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# An Investigation of Biology Lab at Secondary Level in District Mardan

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**Abstract**
An Investigation of biology lab at secondary level in district Mardan was a new study. In this study the following research objectives and research questions were used: (1) To investigate basic facilities related to biology lab at secondary level in district Mardan; & (2) To inquire about biology lab equipment at secondary level in District Mardan. while (1) What are the basic facilities related to biology lab at secondary level in district Mardan? & (2) What is the biology lab equipment at secondary level in district Mardan? This study is very significant for the science students at secondary level in Khyber Pakhtunkhwa. All the Public Sector Science Secondary School in District Mardan was the population. A sample of (51) government School teachers in district Mardan was selected randomly. In which the following respondents were included. Closed-ended questionnaire was used. The experts verified the tool. Instrument reliability was determined to be 0.80. This study was delimited to all the public sector science secondary teachers in District Mardan. It was concluded that biology labs have enough space, light, proper hygiene, experimental tables, whiteboards, safety kits, microscopes, beakers, test tubes, funnels, magnifiers, and balances. It was recommended that biology laboratories be upgraded according to the teachers & students' needs on a regular basis. Furthermore, Teachers & students may be properly trained to use laboratory items.

**Keywords:** Biology, Lab, Secondary Level

## Introduction

Since students learn to remember real work more quickly than one-way announcement, which is typically used in the lecture method, it is essential that teachers incorporate practical work in addition to lectures for scientific topics, especially biology. According to Domin (1999), The four primary types of laboratory work are inquiry, issue posing, discovery, and expository. In the first three forms, the experiment's outcome is prearranged; in the review grace, it is

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not. In inquiry, however, it is the schoolchildren's responsibility to develop the process. A constructivist strategy, the inquiry method aids students in becoming self-sufficient and creating their own knowledge. Each of the aforementioned styles has pros and cons, which are covered in the pages that follow. (Domin, 1999).

To teach biology instructors how to use the lab equipment, they host seminars. Much progress has been made as a result of their efforts, but it is yet unclear whether and how the lab material has been used, as well as what lab work habits this introduction has prompted. In addition to lectures, it is crucial to improve students' practical abilities since this will help them understand the lesson's core concepts and apply the material in real-world situations. Practical work instruction and learning in the biology lab were also examined. A meme for assisting people in realizing their own potential is learning biology. This teaches people how to live in a society, contribute to it, and reap its benefits (Sands & Hull, 1985).

Activities in the lab have long been utilized to achieve a wide range of objectives, including emotive, practical, and cognitive ones. Practical work seemed to improve students' independence and manipulation abilities, but they also showed less focus on the job at hand and needed more time to cover the material thoroughly. (Cunningham, 1946; Bradley, 1968). The idea that the laboratory offers special circumstances for learning these practical, efficient, and cognitive abilities is irrational. Therefore, the teacher's examination and subsequent evaluation of these laboratory abilities are crucial for evaluating student performance and giving crucial evaluative comments. (Giddings et a1., 1991).

**Research Objectives**

- To investigate basic facilities related to biology lab at secondary level in district Mardan.
- To inquire about biology lab equipment at secondary level in District Mardan.

**Research Questions**

- What are the basic facilities related to biology lab at secondary level in district Mardan?
- What is the biology lab equipment at secondary level in district Mardan?

**Review of the Related Literature**

Since new information is discovered by actual observations and/or experiments, and since knowledge is considered to be a partial truth, science is by its very nature tentative. In the transition from science to scientific education, this method of information acquisition is also a crucial component of learning. Improved student outcomes may be attained by teaching such everyday occurrences through experiments and hands-on activity, while also involving schoolchildren in problem-solving also discovery (Harlen, 1999). Single of the main components of scientific education is practical work, and it appears that involving students in laboratory activities improves their comprehension of science (Hofstein & Lunetta, 1982; Tobin, 1990). Furthermore, it provides an opportunity for the learner to develop laboratory abilities, including inquiry skills and the ability to deal with laboratory materials (Millar, 2004).

