



Arab Republic of Egypt



National Authority of Quality  
Assurance and Accreditation of Education

# **National Academic Reference Standards**

## **Environmental Sciences**

January 2009

1<sup>st</sup> Edition

## **Table of Contents**

Introduction to Environmental Sciences Education	3
National Academic Reference Standards	5
Curriculum Structure	11
Glossary	12
References	14

## **Introduction to Environmental Sciences Education**

Our physical environment is being degraded by global climate change, species extinctions, habitat loss, pollution, and other human-caused disruptions. Our social or cultural environment is stressed by unsustainable population growth, increasing gaps between the rich and poor, and sudden social, political, and economic shifts. Although the human population has had undoubtedly a negative impact on our environment, our understanding of environmental sciences has allowed us to become better stewards of the Earth. Environmental sciences attempt to identify and remedy many environmental problems that can cause severe stresses on our limited pool of natural resources. Environmental sciences are considered as a sustainability-based science that meets fundamental human needs while preserving Earth's life support systems.

In Egypt, we face challenges to sustaining the planned and present development activities. Environmental quality is a prime concern to sustain the development of our country. Major environmental issues and concerns, that challenge Egypt today include limited natural fresh water resources, desertification, urban sprawl on agricultural land, deterioration of marine habitats, air pollution in major cities and solid waste generated from human settlements (EEAA, 2001). Therefore, there has been an ever increasing need in Egypt to have professionally qualified environmental scientists and specialists to help understand the

environmental problems facing our country, to find suitable solutions and mitigation measures to solve these problems and to apply the environmental standards and measures to bring such solutions into real-world actions. Accordingly, academic programs in Egypt (both undergraduate and postgraduate) addressing environmental sciences are increasing in number, quality and popularity.

Identifying NARS for the environmental sciences will ensure a high quality environmental sciences graduates that can participate in the best professional practice to solve the environmental problems confronting our nation.

**Career opportunities and employability profiles:**

The majority of Environmental sciences graduates are employed in governmental positions. However, job growth for environmental graduates should be strongest in the private-sector consulting firms and industry. Such growth will be spurred largely by the increasing demands placed on the environment. Further demand should result from the need to comply with the environmental laws and regulations. The most potential job fields include: academic staff, Egyptian Environmental Affairs Agency (EEAA), industrial sectors, scientific research institutions, consultancy offices, school teaching, governmental institutions (e.g. local authorities, drinking water and sewage treatment facilities, etc.), Non-Governmental organizations (NGO's), and international organizations.

## **I. National Academic Reference Standards (NARS)**

There is a wide variety of definitions for environmental sciences found in the literature. These definitions might have different point of views and different levels of details. However, they all agree that environmental sciences is considered an interdisciplinary combination of basic sciences applied to the study of the environment, particularly biology (especially ecology), geology, chemistry and social sciences. Environmental sciences integrate the knowledge from these disciplines to study how we and other living resources are interacting with one another and with their non-living components.

### **1. Attributes of the Environmental Sciences graduates:**

The people working in the field of environmental sciences are called environmental scientists if they work in the academic field otherwise they are called environmental specialists. They are professionals with chemical, physical, geological, ecological and project management expertise who may work in a range of different sectors including conservation, energy, engineering, waste management or water quality. They usually work as part of a team, advising colleagues or managers and writing reports or making presentations. They may assist with environmental impact assessments, which are required for many developments before permission is granted. They monitor the quality of the environment; interpret the impact of human actions on terrestrial and aquatic environments. In addition, they help planners to develop and construct buildings, transportation

corridors, and utilities that protect water resources and reflect efficient and beneficial land use.

Since most environmental issues deal with human activities, study of economics, law and social sciences are often applied in conjunction with environmental sciences. Environmental sciences graduates have a long track record in gaining employment across a number of different professions and organizations, including environment-based industries. This is due to the wide range of skills they have developed in the study of the subject through hands-on learning activities such as fieldwork, laboratory work and team-based projects.

**The graduate of Environmental Sciences must have the ability to:**

- 1.1. Apply the knowledge of environmental sciences, their related disciplines, applications and tools to the management/solution of the environmental issues.
- 1.2. Gain new knowledge and continually enhance the available information to improve the understanding and handling of the environment and natural resources.
- 1.3. Propose sustainable solutions to the environmental problems.
- 1.4. Participate in the development and implementation of environmental policies, strategies and planning.
- 1.5. Disseminate the environmental knowledge and experience through effective interaction to enhance the

performance of the profession and promote community development.

