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A Comparative Study of Using Science Subjects Laboratories between Public and Private Preparatory Schools in Soran Administration

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ABSTRACT:

the present study aims to compare the extent of using science subjects' laboratories in public and private preparatory schools of Soran administration during the academic year (2021-2022). The study population was all science subjects' teachers of preparatory schools in Soran administration. The sample was 115 science teachers in preparatory public and private schools with science laboratories. The sample was selected purposely, 91 science teachers in public preparatory schools and 24 science teachers in private preparatory schools. To achieve the objectives of the study, A likert-scale questionnaire of 49 items was designed as a tool for data collection The validity and reliability of the study tool have been conducted. After obtaining the data from the questionnaire, inferential statistical analysis was implemented by using a One-sample and Two-sample T-test. The study results have revealed that science teachers of public and private preparatory schools believe that using laboratories in teaching science subjects is crucial. However, private schools' science teachers prefer using laboratories more than public schools' science teachers. Besides, there is a significant difference between public and private schools in using science subjects' laboratories, while the extent of using science subjects' laboratories in private preparatory schools is more than in public preparatory schools of Soran administration. Based on the study results, the researchers have recommended that the Ministry of Education needs to provide materials and essential facilities for Soran public schools' laboratories and provide training courses for science teachers to learn how to utilize laboratories effectively and properly. Furthermore, the researchers have recommended that science teachers need to incorporate practical activities in their lessons and benefit from daily and simple materials to conduct scientific experiments.

Keywords: Laboratories, Science Subjects, Preparatory Schools, Public Schools, Private Schools.

1.1 Introduction

The primary goal of science education is to make students develop cognitive capacities such as self-directed learning, problem-solving skills, critical thinking, and decision-making. So, this goal can only be fulfilled if students are actively engaged in the teaching-learning process via activity-based, functional instructional approaches that include laboratories utilization (Osuafor and Amaefuna, 2016). The science curriculum should allow students to practice and to investigative methods in a physical environment, including working in well-equipped and encouraged laboratory conditions. Practical activities are crucial in all levels of understanding of science; especially, at high schools to assist students in internalizing and comprehending the theoretical knowledge of science subjects (Zengele and Alemayehu, 2016).

Many researchers suggest that engaging students in scientific laboratories for practical activities improve their learning and comprehension of science. Laboratories have been assumed as a key and unique position in scientific teaching. Science teachers have indicated that using scientific laboratories provides many advantages in studying science (Muleta and Seid, 2016).

The scientific laboratory directly impacts both academic achievement and students' attitudes. It is often assumed that consistent practice leads to mastery of what the student learns in the classroom; therefore, the dictum "practice makes perfect." The quality of teaching and learning experiences is determined by the suitability of laboratory facilities in preparatory schools and the teacher's efficiency in using laboratory facilities to enable and offer meaningful learning to the learners (Pareek, 2019).

A school laboratory should be well-equipped with the tools needed to conduct relevant experiments. Even though laboratories offer several advantages, from making learning tangible to providing a foundation for science instruction, many students were disallowed such chances (Daba *et al*., 2016). Moreover, sometimes students have a problem in interacting with phenomena and materials to improve the meaningful learning process (Nyanda, 2011). Besides, teachers face obstacles when teaching in the laboratory, for example, insufficient subject information, inappropriate use of instructional methods, and laboratory facility limitations. A hands-on laboratory method has several limitations, including a lack of laboratory resources, restricted time for experiments, financial problems, and safety concerns (Kapici and Akçay, 2018).

Basic and preparatory education is strongly linked to institutions divided into public and private schools. The whole global education system revolves around individuals' academic success, and parents want their children to reach high levels of intellectual accomplishment. These goals make public and private schools more competitive. The trend of sending children to private schools is constantly expanding; even poor families want to send their children to private schools (Shabbir *et al*., 2014). Private schools have become more popular and exciting due to their superior education systems and knowledge generation compared to public schools, which are relatively inexpensive but inefficient. Parents prefer to send their children

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to private schools instead of public schools (Awan and Zia, 2015). This study aims to identify the use of science laboratories in public and private schools in the Soran region and the availability of physical facilities and relevant resources.

1.2 The Research Objectives

The current study objectives are:
1. identifying the extent of using laboratories in teaching science subjects from teachers' point of view in public schools in Soran city.
2. identifying the extent of using laboratories in teaching science subjects from teachers' point of view in private schools in Soran city.
3. investigating the difference between Soran public and private preparatory schools in using laboratories from a science teachers' point of view.

1.3 The Research Questions

The following are the research questions:
1. To what extent do teachers use laboratories to teach science subjects in Soran city public schools?
2. To what extent do teachers use laboratories to teach science subjects in Soran city private schools?
3. What are the differences between Soran public and private preparatory schools in using laboratories?

1.4 Problem Statement

In general, the education system in the Kurdistan region has many problems in the teaching and learning process. This study intended to reveal the issues related to the science subjects and use laboratories in Soran administration. Even though laboratories offer several advantages ranging from making learning tangible to providing a foundation for science instruction, students were disallowed those chances. Since science is a practical subject, it is difficult to teach and learn science without a science laboratory.

According to the researcher's experience as a science teacher in a public school for almost one year, students always claimed that science subject is complex, and they cannot understand science concepts, knowledge, and the nature of science. But when they were asked to practice and work in the laboratories, they were excited and curious doing activities and using materials. In contrast, most students in private schools are interested in science subjects, and their degrees are better than public students. Moreover, in a public school in Soran, even science teachers did not care about science laboratories and did not know how to use them. Besides, the researcher faced many difficulties in teaching science without a laboratory because most science topics need practical work.

Above and beyond, there is an excellent trend in private schools in Kurdistan. Most parents send their children to private schools rather than public schools. When asked why they prefer private schools, they answered that private schools are better than public schools, but they did not have any evidence. Due to these problems and the lack of comparative research between public and private schools in the Kurdistan region, the present study is conducted.

