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Research Article

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Assessment of Chemistry Laboratory Equipment Availability and Practice: A Comparative Study Between Damot and Jiga Secondary Schools

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Abstract

The project was designed to compare the laboratory equipment availability (facilities) and status of practical work between Damot senior secondary school and Jiga senior secondary school and their performance with the standard (average test value). All chemistry teachers and 30 students from each secondary schools a total of 84 respondents were involved. Closed ended questionnaire were prepared and descriptive survey method was employed to describe and one sample t-test method was used to assess the degree of availability of facility and the status of implementation and independent t-test was used to compare the degree of availability of facility and the status of implementation. Total average equipment availability and total average laboratory practice (Mean=2.09, sd=0.29, t(83)=-12.53, $p<0.05$) is far from the test value (2.5). Average Laboratory equipment availability and laboratory practice in Damot high school is (Mean=2.31, SD= 0.221, n=43) had statistically significant difference from Jiga high school (Mean=1.87, SD=0.158, n=41), t(82) =10.611, $p<0.05$, Cohen's d=2.32. From the analysis of Chemistry laboratory equipment availability and laboratory practice in both Damot secondary school and Jiga secondary school were found in very low level and much far less than the average availability of chemistry laboratory equipment and status of laboratory practice. From the data analysis average chemistry laboratory equipment availability and status of laboratory practice of Damot secondary school is better than that of Jiga secondary school.

Keywords: Laboratory Equipment, Laboratory Practice, Facilities, Practical Work

Introduction

Background of the Study

Practical work has been defined as an experiment performed by the teacher and students for demonstrations, or series of experiments and observational exercises carried out by the students to relate theoretical knowledge with practical activities done in the laboratory, classroom, field or elsewhere [1].

Practical activities are essential in all level of science education and in particular it is highly significant in senior secondary schools to help students in internalizing and understanding the theoretical knowledge of science fields such as Chemistry, Biology and Physics. The natural science core subject at the secondary level (grades 9-10) becomes distinctly differentiated as Biology, Chemistry and Physics. Studies should clearly report the amounts of time students spend in practical activities, and how those are integrated or separated from other work in the science course. They should distinguish clearly between long-term and short-term student investigations, and indicate clearly the numbers and roles of students in each laboratory team. Thus, there should be a regular and effective implementation of practical work in senior secondary schools to bring science teaching at a standard level with better understanding and greater achievement of students [2]. However, degree of implementation of practical activities and availability of laboratory equipment are differed from school to school [3].

One purpose of comparative education is to stimulate critical reflection about our educational system, its success and failures, strengths and weaknesses. This critical reflection facilitates self-evaluation of our work and is the basis for determining appropriate courses of action. Another purpose of comparative education is to expose us to educational innovations and systems that have positive outcomes. Most compartivest states that comparative education has four main purposes [4]. These are:

- To describe educational systems, processes or outcomes
- To assist in development of educational institutions and practices
- To highlight the relationship between education and society

- To establish generalized statements about education that are valid in more than one country

There are two secondary schools (Damot and Jiga) with having different approach of teaching chemistry in practical approach. The researchers have got an opportunity to deal with chemistry subject teachers and with school principals, on how to conduct a chemistry laboratory activity as the level or standard expected. Familiarly, natural science in general and chemistry in particular have a lot of laboratory activities that are desired to be done in the chemistry syllabus and teachers are expected to teach students through experimental teaching methods. But in reality, in different schools due to different reasons teachers are teach chemistry, simply using usual presentations method as a chemistry teaching method. This serous issue initiates these researchers to assess and compare laboratory equipment availability and laboratory practice of Damot and Jiga secondary schools. The researchers planned to compare the availability of laboratory equipment in their laboratory class and the status of laboratory practice found in two secondary school in West Gojjam zone [5].

Leading Research Questions

This research has been guided by the following research questions.

1. Are there sufficient facilities for carrying out chemistry practical works in selected secondary schools?
2. How often chemistry teachers plan and conduct practical activities in their respective schools?
3. Is there a significance difference between Damot and Jiga high school with respect to laboratory resource availability and practice?

The Objectives of this Research

The specific objectives of the research were to:

1. Evaluate laboratory equipment facilities for carrying out practical activities in selected secondary schools.
2. Assess the preparation and experience of schools' chemistry teachers in implementing practical activities as planned by the curriculum and syllabus.
3. Compare laboratory equipment availability and laboratory practice of the two secondary school.

