

Development of Laboratories and Learning Environment

Contents

Subject	Page No.
3.1 Introduction	3-2
3.2 Indicators of Laboratories Restructuring and Development	3-2
3.3 The Main direction of Direction Enhancement	3-3
3.3.1 First Direction: Establishment of New Computer Labs	3-4
3.3.1.1 Statistics of New Computer Labs	3-4
3.3.1.2 Examples of New Computer Labs in Different Specializations	3-5
3.3.1.3 A Summary of the Software Purchased through HEEP F Projects	3-7
3.3.2 Second Direction: Establishment of Specialized Labs in Projects Field	3-8
3.3.2.1 Examples of Specialized Labs in Alexandria University	3-9
3.3.2.2 Examples of Specialized Labs in Assiut University	3-10
3.3.2.3 Examples of Specialized Labs in Different University Sectors	3-12
First: The Medical Sector	3-12
Second: The Engineering Sector	3-14
Third: The Veterinary and Agricultural Sector	3-17
Fourth: Various Sectors	3-18
3.3.3 Third Direction: Supplying Classrooms and Labs with Service Equipment	3-20
3.4 HEEP F Management Mechanisms for the Establishment and equipment of Labs	3-21
3.5 Mechanisms of Labs Development Sustainability	3-21

3.1 Introduction

The academic education enhancement system of the projects financed by HEEPF in the four cycles of the first phase is based on various directions through which work should be done to develop the educational process and achieve the desired development goals at the top of which is upgrading the skills of students and graduates who are the main beneficiary of the enhancement process. This enhancement system aims at encouraging self-learning, creativity, and innovation to qualify university graduates for the practical life and enable them to face the requirements of the work market. Figure (3-1) shows the elements of this system.

Therefore, most projects were provided with new and advanced laboratory equipment and appliances to serve the educational process as one of the most important directions on which most projects were based.

This chapter presents the general view and statistical data of the labs financed by HEEPF in different universities and specializations. It aims at informing the academic community of the available potentials and efforts exerted by HEEPF to establish research labs or develop the existing ones. The chapter also presents the mechanisms applied to ensure the sustainability of work in these labs which represent a qualitative advancement for the university and specialized institutes students to gain laboratory experience.

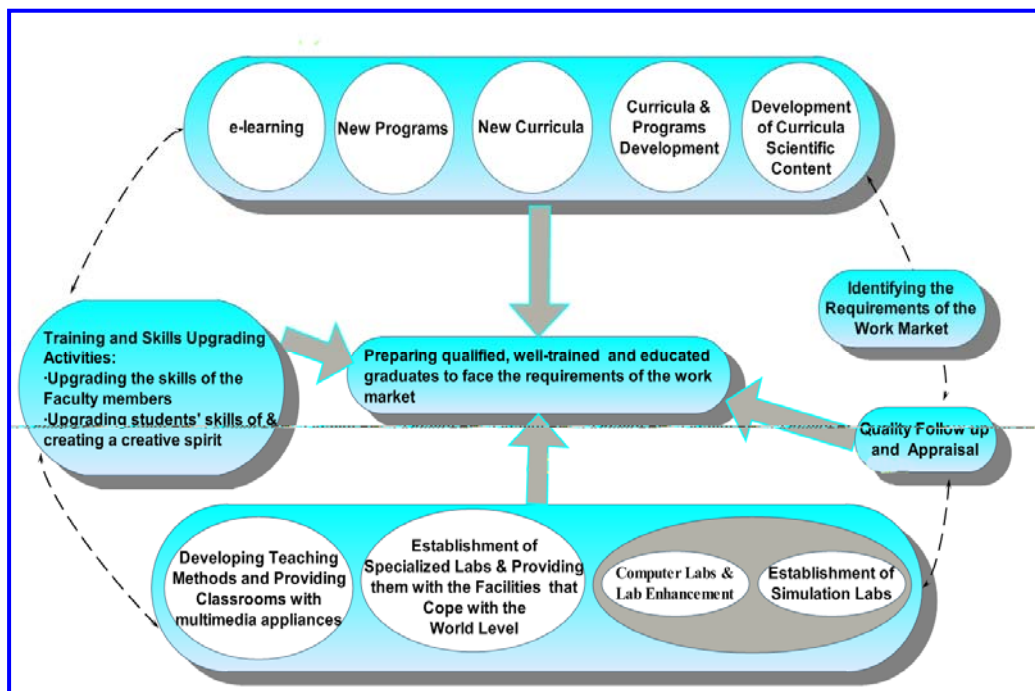


Figure (3- 1): The Academic Enhancement System of HEEPF Projects

3.2 Indicators of Laboratories Restructuring and Development

Most financed projects are based on the purchase of equipment and appliances as is shown in Figure (3-2). The total sum spent on the purchase of equipment and appliances from the financed projects budgets by the end of 2006 surpassed that spent on activities and staff cost with 39% as is shown in Figure (3-2). This shows that HEEPF financed projects effectively contributed in the update and upgrading of laboratory potentials in the universities and institutes where they were carried out.

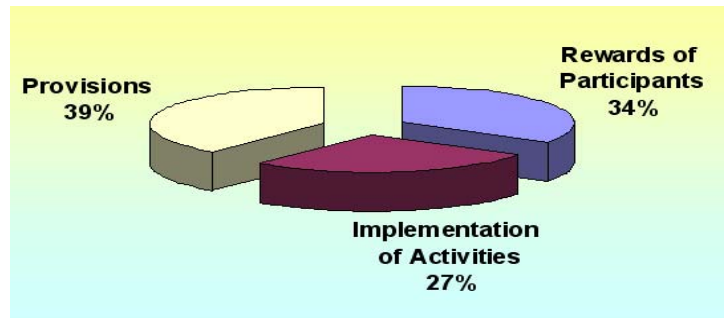


Figure (3- 2): A graph for analysis of HEEPFF projects expenditures till the end of 2006

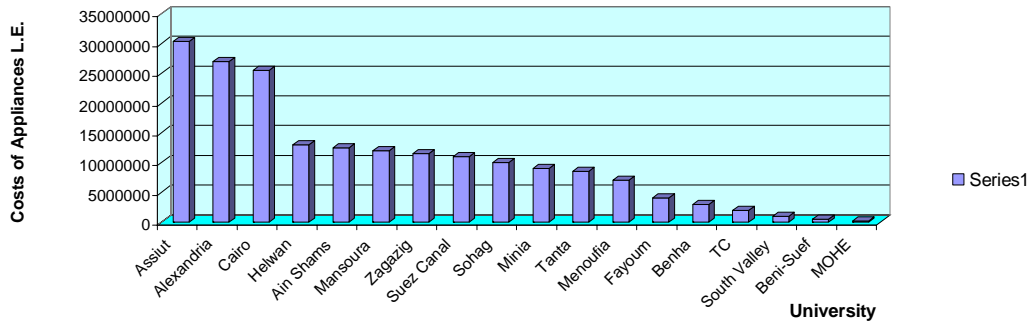


Figure (3- 3): A graphic for the total cost of equipment purchased by HEEPFF projects in universities till the end of 2006

Labs enhancement in the universities that participated in enhancement projects was studied. The enhancement included the establishment of a large number of new labs and the addition of new equipment to the existing labs. The total sums spent on the equipment of labs in each university till the end of 2006 were calculated. Figure (3-3) shows the distribution of these sums on different universities.

