

A Postgraduate Laboratory Renovation

Wedad H. Al-Dahhan¹, Emad Yousif¹, Ali Jassim Al-Zuhairi², Falah H. Hussein³

¹Department of Chemistry, College of Science, Al-Nahrain University, Baghdad, Iraq

²College of Engineering - Al-Musayab, University of Babylon, Babylon, Iraq

³College of Pharmacy, University of Babylon, Iraq

Abstract Scientists at universities throughout Iraq are actively reporting incidents and actual incidents occurring in their labs, as well as structural improvements that have been made to improve safety and security, raise awareness and encourage openness, leading to widespread adoption of Chemical Safety and Security (CSS) practices. The enhancement of students' accepting of ideas in knowledge and its requests, practical scientific skills and understanding of how science and scientists work in laboratory experiences have been considered key aspects of education in science for over 100 years. Facility requirements for the necessary level of safety and security combined with specific requirements relevant to the course to be conducted dictate the the structural design of a particular laboratory, the design process must be addressed both. This manuscript is the sixth in a series of seven case studies describing laboratory accidents, accidents and laboratory improvements. We summarize the process used to guide a major renovation of postgraduate chemistry laboratory facilities at Al-Nahrain University and discuss lessons learned from the project.

الملخص

يعمل العلماء في الجامعات في جميع أنحاء العراق بنشاط للإبلاغ عن الاحداث والحوادث الفعلية التي تحدث في مختبراتهم، فضلا عن التحسينات في البنية التحتية التي تم إجراؤها لتحسين السلامة والأمن ورفع مستوى الوعي وتشجيع الانفتاح على الآخرين مما يؤدي إلى اعتماد واسع النطاق في الجوانب العملية للسلامة والامن الكيميائي (CSS). اعتبر تحسين فهم الطلاب للمفاهيم في العلوم وتطبيقاتها، والمهارات العلمية العملية وفهم كيفية عمل العلماء في التجارب المخبرية يعتبر من الجوانب الرئيسية المهمة للتعليم في العلوم لأكثر من 100 سنة. ان متطلبات العمل للمستوى الضروري من السلامة والأمن جنبا إلى جنب مع متطلبات ذات الصلة التي يتعين

إجراؤها للارتقاء بالتصميم الهيكلي لمختبر معين، ويجب أن تعالج عملية التصميم على حد سواء. هذا البحث هو السادس في سلسلة من سبع دراسات حالة تصف الحوادث المخبرية والحوادث والتحسينات المخبرية. نلخص هنا عملية التأهيل المستخدمة لتحسين البنية التحتية لأحد مختبرات الدراسات العليا في قسم الكيمياء / جامعة النهرين ومناقشة الدروس المستفادة من المشروع.

Keywords: Science laboratory, chemistry laboratory, laboratory investigation

Introduction

A fundamental laboratory knowledge is a very important part of a precise chemistry course for chemists who connect in both chemistry study and chemical learning ^[1, 2]. Therefore, a chemistry labs layouts must maintenance and raise the analysis and synthesis of both concepts and resources ^[3, 4]. The creation of a laboratory training environment, both academic and material, that moves the real towards the ideal is a valuable and in progress goal of quality chemical education ^[5]. This paper will draw round strategies that were developed and applied as part of a most important renovation of the Chemistry lab in the main Building at the Al-nahrain University.

On March 20, 2015, the Iraqi Ministry of Higher Education and scientific research announced funding of \$5000 (five thousand) for postgraduate laboratory renovations in the main building at Al-nahrain University Chemistry department.

The Chemistry laboratories were built almost 20 years ago and in many cases hardly meet today's narrow values (Figures 1, 2).



Figure 1: Old benches with bad surface quality

Figure 2: Old benches with bad surface quality

Renewal to a considerable part of the main Building F-block, updated infrastructure needed for today's scientific teaching and research. As part of

our own interest in the field in safety and security ^[6-10] we have improved many ideas and aspects.

Renovation Project Overview

The modernization of the infrastructure included new electrical systems, emergency power, usable fire alarms, and communication and data lines. Updated mechanical work (heating, ventilation and air conditioning) with exhaust heat recovery, low-flow smoke hoods (which reduced engineering and construction costs and equipment associated with active controls and inhibitors installed on outdoor air ducts), suppression of pipes of deionized water, air, natural gas, Vacuum, nitrogen, hot and cold water ^[11] (Figure 3, 4, 5, 6).



Figure 3: Piping of deionized water, air, vacuum, and hot and cold water



Figure 4: the old sewage pipes (2) inches



Figure 5: Heating, ventilation and air conditioning.



Figure 6: The old fume hood.

Most of the activities are finished at the lab bench. Side seat, with three tubs, drying racks, adjustable adjustable bench top is available for common use. Four smoke hoods are provided for 6 feet of work space if volatile chemicals are used. When possible, a complete set of common equipment is stored for

each experiment in the drawers at each workstation, and when safe to do so, chemicals are distributed from the bench position. This reduces the risk of carrying chemicals around the laboratory and reduces bottle neck and congestion (Figures 7, 8).



Figure 7: A side benches, with sinks.



Figure 8: A side bench, with three sinks.

The labs are equipped with smoke hoods, safety shower, eye wash, hose hoses, fire extinguishers, spill sets, emergency lighting, security systems and video alarms (Figures 9, 10).



Figure 9: 6-foot fume hoods are provided for workspace if volatile chemicals



Figure 10: The new high quality benches

Conclusions

One of a complex learning location is the instructional chemistry laboratory. The laboratory area must be cautiously planned in order to give a significant knowledge for learners inside this atmosphere, in the status of the related course. So, the material services need care and match the educational objectives. This connection is obvious in the strategies that were applied to the renovation development that is reported here.

Assignments at different organizations are certainly working to be exclusive in their character founded on their institutional tradition. To the level that goals are engaged, a certain sharing points of features will also stand out. It is well known that the sharing of understandings between organizations tells upcoming approaches and improves products. So, in this process of development of laboratory design, motivated together by the alterations in the chemical sciences and in related alterations in education. We wish that our involvements give towards the continual development in the strategy and use of instructional chemistry workrooms in our country.

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