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Application of quality assurance for graduate studies: A model for Pesticides program

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ABSTRACT: The government of Egypt is highly concerned with raising awareness of educational quality assurance and accreditation among Egyptian academic institutes. In 2007, The National Authority for Quality Assurance and Accreditation of Education (NAQAAE) was established by a Presidential Decree. The main goals of NAQAAE are supporting Egyptian educational institutes by fostering their quality assurance practices through establishing an integrated system for accreditation, setting up educational standards and performance assessment indicators and supporting Egyptian educational institutions in their preparation of self assessment. In accordance with these goals, Egyptian educational institutions are strongly urged to revise and improve their educational programs to meet with the international standards for quality assurance and accreditation. The Department of Economic Entomology and Pesticides, Faculty of Agriculture, Cairo University pioneered in that direction and developed two new educational postgraduate programs for studies towards M.Sc. and Ph.D. degrees in Pesticides. Both programs were designed to meet the requirements of the international standards of quality assured education and the official bylaws related to postgraduate studies. The two programs have been reviewed by internal and external highly recognized scientists then submitted to NAQAAE for final approval and accreditation. Besides M.Sc. and Ph.D., students must score 400 and 450, respectively in TOEFL exam, get ICDL and publish at least one scientific paper. Ph.D students must also pass written and oral qualifying examinations. For M.Sc. degree, the student is required to study 39 credit hours (1 credit hour = 1 theoretical hour or 2 practical hours) and submit and discuss a scientific thesis. For Ph. D. degree, the student is required to study 53 credit hours and submit and discuss a scientific thesis.

Keywords: Educational programs, Pesticides, Quality assurance.

INTRODUCTION

Higher Education systems became more complex and were forced to become more flexible and adjustable to change, which was incompatible with centralized systems of detailed oversight and control. At the same time, higher education is facing unprecedented challenges arising from the convergent impacts of globalization, the increasing importance of knowledge as a main driver of growth, and the information and communication revolution (Ramadan et al, 2011).

Towards the reform strategy of higher education in Egyptian institutions, the government established an internal quality assurance (QA) and accreditation system through many distinct projects. The Quality Assurance and Accreditation Project (QAAP) is one of these main projects. QAAP main mission is to assure quality, on-going improvement and increasingly effective performance of higher education institutes to gain the confidence of the community in the capabilities and efficiency of their graduates at the national and international levels, by means of supporting public universities to become accredited (Ramadan et al, 2011).

Subsequently, National Authority of Quality Assurance and Accreditation in Education (NAQAAE) was established as the Presidential Decree was issued for its establishment. The NAQAAE outputs include the following; 1- The standards for institutional accreditation of academic institutions. 2- The National Academic Reference Standards (NARS) for the educational

programs. 3- Database of peer reviewers, field visits team leaders, and technical experts and administrators trained for five years in the domain of educational quality (Ramadan et al 2011).

Mission of NQAAC is to ensure the best quality of education, commit to continuous improvement and efficient performance of Egyptian higher education institutions, and solicit community confidence in their graduate's caliber which fulfill international recognized standards (Badrawi 2006).

NQAAC main goals are to create awareness of the culture of quality assurance among higher education and community and to prepare higher education institutions for quality assurance and accreditation based on international good assurance and accreditation (Badrawi 2006).

Cairo University, which is a lead educational institution in the Arab World for more than one century, benefited from this initiative and encouraged its affiliated faculties and specialized scientific institutes and centers to restructure new quality assured educational programs at both undergraduate and postgraduate levels. The Department of Economic Entomology and Pesticides at the Faculty of Agriculture pioneered in that approach and developed two new educational graduate programs for studies towards M. Sc. and Ph. D degrees in Pesticides. Both programs are designed to meet the international standards of quality assured education as well as the official bylaws organizing graduate studies (Anonymous, 2009).

In this report the authors in the Department of Economic Entomology and Pesticides described the outcome of proposed structure of the aforementioned programs towards M.Sc. and Ph. D. degrees in pesticide sciences with regards to the accreditation needs set by NAQAAE and the faculty of agriculture official bylaws that regulate graduate studies affairs.