As shown, Assiut University came in the first place since its faculties were supported with more than L.E. 3.400.000 till the end of 2006 to make renovations and new equipment for labs through 19 projects financed by HEEPFF. Alexandria University came in the second place with more than L.E. 2.700.000 through 24 projects financed by HEEPFF.

3.3. The Main direction of Direction Enhancement

Labs enhancement was based on three main directions.

1. Establishing new computer labs or equipping the existing labs with computers
2. Establishing specialized scientific labs or equipping the existing labs with equipment in addition to fixing the old lab equipment to maximize their use
3. Providing classrooms and labs with data show equipment or providing faculties with service equipment

Work on these directions was equal. HEEPFF management calculated the total sums spent on these directions till the end of 2006. Figure (3-4) shows these percentages.

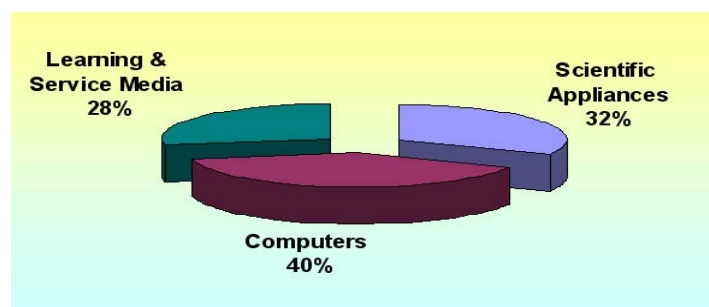


Figure (3-4): A graph calculating the expenses related to the equipment of labs till the end of 2006

The number of HEEPf financed projects that enhanced and established labs reached 122 projects out of 158 projects financed during the four cycles of the first phase of HEEPf. The following is a review of the labs enhancement restructuring mechanisms with regards to the three directions above mentioned.

3.3.1 First Direction: Establishment of New Computer Labs

Upon the appraisal of the projects that depended for the achievement of their goals on labs enhancement, it has been found that establishing computer labs that have access to the internet to facilitate gaining knowledge, scientific exchange, and learning occupied the first place.

Despite the emphasis on the concept of originality for the projects financed by HEEPf, a large number of such projects that established advanced computer labs sought to achieve a number of joint strategic goals that can be summed up as follows:

1. Enhancing the educational process through upgrading and training faculty staff members and their assistants on using computers
2. Upgrading students' self-learning through facilitating connection to the internet which accords with the requirements of globalization
3. Providing faculty staff members with technical service to prepare electronic courses using multimedia
4. Overcoming the problem of the increasing number of students which faces most Egyptian universities by distance of learning, electronic exams, and simulation of experiment in virtual labs

3.3.1.1 Statistics of New Computer Labs

The graph in figure (3-5) shows the number of new computer labs established in each university through the projects financed by HEEPf. It reached 51 new labs distributed on 13 universities. In addition, 13 existing labs were enhanced and equipped with a number of modern computers in these universities.

The number of computers added to computer labs regardless of those used in developing courses including laptops and servers reached 1000 computers for all the projects financed by HEEPf during the four cycles of its first phase till the end of 2006. Figure (3-6) shows the percentages of computers distribution on the labs of Egyptian universities that benefited from a number of the projects financed by HEEPf.

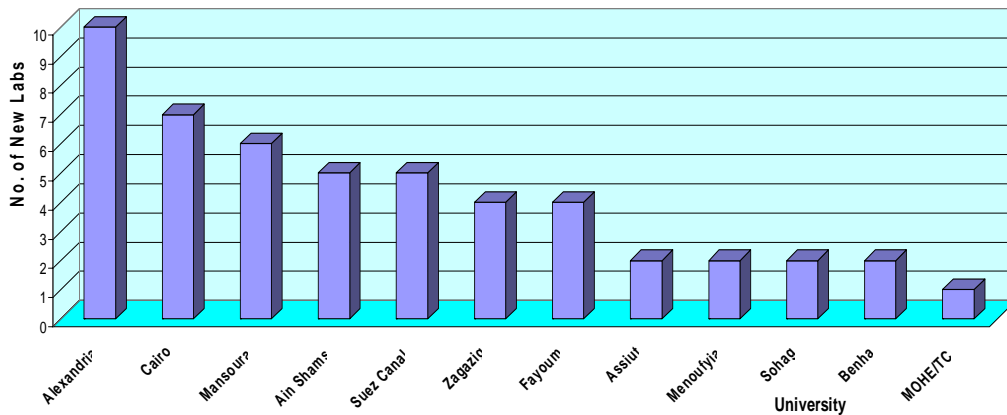


Figure (3-5): A graph of the number of new Computer labs

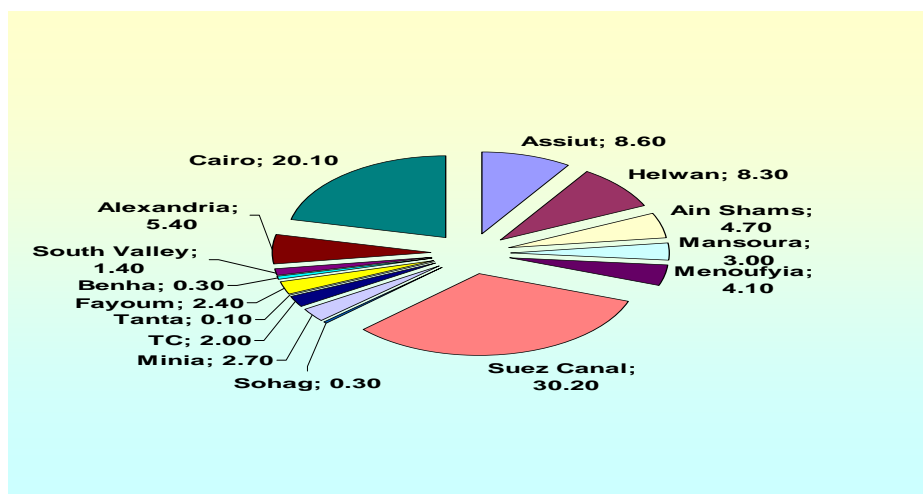


Figure (3- 6): A graph for the percentage of purchased computers in universities till the end of 2006

As shown in figure (3-6), Suez Canal University has purchased the largest number of computers for its faculties (more than 300 computers) through the eight projects financed by HEEPf in this university. Cairo university comes the second place with more than 200 computers, then Assiut and Helwan with more than 80 computers each.

