndGuidance/Pages/Subject-benchmark-statement-Biomedical-science.aspx

Appendix 1 Examples of learning outcomes:

Science topics
Chemistry
Learning outcomes
At the end of the course the student shall:

- Describe the properties of atoms based on the position within the periodic table, and understand the type of bonds they make
- Explain a redox process and balance a redox equation to calculate the potentials at different concentrations and temperatures
- Explain chemical balance and be able to calculate chemical kinetic
- Calculate pH in different acid/base and buffer solutions, as well as analyze the capacity of a buffer
- Explain and be able to perform calculations using the ideal gas law and colligative properties
- Verify the safety of a procedure according to safety regulations

Specific topics
Molecular Biology
Learning outcome
At the end of the course the student shall:

- Explain the chromosomal and molecular basis for the production of proteins in cells
- Explain how mutations are inherited, how these can lead to disease, and how different polymorphisms may be used as genetic markers in diagnostics
- Summarize basic topics within functional genomics and proteomics
- Provide examples and descriptions of different forms of genetic testing, gene therapy, and cloning
- Explain how key laboratory methods within molecular biology are used in diagnostics and development of methods for treatment
- Provide examples of and discuss ethical challenges related to genetic-related diseases
- Explain the principles for, and be able to use, key methods in molecular biology, such as extraction of nuclei acids, PCR, electrophoresis, and DNA sequencing

Other topics
Statistics and science methodology
Learning outcome
At the end of the course the student shall:

- Explain basic statistical tools in descriptive statistics, such as distribution and variation
- Use and interpret confidence intervals, as well as the most common methods for hypothesis testing
- Explain establishment of a reference range, and how the diagnostic value of an analytical method is evaluated
- Explain the term quality control and how this is conducted in practical work
- Explain the most common statistical methods used during validation of analytic methods
- Plan and conduct validation of an analytic method, as well as interpretation of the result