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The significance of lab-oriented practical class: A case study of New Universities in Kingdom of Saudi Arabia

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Abstract -In Saudi university education, the conflict between practical programs and industrial demands is increasingly attracting students' attention. This is especially so in new universities' involvement in practical-oriented courses that do not achieve their expected level due to the various factors, such as course design, equipment, expertise, adequate faculty training, student involvement and management support. No research proposal so far has discussed this issue in Saudi Arabia. We conducted one case study on a 'new university', one which was established within the past 10 years. The aim of this study is to discover whether interpersonal trust and the effectiveness of practical training significantly affect the future participation intentions of students in practical training classes. This case study integrated students, practical sessions and faculties to raise them to a maximum level of laboratory utilization in order to achieve the current requirements of industry. Also, we suggest that in the future, all new universities should consider conducting internship programs with high technology and large-scale companies to promote the participation intention of students and boost their training results.

Key words: **Practical, Laboratory, Infrastructure, Equipment, POL.**

I. INTRODUCATION

An important challenge of higher education is to integrate the acquisition of domain-specific knowledge with practical knowledge and skills, e.g., social skills, communication and technology skills, and, further, to encourage students to apply their knowledge to solve problems and to tackle problems at higher levels, in addition to acquiring basis knowledge and skills [1]. In practical-oriented curricula, such as those in the study of engineering and technology, the importance of the practical point of view is highlighted because professional expertise develops mainly in authentic working life conditions, and it is dependent on how it is learned and how it is used. Furthermore, practical knowledge manifests itself as skills or "know how". As it develops in those concrete situations where it is learnt, it is contextual and social in nature. Practical learning can be implicit, reactive or deliberative. Deliberate processes are needed in work. These include decision making, planning and problem solving Moreover practical's are linked with the skills to organise and review one's behaviour, including one's ability to act reflectively, to think critically and to develop a positive attitude towards lifelong learning [2]. Practical-oriented education in the Saudi Arabia faces a number of challenges. There is a large amount of research relating to the role and value of practical work in science and engineering education. The benefit of practical-oriented learning is to improve the dynamic ability of combining two kinds of knowledge [1]. This research paper introduces a case from a new university in Saudi Arabia. Based on interviews with students from construction management who majored in that university, this paper adopts a qualitative research method to build a mode of practical knowledge with the aid of internships in order to explain the mechanism of the practical lab and related activities (1).

II. BACKGROUND STUDY

According to the literature, several research papers have discussed aspects of problems around practical sessions. If knowledge is important with respect to practical reasoning, it is because it brings this knowledge to the real world.

Nina Katajavuori, Sari Lindblom-Ylanne and Jouni Hirvonen discussed the issue in their research article, "The significance of practical training in linking theoretical studies with practice" (2006). This article analyses interviews, showing that the practical training increased students' understanding of theoretical knowledge and their motivation to study. The students acquired practical skills and knowledge in a working community of professionals. The results also showed that the students should be able to rehearse their reflective skills during theoretical studies as well, even though the practice period was too short to permit adequate development of reflective skills.(2)

Ian Abrahams and Robin Millar produced a research report entitled, "Does Practical Work Really Work? A study of the effectiveness of practical work as a teaching and learning method in school science (2008)". Practical work was generally effective in getting students to do what was intended with physical objects, but much less effective in getting them to use the intended scientific ideas to guide their actions and reflect upon the data they collected. The analytical framework used in this study offers a means of assessing the learning demands of practical tasks, and identifies those that require specific support for thinking and learning.(4)

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Meiching Chen, Jianshen Chen and Juiyuan Chu wrote a paper entitled, "Determining the effectiveness of practical training for students of Universities of Technology in Taiwan: Empirical findings using a structural equation model" (2008). In this study, students who participated in the interactive activities of three universities of technology in 2002 were surveyed and a structural equation model was used to understand the determinants aff ecting practical training for students.