3.3.1.2 Examples of New Computer Labs in Different Specializations

Various scientific specializations (Basic sciences, engineering sciences, medical sciences, agriculture and veterinary medicine) had the biggest share in the establishment of new computer labs. The photo in figure (3-7) show the computer labs established for scientific specializations in five universities. Photo for project (D-042-L0) shows the use of a computer lab in teaching e-courses in the Electronics Department of the Faculty of Engineering at Mansoura University. Photo for project (C-023-L0) shows the contribution of the new computer lab in upgrading students' clinical skills in the Faculty of Nursing at Mansoura University.

The Physics Teaching Enhancement Project (B-097-Q0) established in the Faculty of Sciences, Suez Canal University purchased 126 computers for student use in different labs to carry out simulation experiments or to connect to the internet. Project (B-051-I0) established in Assiut University to establish educational resources and multimedia center in the Faculty of Sciences is considered one of the successful examples which used computer labs to achieve

desired goals and overcome the increasing numbers of students. Project (D-067-T1) established in Banha University to develop courses related to information systems in the Spatial Engineering Section in Shubra is also considered one of the unique examples which depended on the equipment of a computer lab to set up training courses on geographic information systems for the fourth year students and post-graduates of the faculty and other faculties.

As for the Humanitarian studies sciences (Athletics, Specialized Education, Education, Musical Education, Domestic Economy, Archeology, Tourism & Hotels, Commerce, Law, Arts, Applied Arts, Girls' Faculty, the Administration of universities, the MOHE), a large number of projects used computer labs to reach the best results. Project (D-149-G0) is one of the best examples that distinguished Ain Shams University and aimed at training blind students in the Faculty of Arts on using "Ibsar" software to be able to read and write any text, as well as answer exams without anybody's help using the computer. Blind students have proceeded to use these potentials in studying, reading the cultural library, and reading the latest issues through the internet as shown in the images in figure (3-8).

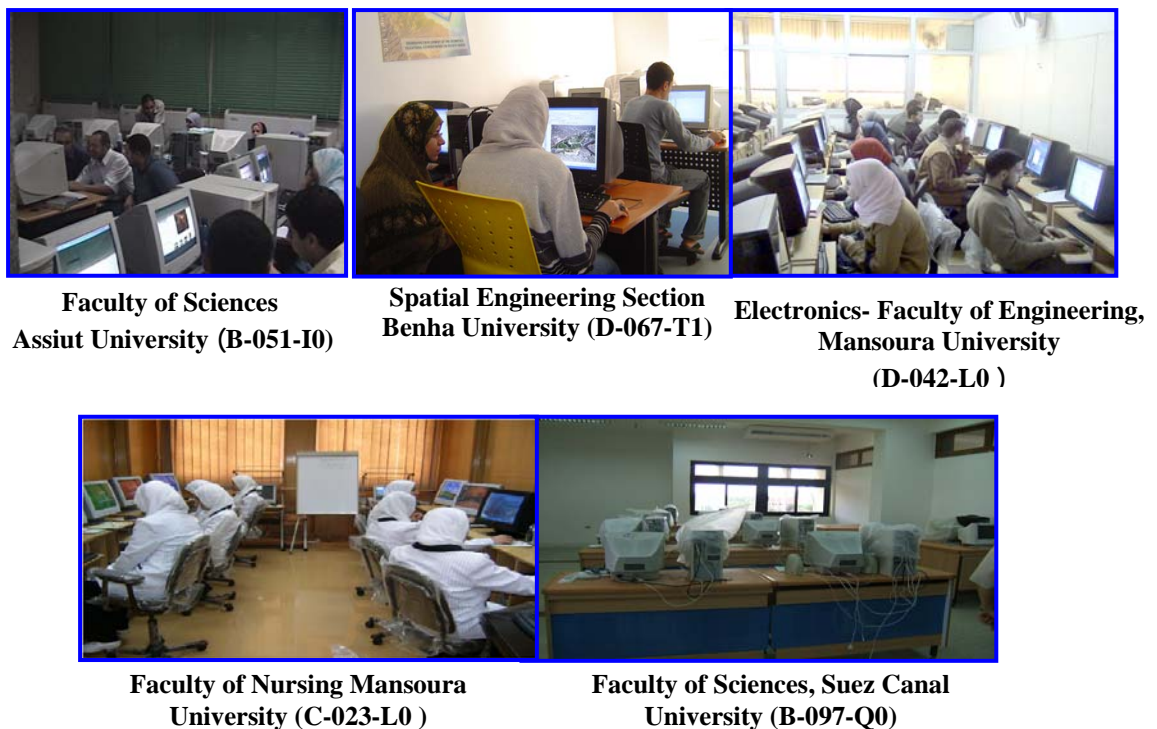


Figure (3-7): Examples of the computer labs established through the projects financed by HEEPf in various scientific specializations



Figure (3-8): Images of training blind students in the computer lab in the Faculty of Arts, Ain Shams University (D-149-G0)

3.3.1.3 A Summary of the Software Purchased through HEEPF Projects

Most labs established and enhanced through the first phase projects were provided with different kinds of software to operate them. Figure (3-9) shows the distribution of these software in a large number of specializations. Figure (3-10) offers a graph of the total sums spent to purchase these software from the budgets of the financed projects till the end of 2006 compared to the total sums spent on the purchase of scientific equipment, educational and service media, and computers.

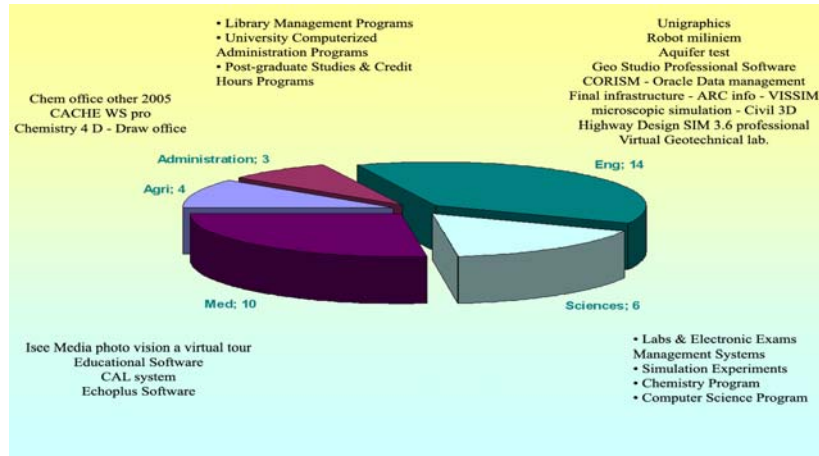


Figure (3-9): Examples of software purchased through the financed projects classified according to the specialization