- 1.6. Share in multidisciplinary team work and be flexible for adaptation and working under contradictory conditions.
- 1.7. Use IT technology effectively.
- 1.8. Hold professional values that maintain individuality, positive thinking, self-confidence, dignity and honor.

**2. Knowledge and Understanding Environmental graduates\ specialist must acquire knowledge and achieve understanding of:**

- 2.1. Basics of biology, chemistry, mathematics, earth sciences, physics and computer sciences.
- 2.2. Principles of ecology, environmental geology, biodiversity, conservation, and natural resources management.
- 2.3. Environmental chemistry, pollution, environmental health and waste management.
- 2.4. Remote sensing, statistics and geographical information systems.
- 2.5. Environmental policies, impact assessment, environmental economics, environmental management and legislation, national and international regulations and law.
- 2.6. Sustainable development concepts as well as the tools and indicators of evaluating sustainability.

- 2.7. Systems analysis and modeling of environmental systems.
- 2.8. Planning, implementation and reporting of fieldwork (data collection, sampling and working with portable apparatuses).
- 2.9. The relevant and recent laboratory methodology; the safe and proper operation of laboratory techniques and instruments
- 2.10. The methods of data management and analysis.
- 2.11. The most important contemporary environmental issues, treaties or conventions and/or organizations.
- 2.12. The role analysis of national and international policies and regulations.

**3. Practical and professional skills:**

**The graduate must be able to:**

- 3.1. Apply the principles of environmental sciences to come with the best practices that will ensure a sustainable human development.
- 3.2. Use acquired knowledge and understanding to participate in the implementation of the proper solutions and mitigation measures of environmental issues.
- 3.3. Evaluate and monitor features of nature conservation interest in habitats and sites.



- 3.4. Collect and interpret data from a variety of sources, and present it as written scientific reports and policy recommendations.
- 3.5. Conduct field surveys to establish baseline data or other levels.
- 3.6. Conduct audits to evaluate the environmental performance of particular activities.
- 3.7. Investigate reasons for deterioration of the water and air quality and suggesting changes or solutions to these problems.
- 3.8. Develop environmental programmes that ensure corporate compliance with the environmental regulations and laws.
- 3.9. Develop pollution control, pollution prevention and recycling programs through cleaner production techniques.
- 3.10. Prepare and implement annual management plans based on ecological surveys and scientific observation.

#### **4. Intellectual Skills:**

##### **The graduate must be able to:**

- 4.1. Examine critically scientific evidence, both quantitative and qualitative, in order to arrive at evidence-based conclusions.
- 4.2. Understand not only the theoretical underpinnings of the discipline but also how that theory influences practice.

- 4.3. Assess alternatives which take account of qualifying, affording and constraining circumstances.
- 4.4. Monitor and review the applications, progress and outcomes of suggested solutions.
- 4.5. Evaluate critically published information.
- 4.6. Analyze and identify criteria and specifications appropriate to specific problems at different levels, and propose options for their solution.
- 4.7. Carry out environmental impact assessments for a wide range of projects.

### **5. General and Transferable Skills**

#### **The graduate must be able to:**

- 5.1. Present information and express ideas through structure and writing essays and oral modes using IT.
- 5.2. Manage one's own learning and development, including time management and organizational skills.
- 5.3. Work in team and comprehend and assume the interchangeable role of leaders and followers.
- 5.4. Possess good project management and business skills
- 5.5. Demonstrate respect, tact, empathy and appropriate verbal and nonverbal expression when dealing with colleagues, superiors and the general population.
- 5.6. Enhance sense of responsibility towards environmental sustainability to build positive interest or affection for environmental research and inquiry.

### Curriculum Structure

The percentages mentioned in the following table for each area of study are just a guide for the faculty and not obligatory to follow.

Table 1. Percentages of areas of study

<b>Subjects</b>	<b>Percentage</b>	<b>Tolerance</b>
Basic Science	28	26-30
Humanities (including language)	9	8-10
Specialty(Professional)	42	40-44
Computer and IT	6	5-7
Field training project	7	6-8
Others (Discretionary)	8	7-9
Total	100	92-100

## II. Glossary

### 1. Institution

A University, faculty or higher institute providing education programs leading to a first university degree or a higher degree (Master's or Doctorate).

### 2. Graduate Attributes

Competencies expected from the graduate based on the acquired knowledge and skills gained upon completion of a particular program.

### 3. National Academic Reference Standards (NARS)

Reference points designed by NAQAAE to outline / describe the expected minimum knowledge and skills necessary to fulfill the requirements of a program of study.