1.5 Significance of the Research

The significance of the present study lies in the following points:
1. The results of the present study are expected to be valuable to policymakers, academics, science teachers, and educational institution administrators.
2. Since there has been no research conducted in Soran administration to compare public and private schools using science laboratories, the present study is expected to bridge this gap.
3. A remarkable difference between this study and any previous studies is that it focused on only using the laboratories in preparatory public and private schools and the viewpoint of science teachers on it.
4. The results of this study are expected to encourage the government to put more effort into constructing laboratories and equipping them with the required materials.
5. The researchers also believe that the results will be relatively helpful in treating this ignored subject. The Ministry of Education also can take advantage of this research.
6. The researchers believe that the results will show the differences between public and private schools. It will also indicate differences between their laboratories and perceptions of the teachers on using them.

1.6 The scope of the study

The current research dealt with the circumstances of public and private preparatory schools in using science subjects' laboratories. The focus of the study was on the availability and utilization of laboratory materials and resources. The current research was limited to investigate the use of the laboratories in preparatory schools in Soran administration because the setting of this study is exclusive to Soran administration, and it cannot be applied across the country.

1.6.1 Subject matter

The current research intends to detect the extent of using science subjects' laboratories in public and private schools in four districts of Soran city from the viewpoint of teachers of science subjects.

1.6.2 Human scope

The human scope of the current research consists of all science teachers (Biology, Chemistry, and physics) of public and private preparatory schools who have laboratories in their schools.

1.6.3 Time frame

The time frame of this research is between (2021-2022).

1.6.4 Territory

The scope of this research is all preparatory schools, which have scientific laboratories, in four districts of Soran city (City Center, Rawanduz, Mergasor, and Choman).

1.7 Definitions of Key Terms

1.7.1 A laboratory is a place with materials and facilities where students and teachers practice science. Students conduct experiments and observations to solve the problems given by teachers, which promotes creativity and curiosity toward science subjects and makes them discover solutions for such problems (Isozaki, 2017).

A laboratory is a learning experience where students engage with models and materials to investigate and understand the natural environment (Hofstein and Lunetta, 2004).

The researchers define a laboratory as a place with scientific materials and resources for each science (biology, chemistry, and physics). Students practice and experience the knowledge they have learned theoretically. Thus, they comprehend science better and become more interested in science subjects.

1.7.2 Science Subjects: science is a practical subject, such as Biology, Chemistry, and Physics (Zengele and Alemayehu, 2016).

Science Subjects are hands-on subject in which both the teacher and the students engage in a frequent practical activities (Osuafor and A. Amaefuna, 2016).

The researchers define science as the most important subject because it makes students comprehend nature, their creation, the variety of animals, plants' composition, and their environments.

1.7.3 Preparatory Schools: They consist of preparatory stages, which are (10-11-12) stages. They have scientific and literature branches; they have different curricula. Each of these stages is composed of two semesters. After passing these

semesters successfully, students can go to university (Ministry of Education, 2015, p.16).

The researchers define preparatory schools as the schools that have only (10-11-12) grades, and this stage is called preparatory, Students at this stage are equipped with required knowledge to get ready to join university.

1.7.4 Public Schools: This type of school includes community-owned schools, and it obtains support and funding from the government, mainly for teachers' salaries and providing necessary materials (George and Kolobe, 2014).

Public schools are also called government schools because they are owned, funded, controlled, and administered by the government and have limited flexibility (Härmä, 2011).

The researchers define public schools as those schools that are entirely managed by the government, and they have to follow the instructions of the Ministry of Education.

1.7.5 Private Schools: They are schools that are managed by a private group but get the common of their financing from the government. It relies heavily or entirely on personal resources and investment (Donkers and Avram, 2009).

Private schools are self-supporting schools, depending on the tuition provided by students, and are owned by private individuals or private well-being foundations in some situations (Shabbir *et al.*, 2014).

The researchers define private schools as schools that are managed independently without government funding. They have their curriculum and rules, which differ from public schools.

1.7.6 Soran Administration: is an independent administration consisting of four districts; Soran city, Rawanduz, Mergasor, and Choman. On 14 December 2021, it was decided to become an independent administration. It includes 13 sub-districts and 798 villages. According to the population projection of (2020), the population of this administration has reached 340,970 people (Gundazhori, 2021).

2.1 Literature Review

A high level of research in the world has been conducted regarding; the importance of using laboratories in science subjects and comparing private and public schools in the availability of facilities and materials for teaching and learning science subjects. Also, some studies are about neglecting laboratories by teachers and educational administrations. The following are some examples of the studies investigated this field:

Townsend (2012), in his research, intended to identify the effects of laboratory activities on students' attitudes toward science subjects in the United States of America. A survey design was used, and a questionnaire form and interview as research tools were utilized. It was given to 5th- grade students, (25) students as pre and (26) students as post, to collect their science information and identify the types of laboratory experiments during science classes. Another questionnaire was given to 80% of 4th-grade teachers at Montana State University. The study took five months and 45-minute studying science each day. The data from teachers were compared to students' interviews to determine their perceptions of the effects of the scientific laboratory. The basic descriptive analysis, such as percentages, was used to analyze the data. Consequently, according to the data, there was evidence of the significant role of using science laboratories. After working in labs, many students changed their idea about science subjects and became more enthusiastic and engaged with science.

Iqbal (2012), in his study, aimed to compare public and private schools in physical facilities provided in those schools, leaders' leadership styles, and management practices in Lahore city, Pakistan. Interviews for each stakeholder, observation, and document analysis were used as research tools for collecting data. The samples had been chosen as a case from three public and three private schools in this city. They were students of 9th and 10th classes and their parents, teachers, and secondary school principals. 96 interviews were conducted, 48 interviews in public schools and 48 in private schools. Qualitative analysis methods were used to analyze the data. The results reveal that public schools offer better facilities, larger buildings, and more qualified teachers in comparison to private schools. Private school administrators and teachers wished to transfer to public schools. It is also recommended that the government should obligate the private sector to offer identical infrastructure and facilities to students as public schools provide.