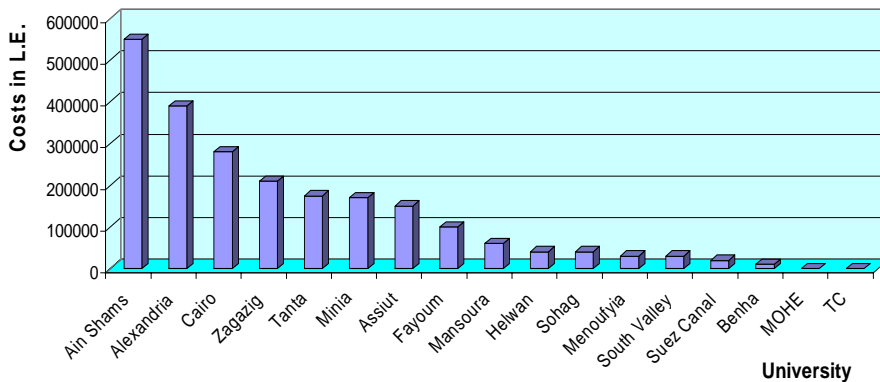


Figure (3-10): The expenses of purchased software distributed on universities

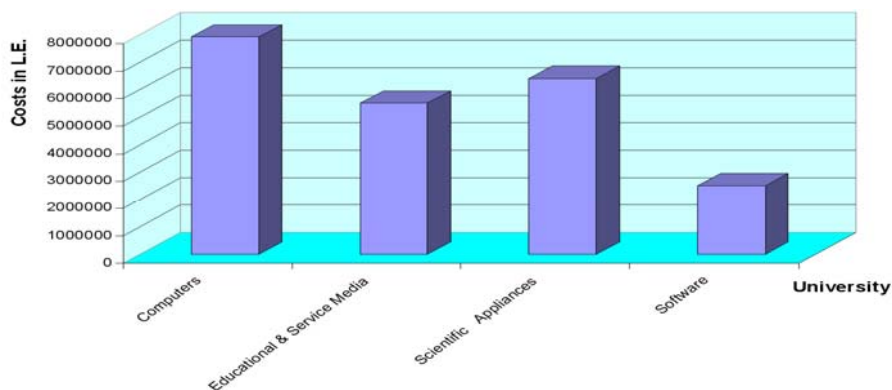


Figure (3-11): Comparison of the sums spent on software and those spent on scientific equipment, educational and service media, and computers

Project (D-147-P2) is one of the projects that used the designing tools in the computer to upgrade teaching and training in the fields of electrical engineering, Faculty of Engineering, Southern Valley University where a modern designing center was established to train and teach electrical and computer systems designers. The center was supported with programs used in designing: (5.0.3 ETAP, 10.5 OrCAD, Boson NetSim 6, EMU8086, PSIM).

The cost of purchasing the above-mentioned software programs was L.E. 57941.4 equal 22 % of the project budget. The university contributed with 20% of the cost of the program PSIM.

3.3.2 Second Direction: Establishment of Specialized Labs in Projects Field

A number of HEEPF financed projects were based on the establishment of specialized labs in the project field to develop students' laboratory skills to enable them to develop themselves which entails developing the staff members' experiences and holding training courses to increase the efficient use of these labs. HEEPF management has offered the technical and administrative support necessary for the establishment of these labs which exceeded 70 specialized labs in different fields. Figure (3-12) shows examples of the specialized labs that were established or equipped with modern equipment.

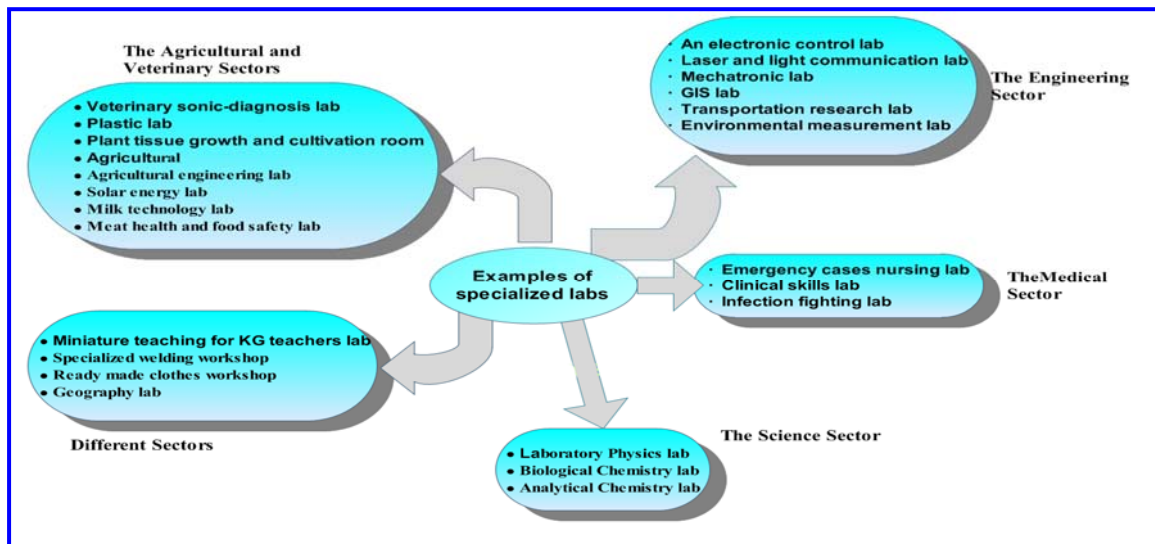


Figure (3-12): Examples of specialized labs established through the projects

The graph in figure (3-13) shows the number of specialized labs for each university separately. As shown, Alexandria and Assiut Universities have had the highest number of such labs, 17 and 15 labs respectively, followed by Mansoura and Suez Canal Universities with 7 specialized labs each.

The following is a review of some examples of specialized labs in Alexandria and Assiut Universities followed by a review of a number of specialized labs according to different specializations.

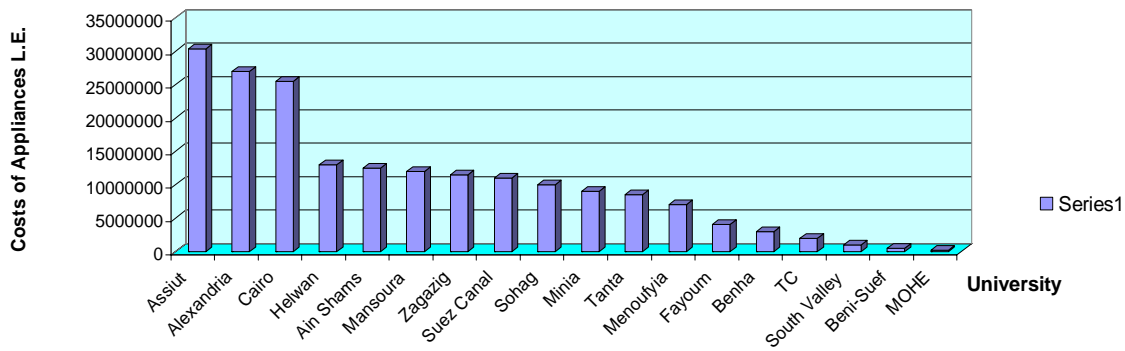


Figure (3-13): A graph of the number of specialized labs

3.3.2.1 Examples of Specialized Labs in Alexandria University

- Two of the most distinguished projects financed at Alexandria University are Projects no. (A-095-H0) and (D-097-H0) in the Faculty of Agriculture. One of them was carried out in the first cycle and aimed at developing a solar and wind energy lab; the second aimed at establishing an educational program and center for renewable energy. Figure (14) shows models of the energy lab and meteorology station which are considered two of the most important outcomes of the two projects.