MATERIALS AND METHODS

Faculty of Agriculture, Cairo University, held the first conference on the future of agricultural education in the Arab Nations in 2002. Several papers dealing with the conference title were discussed. The majority of the papers concerned with the future of agricultural education at the undergraduate (B.Sc.) level with very little attention to postgraduate studies (Belal 2002). In 2009, the same faculty applied new internal bylaws set by a Ministerial Decree (No.2167/2009) to manage postgraduate studies in the different fields of agricultural sciences (Anonymous 2009). Accordingly, the structure and components of the existing programs of postgraduate studies towards M. Sc. and Ph.D. degrees needed to be revised, modified and amended to cope with the new bylaws as well as the quality assurance parameters set by NAQAAE which rendered a necessary requirement for official accreditation (Samir-El-Sherif et al. 2012). Pesticide program was one of those revised ones. In this study, the qualitative research approach was followed. A sample of 29 persons affiliated to the Department of Economic Entomology and Pesticides, Faculty of Agriculture, Cairo University was randomly selected. The sample consisted of 25 staff members (representing the different academic positions i.e. emeritus professors, professors, associate professors, assistant professor / lecturers and instructors at a rate of 5 persons /position) and 4 postgraduate students (not including instructors and representing senior and junior levels at a rate of 2 persons / level). Data were collected through verbal interviews (either by person-to-person interview or by telephone) (Abd et al. 2002a, b). Interviews were based on a questionnaire form designed to explore views about the following for each considered academic degree: general attributes, knowledge and understanding, practical skills, intellectual skills and general skills. The questionnaire form further explored views about program objectives, program structure and components, compulsory courses and elective courses. Collected data were classified and analyzed qualitatively then utilized for proposing tentative programs for postgraduate studies towards M.Sc. and Ph.D. degrees in pesticides. The two proposed tentative programs were then thoroughly reviewed, discussed and amended during several brain storming sessions attended by most of the staff members of the department, invited specialized scientists from the National Research Center and the Agricultural Research Center of the Ministry of Agriculture, in addition to representatives of postgraduate students and postgraduate affairs officials. When completely finalized, the proposals were conveyed to an internal reviewer (a highly reputed scientists specializing in Pesticides) for revision comments. After taking the comments of the internal reviewer into account, the proposals were conveyed once more to two external reviewers (highly reputed recognized in Pesticides) .The comments made by the external reviewers were also considered and, thus, the two new programs became ready to proceed into the accreditation process (Samir-El-Sherif et al. 2012).

RESULTS AND DISCUSSION

M. Sc. Program:

Structure and components:

The structure and components of M. Sc. program are shown in Fig (1). The program is based on the credit hours (chs) system. A credit hour is 1 hour theoretical study or 2 hours practical study.

M.Sc Program Objectives:

The program aims at qualifying postgraduates for M. Sc. degree in Agricultural Sciences (Pesticides), Through providing a package of advanced specialized educational courses that help the enrichment of scientific background in the area of pesticide sciences and its different approaches for maximizing pesticides benefits. The program enhances both the research and training capabilities of postgraduates, introduces them to recent technologies, urges them to utilize appropriate recent technological methods, enables them to master the principles, approaches and ethics of theoretical and applied scientific research, improves their personal skills and capacity to pursue independent life-learning and self-education and promotes their role in serving community and environmental conservation. The program further aims at preparing postgraduates to proceed in scientific career towards Ph. D degree.