Olasehinde and Olatoye (2014) compred students' science achievement in public and private secondary schools in Katsina State, Nigeria. A descriptive survey was performed, and a science achievement test was used as a research tool. The samples were randomly selected, 204 senior secondary school students participated in the survey. T-test was used as a statistical treatment for analyzing the data. The result showed a significant difference between public and private secondary schools in students' science achievement, and private school students performed meaningfully better than public school students.

Awan and Zia (2015) conducted a comparative analysis of public and private schools. They aimed to explore why parents prefer to send their children to private schools over public schools. This study was done in District Vehari, Pakistan. A descriptive survey design was used, and they collected data by designing four different questionanires. The study sample consisted of 880 participants, including 360 students, 220 teachers, 220 parents, and 80 administrators from 90 private and public schools randomly selected. They consisted of students, teachers, the administration of the schools, and parents. They were distributed into two groups; one of them was in private schools, and the second one was in public schools during the academic year 2014. The data were analyzed via statistical methods such as linear regression and ANOVA. Consequently, there were many reasons for choosing private schools, one of them was the perception of parents about the private schools' quality and availability of learning facilities tools.

Dickson et al. (2015) conducted a comparative study between public and private schools in practicing science classrooms in Abu Dhabi, United Arab Emirates. They intended to investigate the science teachers' point of view about using laboratories in both types of schools. The study was descriptive, and the survey was implemented. 248 public school teachers and 66 private school teachers have been asked about practicing science subjects in the classrooms, such as inquiry-based learning strategies, hands-on student-centered approach to learning science, and how to apply science in real life. A two-tailed T-test was used to analyze the data. According to the result, there was a big difference between teachers' responses in public and private schools.

Dickson et al. (2016) studied public school science teachers' classroom practices and correlate belief statements about science teaching and learning. This study was done in Abu Dhabi, United Arab Emirates. A four likert scale questionnaire was employed as a research tool. The sample consisted of science teachers, and their number was 248 teachers in 60 public schools. The Correlation-Coefficient was used as a statistical treatment. The results showed that the overwhelming majority of those who expressed attitudes in science was consistent with acknowledged "best practices," such as the importance of students learning independently and via inquiry-based methods to learning. But there was only a low statistical correlation between their views and scientific classroom practices. It is due to restrictions such as a lack of resources and skilled science lab assistants, which they perceive as preventing them from practicing their science teaching and learning ideas.

Nigussie et al. (2018) conducted a study to evaluate the challenges of implementing laboratories in teaching biology,

chemistry, and physics in some preparatory schools in North Shewa Zone, Ethiopia. The questionnaire and observation were used as study tools. The sample was a total of 8 male laboratory technicians, 8 male school principals, 28 biology teachers (20 males and 8 females), 17 chemistry students(12 males and 5 females), 26 physics teachers (24 males and 2 females) filled the questionnaire. Furthermore, 104 biology students (55 males and females), 78 chemistry students(41 males 37 females), 112 physics students (61 males and 51 females) participated in the study. The data collected from the participants were put into Excel, then Microsoft Excel was used to manipulate the data in the form of figures and tables. The study found that all schools 100% have laboratories for each subject. However, those labs had a deficiency in materials and chemicals, and students were interested in learning practically all science subjects.

Duban et al. (2019) aimed to study primary school teachers' opinions on the practices of science laboratories in Turkey. The study was phenomenological design as a qualitative method, and a semi-structured interview was implemented as a research tool. The study sample was 18 classroom teachers, including six class teachers working in public schools with 8 to 30 years of experience. Nine participants were females, and the rest were males. Qualitative data analysis was carried out to evaluate the data (grouping the codes of the data into themes). Subsequently, some teachers stated that their schools did not have science laboratories, but some said they had some materials kept in the school's storage room. Some teachers used the materials vigorously in their classes. Moreover, most teachers preferred working in primary school because equipped with laboratories and materials. Finally, teachers stated that using laboratories in science subjects could benefit both teachers and students.

3. Methodology

3.1 Targeted Population and Samples

The targeted population of this research is all science subjects (Biology, Chemistry, Physics) teachers of public and private preparatory schools in four districts of Soran administration. The researchers obtained the data from the education directorate of each district and asked them if any school manager requested to provide laboratories and materials for their schools Unfortunately, their ans there was no request for laboratories in Soran and Choman education directorate; some little desires in Rawanduz education directorate; in contrast, almost all school managers had asked for providing laboratories in Mergasor education directorate.

For the reliability of the data, the researchers wanted to know from each school manager whether they have laboratories or not, the number of laboratories they have and the number of science teachers at their schools in all stages(10,11,12). these data are shown in Table (3.1). The number of the population is 236, and the number of science teachers in those schools is 159.

Table (3.1): Population of the Study.

Ser	Education Directorate	Number of Preparatory Schools	Public	Private	Schools with Labs	Science Subjects Teachers	Science Subjects Teachers (With Labs)
1	Soran	63	59	4	14	130	90
2	Rawanduz	16	16	0	4	27	19
3	Mergasor	29	29	0	9	44	27
4	Choman	18	18	0	7	35	23
Total	**4**	**126**	**122**	**4**	**34**	**236**	**159**

The study sample includes those preparatory science teachers who have laboratories in their schools. The sample was chosen purposely from 30 public and 4 private schools. The number of participants is 115 science teachers (91 teachers from public schools and 24 teachers from private school) (See Table 3.2).

Table (3.2): The Sample of the Study.

Ser	Education Directorate	Number of Preparatory Schools	Public	Private	Number of the Sample	Number of the Sample in public schools	Number of the Sample in private schools
1	Soran	14	10	4	59	35	24
2	Rwandz	4	4	0	15	15	0
3	Mergasor	9	9	0	25	25	0
4	Choman	7	7	0	16	16	0
Total	**4**	**34**	**30**	**4**	**115**	**91**	**24**

3.2 Methods and Tools of Data Collection

In the current research, a quantitative survey design has been conducted. To achieve the objectives and find answers to the questions of the study, the researcher and the supervisor designed a likert- scale questionnaire form. It was directed to the science subjects' teachers of public and private preparatory schools in four districts of Soran administration.