Figure (3-14): Models of electricity generating unit, meteorology station, training on manufacturing solar heaters, and electrical light cells in the Faculty of Agriculture, Alexandria Univ. (D-097-H0) & (A-095-H0)

- In the engineering field, the Faculty of Engineering, Alexandria University excelled in the field of developing a program for industrial/academic training in desalination technology using traditional and electronic education. In this context, an integrated lab for traditional desalination systems, a solar and wind desalination technology lab, and a lab for water features measurement were equipped with such equipment as: PH Measurement set, Water Components Measurement and Analysis set, Diluted Minerals Measurement set, Turbidity Measurement set, an Experimental Desalination set using RO, Rarefaction Pump for the Desalination Unit MSF, Wind turbine, and PV-Panel. Thus, the project contributes in training a large number of technicians and engineers who have the knowledge and skills necessary for managing water stations. Figure (3-15) shows models of the equipment added to the desalination technology lab.



Figure (3-15): Models of the equipment added to the desalination technology lab, Faculty of Engineering, Alex. Univ. (C-096-H0)

Project (B-104-H0) in the Post-graduate Institute which aimed at establishing a training center in the field of biological technology excelled in developing the process of laboratory experimental training and upgrading research through the purchase of a large number of equipment for the biological technology lab. Figure (3-16) shows images of some equipment added to the particle biology lab. Examples of the equipment supplied by the project are: chromatographic pump, a vertical set for electricity emigration, a horizontal set for genetic analysis, chromatographic samples collecting set, a rocking incubator set, and others. The cost of equipment purchase was more than L.E. 188.000. The lab in its present state has allowed the training of a large number of researchers and specialists from different Egyptian universities and institutes in the field of drug manufacturing and agricultural industry.



Figure (3-16): Images of some equipment added to the biotechnology Univ. (B-104-H0)lab, Faculty of Sciences, Alex.

3.3.2.2 Examples of Specialized Labs in Assiut University

A number of HEEPF financed projects were distinguished with the development of some specialized labs in Assiut University such as the internationally accredited chemical analysis lab, the Egyptian arts museum, speculum surgery center, and environmental measurement center.

- Project (C-067-I0) is one of the projects that developed labs in the Faculty of Sciences, Assiut University. A new chemical analysis lab which satisfied the requirements of international accreditation for analytic labs was established. The University decided to regard it as a special unit. In addition to environmental and industrial analyses, the lab offers its services to post-graduate students in analytic chemistry to train them on the concepts of laboratory quality and good laboratory performance. An Electrophoresis Capillary set was purchased for the lab as shown in figure (3-17) with \$ 46590. Since the estimative value of the set exceeded the maximum limit set by HEEPF, Assiut University agreed to pay \$ 11.000 as an

additional contribution in the total cost of the set while the project afforded the remaining sum.



Figure (3-17): An image of Electrophoresis Capillary set in the Faculty of Sciences, Assiut Univ (C-067-I0)

- In the field of developing and updating Organic Chemistry educational program for the undergraduate stage in the Faculty of Sciences, Assiut University, Project (B-048-I0) established an Organic Chemistry lab.
- In the field of mechatronic engineering courses development in the Faculty of Engineering, Project (A-085-I0) developed mechatronic labs and equipped them with a number of testing, measurement, and training equipment.
- In the field of establishing an educational Egyptian arts museum in the Faculty of Sciences, Project (D-090-I0) established one that depended on the establishment of a strict preparations and mummification unit. Besides, an electronic database for Egyptian arts was established. The success of the project appeared in the crowdedness of school students on the section to learn about different animal samples.

Figure (3-18) shows images of a number of labs developed in Assiut University



**Biological (B-048-I0)
Chemistry Lab, Faculty
of Sciences**



**Mechatronic Labs,
Faculty of Engineering
(A-085-I0)**



**Educational Museum for Egyptian Arts,
Faculty of Sciences (D-090-I0)**



Figure (3-18): Examples of the specialized labs established through HEEPf financed projects in Assiut University

- Project (A-084-I0) aims at the development and restructuring of the curriculum and study plans of the post-graduate studies in the Higher Institute for Sugar Industry Technology Research and Studies, Assiut University. The project is mainly based on the establishment and equipment of a technically distinct analysis and measurement lab as shown in figure (3-19). The lab includes a programmed logical control set, an ultra-violet and spectrum measurement set, convulsions measurement set, direct measurement of dust particles condensation set, and other sets that serve and fulfill the requirements of distinguished lab application of all developed diplomas in addition to the unique support of the needs of researchers and concerned parties from different sectors, institutions, and social organizations through specialized training programs and continuing education courses for beneficiaries of the industrial and civil sectors.

As a continuation of the plan to use these equipment, the project prepared a guide which shows the laboratory experiments plans that serve the laboratory part of the diplomas developed by the project, in addition to explaining the uses of these equipment in training, consultation, and analysis programs as well as continuing education programs for all targeted sectors.



Figure (3-19): Images of the analyses and measurements lab in the Higher Institute for Sugar Industry Technology Research and Studies, Assiut University. (A-084-I0)

3.3.2.3 Examples of Specialized Labs in Different University Sectors

First: The Medical Sector

In the field of medical sciences which include medicine, dentistry, pharmacy, and nursing, a large number of projects were distinguished with the establishment of specialized labs in medical fields such as:

- Project (B-092-L0) established in the Kidney Center at Mansoura University equipped a videoconference and direct transmission room with three video cameras in addition to equipping the surgery room of experiment animals with three surgery tables and four surgery spotlights as shown in figure (3-20) to shoot and transmit operations from the surgery room to the conference hall and hold training courses in various urinary passages surgeries. The software programs required for entering, saving, treating, and getting patients' data in various fields were activated a basic activity of the project. For example, the project purchased Echoplus Software with L.E. 149.900 and Dicom 3.0 to develop the ultrasonic set and connect it with the information network of the Kidney Center with L.E. 32.000. The educational institution has allotted a budget of \$ 10.000 in the original proposal of the project to contribute in the purchase of these programs, but its contribution exceeded that limit and reached L.E. 115.000 to purchase a software program for the update of lithotripsy set to save data on the information network of the Kidney Center to use it in teaching post-graduates.