Intended learning Outcomes (ILOs):

After the successful completion of the requirements for M.Sc degree in pesticides, the graduate student should be able to accomplish the following skills:

a) Knowledge and understanding skills:

- 1- Define the scientific terminologies related to the pesticides and their classes, formulations, chemical structures, side effects and safe handling.
- 2- Recognize the national and international pesticide safety criteria with regards to pesticide application and their residues in food stuff.
- 3- Identify the international standards and the legislations relevant to registration, handling and application of pesticides.
- 4- Recognize the relationships between pesticides and the different environmental factors.
- 5- Understand general bases and theories used for data collection and statistical analysis in agricultural experiments.
- 6- Outline the specifications and National Academic Reference Standards (NARS) of quality control in pesticides
- 7- Define the professional legal and ethical principles particularly those related to scientific research in pesticide handling, environmental pollution and agricultural quarantine.

b) Intellectual skills

- 1- Design appropriate management program for controlling the different agricultural pests particularly relevant to chemical control.
- 2- Explain the possible reasons for emerging a pest.
- 3- Apply the proper methods for application of pesticides.
- 4- Assess the dose response relationship of a pesticide against specific test pest under controlled environmental conditions.
- 5- Deal with pesticide contamination issues in different environmental media.
- 6- Link between the current advanced technologies and solving pest control problems.
- 7- Analyse obtained data on pests damage and predict their impacts on agricultural production.
- 8- Participate in analysis and evaluation of pesticide contamination in food and feed.
- 9- Detect the risk of unsafe use of agricultural pesticides (risk assessment) in different environmental media and recommend the possible remediation
- 10- Determine the pesticide residues in agricultural commodities
- 11- Improve background and professional performance through the modern approaches of self-learning and continuous education.

c) Professional and practical skills

- 1- Choose and calibrate the suitable pesticide formulation based on the purpose of the application.
- 2- Minimize the hazards associated with pesticide application.
- 3- Practice rearing and biological evaluation techniques of a test pest in the bioassay experiments,
- 4- Master the methods used for extraction of pesticides from different matrices.
- 5- Analyze pesticide residues in different samples taken from agricultural products and others.
- 6- Prepare scientific technical reports.
- 7- Prepare periodical reports on progress in research and practice modern technological approaches to conduct research, present results and demonstrate scientific views.
- 8- Apply statistical methods to analyze and illustrate the results of pesticide experiments.
- 9- Employ efficiently the resources available and the methods followed for conducting and implementing laboratory and field studies.
- 10- Prepare and publish a research paper.
- 11- Write a thesis following the proper scientific approach in perfect scientific language.

d) General skills

- 1- Communicate effectively with others.
- 2- Follow the rules and regulations and comply with intellectual property rights.
- 3- Participate in evaluating graduates in seminars and workshops effectively.

- 4- Practice self-evaluation and determine his personal needs.
- 5- Practice efficiently IT technologies and computer/ internet application to analyze and demonstrate results of scientific research.
- 6- Work and cooperate efficiently within a team
- 7- Show leadership, objectivity and responsibility skills
- 8- Manage time effectively
- 9- Practice self and continuous learning skills
- 10-Improve personal attributes academically and professionally.
- 11-Evaluate study courses and comment on benefiting from them scientifically and/or practically.
- 12-Participate in scientific discussions taking the views of others into consideration.
- 13-Prepare and write a scientific research paper and professional technical scientific reports.

Ph. D. Program

Structure and components:

The structure and components of Ph. D. program are shown in Fig (2). The program is based on the credit hours (chs) system. The student is required to study 53 chs and prepare a thesis on his research problem. Credit hours include 41 for study courses and 12 for thesis. The student is also required to complete, before graduation, the following non-credit requirements: (a) successfully pass TOEFL exam with a minimum score 450, (b) publish at least one research paper derived from the results of his research problem, (c) successfully pass a written then an oral qualifying exams.

Study courses are divided into compulsories and electives (20 and 21 chs, respectively). Compulsory courses are, in turn, divided into faculty requirements (5 chs) and department requirements (12 chs). Compulsory courses are listed in Table (3). Electives are determined by the supervision committee either from the department courses or from other departments according to the nature of the student's research problem. As a compulsory rule, 2 of the elective courses are from another faculty within the university. Elective courses from the department are listed in Table (2). The whole program is completed in 3-4 years.