Significance of the Research

This research is significant in:

- Providing insight for policy makers and developers how to monitor the regular implementation of practical activities in schools as planned by the curriculum.
- Inspiring teachers and schools to carry out practical activities as designed by the curriculum or syllabus in a sufficient way to produce well qualified science graduates.
- Provision of feedbacks for schools to develop their capacities by fulfilling basic facilities of laboratory and by solving the problems associated with them.

Methodology of the Research

Research Design

The research was designed to asses and compare laboratory equipment availability and laboratory practice in Damot and Jiga senior secondary school and to compare the laboratory equipment availability and laboratory practice between Damot and Jiga secondary school with the standard (average test value).

Quantitative research method with descriptive design were used to explore and compare laboratory equipment availability and laboratory practice in Damot and Jiga senior secondary schools.

Sampling Techniques

The population of the study was all-natural science students and all chemistry teachers in those selected schools.

Among them, ten students from grade 9, ten students from grade 10 and other ten students from grade 11 with a total of 30 students were selected using random sampling selection method from each school. So, a total of 60 students were participated in the research group from each secondary school. Besides, all chemistry teachers from Damot secondary school (13) and Jiga secondary school (11) were included by using target sampling method. However, since grade 12 students were not in school at the time of the study they were not included in the sample. Therefore, the total number of participants was 84 individuals from diverse categories.

Data Collection Instrument

To assess the practice and laboratory status at Damot and Jiga secondary school and to answer the basic research questions; questionnaire was used as data collecting instruments. Closed ended questionnaires with 23 items from which 8 items for availability of laboratory equipment and 15 items for laboratory practice were set in the form of "Likert" rating scale with four options (4=strongly agree, 3=agree, 2=disagree and 1=strongly disagree) and dispatched to chemistry teachers and sampled students and carefully collected back then analyzed. 8 items of availability of equipment were again sub grouped in to physical facility (4 items), chemical availability (2 items), and laboratory apparatus (2 items) whereas 15 items of laboratory practice were further categorized as before actual laboratory (4 items), during actual laboratory practice (6 items) and after actual laboratory (5 items). Most of the questionnaires were taken from literature and some others are prepared as appropriate as possible and the questionnaires were prepared as appropriate as possible and first commented by chemistry college instructors and English instructors on their grammatical and conceptuality to assure its validity. And to assure the reliability of the questionnaire a pilot study on a non-sampled teachers and students were conducted and Cronbach's Alpha was applied to measure the coefficient of internal consistency. A reliability coefficient of 0.71 was obtained and considered high enough for the instruments to be used for this research.

Data Analysis Techniques

The data obtained through questionnaire were computed and analyzed using different statistical techniques. Respondents' demography was computed and analyzed by the help of percentages distribution to describe the characteristics of the respondents. All the questionnaires were replied using a four-point Likert scale ranging from strongly disagree to strongly agree and from often to always. All the responses were loaded to the SPSS software and being analyzed using one sample t-test to assess the availability of laboratory equipment and laboratory practice and independent t-test methods to compare availability of laboratory equipment, laboratory practice and students' chemistry results b/n Damot and

Jiga secondary schools. The data were analyzed using mean value, standard deviation, t-value, P-value and discussion was made accordingly to answer project question.

Presentation and Data Analysis

In this section of the project; demographic characteristics of project participants, analysis of availability of equipment in Damot and Jiga secondary school, analysis of status of practice in Damot and Jiga secondary schools, analysis of comparison of availability of equipment and practice between Damot and Jiga secondary schools and analysis of comparison between chemistry results of Damot and Jiga secondary schools were included.

Demographic Profile of Respondents

The following table summarizes the demographic profile of the project participants in terms of their sex and level of education in their schools.