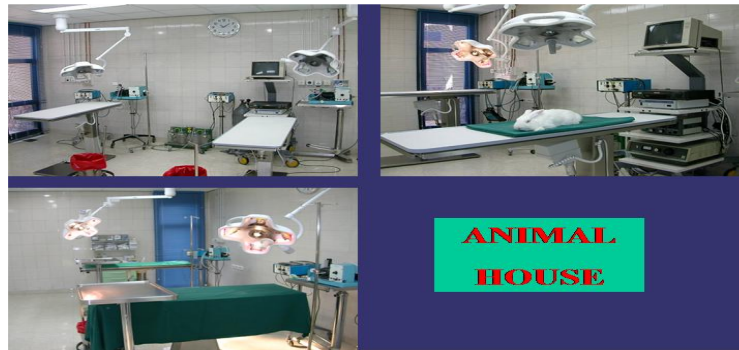


Figure (3-20): Images of experiment animals surgery room in the Kidney Center, Mansoura Univ. (B-092-L0)

- In the field of enhancing the educational clinical skills of faculty staff members and their assistants in the Faculty of Nursing, Mansoura University, Project (C-023-L0) developed and modernized two nursing skills labs as shown in figure (3-21) and equipped them with the following manikins:
 1. Five years heart and lung sound manikin
 2. Adult mega code
 3. Advanced casualty simulation

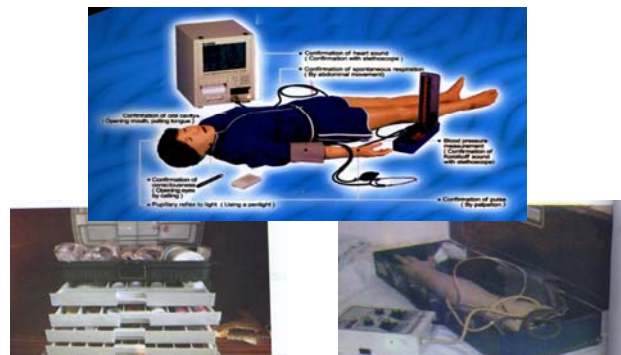


Figure (3-21): Images of manikins and requisites added to clinical training classrooms in the Faculty of Nursing, Mansoura Univ. (C-023-L0)

- In the field of preparing educational and training programs for workers in the medical sector and targeted communities that support and save lives, Project (B-089-L0) carried out in the Faculty of Medicine, Mansoura University, depended on the provision of a number of manikins (an advanced life-saving manikin, an initial life-saving manikin, and cardiac graph simulator).
- Project (C-015-Q0) carried out in the Faculty of Medicine, Suez Canal University, introduced computer-assisted training in clinical skills labs and equipped 16 clinical training rooms with a large number of manikins as shown in figure (3-22):
 1. Prostate examination simulator
 2. Intramuscular injection model
 3. Cardiopulmonary resuscitation model
 4. Gynecological training model
 5. Breast Examination Simulator



Figure (3-22): Images of manikins in the training classrooms in the Faculty of Medicine, Suez Canal Univ. (C-015-Q0)

- Project (A-107-J0) carried out in the Faculty of Medicine, Cairo University, equipped two clinical skills labs with the latest training models and clinical skills simulators which contributed in giving students in the Faculty of Medicine the knowledge and clinical skills necessary for entering the practical life as distinguished physicians. The project was based on using the latest information technology methods like e-learning and distance learning to teach undergraduates and post-graduates in El-Kasr El-Aini and other Faculties of Medicine within and outside Egypt. To achieve this goal, a computer lab was equipped with 28 computers and a modern information center comprising 8 servers in collaboration with the simulation project in the medical field financed by TEMPUS. Figure (3-23) shows images of the labs developed through the project

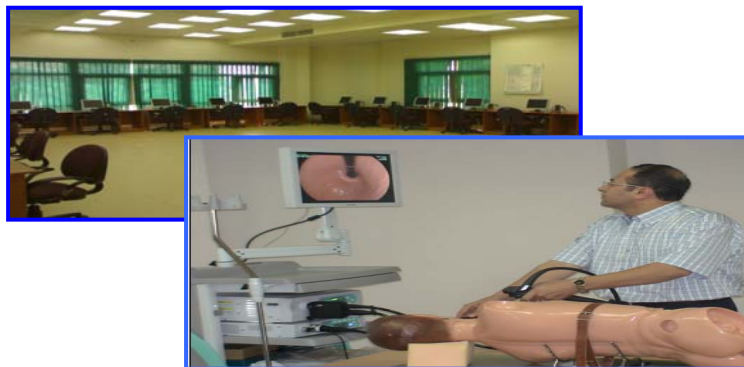


Figure (3-23): Images of the computer and clinical skills labs equipment, Faculty of Medicine, Cairo Univ. (A-107-J0)

Second: The Engineering Sector

- In the context of the efficient use of simulation experiments, students could watch experiments and follow their analysis and results through the internet thanks to project (B-091-L0) that was carried out in the Faculty of Engineering, Mansoura University. The project used the central lab in preparing a database that forms the basis of simulation labs where students perform experiments on the computer without the need of visiting the lab as shown in figure (3-24).

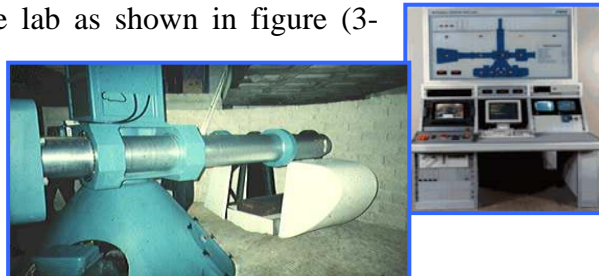


Figure (24): Images of using the central lab in the Faculty of Engineering, Mansoura Univ. (B-091-L0)

- Project (A-253-J0) in the Faculty of Engineering, Cairo University, excelled in the context of cooperating with the service sector by virtue of the advance labs it established and the laboratory experiments it designed to qualify graduates for community service through training them on advanced applied systems. Figure (3-25) shows some of lab potentials that were developed or supplied through the project such as the three remote control labs that are equipped with modern measurement and control equipment that qualify undergraduates for practical life (for example, a digital control system for machines and location setting engines, a control system of production line balance). The labs were also equipped with modern units for signals collection to help in the practical applications of Master's and doctorate theses. Through the project, a unit for lab equipment maintenance and fixing was established, which contributed in the sustainability of work in the labs after the end of the project. The unit has already been used in fixing five lab units and collecting three advanced tests for the undergraduate stage.



Figure (25): Images of experiments in the control lab in the Faculty of Engineering, Cairo Univ. (A-253-J0)

- In the field of post-graduate courses update in the Faculty of Engineering, Cairo University, Project (A-045-J0) purchased a robot that has the following technical features (Axis-4, Servomotors AC, Computer Programming, Repeatability $\leq .1$ mm) and costs with its supplements (Training Rack, Gripper and all Accessories, Training Software) 13600 Euro. Figure (3-26) shows its use in research and upgrading the teaching of Robotics Engineering course.