3.2.1 Data Collection Tool

A likert-scale questionnaire of 70 items in the initial form was designed by the researchers for data collection from the study sample.

The questionnaire consists of two parts; the first part includes demographic variables (name of school, types of school, gender, and specialty). The second part consists of items related to using laboratories, availability of teaching aids within labs, and teachers' point of view on the using laboratory. The second form of the tool is the five-point Likert scale, as shown in Appendix (A).

3.2.2 Scale of Measurement

In the current research, the Likert scale was used to answer the items of the questionnaire , and it consisted of five options (Always, Extremely, Sometimes, Rarely, and Never). The answers were coded by numerical values of 5,4,3,2,1,

respectively. The minimum score was 132, and the maximum score was 215. The overall score of the questionnaire was (177.6).

3.3 The Validity and Reliability of the Tool

3.3.1 The validity of the Research Tool

The validity of a measuring instrument refers to the degree to which it measures what it is designed to measure. It is also the degree to which the results are truthful (Thatcher, 2010). Validity tests are mainly classified into content validity, face validity, construct validity, and criterion-related validity (Taherdoost, 2018). In the current research, face validity has been used. The researcher presented the initial outline of the research tool to a number of experts in the field. They evaluated the research tool regarding which item matches the scale or not and the clarity and integrity of the items.

The experts agreed with most of the items, but most of them noted that the number of items is extremely high. So, they recommended reducing the number of items according to the researchers' opinions. They decided to eliminate some items. After considering their suggestions, Chi-square was done by Statistical Package for Social Science (SPSS-25) program for the tool's validity. Subsequently, the number of items in the final form was reduced from 70 to 49, as shown in Appendix (A).

3.3.2 Tool Reliability

Reliability is a term related to the stability, consistency, and repetition of outcomes. For instance, a researcher's result is reliable or unbiased if consistent results are similar but in different situations (Twycross and Shields, 2004). There are two main methods to test reliability; test-retest reliability and parallel-form reliability (Richard et al., 2013). The reliability coefficient achieved by repeating the same test for the second time is referred to as test-retest reliability (Mohajan, 2017). In the current research, test-retest reliability has been used.

To reveal the stability of the test, two weeks after the first application, the researcher repeated the same test on the 18 science teachers, which excluded (outside) the sample. It was in 5 different schools in the Soran district. Then, the Pearson correlation coefficient was done by Statistical Package for Social Science (SPSS-25) program. The reliability scores of each two forms of the same respondent were calculated. Finally, the reliability of the test was 0.92, as shown in Figure (3.1). So, it means that the scale was at a high level of stability.

Correlations

		Test	Re-test
Test	Pearson Correlation	1	.925**
	Sig. (2-tailed)		.000
	N	18	18
Re-test	Pearson Correlation	.925**	1
	Sig. (2-tailed)	.000	
	N	18	18

**. Correlation is significant at the 0.01 level (2-tailed).

Figure (3.1): The reliability result

3.4 Method of Data Analysis

Descriptive and inferential statistical methods have been conducted to achieve the current study's objectives and test the questions. Descriptive statistics was performed after organizing and summarizing the data obtained from the questionnaire forms. This method was used in percentages, graphs, means, and standard deviations. Moreover, a normal distribution curve was conducted as well. Inferential statistics has been used to obtain each objective and answer each research question.

3.5 Research Procedures

The current study was conducted through many steps. First, the researcher directed four facilitation requests from the Faculty of Education of Soran University to the directorates of education of the four districts of the Soran administration. To obtain data about the numbers of science teachers and the number of public and private preparatory schools, which have laboratories for science subjects, and to get a permit for visiting the schools and administering the survey in the schools. The researchers asked all those schools' managers to reveal the stability and reality of the data, as mentioned above.

Then after obtaining the required data, the researchers designed a questionnaire and presented it to some experts in the field to check the suitability of its items for the current study. After validation, the questionnaire was administered to 18 science teachers twice outside the sample at two different times, which was two weeks, to ensure stability and reliability of the scale. Besides, after the validity and reliability of the study tool, the questionnaire was distributed to the sample, which was 91 science teachers in public schools and 24 science teachers in private schools who use laboratories in their schools. The researchers explained the aims and objectives of the study to them before filling out the questionnaire and answering their items. Finally, all the data obtained from the participants were summarized and collected in data code in the Excel sheet. The Statistical Package for Social Science (SPSS-25) program was used to analyze, interpret, and calculate the data.

4. Results and Discussion

4.1 The Distribution of the Respondents Based on Specialty

In the survey of the current research, four specialties of science subjects' teachers participated. Figure (4.1) states the number of participants in each science specialty in public and private schools in Soran administration.

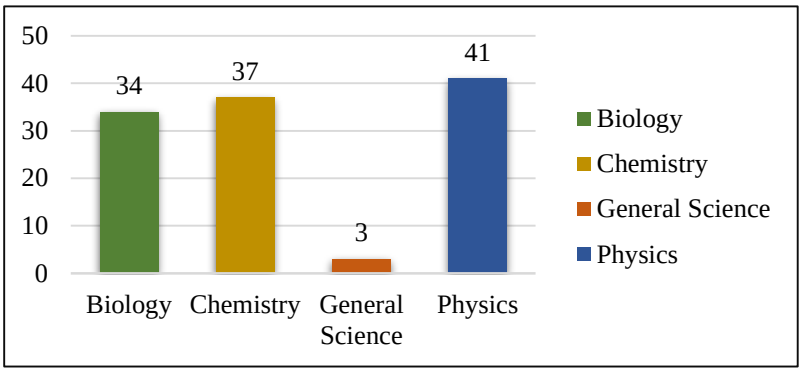

Figure (4.1): Distribution of the sample based on specialty (by researchers)

4.2 Normal Distribution

Before analyzing the results of the application of the research tools, the distribution shape of the data obtained as a result of the application of the research variable measurement tool should be known. Accordingly, the researchers inserted the data into statistical analysis to identify the form of the normal distribution. Table (4.1) shows the values of statistical analysis to identify the shape of the data distribution for scale (Using Science Subjects Laboratories in Preparatory Public and Private Schools of Soran Administration). Furthermore, Figure (4.2) shows the form of the data distribution of the study sample according to the scale.