According to Schunk (2012), lab work involves both the observation of natural

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occurrences and the actual completion of lab work. If the teacher provides constructive criticism, the results are often favorable. Learning can be accomplished actively or vicariously; the latter takes place while the student is working on practical tasks independently, while the former happens through observation. Furthermore, White (1996) asserts that hands-on learning improves students' retention of the material and helps them retain it in long-term memory. It also fosters critical thinking and a deeper comprehension of the subject matter. For instance, biology education gives pupils the chance to learn about our living environment. The study of life and its development, as well as the rigidity, frictions, processes, and interactions of organisms with their surroundings and with one another, is known as biology. According to Gartuer and Gauld (1995), laboratory work gives students experience and opportunities to improve their scientific attitudes and enjoyment of science. Different methods can be used for different purposes in laboratory sessions (Carter & Lee, 1981). Systems for assessing students' laboratory activities fall into one of the following primary groupings: In black and white proof (in black and white reports otherwise kits on broadsheet also color exams), practical test site tests, computer and cinematographic stimulations, also ongoing observational evaluation (Giddings et al., l99l).

Both teacher education and instructional materials may be modified to enhance the learning experience and quality of life for students in tire laboratories (Woolnough, 1991). Exceptional defiance (patieirce, acceptance of ambiguity, willingness to embrace letdown, broad-mindedness), special instructional skills (facilitating discussions before and after laboratory work), and special management skills (budgeting time, managing small groups, and ensuring safety) are all necessary when teaching in a laboratory (famir, 1991).

Joshi (2008) asserts that the laboratory method is a distinctive teaching approach that is essential to the successful teaching of science. The instructor uses neither lecture nor experiment demonstration in this approach. Instead, by carrying out the experiments themselves, the students are urged to discover the rules and principles of science for themselves. All of the lab's supplies and tools are provided to the students, along with the appropriate guidance on how to conduct their experiments independently. The findings are deduced once the observations are documented. In addition to providing students with the chance to engage with the process and develop a respect for scientific methodology, it aids pupils in understanding difficult abstract concepts. In his opinion, the information and abilities acquired by laboratory methods are more durable and long-lasting since they are acquired through personal experience, observation, testing, and verification.

The conventional (or verification) laboratory method is the one that professors utilize the most in their classrooms. In this style, the instructor discusses the subject that will be studied and makes a connection to earlier work. The students simply follow the lab manual or mimic the teacher to replicate the activities (Tamir, 1977). Lack of resources such as materials, time and space are among other difficulties which hinders successful implementation of laboratory work (Tobin, 1990).Traditional laboratory methods failed to introduce the nature of science accurately and as a consequence of this failure students tend to accept science as a collection of facts to be memorized rather than set of scientific principles confirmed by evidences (Burbules & Linn, 1991).Tobin (1990)

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describes this type of hands-on work as confirming scientific principles and identifying verifiable facts. Since students gather data without comprehending the connection between the data and its profound significance, such lab work cannot be a suitable teaching method in and of itself to teach. In a discovery approach, the teacher strives to guide the pupils to find the intended result while following a planned process. This approach is not without its detractors For example, in comparison to the expository method it takes more time (Johnstone & Al-Shuaili, 2001), and Hodson (1996) explains that it is a perplexing process that can occasionally result in the student not being "conceptually" prepared to absorb all of this complexity Furthermore, Domin (1999) comments that the process can no longer be referred to be "discovery" once the instructor is aware of the steps used and the results. A strategy that is comparable to inquiry is problem-based lab work. There are more opportunities to address the students' unanswered queries in this type of practical activity in this method, the student poses the question or hypothesis, and the teacher guides the class to the correct response by providing guidance. The student also prepares a written paper outlining the hypothesis and the steps taken to arrive at the answers, including the discussion and conclusion (Domin, 1999). The expository approach is more effective in teaching concepts and abilities and boosting students' confidence as compared to the problem-based approach (Young et al., 1968). Students should be given challenges with problem-solving skills while learning topic knowledge through the use of novel lab equipment (Linn, 1977), it can be harder than what the pupils can handle. Inquiry primarily focuses on the process of the task, paying less attention to the material to be learnt (Hegarty-Hazel, 1990). Domin (1999) identified four methods for teaching laboratory work: open-ended inquiry, discovery, asking problems, and classic explanatory style. Other words that have been used to describe the expository style are cookbook, recipe, traditional, and verification. In both discovery and problem-based training, the experiment's conclusion is predetermined, much like in the expository technique, but often only the teacher is aware of the outcome, not the learner Ergül et al. (2011).As science follows stages and its knowledge and abilities are arranged according to a hierarchical sequence, it is suggested that the instructor first identify an appropriate program for applying scientific skills before modifying this program with the science curriculum. Even though they lack the fundamental lab skills, students are typically expected to carry out the experiments directly in class. Therefore, in order to prevent syllabus overload and time shortage issues, the method of learning science skills should be followed step-by-step. According to Hodson (1996) Learning about science (including epistemology and philosophy of science), learning about science (the content), and learning to do science (skills like inquiry, problem solving, and being involved in implementing the science) are the three main objectives of science education. Practical activity, which falls under the third category of the three scientific curricula, fosters critical thinking about the world we live in by providing a hands-on experience with science.

