



## PHYSICS LABORATORY COMPETENCE AND ACADEMIC ACHIEVEMENT IN PHYSICS

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**Paper Received On:** 25 NOV 2022

**Peer Reviewed On:** 30 NOV 2022

**Published On:** 1 DEC 2022

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### Abstract

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*The main purpose of the paper is to explore the relationship between Physics Laboratory Competence and Academic Achievement in Physics among Higher Secondary students. The sample of the study comprises of 300 school students (150 male and 150 female) of Higher Secondary class were selected. Normative survey method was employed for data collection. The investigator modified and used the Tool – of Dr. Meena BuddhisagarRathod,RenuMoyadeKotwale(1971). There is no significant relationship between Physics Laboratory Competence and Academic Achievement in Physics. There is no significant difference between male and female Higher Secondary students in Physical Laboratory Competence and Academic Achievement. There is no significant difference in Physics Laboratory Competence based on school type. There is significant difference in Academic Achievement based on school type. There is no significant difference in Physics Laboratory Competence, Academic Achievement based on Father's occupation. There is no significant difference in Physics Laboratory Competence, and Academic Achievement based on Mother's occupation*

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### 1. Introduction

Laboratory work is essential in the study of science (physics). A Physics Laboratory is a workshop for physicist. Here students learn the techniques of the preparation, identification and estimation of physical apparatus. The primary goals of introductory laboratories have been evolving over the past century. The current impetus for changes in laboratory instructions stem form new research on students' learning and technology, as well as changes in overall goals of instructors. The purpose of this document is to develop a set of

common goals for laboratory instructions that can serve as a guide to those responsible for designing and evaluating introductory physics laboratory programs.

## **2. Physics Laboratory Competence And Academic Achievement In Physics**

Physics Laboratory is a place where experiments of Physics are carried out. Physics is that branch of science where experimentation is an integral part of the core subject. Almost in every educational institution, these physics laboratories are found. It gives students first-hand experience and offers better opportunities for learning. A laboratory is not a contest whose object is to get the “right answer”, but the purpose is to learn how to gain knowledge, how to observe and to learn the meaning of what happens. The General-Purpose Wet Laboratory (Clean) is a multi-purpose laboratory where samples can be processed under clean conditions, data recorded and analysed. It is typically used for plankton sampling and other science sampling (no mud or biological spillage). Various studies revealed positive relationship between practical work and academic achievement in learning physics education. A Physics lab aids a student in establishing the relevance of the theory. It brings clarity in the mind of the students regarding the basic concept of the subject. Students understand the difference between theory and application. Physics laboratory helps a student in improvising their approach towards the subject. Using adequate and suitable laboratory equipment to teach Physics will help to improve Academic achievement in physics.

## **3. Need for the Study**

The study is to identify knowledge level and awareness among the students about handling the apparatus, knowing the effects and defects of the physical components, provide experience to acquire skills and help students to achieve their academics also.

## **4. Statement of the Problem**

The problem of the study is stated as “Physics Laboratory Competence and Academic Achievement in Physics among Higher Secondary students”

## **5. Research Questions**

The following research questions were formulated to guide this study.

- Is there any significant relationship between Physics Laboratory Competence and Academic Achievement in Physics.
- Is there any significant difference between male and female higher secondary students in Physics Laboratory Competence and Academic Achievement in Physics.

- Are there any significant difference among the students studying in Government, Government aided and Private schools in Physics Laboratory Competence and Academic Achievement in Physics.
- Is there any significant difference between students whose father or mother belongs to science and non-science occupation.

## **6. Methodology**

Normative survey method is used for this study. The subjects for the study were 300 students drawn from Government and government Aided and Private Higher secondary students in Chennai district.

## **7. Instrumentation**

- The investigator modified the scale of Dr. Meena Buddhisagar Rathod, RenuMoyadeKotwale for Physics Laboratory Competence and Academic Achievement in Physics .
- The tool consists of 27 items. There is five sections (A, B, C, D, E) and developed on 4 scale response category (a,b,c,d).
- The reliability value is calculated using Cronbach's Alpha method. The index of validity has been computed by finding the square root of validity and has been found be 0.855 and hence the scale is considered to be having high reliability and validity.
- Physics Quarterly marks of the Higher Secondary students were taken for Academic Achievement in physics.

## **8. Data Analysis**

Data collected form the subjects were subjected to appropriate statistical analysis to draw up inferences from it. 't' test, ANOVA were used for data analysis.