			Statistic	Std. Error
Total	Mean		177.6783	1.91778
	95% Confidence Interval for Mean	Lower Bound	173.8792	
		Upper Bound	181.4774	
	5% Trimmed Mean		178.1135	
	Median		180.0000	
	Variance		422.957	
	Std. Deviation		20.56592	
	Interquartile Range		32.00	
	Skewness		-.413	.226
	Kurtosis		-.742	.447

Table (4.1): Using science subjects laboratories in preparatory public and private schools of Soran administration.

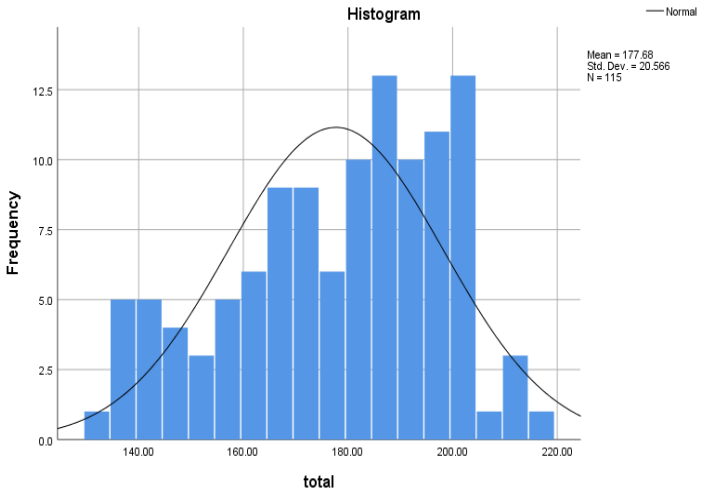

Figure (4.2): Distribution of the sample members according to the scale

To accomplish the first objective, the sample mean was calculated, which was found to be 175.41 The standard deviation is 21.21 then after comparing it with the hypothetical mean of 147. Besides, the researchers used the t-test to indicate the differences between the sample and the community (One Sample T-test). The results indicated that the calculated t-value amounted to 78.88 compared with the schedule t-value of 1.671 Thus, there are statistically significant differences at the significance level 0.05 and the degree of freedom 90 Table (4.2) shows these results.

Thus, from the data presented in table (4.1) and figure (4.2), which were shown above, it is clear that the degrees of the research sample are distributed moderately. Accordingly, the researchers must use parametric inferential statistical methods.

4.3 Results of Statistical Analysis

4.3.1 Result of the First Objective

To identify the extent of using laboratories in teaching science subjects from teachers' point of view in public schools in Soran administration.

Table (4.2): One-Sample T-test for viewpoints of science teachers in public schools of Soran administration

Arithmetic Mean	Hypothetical Mean	Standard Deviation	Calculated T value	Schedule T value	Number of the Sample	Degree of Freedom	Significance Level at (0.05)
175.41	147	21.21	78.88	1.671	91	90	Significant

The result of the first research question (To what extent do teachers use laboratories to teach science subjects in Soran city public schools?) reveals that science teachers of public preparatory schools in Soran administration prefer to teach science subjects in the laboratories. It also shows that this teaching method is beneficial and crucial for preparatory students in those teachers' opinions. As described above, teaching and learning science are more entertaining and enjoyable in laboratories than in regular classes. Moreover, as the result of learning from experience and engaging with science subjects in labs, students' science achievement will be improved, as it is applied in many developed countries. This result does not correspond with (de Borja, 2020; Dickson et al., 2016; Duban et al., 2019) from previous studies. These three previous studies found that in public high schools, laboratory activities have not been performed because of insufficient space to do experiments and a lack of resources and skilled science lab assistants.

4.3.2 Result of the Second Objective

To identify the extent of using laboratories in teaching science subjects from teachers' point of view in private schools in Soran administration.

To attain the second objective, the sample mean was calculated, which was found to be 186.25, with a standard deviation of 15.45 then after comparing it with the hypothetical mean of 147 Furthermore, the researcher used the t-test to indicate the differences between the sample and the community (One Sample T-test). The results showed that the calculated t-value amounted to 59.04 compared to the scheduled t-value of 1.711 Accordingly, there are statistically significant differences at the significance level 0.05 and the degree of freedom is 23 Table (4.3) shows these results.

Table (4.3): One-Sample T-test for viewpoints of science teachers in private schools of Soran administration

Arithmetic Mean	Hypothetical Mean	Standard Deviation	Calculated T value	Schedule T value	Number of the Sample	Degree of Freedom	Significance Level at (0.05)
186.25	147	15.45	59.04	1.711	24	23	Significant

According to the result of the second research question (To what extent do teachers use laboratories to teach science subjects in Soran administration private schools?), private schools science teachers prefer using laboratories in their teaching process. They believe that using labs is suitable and accessible with the current science concepts and educational process, and all scientific theories insist on teaching science practically. Since laboratories materials are quite helpful to enhance students' learning of science subjects, science needs more focused and critical thinking. This result corresponds with Duban et al. (2019) from previous studies, who found that most teachers prefer using laboratories in science subjects, and they said it could be beneficial for both teachers and students. In contrast, the result of the second question does not correspond with those obtained by De Borja(2020), Dikson et al. (2016)

4.3.3 Result of the Third Objective

To investigate the difference between Soran public and private preparatory schools in using laboratories from a science teachers' point of view.