## Methodology

### Population

All the Public Sector Science Secondary School in District Mardan will be the population.

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**Sample**

A sample of (51) government School teachers in district mardan was selected randomly. In which the following respondents were included.

| School No | Teachers | Total |
|---|---|---|
| **10** | 51 | 51 |
| **Total Sample Size** | | **51** |

**Research Instrument**

A three-choice, closed-ended questionnaire was created.

**Validity**

The experts verified the tool.

**Reliability**

Instrument reliability was determined to be 0.80.

**Delimitation**

This study was delimited to all the public sector science secondary teachers in District Mardan.

**Data Analysis**

Table No. 1 Your biology lab has enough space.

| No of SST | Yes No with % | No No with % | Undecided No with % | High % |
|---|---|---|---|---|
| 51 | 43 (86 %) | 06 (12 %) | 1 (02 %) | 86 % |

Table No, 1 show that (86 %) SST were said 'Yes' that biology laboratories have enough space in their schools.

Table No. 2 Your biology lab has enough light.

| No of SST | Yes No with % | No No with % | Undecided No with % | High % |
|---|---|---|---|---|
| 51 | 47 (94 %) | 02 (04 %) | 1 (02 %) | 93 % |

Table No, 2 shows that (93 %) SST were said 'Yes' that biology laboratories have enough light in their schools.

Table No. 3. Your biology lab have proper hygiene system.

| No of SST | Yes No with % | No No with % | Undecided No with % | High % |
|---|---|---|---|---|
| 51 | 40 (80 %) | 09 (18 %) | 1 (02 %) | 80 % |

Table No, 3 show that (80 %) SST were said 'Yes' that biology laboratories have proper hygiene system in their schools.

Table No. 4. Your biology lab have experimental tables.

| No of SST | Yes No with % | No No with % | Undecided No with % | High % |
|---|---|---|---|---|
| 51 | 46 (92 %) | 03 (06 %) | 1 (2 %) | 92 % |

Table No, 4 show that (92 %) SST were said 'Yes' that biology laboratories

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have experimental tables in their schools.

Table No. 5. Your biology lab have whiteboard.

| No of SST | Yes No with % | No No with % | Undecided No with % | High % |
|---|---|---|---|---|
| 51 | 42 (84 %) | 07 (14 %) | 1 (02 %) | 84 % |

Table No, 5 show that (84 %) SST were said 'Yes' that biology laboratories have whiteboards in their schools.

Table No. 6. Your biology lab have safety kites.

| No of SST | Yes No with % | No No with % | Undecided No with % | High % |
|---|---|---|---|---|
| 51 | 42 (84 %) | 06 (12 %) | 02 (04 %) | 84 % |

Table No, 6 show that (84 %) SST were said 'Yes' that biology laboratories have safety kites in their schools.

Table No. 7. Your biology lab has microscopes.

| No of SST | Yes No with % | No No with % | Undecided No with % | High % |
|---|---|---|---|---|
| 51 | 43 (86 %) | 05 (10 %) | 02 (04 %) | 86 % |

Table No, 8 show that (86 %) SST were said 'Yes' that biology laboratories have microscopes in their schools.

Table No. 8. Your biology lab has beakers.

| No of SST | Yes No with % | No No with % | Undecided No with % | High % |
|---|---|---|---|---|
| 51 | 45 (90 %) | 02 (04 %) | 03 (06 %) | 90 % |

Table No, 8 show that (90 %) SST were said 'Yes' that biology laboratories have beakers in their schools.

Table No. 9. Your biology lab has test tubes.

| No of SST | Yes No with % | No No with % | Undecided No with % | High % |
|---|---|---|---|---|
| 51 | 46 (92 %) | 03 (06 %) | 01 (02 %) | 92 % |

Table No, 9 show that (92 %) SST were said 'Yes' that biology laboratories have test tubes in their schools.