Adam Dasmani published research entitled, "Challenges facing technical institute graduates in practical skills acquisition in the Upper East Region of Ghana (2011)". The purpose of the study was to explore and describe the challenges confronting technical institute graduates in practical skills acquisition in the upper east region of Ghana. The study revealed that there was an inadequate supply of instructional materials, large class sizes, inadequate training facilities and weak linkages with local industries for hands-on-experience for both instructors and trainees. (3)

Tang Yong provided a discussion on "The Mode of Theoretical Knowledge and Practical Knowledge Combination: The Significance of Internship (2012)". Based on a quantitative study, this paper extracts three themes and ten subthemes through recorded sentences and paragraphs. With further definition of each theme, this paper constructs a theoretical mode consisting of four stages in exhibiting the combination processes of theoretical and practical knowledge. Internship provides the platform for students to develop an authentic context. (1)

III. RESEARCH PURPOSE

Universities utilize the resources of industry to promote their technical activities, making the academic environment of the students expand to their relevant working environment and can hopefully developing a type of education program for learning effectiveness. Narrow practical training uses technical and vocational education as a direction and has clear cooperative education schemes of training programs. The importance of practical work in engineering and technology and science is widely accepted, but it is important we ensure that such practical work genuinely supports learning and teaching, and that flexibility is given to the faculty to do this in relation to their pupils' needs and the courses they are studying. The impact of practical work for those learning engineering, technology and science, particularly how benefits can be maximised and how far they extend across all types of learner that needs to be assessed. Generally in the practical lab, education involves various factors such as equipment, infrastructure, students, faculty, management and parents to determine the effectiveness of practical education. The role of every factor's activity is important for effective real time applications. The purpose of our research is to identify each factor's backlog and increase the effectiveness and importance of practical education for the current industrial market. One of the great cultural claims of practical education is its potential as a liberating force that the individual can and may interact with the natural world. The aim of the proposed research as follows:

- It will enhance students' activities
- It will coordinate the lab's staff-students-parents management
- It will enhance the effectiveness of practical classes for real-world applications
- It will encourage team work activities
- It will suggest the place of practical work within the curriculum as part of real-world application
- It will provide comparative studies
- It will provide the outcomes of the research motivating faculty and students' activity in labs
- It will promote students' confidence and encouragement
- It will identify the roles and responsibilities of each entrepreneur related with lab activities.
- It will bring new ideas to society, management and parents

IV. PROPOSED STRUCTURE

The aim of quality lab/practical education is to find various factors of behavior, understanding and reasons that govern such behavior. Qualitative researchers typically rely on participant observation, field notes, semi-structured interviews, unstructured interviews, and analyses of documents and materials to collect data. In our study, we choose a focused sample observation from students' practical/laboratory activities in new universities to measure their knowledge structure and the function of internship on knowledge combination in practical/laboratory activities.

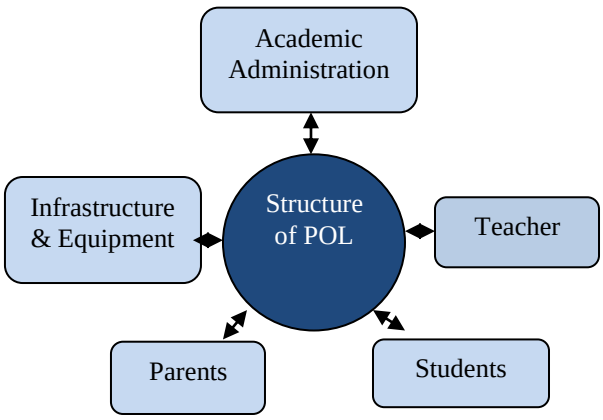

Fig 1: POL (Practical Oriented Learning) structure

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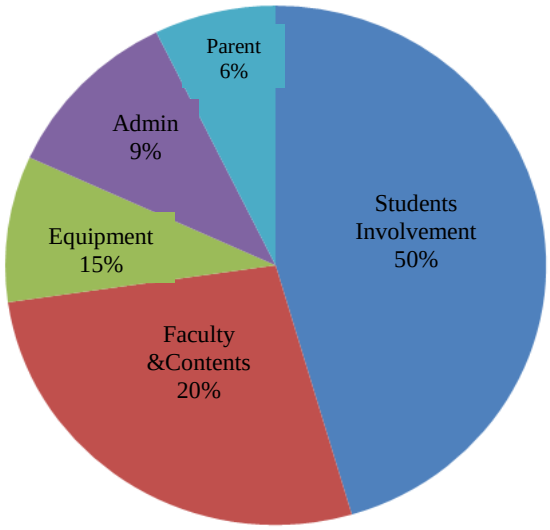

Fig 2: The factors which influence the effective lab performance

V. SOLUTION FOR THE PRACTICAL LAB

Our objective from the research is to improve practical learning methods. Here, we summarize some suggestions to increase the influential factors for expanding practical-oriented learning methods. Students must assume responsibility for their educational experiences, but independent study has certain limitations. If learners do not receive adequate support from the faculty/instructor, parental guidance, management support and required equipment, they will not absorb accurate knowledge of their relevant subjects. So, it is essential to discuss the role of each factor in achieving a good result. In the following paragraph, we analyses each factor's role in order to increase the effectiveness of the practical session.