To achieve the third objective, the researchers calculated the arithmetic mean of teachers in public and private schools. The results showed that the arithmetic mean of the degrees of science teachers in public schools reached 175.42, and a standard deviation of 21.21 In contrast, teachers of science subjects in private schools calculated arithmetic mean was 186.25 with a standard deviation of 15.45 So, the researcher has used these results in calculating the differences between public and private preparatory schools by using the t-test for two independent samples. The results showed that the calculated t-value amounted to 2.340 at the degree of freedom 113 and the level of significance 0.05 Finally, after comparing the calculated t-value with the scheduled t-value of 1.960 As shown in Table (4.4), the results indicated statistically

significant differences in using science subjects' laboratories between Soran public and private preparatory schools from teachers' point of view for the benefit of private schools.

Table (4.4): Two-Sample T-test for public and private preparatory viewpoints of science teachers in Soran administration

Sample's Nature	Number of the Sample	Arithmetic Mean	Standard Deviation	T Value		Degree of Freedom	Significance Level at (0.05)
				Calculated	Schedule		
Public Schools	91	175.42	21.21	2.340	1.960	113	Significant
Private Schools	24	186.25	15.45				

According to the result of the third research question (What are the differences between Soran public and private preparatory schools in using laboratories?), and from the teachers' point of view in public and private schools, the results indicated that the extent of using science subjects laboratories in private preparatory schools is more than public schools in Soran city. According to the researchers' opinion, because students' parents pay money to private schools, they observe every detail in those schools. For instance, some parents send them to learn a second language, or some send their children just because of their high financial situation. Furthermore, some of them to make their children love the schools or particular subjects because they have many activities. Those schools entertain students with enjoyable lessons such as art and sport. Thus, those schools have to provide better quality in every aspect, especially science subjects as the main subjects for students. Overall, teaching science subjects as any other subject has been paid attention . Awan and Zia (2015) mentioned that there aremany reasons make parents choose private schools. One of them is their perceptions about the quality and availability of learning facilities tools in private schools.

The result of the fifth research question corresponds with the previous studies conducted by Dickson et al, (2015),Olasehinde and Olatoye (2014), Salih and Khalifa (2013). In contrast, it does not correspond with Iqbal(2012) who found that public schools are better than private schools because they offer better facilities, larger buildings, and more qualified teachers. Consequently, the result of the fifth objective is illustrated in Figure (4.3).

1. Science teachers in public and private preparatory schools of Soran administration agreed that using laboratories is beneficial for preparatory students and teachers. They also prefer to teach science subjects in laboratories.
2. There is a significant difference between public and private preparatory schools in using laboratories.

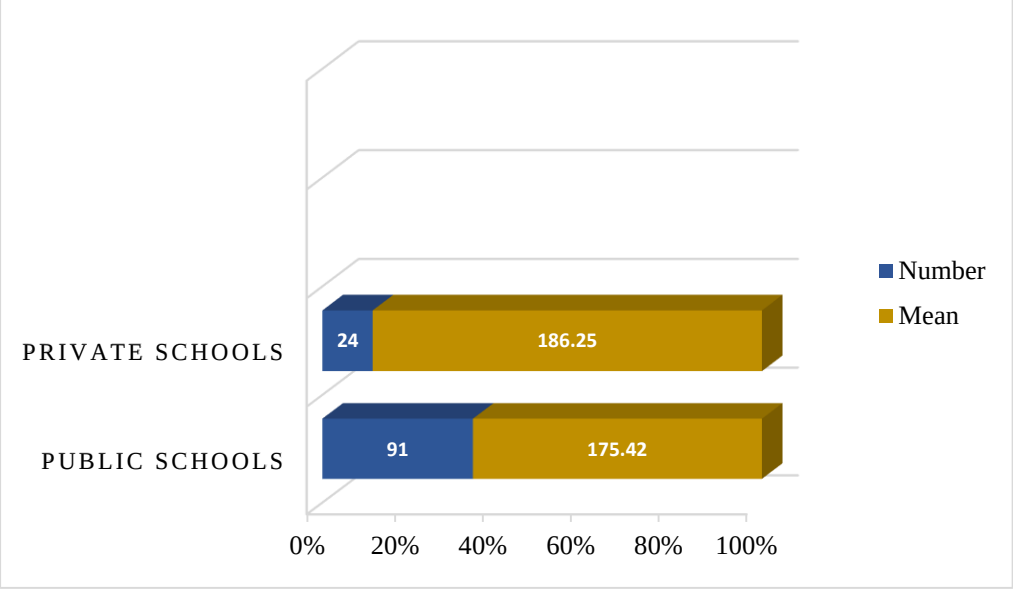

Figure (4.3): The result of the fifth objective (by researcher)

5. Conclusions, Recommendations, and Suggestions for further Research

5.1 Conclusions

The present study has arrived at the following concluding remarks.

3. The extent of using science subjects laboratories in private preparatory schools is more compared to the public preparatory schools of Soran administration.

5.2 Recommendations

5.2.1 Recommendations to the Ministry of Education

In the light of the current study, the following recommendations are forwarded to the Ministry of Education:

1. Implementing an effective monitoring and evaluation mechanism to improve public school laboratories.
2. Provide materials and essential facilities to Soran public schools' laboratories.
3. Establishing a strong relationship between the four directorates of the Soran administration and making them work cooperatively to improve their shortage of laboratories.
4. Balancing the provision of laboratory materials to Soran districts and the sub-districts or villages that belong to the Soran administration.
5. Running regular training courses and holding workshops for science teachers to gain knowledge about using science laboratories.

5.2.1 Recommendations to the Science Teachers

The following recommendations are directed to the science teachers of the Soran administration:

1. Incorporating practical activities in the lessons to make the subject more interesting.
2. Benefiting from the daily and simple materials to conduct scientific experiments in the schools that do not have laboratories.
3. Establishing relationships between science teachers from different schools is required so as to encourage each other and provide better science teaching.
4. Recurrent asking for materials and facilities for the laboratories.
5. Educating themselves about science subjects and the ways to conduct scientific experiments.