Figure (26): An image of the Robot provided to the Faculty of Engineering, Cairo Univ. (A-045-J0)

- In the engineering field in Cairo University, Project (C-054-J0) excelled in the field of increasing the use of laboratory equipment that deal with water resources engineering. Thus, a number of modern laboratory equipment were purchased as shown in

figure (3-27) including: (Water level logger with the associated cables and software, Ultra-sonic flow meter, GPS, Turbidity meter, Weather station, Water quality kit). The lab development mechanism coincided with the renovation measures of the lab classroom and its equipment with a data show, screen, and digital camera, which help develop and update the teaching of irrigation and hydraulic courses and consequently benefiting graduates in the field of hydraulic measures and resources management to face the problem of water shortage.



Figure (3-27): Images of laboratory equipment that deal with water resources engineering , Cairo Univ. (C-054-J0)

- Project (C-005-M0) in the Faculty of Engineering, Minia University, excelled in the field of updating the teaching of transportation engineering through equipping a transportation and geodesic survey lab with the equipment required to facilitate teaching real field problems and tests as well as setting up models for some undergraduate courses and using them as a basis for some graduation projects as show in figure (3-28).

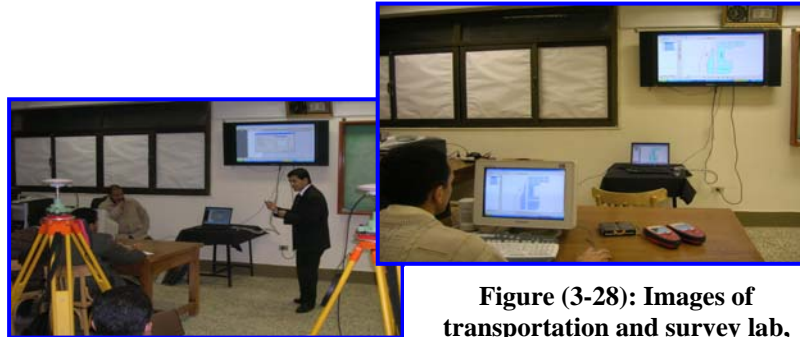


Figure (3-28): Images of transportation and survey lab, Faculty of Engineering, Univ. (C-005-M0)Minia

- Project (B-040-G0) in the Faculty of Engineering, Ain Shams University established light communication and electronic lights technology center to offer its service to civil and military applications. The project provided the center with 8 light signal transmitters/ receivers with 2.7 gigahertz on which work was done to increase their capacity to 10 gigahertz in addition to 4 light magnifiers using EDFA and the establishment of 14 laboratory experiments to measure the features of light networks, circles, and components as show in figure (3-29).



Figure (3-29): An image of light communication and electronic lights technology center , Faculty of Engineering, Ain Shams Univ. (B-040-G0)

Third: The Veterinary and Agricultural Sector

- In the field of developing an agricultural biology technology program for the undergraduate stage of the Faculty of Agriculture, Cairo University, Project (A-056-J0) provided adequately equipped labs with deep freezers (80C), rocking incubators, and a cooling and heating incubator as shown in figure (3-30).



Figure (30): Images of Agricultural Biology Technology labs, Cairo Univ. (A-056-J0)

- In the field of new specialized labs in the Faculty of Veterinary Medicine, Menufeya University, Project (A-041-N0) established veterinary labs that include the latest medical equipment in addition to mobile labs for the treatment of sick cases in their different places as show in figure (3-31).



Figure (3-31): Images of animals diagnosis using a mobile veterinary lab, Menufeya University. (A-041-N0)

- In the field of adding advanced laboratory equipment to existing specialized labs, a distinguished project in Beni-Suef University (A-001-J0) added advanced laboratory equipment which allow the establishment of a bank of referential sections for the sick tissues in the Pathology Department to facilitate the teaching of animal diseases and to

use them in the fast diagnosis of different diseases as show in figure (3-32). This project is considered an excellent example of the effective contribution of the university in laboratory equipment for Beni-Suef University contributed with more than L.E. 175000 to provide the project with a microtome set that costs L.E. 47600, a Cairo stat set for the preparation of samples out of cooled fresh tissues that costs L.E. 81531, and a research microscope with a camera that costs L.E. 47600.



Figure (3-32): Images of samples taking using advanced equipment in the Pathology lab, Beni-Suef. (A-001-J0)

Fourth: Various Sectors

Upon the appraisal of laboratory equipment in technical institutes, there were more than one distinguished project:

- Project (B-080-O0) in the Technical Industrial Institute in Mahalla established a section for ready made clothes. Since qualifying technical graduates who can deal with modern technology in the field of ready made clothes is one of the primary goals of the project, it equipped specialized ready made clothes workshops with 15 machines of different types and 18 traditional sewing machines as shown in figure (3-33).

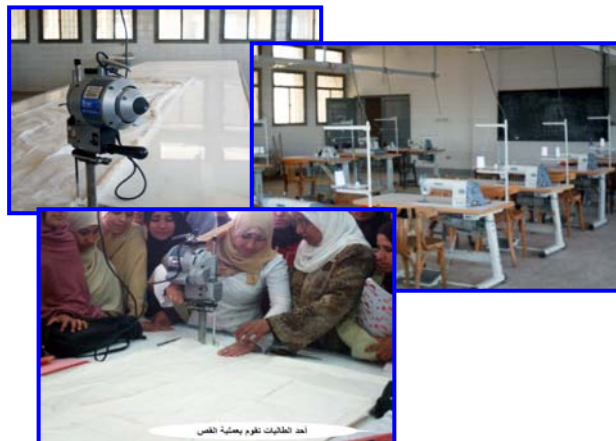


Figure (3-33): Images of ready made clothes workshops in the Technical Industrial Institute in Mahalla (B-080-O0)

Through the equipment of specialized workshops, the project has succeeded in connecting the educational process with the surrounding environment and encouraging the establishment of small industrial communities that give graduates independence. In addition, these workshops

have increased the added value of the project potentials and resources because of their use as a training center at a cost or a special unit that makes use of students' outcomes to ensure self finance.

- Project (D-140-O0) in the Technical Industrial Institute in Port Said established a Section for Welding Technology and its Applications in Port Said and equipped two welding workshops for the new section with all equipment and requisites for practical application as shown in figure (3-34). In this context, the project equipped the two welding workshops with two welding machines DC 500 amperes, two half-automatic welding machines 450 amperes, a yoke for carrying out magnetic field tests, an oven for roasting electrodes, a rocket with 4.5 horsepower, and other equipment and requisites. Thus, the project contributed in providing the work market with specialized technicians in the field of welding according to international standards.