A. The Role of Administration

Administration place a high value on the integrity, effectiveness and efficiency of the organization, particularly as embodied in the stewardship role of universities and college departments. The core responsibility of administration in the new developments relating to creative and experimental attitudes is to improve quality of education as follows:

- To recommend the area of responsibilities of staff
- To recommend selection of personnel for appropriate labs
- To maintain the faculty reporting relationship to his/her immediate supervisor
- To keep the supervisor informed of activities of the lab supervising unit
- To appraise the supervisor of major or unusual developments
- To consider faculty advice, suggestions and counsel
- To coordinate staff, student and practical session activities
- To arrange the necessary practical equipment according to the subject
- To update/maintain equipment in the laboratory
- To maintain effective relations with faculty, students and the wider community
- To observe changes in college policies and programs accurately
- To serve on lab committees and councils as directed by the laboratory supervisor
- To attend professional meetings as authorized by the laboratory supervisor
- To observe the course description and overview of subjects covered during the class
- To compile biographical sketches of staff that highlight both their professional and personal experiences
- To observe the assignment schedule for each week of the course
- To review practical session policies for attendance, grading and participation
- To discuss frequently asked questions about assignments and computer problems
- To provide enough practical equipment and supporting devices

B. The role of faculty

Teachers realize that computer-mediated education requires developing a new contemporary vision of learning, a teaching and learning model that stresses student-centered instruction. Ultimately, it will demand changing the traditional role of teachers from information transmitters to guides who arrange meaningful learner-centered experiences. The teacher seeks to guide his/her students toward greater maturity, preparing them to effectively adapt to a rapidly changing industrial requirement through the following:

- Find the most suitable methodologies to explain the concept
- What are the ethical issues?
- Discuss various useful tools for the practical session
- Identify the slow learners; concentrate on them additionally
- Frequently evaluate the students by giving them more practical.
- Identify area of understanding and areas where students are lacking

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- Identify process (efficiency), outcome (effectiveness) of the practical session
- Justify the need for studying practical sessions
- Don't start new topics until they are understand the previous exercise
- Frequently ask the students whether practical findings have any effect
- Ask the students to identify the most appropriate techniques for the problem statement.
- Promote more self-directed learning activities
- Prepare the students for equipment handling skill
- Design instructional activities that guide the students into online learning situations
- Strive to encourage positive learning habits
- Encourage adult learning styles while serving an ethnically diverse student population.
- Promote genuine interactivity, such as communication, participation and feedback.
- Cultivate both self-directed instructional skills and develop enriching dialogue with others.
- Motivate critical thinking skills in times of emergency
- Develop a detailed syllabus for each session.
- The syllabus plays a vital role in helping students understand the teachers' expectations:
- Observe the influence-based factors, such as knowledge of the subject and learning assignments
- Encourage new learning ideas and academic disciplines
- Arrange the industrial training/industrial camp
- Design relevant lesson plans and be willing to experiment with innovative educational methods
- Frequently observe the participants' know-how in grasping knowledge and applying it
- Provide enough of time to become used to the practical environment
- Create a more open and equal environment for all students
- At the end of session, provide an evaluation questionnaire or an area for reflection
- Allow active participation as a mentor
- Identify the learning pressures on the students
- Show the experiment results to the students

C. The role of students

Students are the core factor in this research because their involvement makes effective practical learning more important. Here, a few points taken from students' contributions are discussed about creating effective lab activity.