5.3 Suggestions for Further Research

There is a need to investigate and conduct more research in this field. Based on the current research, the following are some suggestions for further research: -

1. The effect of using science subject laboratories on students' attitudes toward science subjects in Soran city's basic schools.
2. The effect of using science subject laboratories on students' achievement in science subjects in Soran city's public schools.
3. A comparative study of using science subjects' laboratories in public and private preparatory schools in Soran city from the students' point of view.
4. Investigation of the difficulties encountered by science subjects' teachers in using laboratories in public schools of Soran city.
5. The relationship between using laboratories in science subjects and the rate of students' success in basic and preparatory levels.

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Appendix (A): Final Form
Soran University /Faculty of Education
General Science Department
Higher Education /Master

Final Form

Dear teacher

The researcher intends to conduct scientific research entitled "A Comparative Study of Using Science Subjects Laboratories Between Public and Private Preparatory Schools in Soran City." After reviewing several educational resources and taking the opinion of several experts in the field, the researcher has started to prepare the questionnaire form to find out the viewpoint of science teachers in using laboratories, and reveal the differences between public and private schools in using laboratories for science subjects (Biology, Chemistry, and Physics). Please answer all items of the attached questionnaire by ticking (□) in the square of your option. For your awareness, this information is used only for scientific research purposes and does not need to write your name.

Your cooperation is highly appreciated.

School name: …….
Gender: ……..
Specialty: ……..
Types of school (Public/Private): …….

Researcher
Ara Jalal Hamad Ameen

Supervisor
Prof. Dr. Omer Yassen Ibrahim

Ser	Items	Always	Extremely	Sometimes	Rarely	Never
1	Using laboratories in schools increases students' understanding of complex concepts.					
2	There are convenient lighting and heating sources and air conditioning in the laboratories.					
3	The laboratories are standard, neat, and clean at our schools for students' learning.					
4	There is a lack of teaching technologies and explanations in the laboratories.					
5	All required equipment is available in the school laboratories.					
6	Teachers can control and manage the labs' halls during scientific tests.					
7	The lab rooms at our school are large enough to accommodate the number of students.					
8	The teacher's personality and skills of behaving in the laboratories affect the teaching process.					
9	Having labs is a reason for making students close to both schools and studying.					
10	Laboratories in our school have the required equipment and tools to conduct scientific experiments.					
11	Using labs in teaching science subjects creates students' innovative skills.					
12	There are essential guidelines to protect students while working or using devices and dangerous substances in the laboratories.					
13	The location of the laboratories hall is convenient in our schools.					
14	As a teacher, I am satisfied with all the facilities and needs of my laboratory.					
15	There is a scientific assessment to follow a required (time table) in the laboratories.					
16	Teachers allow their students to work in pairs or small groups in the labs.					
17	The labs are suitable for teaching the three science subjects (Chemistry, Physics, and Biology).					

Ser	Items	Always	Extremely	Sometimes	Rarely	Never
18	I am very skillful and experienced in using labs.					
19	I allow students to participate in the practical activities in the labs.					
20	Teachers provide a suitable psychological environment for the students in the labs.					
21	It is preferable to make the science labs mandatory.					
22	Teachers motivate students while working in the science labs.					
23	I believe that the ministry of education is aware of providing science labs with the required equipment.					
24	Controlling students is difficult in the science labs.					
25	We always have problems in using labs with the school administration.					
26	Using labs strengthens teacher and students' relationships.					
27	I think students try to build a relation between scientific subjects and other subjects in the lab.					
28	Some teachers consider the individual differences between students during the scientific activities in the labs.					
29	As a teacher, I use more than one method to teach science subjects in the labs.					
30	There is a shortage of students' evaluation by teachers as they do not reward active students and guide the weak ones.					
31	I try to link inquiry and discovery skills with science subjects (chemistry-Physic-Biology).					
32	The duration of practical lessons is insufficient to conduct some scientific experiments in the lab.					
33	There is a shortage of unique instructional resources for teaching some scientific subjects in the lab.					
34	As a science subject teacher, having a lab helps a lot in the teaching process.					
35	Schools are short of money to buy labs' necessary tools and equipment.					
36	Teaching science subjects in the lab enables teachers to make students love the subjects.					
37	There is noise while teaching in the labs.					
38	Our school administration gives special attention to the science labs.					
39	As a teacher, I try to relate the scientific concepts studied in the lab to students' daily life and the real world.					
40	Teachers are afraid of having problems and obstacles in the labs while teaching science subjects.					
41	Based on my experience, the students in public schools have more problems with science subjects compared to private schools.					
42	Teachers advocate the strategies used in teaching science subjects in the lab.					
43	Teachers need training courses to learn how to teach in the lab.					
44	Teachers are capable of motivating and promoting students learning in science subjects.					
45	Students in the lab are interested in different sources to improve their learning of the science subjects.					
46	Managing laboratory lessons by the new teachers alone without getting any help from experienced teachers affects students' learning.					
47	I use various experiments and activities in the lab to improve students' learning levels of science subjects.					

Ser	Items	Always	Extremely	Sometimes	Rarely	Never
48	Students' commitment to the working rules in the lab positively impacts learning.					
49	Teaching science subjects in the labs is more entertaining than teaching in the classroom.					