Figure (3-34): Images of equipment and requisites for the Technical Industrial Institute in Port Said (D-140-O0)

- The Faculty of Domestic Economy in Helwan University has implemented Project (D-058-K0) which achieved the enhancement strategy in the field of leather products. One of the basic goals of the project, the equipment of an educational lab with the modern equipment used in leather industries, was successfully achieved. The lab was equipped with special modern tools and machines in addition to the tools and devices used by students in practical applications. Because of the lack of training on this type of industry in any other educational institution in Egypt or any other academic study, the project supplied the work market with highly qualified graduates, which reflected on the quality of the final products.



Figure (3-35): Images of leather industry workshops in the Faculty of Domestic Economy, Helwan University (D-058-K0)

- In the field of Chemistry education development and the achievement of integrated educational resources, theoretical and practical, in the Faculty of Sciences, Helwan

University, a Biological and Organic Chemistry lab was developed in addition to the Analytic Chemistry lab through Project (B-143-K0) as shown in figure (3-36).



Figure (3-36): Images of the equipment purchased for the developed Chemistry labs in Helwan University (B-143-K0)

3.3.3 Third Direction: Supplying Classrooms and Labs with Service Equipment

The basic goal of this direction is to renovate, furnish, and provide classrooms, lecture halls, and labs with equipment and illustration tools to serve the educational process according to the latest applied systems. Lecture halls in faculties and institutes on the level of all HEEPf financed projects have actually been provided with service equipment like data show, projector and special screens as shown in figure (3-37). This led to an overall revolution in teaching methods because these equipment have benefited both students and faculty staff members. Students benefited from clear, speedy and high quality explanation of information, while faculty staff members were easily capable of driving information home to their students without much effort on their part.

- Project (A-084-10) which aimed at the development and restructuring of post graduate curricula and study plans in the Institute of Sugar Industry Technology Research and Studies, Assiut University, is an excellent example of the upgrading and development of the teaching and learning process through the update of the existing potentials and infrastructure to serve the mechanisms and methods of the educational process with its all aspects. In particular, it used advanced electronic technology and multimedia to establish, furnish, and widen a number of classrooms; and develop, update, and make new additions to labs and libraries in a highly professional way.
- Project (D-078-Q0) in the Zoology Section of the Faculty of Sciences, Suez Canal University, is a good example of developing the infrastructure of labs and classrooms that are used in teaching advanced courses. Four lecture halls were each equipped with a computer and fixed data show and the University installed air conditioning sets in them.



One of the classrooms in the Institute of Sugar Industry Technology Research and Studies (A-084-10)



One of the classrooms in the Zoology Section of the Faculty of Sciences, Suez Canal Univ.(D-078-Q0)

Figure (3-37): Images of classrooms equipped with modern presentation equipment

3.4. HEEPf Management Mechanisms for the Establishment and equipment of Labs

The following are the measures taken by HEEPF management to support projects in the establishment and equipment of labs:

1. Ensuring the adequacy of the place allocated for the lab:

Project (D-140-O0) is an example of HEEPF management concern with the adequacy of the place allocated for the lab. The Technical Industrial Institute in Alexandria was the place allocated for the establishment of new specialized welding workshops. However, because of the restoration work that was going on there, HEEPF management monitored the process of finding an adequate place. Institute of Sugar Industry Technology Research and Studies Hence, the project was carried out in the Technical Industrial Institute in Port Said where two big adjacent workshops (13 meters x 8 meters) were equipped and annexed with an upper classroom (30 square meters).

2. Monitoring the Equipment Purchase Measures:

HEEPF management monitored the equipment purchase measures and made sure that they have the required technical specifications and achieve the project desired goals. It gave technical support through providing projects with experts in the field and monitoring the fulfillment of the World Bank conditions in the second appendix of the contract.

3. Fiscal Monitoring Work including:

Monitoring the inspection, addition, fiscal, and technical decision committees; ensuring the presence of maintenance and guarantee contracts; supporting projects in case of difficulties and hardships with suppliers; and facilitating the purchase measures from abroad with foreign currency through the import unit in the Higher Education Enhancement Projects Management Unit

4. Making sure that equipment are benefited from and following their operation:

After the end of the actual project, HEEPF management requests projects before their hand-over to lay out a plan for using equipment a year after the end of the project.

3.5. Mechanisms of Labs Development Sustainability

HEEPF financed projects contributed in the upgrading of the labs equipment infrastructure in Egyptian universities. This development had to continue after the end of financing these projects. A large number of projects have set broad guidelines to maximize the use of advanced labs after the end of HEEPF finance. They can be summed up as follows:

1. The University should continually appoint trained technicians to manage these labs.
2. Regular Maintenance contracts should be held to ensure the continuation of work in the labs, not only upon needing it.
3. The educational institution should allocate a share of its budget to update computers in these labs, the lamps of data show, or replace any worn requisites of the labs equipment.
4. The introduction of special activities in post-graduate studies and scientific research (to do scientific research on the equipment).
5. The educational institution should carefully coordinate between study schedules to operate labs with the highest possible capacity and allow maintenance.
6. Considering the possibility of integrating labs in the same specialization or within the same university.
7. The introduction of any activity in the lab at a cost and the establishment of an independent special unit or through an existing one. Activities could vary as follows:

- Offering training programs in the lab
- Carrying out new experiments for other bodies
- Doing analyses and samples for other bodies
- Renting computers to students

In fact, a large number of projects (42 projects) have supplied additional financing resources to buy any requisites to operate the labs equipment or purchase new equipment during the sustainability period of the project through marketing some lab activities at a cost, organizing training courses in the labs, in addition to maximizing their use in the field of scientific research and post- graduate studies as shown in figure (3-38). In light of the various potentials provided by a large number of projects to establish and develop labs that serve the field of the projects, it was necessary for HEEPF management and the administrations of the universities where labs were established to maintain these labs:

- HEEPF management keenness to achieve this is represented in the measures it took to offer full support to projects in this field, help the distinguished ones to get accredited, or offer the administrative and technical support to transform these labs into service labs or special units.
- The administrations of the universities where labs were established have already offered the support necessary to do all maintenance and fixing work for the labs equipment including holding maintenance contracts and bearing maintenance costs to keep these labs working efficiently for the longest time possible to greatly benefit students.

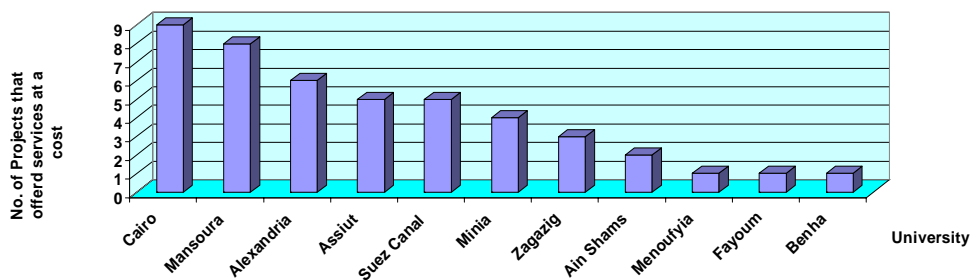


Figure (3-38): A graph of the number of projects that provided additional financing resources