- Students have to find the difficult part of practical learning
- Students should practice interacting with the faculty
- Students should learn from their mistakes and errors
- Students have to access the relevant material related to the practical session at home
- Students should not involve family duties; it slows learning down
- Students should attend the practical session regularly
- Students should choose their university/college based on not more than 30 minutes of travel time
- Students should get adequate feedback from their teachers
- Students should practice as independent learners.
- Students should be involved in group practical activities
- Students should write a scientific report in which they justify their conclusions
- Students should design and do their own 'open-ended' investigations
- Students should emphasise the quality of the design and data collected and make improvements to practical sessions
- Students should interpret data in support of competing theories or explanations
- Students' practical activity should reflect that of a professional
- Students should cultivate achieving knowledge objectives through personal observation of data
- Students should prepare questionnaires from practical learning
- Student should practice completing their task within the stipulated time

D. Parental support

Parents have a responsibility to educate their children by:

- Making sure the child attends the session
- Not allocating family duties and responsibilities to children.
- Locating a university/school for the children not more than 5 kilometers away

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- Receiving information frequently from the faculty
- Encouraging children's participation in all activities
- Providing necessary material for children to learn more
- Finding any extra time required for children's education
- Meeting personally with their children's faculty frequently
- Registering their details with the faculty for any necessary communication
- Discussing with their children everyday activity on the campus
- Allowing the students to do some practical in their home
- Arranging the sources of information collected from the internet or other media

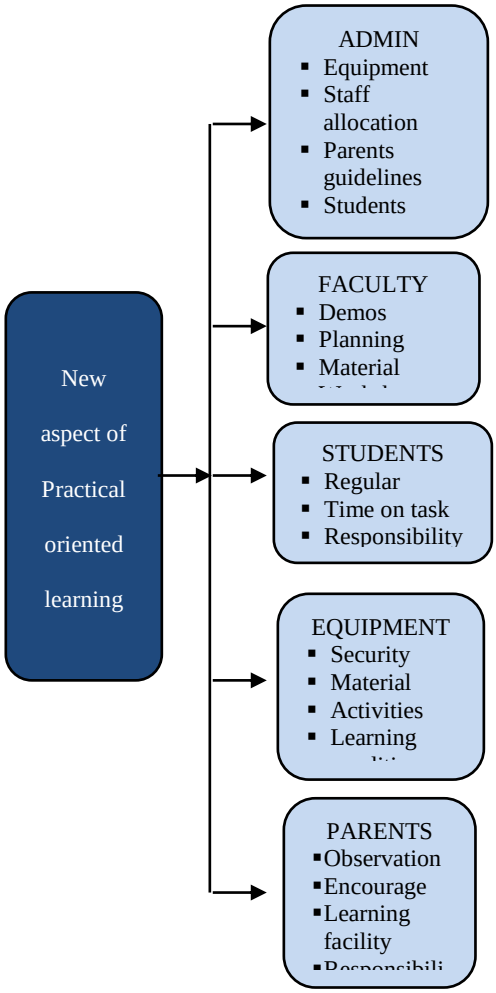

Fig 3: New aspects of POL

E. Infrastructure and Equipment

The primary objective of infrastructure design should be to provide a safe, accessible environment. A secondary objective is to allow for maximum flexibility for safe research and teaching use. Infrastructure provision and the requirement for equipment vary according to education discipline, such as whether it is medical, engineering or basic sciences.

- The infrastructure and equipment has to fulfill the specific applications of the course
- Find and allocate the equipment according to the course priorities
- Staff should maintain lab equipment properly
- Staff should verify hardware and necessary materials for the lab assignment
- Appoint proper staff to maintain the lab
- Paste on the laboratory wall practical briefing sheets or performances
- Explain the lab or practical safety regulations and guides
- Advise people to use protective clothing and equipment
- Maintain the activity register before and after the each session
- Discuss possible modification of lab and equipment in advance
- Display instructions visually in addition to giving oral instructions in noisy laboratory environments
- Provide a detailed description of the practical activity and what it will involve
- Check in advance that the location of the practical activity is accessible
- Provide authentication code for everybody to avoid unwanted situations

VI. CONCLUSION

The POL model of learning encourages teachers to view their students as academic partners who work together to produce relevant and meaningful learning experiences. POL education literature reveals that instructors are just beginning to develop new assessment procedures. Other factors enhance these effective learning methods. Faculty must consistently affirm the independence and autonomy of their learners by enabling them to freely pursue practical learning objectives. Therefore, the context of learning POL skills is interactive and built upon taking individual responsibility for academic achievements.

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