Objectives :

The program aims at qualifying postgraduates for Ph. D. degree in Agricultural Sciences (pesticides) through mastering the principles of related modern sciences and scientific research, recent technological approaches, philosophical analytical scientific criticism and improving professional, practical and personal skills in addition to initiating strong enthusiasm to pursue continuous life – learning and self-education. The program provides a package of advanced specialized educational courses that broaden and enrich the scientific background of postgraduates in the different areas related to specialty . The program generates opportunities for advanced technological training. It builds the capacity to accurately plan, design and implement proper research projects in the area of specialty, statistically analyze, illustrate, explain and discuss results.

The graduate students are also required to prepare technical reports with applicable recommendations taking into consideration professional ethics. The program encourages participation in seminars, workshops and conferences as well as serving community and environmental conservation.

Intended Learning Outcomes (ILOs):

After the successful completion of the requirements for Ph.D. degree in pesticides (14 study courses, thesis, publishing at least 1 scientific paper, passing TOEFL exam with a minimum score 450 and written and oral qualifying exams) the graduate student should be able to achieve the following skills:

a) Knowledge and understanding skills:

- 1- Define the methodology and the basic of the scientific research.
- 2- Identify the theories and principles of classifying pesticides , their adverse effects, safe handling and transport.
- 3- Define novel techniques used for pesticide application and analysis.
- 4- Describe good agricultural practices , the international standards and legislation related to pesticide registration, handling, storage, application and transport .
- 5- Realize problems associated with pesticide application and how to mitigate their side effects.
- 6- Identify the fundamentals, methodology and ethics of scientific research
- 7- Identify the theories and principles of data collection, and statistical analyses utilizing either manual or recent electronic techniques.
- 8- Outline the specifications and NARS in pesticides.

b) Intellectual skills

- 1- Analyze data and extrapolate relationships among these obtained data.
- 2- Plan for conducting specific experiments according to data obtained and resources available

- 3- Create new research study to solve problems related to pesticide and the risk of unsafe use.
- 4- Specify hazards and risks resulting from misapplication of pesticides.
- 5- Designs proper programs for solving the problems of pest infestation (Integrated pest management)
- 6- Propose appropriate pest control strategy for managing specific pest under particular conditions
- 7- Decide the best pesticide formulation to be applied.
- 8- Summarize, arrange and explain results of technical research studies in written reports and open discussions.
- 9- Create non-traditional means for pesticide application.

c) Professional and practical skills

- 1- Prepare periodical reports on progress in research including obtained results
- 2- Offer technical consultation in pesticide related fields.
- 3- Write a thesis following the proper scientific approach in a good scientific language.
- 4- Practice efficiently the technological means available for his professional career.
- 5- Discover new ideas for improvement of professional practices and raising professional capacities of others.
- 6- Apply manual statistical methods and operate electronic statistical packages to analyze, illustrate and explain results of pesticides experiments.
- 7- Practice modern technological approach to present research results and demonstrate scientific views.
- 8- Prepare periodical reports on progress in research.
- 9- Prepare and publish research papers.
- 10- Participate in drafting proposals for research projects.
- 11- Write a thesis following the pragmatic scientific approach in perfect scientific language.
- 12- Discover new ideas for improvement of professional practices and raising professional capacities of others taking into consideration professional legislation and ethics.

d) General skills

- 1- Communicate effectively with others.
- 2- Master the use of computer and its application to prepare for data analysis
- 3- Volunteer to transfer experiences and train others.
- 4- Practice self-evaluation and remain to learn continuously.
- 5- Manage time efficiently.
- 6- Practice efficiently IT technologies and utilize electronic resources to analyze and demonstrate results of scientific research.
- 7- Work and cooperate efficiently within a team.
- 8- Manage scientific discussions effectively.
- 9- Show leadership, objectivity and responsibility skills.
- 10- Improve personal attributes academically and professionally.

The two new quality assured programs for graduate studies described in this paper are designed to qualify the graduate, after fulfilling the requirements of both M. Sc. and Ph. D. degrees, to become a lecturer and/ or researcher in pesticides with high competitive capacity in labor market. The programs further support the graduate with an elite package of intended learning outcomes (knowledge and understanding, intellectual, professional and practical and general skills) that support him to proceed progressively and successfully in his future career. The graduate achieves this level of education in 5 to 8 years of extended learning and professional training. Throughout that period the graduate student study a total of 92 credit hours distributed as 72 credit hours for educational courses and 20 credit hours for research. Study courses are divided into 14 compulsories (39 credit hours) and 11 electives (33 credit hours). The M.Sc. and Ph.D. programs also emphasize on supporting the graduate to master English language, computer skills and scientific writing.