### 4. Academic Standards

Reference points defined by an institution comprising the collective knowledge and skills to be gained by the graduates of a particular program. The academic standards should surpass the NARS, and be approved by NAQAAE.

### 5. Subject Benchmark Statements

Guideline statements that detail what can be expected of a graduate in terms of the learning outcomes to satisfy the standards set for the program. They enable the outcomes to be compared, reviewed and evaluated against agreed upon standards.

### 6. The Program

A set of educational courses and activities designed by the institution to determine the systematic learning progress.

The program also imparts the intended competencies required for the award of an academic degree.

**7. Intended Learning Outcomes (ILOs)**

Subject-specific knowledge, understanding and skills intended by the institution to be gained by the learners completing a particular educational activity. The ILOs emphasize what is expected that learners will be able to do as a result of a learning activity.

**8. Knowledge and Understanding**

Knowledge is the intended information to be gained from an educational activity including facts, terms, theories and basic concepts. Understanding involves comprehending and grasping the meaning or the underlying explanation of scientific objects.

**9. Intellectual Skills**

Learning and cognitive capabilities that involve critical thinking and creativity. These include application, analysis, synthesis and evaluation of information.

**10. Professional and Practical Skills**

Application of specialized knowledge, training and proficiency in a subject or field to attain successful career development and personal advancement.

**11. General and Transferable Skills**

Skills that are not subject-specific and commonly needed in education, employment, life-long learning and self development. These skills include communication, team work, numeracy, independent learning, interpersonal relationship, and problem solving... etc.

### III. References

- Barrows HS, Tamblyn RM. Problem-based learning, an approach to medical education. New York: Springer Publishing Co.,1980.
- Guyatt G, Chairns J, Churchill D et al. Evidence-based medicine. A new approach to teaching the practice of medicine. A new approach to teaching the practice of medicine. JAMA 1992; 266: 2420-2425.
- Hendricson WD, Cohen PA. Future directions in dental school curriculum, teaching, and learning. In: Haden NK, Tedesco LT, eds. Leadership for the future: the dental school in the university. Washington, DC: American Association of Dental Schools, 1999.
- Kelly M, McCartan BE, Schmidt HG. Cognitive learning theory and its application in the dental curriculum. Eur J Dent Educ 1998; 3: 52-56.
- Lantz MS,ChavesJF. What should biomedicalsciences education in dental schools achieve? J Dent Educ 1997;61: 426-433.
- Leahey TH, Harris RJ. Learning and Cognition, 4<sup>th</sup> edn. Englewood Cliffs, NJ: Prentice Hall, 1997.
- Whipp JL, Ferguson DJ, Wells LM, Iacopino AM. Rethinking knowledge and pedagogy in dental education. J Dent Educ 2000; 64 : 860-866.
- Yip H, Barnes I. Learning in dental education. Eur J Dent Educ 1997; 1: 54-60. Cunningham, W.P., and Cunningham,

- M.A. (2007), Environmental Science: A global concern, 10<sup>th</sup> Edition, McGraw-Hill, Boston, MA.
- Egyptian Environmental Affairs Agency [EEAA], (2001), The National Environmental Action Plan of Egypt 2002/2017 - Environment at the centre of Modernizing, Egypt. EEAA, Cairo.
  - Miller, G.T. (2004), Living in the Environment: Principles, Connections and Solutions, 14<sup>th</sup> Revised Edition.
  - Murck, B.W. (2005), Environmental Science: A Self-Teaching Guide. John Wiley & Sons, New Jersey.
  - Raven, P.H., Berg, L. R., and Johnson, G.B. (1995), Environment. Saundert College Publishing, UK.
  - Withgott, J.H., and Brennan, S.R. (2007), Essential Environment: The science behind the stories, 2<sup>nd</sup> Edition, Prentice Hall.
  - University of California, Davis – College of Agricultural and Environmental Sciences; <http://www.aes.ucdavis.edu/>
  - University of East Anglia, Faculty of Science, Environmental Science degrees <http://www1.uea.ac.uk/cm/home/schools/sci>
  - University of Lancaster, Department of Environmental Science, <http://www.es.lancs.ac.uk/>
  - Brown University, Centre for Environmental Studies, <http://envstudies.brown.edu/>
  - University of California, Berkeley, College of Natural resources, Faculty of Environmental Sciences, <http://environmentalsciences.berkeley.edu/faculty.html>

- University of Sydney, Australia, Environmental Science degree, <http://www.usyd.edu.au/su/envsci/index.htm>
- University of Florida, School of Natural Resources, <http://snre.ufl.edu/>