Table No. 10. Your biology lab has funnels.

| No of SST | Yes No with % | No No with % | Undecided No with % | High % |
|---|---|---|---|---|
| 51 | 37 (74 %) | 08 (16 %) | 5 (10 %) | 74 % |

Table No, 10 show that (74 %) SST were said 'Yes' that biology laboratories have funnels in their schools.

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Table No. 11. Your biology lab has magnifier equipment.

| No of SST | Yes No with % | No No with % | Undecided No with % | High % |
|---|---|---|---|---|
| 51 | 38 (76 %) | 07 (14 %) | 5 (10 %) | 76 % |

Table No, 11 show that (76 %) SST were said 'Yes' that biology laboratories have magnifier equipment in their schools.

Table No. 12. Your biology lab has laboratory balances.

| No of SST | Yes No with % | No No with % | Undecided No with % | High % |
|---|---|---|---|---|
| 51 | 37 (74 %) | 11 (22 %) | 02 (04 %) | 74 % |

Table No, 12 show that (74 %) SST were said 'Yes' that biology laboratories have balance in their schools.

## CONCLUSION

On the basis of analysis, it was concluded that biology labs have enough space, light, proper hygiene, experimental tables, whiteboards, safety kits, microscopes, beakers, test tubes, funnels, magnifiers, and balances.

## Recommendations

On the basis of conclusion, it was recommended that biology laboratories be upgraded according to the teachers & students' needs on a regular basis. Furthermore, Teachers & students may be properly trained to use laboratory items.

## References

Burbules, N.C. & Linn, M.C. (1991) Science education and philosophy of science: Congruence or Contradiction? International Journal of Science Education13 (3).

Domin, D.S. (1999) A review of laboratory instruction styles, Journal of Chemical Education76 (4).

Giddings, G.J. Hofstein, A. & Lunetta, V. (1991). Assessment and evaluation in the Science Laboratory. In B.E.Woolnough (Ed.), Practical Science, The role and reality af practical work in school science (pp.167-177). Philadelphia: Open University Press.

Gmdner, P. &. Gauld, C. (1990). Lab work and Students' attitude. In E. Hegarty-Hazel (Ed.). The Student Laboratory and the Science Curriculum (ppl32-1 59). London: Routledge.

Gmdner, P. &. Gauld, C. (1990). Lab work and Students' attitude. In E. Hegarty-Hazel (Ed.). The Student Laboratory and the Science Curriculum (ppl32-1 59). London: Routledge..

Harlen, W. (1999) Effective Teaching of Science, Edinburgh: Scottish Council for Research in Education.

Hofstein, A. and Lunetta V. N. (1982) the role of the laboratory in science teaching: neglected aspects of research, Review of Educational Research 52(2).

ISSN Online: 3007-3154
ISSN Print: 3007-3146



Hodson, D. (1996) Laboratory work as scientific method: three decades of confusion and distortion. Journal of curriculum studies 28(2).

Hegarty- Hazel, E. (1990) Overview. In E. Hegarty- Hazel (Ed.) the Student Laboratory and the Science Curriculum. London, England: Rutledge.

Joshi, S.R. (2008). Teaching of Science. New Delhi: APH publishing cooperation.

Millar, R. (2004) The Role of Practical Work in the Teaching and Learning of Science. Paper prepared for the committee: High School Science Laboratories: Role and vision, national academy of science. Washington Dc. York: University of York.

White, R.T. (1996) the link between laboratory and learning, International Journal of Science Education 18(7).

Tamir, P. (1977) how are Laboratories Used? Journal of research in science teaching, 14(4) Retrieved 2014-08-05 fromhttp://onlinelibrary. Wiley .com/.

Johnstone, A. H. & Al-Shuaili, A. (2001) Learning in the Laboratory: Some thoughts from the Literature. U. Chem. Ed. 5(2).

Linn, M. C. (1977) Scientific reasoning: Influences on Task Performance and Response Categorization. Science Education 61(3).

Tobin, K.G. (1990) Research on science laboratory activities: in pursuit of better questions and answers to improve learning, School Science and Mathematics 90(5).

Schunk, D. H. (2012) Learning Theories; an Educational Perspective. Boston: Pearson Education, Inc.

Woolnough, B. E. (1991) Setting the scene. In B. E. Woolnough (Ed.), Practical Science. Milton Keynes: Open University Press.

Young, J. A., Malik, j. G., Hutton, William, Shurvell, H. F. Dessel, Norman (1968) Chemical queries. Especially for High school Teachers, journal of Chemistry education 45(4).