In conclusion, the purpose of a scientific research is to inform action. Thus, research must always be high quality in order to produce knowledge that is applicable outside of the research setting with implications that go beyond the group that has participated in the research. Furthermore, the results of the scientific study should have implications for the society. Egypt must improve its economic competitiveness through enhancement of capacity building in quality assurance and foster smart innovation. Higher education institutions have to expand and raise quality while supporting more effectively and equitably a more diverse student population.

That would tackle some of the challenges facing graduate students particularly problems related to fitting labor market needs and the research that is disconnected from the national innovation system.

Table 1. Compulsory courses for M.Sc degree in Pesticides (19 credit hours (chs))

Course title	Credit hours	Lectures	practical
Faculty requirements			
Scientific writing	2	-	-
Design and analysis of agricultural experiments	2	-	-
Seminar	3	-	-
Departmental requirements			
Mode of action of pesticides	3	2	2
Insect Physiology	3	2	2
Chemistry of Pesticides (1)	3	2	2
Advanced in pesticide analysis(1)	3	2	2

Table 2. Elective courses for M.Sc. degree in Pesticides (12 credit hours (chs))

Course title	Credit hour	Lect.	Lab.
Fate of pesticides in the environment	3	2	2
Recent techniques in pesticides	3	2	2
Advanced pesticide formulations	3	2	2
Fungicides	3	2	2
Herbicides	3	2	2

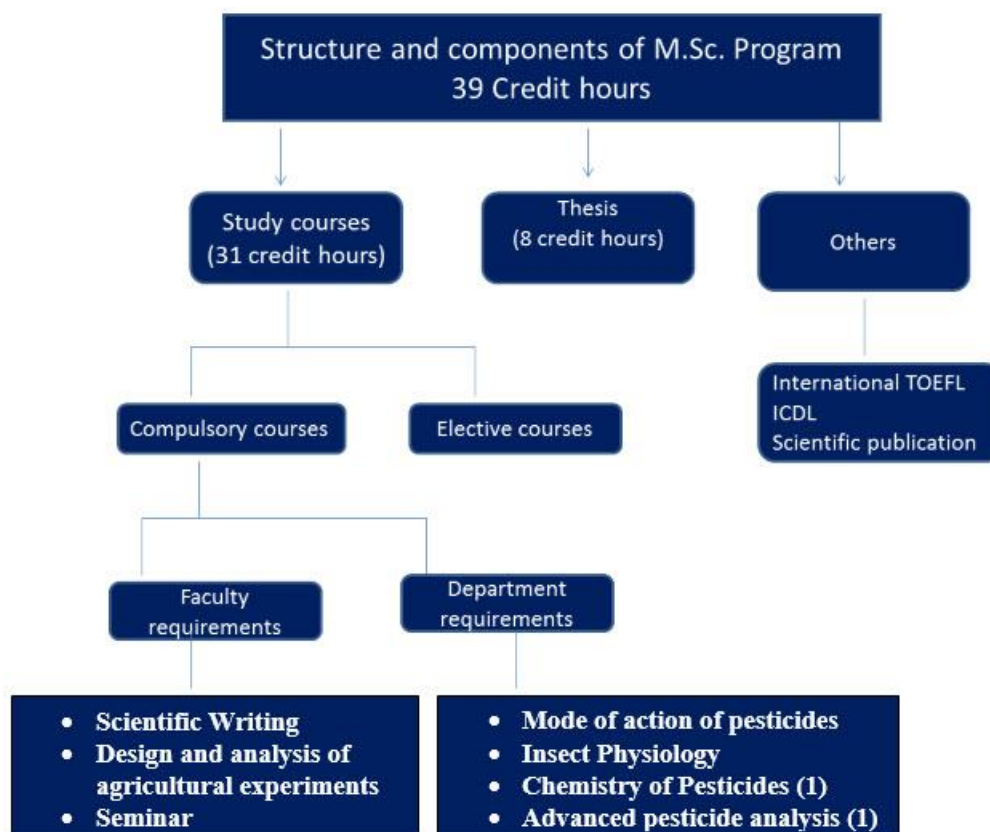


Figure 1. Structure and components of M. Sc. program

Table 3. Compulsory courses for PhD. degree in Pesticides (19 credit hours (chs))