## **9. Answers to Research Questions**

Research question 1: Is there any significant relationship between Physics Laboratory Competency and Academic Achievement.

**Table 1: Showing the relationship between Physics Laboratory Competence and Academic Achievement.**

Variable	Physics Laboratory Competency	Academic achievement
Physics Laboratory Competency	1	.019
Academic Achievement	.019	1

*Correlation is not significant at 0.01 level.*

The calculated ‘r’ value in the above table shows that there is no significant relationship between Physics Laboratory Competence and Academic Achievement in Physics.

Research Question 2: Is there any significant difference between male and female higher secondary students in physical laboratory competency and academic achievement.

**Table 2: Showing the mean difference between male and female higher secondary students in physical laboratory competency and academic achievement.**

Variable	Gender				t value	Level of significance
	Male		Female			
	Mean	SD	Mean	SD		
Physics Laboratory Competency	27.733	.901	27.79	.571	.684	NS
Academic achievement	63.22	14.64	65.61	19.47	1.206	NS

*Note: NS- Not Significant*

It is inferred from the above table value that there is no significant difference between male and female Higher Secondary students in Physical Laboratory Competence and Academic Achievement.

Research Question 3: Is there any significant difference between students based on school type in Physics Laboratory Competency and Academic Achievement in Physics.

**Table 3: Showing the mean difference between school type among Higher Secondary students in Physical Laboratory Competency and Academic Achievement in Physics**

		Sum of squares	Difference	Mean square	F	Level of significance
<b>Physics laboratory competency</b>	<b>Between groups</b>	1.348	2	.674	1.12	NS
	<b>With groups</b>	170.8	297	.575		
	<b>Total</b>	172.19	299			
<b>Academic achievement in physics</b>	<b>Between groups</b>	16478.95	2	8239.4	33.801	S**
	<b>Within groups</b>	72397.9	297	243.76		
	<b>Total</b>	88876.9	299			

Note: \*\*Denotes significant at 0.01 level

NS-Not Significant

It is inferred from the above table value that there is no significant difference in Physics Laboratory Competence based on school type. There is significant difference in Academic Achievement based on school type.

4. Is there any significant difference among students based on father's occupation.

**Table 4: Shows the significant difference among students based on father's occupation**

<b>Variable</b>	<b>Father occupation</b>				<b>t value</b>	<b>Level of significance</b>
	<b>Science</b>		<b>Non-Science</b>			
	Mean	SD	Mean	SD		
<b>Physics Laboratory Competency</b>	27.88	.471	27.75	.773	.723	NS
<b>Academic Achievement</b>	27.55	.773	65.61	19.47	1.110	NS

Note: NS-Not Significant

It is inferred from the above table value that There is no significant difference in Physics Laboratory Competence and Academic Achievement based on Father’s occupation.

5. Is there any significant difference between among students based on father’s occupation.

**Table 5: Shows the significant difference among students based on mother’s occupation**

Variable	Father occupation				t value	Level of significance
	Science		Non-Science			
	Mean	SD	Mean	SD		
<b>Physics laboratory competency</b>	27.42	1.91	27.78	.5892	2.108	NS
<b>Academic achievement</b>	77.142	15.71	63.4	16.99	3.576	NS

NOTE: NS-Non Significant

It is inferred from the above table value that There is no significant difference in Physics Laboratory Competence and Academic Achievement based on Father’s occupation.

### 10. Educational Implications

The study has indicated about appropriate steps to be taken for learner’s motivation and learners’ high participation in learning situations. Students learning to appreciate and impact, emulate the role of the scientist through acquisition Physics Laboratory Competence and Academic Achievement of manipulative skills. The students should be allowed to investigate by:

- (a) Indirect observation of objects and materials for the acquisition of mental as well as manipulative skills, example measuring substances, using weighing balances pictures, cylinder, etc.
- (b) Through multiple trials, students can in the process of fiddling with materials and activities without stated theories arrive at useful conclusions.
- (c) Given a known theory, students can be guided to observe some phenomena selected by the teacher and from such observation make predictions that are likely to occur.

## **11. Conclusion**

The lab space has to be used optimally to satisfy all the needs. It is important that needs are met in a way that the lab does not look cluttered and cramped. In fact, a general physics lab should look spacious, airy, well-lit and neat. The windows in the lab allow in light and air to make the lab well-lit and well-ventilated. Maintaining cleanliness in the lab and arranging things neatly will be your job.