توێژینەوەیەکی بەراوردکاری لە بەکارهێنانی تاقیگەی بابەتە زانستیەکان لە قوتابخانە ئامادەییە حکومی و ناحکومیەکانی ئیدارەی سۆران

پوختە:

ئامانجی توێژینەوە بەراوردکردنە لە پادەی بەکارهێنانی تاقیگەی بابەتە زانستیەکان لە قوتابخانە ئامادەییە حکومی و ناحکومیەکانی ئیدارەی سۆران لە ساڵی (٢٠٢١-٢٠٢٢). ژمارەی دانیشتوانی توێژینەوەکە هەموو مامۆستایانی بابەتە زانستیەکانی قوتابخانە ئامادەییەکانە لە ئیدارەی سۆران. نموونەی توێژینەوەکە (١١٥) مامۆستای زانستی بوو لە قوتابخانە ئامادەییە حکومی و ناحکومیەکانی کە تاقیگەی زانستیان هەبوو. نموونەکە بە مەبەست هەڵبژێردرا، (٩١) مامۆستای زانستی لە قوتابخانە ئامادەییە حکومیەکان و (٢٤) مامۆستای زانست لە قوتابخانە ئامادەییە ناحکومیەکان. بۆ گەیشتن بە ئامانجەکانی توێژینەوەکە، ڕاپرسی ڕوپێوی بەکارهێنراوە. توێژەرەکان پێوەرێکی پێکهاتوو لە بڕگەیان دانا وەکو ئامرازی توێژینەوەکە کە لە (٤٩) بڕگە پێکهاتووە. ڕاستگۆیی و جێگیری بۆ ئامرازی توێژینەوەکە ئەنجام دراوە. دوای دەست کەوتنی داتا لە ڕاپرسیەکە، شیکردنەوەی ئاماری بۆ کرا بە بەکارهێنانی (One-sample) وە (Two-sample T-test).دەرەنجامەکانی توێژینەوەکە ئەوە دەردەخەن کە کە مامۆستایانی زانست لە قوتابخانە ئامادەییە حکومی و ناحکومیەکان باوەڕیان وایە کە بەکارهێنانی تاقیگە لە پرۆسەی فێربوواندا زۆر گرنگە. هەرچەندە مامۆستایانی زانستی قوتابخانە ناحکومیەکان بەکارهێنانی تاقیگەیان زیاتر پێ پەسەندە لە مامۆستایانی زانستی قوتابخانە حکومیەکان. هەروەها جیاوازیەکی دیار هەیە لە نێوان قوتابخانە ئامادەییە حکومی و ناحکومیەکان لە بەکارهێنانی تاقیگەی بابەتە زانستیەکان، لە کاتێکدا ڕادەی بەکارهێنانی تاقیگەی بابەتە زانستیەکان لە قوتابخانە ئامادەییە ناحکومیەکان زیاترە لە قوتابخانە ئامادەییە حکومیەکانی ئیدارەی سۆران. لەسەر بنچینەی ئەنجامەکانی توێژینەوەکە، توێژەرەکان ڕاسپاردەی دابین کردنی مادەو ئاسانکاری پێویستیان کردووە لە لایەن وەزارەتی پەروەردەوە بۆ قوتابخانە ناحکومیەکانی سۆران وە کردنەوەی خولی ڕاهێنان بۆ مامۆستایانی زانستی بۆ فێربوونی چۆنیەتی بەکارهێنانی تاقیگەکان بە شێوەیەکی کاریگەرو گەنجاو. لەوەش زیاتر، توێژەرەکان ڕاسپاردەی یەکگرتنی چالاکی کرداریان کردووە لە لایەن مامۆستایان و سوود وەرگرتن لە مادەی سادە و ڕۆژانە بۆ ئەنجامدانی تاقی کردنەوەی زانستی. لە کۆتاییدا، هەندێک توێژینەوەی زیاتر لە داهاتوو پێشنیار کراوە.

پەیڤێن سەرەکی: تاقیگەکەن، بابەتە زانستیەکان، قوتابخانە ئامادەییەکان، قوتابخانە حکومیەکان، قوتابخانە ناحکومیەکان.

دراسة مقارنة في إستخدام مختبرات المواد العلمية في المدارس الإعدادية الحكومية وغير الحكومية لإدارة سوران

الملخص:

هدف البحث هو المقارنة في مدى إستخدام مختبرات المواد العلمية للمدارس الإعدادية الحكومية وغيرالحكومية لإدارة سوران للعام الدراسي (2021–2022). عدد أفراد مجتمع البحث هو جميع مدرسّي ومدرسّات المواد العلمية للمدارس الإعدادية الحكومية وغيرالحكومية لإدارة سوران. يتكون عيّنة البحث من (115) مدرّسا علميا في المدارس الإعدادية الحكومية وغيرالحكومية ذات المختبرات العلمية. أختيرت أفراد العينة بطريقة قصدية حيث شملت (91) مدرّسا علمياً في المدارس الإعدادية الحكومية و (24) مدرسا علميا في المدارس الإعدادية غيرالحكومية وبهدف جمع المعلومات عن عينة البحث استخدام الإستبيان، واستخدمت الوسائل الإحصائية لتحليل المعلومات عن طريق استخدام (One-sample) و (Two-sample T-test). أظهرت النتائج بعد استخدام الصدق والثبات للفقرات (49) أن مدرسّي المدارس الإعدادية الحكومية وغيرالحكومية يعتقدون بأن استخدام المختبرات العلمية في عملية التعلم مهمة جداً علماً بأن استخدام المختبرات العلمية لدى مدرسّي المدارس الإعدادية غيرالحكومية هي أكثر من مدرسّي المدارس الإعدادية الحكومية في إدارة سوران. بناءً على نتائج البحث الحالي قام الباحثان بتقديم بعض التوصيات لوزارة التربية منها توفير المدرسّين والمواد العلمية والأثاث واللوازم الظرورية لمختبرات المواد العلمية في المدارس الإعدادية غير الحكومية، وكذلك فتح الدورات التأهيلية لمدرسّي المواد العلمية في المدارس الإعدادية ذات المختبرات العلمية بهدف تعليمهم طريقة كيفية إستخدام المختبرات بطريقة مؤثرة ومناسبة، إضافة إلى توصيتهما بتوحيد أنشطة المدرسّين والإستفادة من المواد المختبرية البسيطة واليومية في إجراء الإمتحانات للمواد العلمية. اقترح الباحثان إجراء بحوث أخرى في هذا المجال مستقبلاً.

الكلمات الدالة: المختبرات، المواد العلمية ، المدارس الإعدادية ، المدارس الحكومية ، المدارس غير الحكومية.