Course title	Credit hour	Lect.	Lab.
Advanced Pesticide formulations	3	2	2
Fungicides	3	2	2
Herbicides	3	2	2
Fate of Pesticide in the environment	3	2	2
Recent techniques in pesticides	3	2	2

Table 4. Elective courses for PhD. degree in Pesticides (12 credit hours (chs))

Course title	Credit hour	Lect.	Lab.
Advanced pesticide formulations	3	2	2
Fungicides	3	2	2
Herbicides	3	2	2
Fate of pesticide in the environment	3	2	2
Recent techniques in pesticides	3	2	2

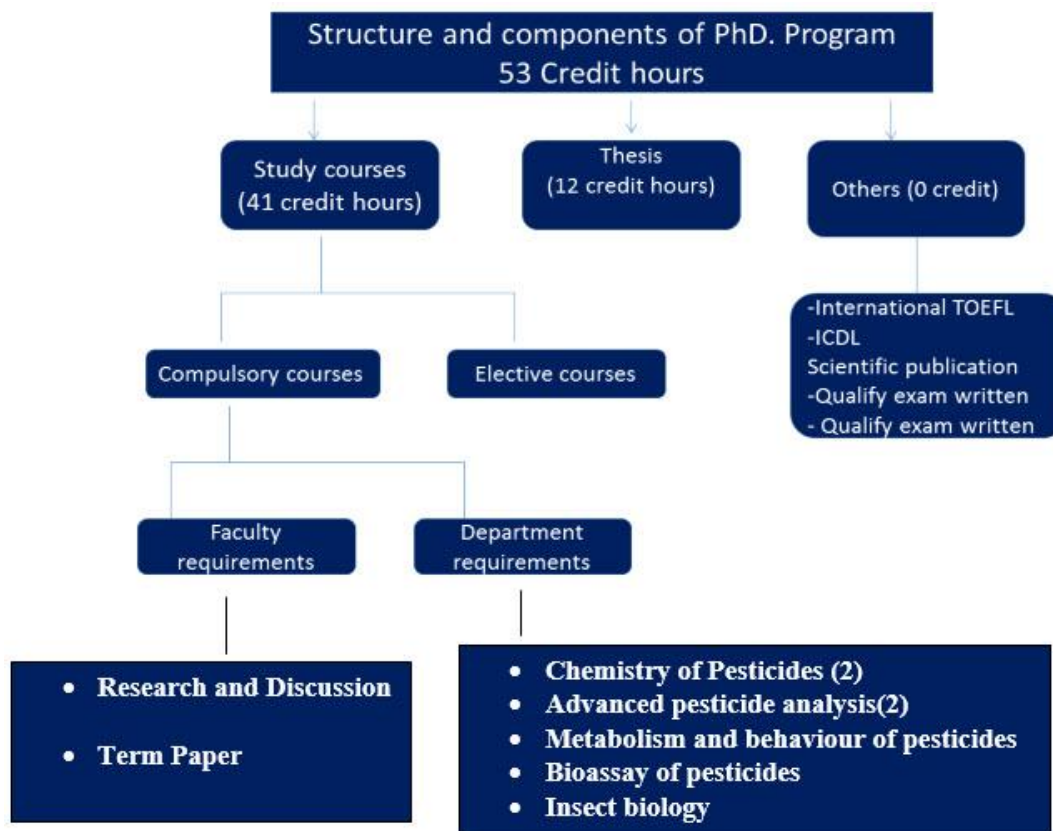


Figure 2. Structure and components of Ph.D program

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