Table 1: Respondent's Demography

#	variable	item	Teacher				Student				Total		
1	participant		M	%	F	%	M	%	F	%	M	F	Sum
		Damot high School	13	15	-	-	19	23	11	13	32	11	43
		Jiga high school	10	12	1	1	21	25	9	11	31	10	41
		Total	23	27	1	1	40	48	20	24	63	21	84
2	Educational level	Grade 9					11	13	9	11	11	9	20
		Grade 10					15	18	5	6	15	5	20
		Grade 11					14	17	6	7	14	6	20
		Degree	12	52	1	1					12	1	13
		Masters	11	48	-	-					11	0	11
		Total	23	100	1	1	40	48	20	24	63	21	84

P<0.05

The total number of participants in the project area was 24 (29%) teachers and 60 (71%) students selected from Damot and Jiga secondary school. Regarding teacher respondents' sex, and education status, 13 (15%) from Damot secondary schools all are males, and the remaining 1 (1%) female and 10 (12%) males a total of 11 (13%) of the sampled teachers are from Jiga. Among 24 teachers 13 (54%) of them are degree holders and remaining 11 (46%) are masters. From 60 sampled students 19 (32%) male 11 (18%) females are from Damot and 21 (35%) male 9(15%) students from Jiga were participated in the project. Among 60 sampled students 11 (18%) male and 9 (15%) female grade 9, 15 (25%) male and 5 (8%) female grade 10 and 14 (16%) male and 6 (10%) female students from grade 11 students were participated.

As one can see from the table that almost all of teacher participants 23 (95%) are male and only 1 (5%) are female.

Analysis of Availability of Equipment and Laboratory Practice

The questionnaire 13 questionaries from Damot secondary school chemistry teachers, 30 questionnaires from 9-11 Damot natural science students, 11 questionnaires from Jiga chemistry teachers and 30 questionaries from Jiga secondary school students a total of 84 responses were collected and analyzed using SPSS version 20.

Analysis of Availability of Equipment in Each Secondary School

Availability of laboratory equipment in each Damot and Jiga secondary school were analyzed. The analysis result has been shown below.

Table 2: Availability of Equipment in Each Secondary Schools

#	Item	Damot						Jiga					
		N	Mean	Sd	Test value =2.5			N	Mean	Sd	Test value=2.5		
					t	df	Sig (2-tailed				t	df	Sig (2-tailed
1	Physical facility	43	2.36	0.44	-2.07	42	0.044	41	2.01	0.28	-11.2	40	0.00
2	Availability of chemicals	43	2.6	0.58	-1.45	42	0.154	41	1.81	0.51	-8.58	40	0.00
3	Laboratory apparatus	43	2.05	0.62	-2.46	42	0.018	41	1.68	0.44	-11.8	40	0.00
4	Average of equipment	43	2.33	0.35	-3.08	42	0.004	41	1.87	0.29	-14.6	40	0.00

P<0.05

As can see from table 2, a chemistry laboratory equipment facility can be broadly classified in to three groups these are Physical facility, Availability of chemicals and laboratory apparatus.

As one can see from table 2, availability of equipment in both Damot (Mean=2.33. sd=0.35, t(42)=-3.08, p<0.05 and Jiga (Mean=1.87. sd=0.29, t(40))=-14.6, p<0.05 secondary schools were below average. Even though the availability of equipment in both schools were below average the availability of chemicals in Damot (Mean=2.6. sd=0.58, t(42))=-1.45, p=0.157) secondary school were at the average availability of chemical. As can be seen from appendix A the availability of laboratory chemicals in Damot secondary school (Mean=2.76. sd=0.72, t(42))=-2.2, p<0.05 is much greater than the average the availability of laboratory chemicals and the arrangement of chemicals in Damot secondary school (Mean=2.49. sd=0.82, t(42))=-0.09, p=0.93) indicates available chemicals are arranged as average expectation.

Analysis of Laboratory Practice in Damot and Jiga Secondary Schools

Availability of laboratory practice in Damot and Jiga secondary school were analyzed. The analysis result has been shown below.

Table 3: Laboratory Practice in Each Secondary Schools

#	Item	Damot						Jiga					
		N	Mean	Sd	Test value =2.5			N	Mean	Sd	Test value=2.5		
					t	df	Sig (2-tailed				t	df	Sig (2-tailed
1	Before lab practice	43	2.29	0.39	-3.35	42	0.002	41	1.83	0.26	-16.0	40	0.00
2	During lab practice	43	2.31	0.36	-3.48	42	0.001	41	1.95	0.29	-11.7	40	0.00
3	After lab practice	43	2.28	0.36	-3.99	42	0.00	41	1.92	0.31	-12.1	40	0.00
4	Average of practice	43	2.29	0.23	-5.81	42	0.00	41	1.90	0.16	-23.3	40	0.00

P<0.05

Effective laboratory practice has three stage these are before or preparation to the actual laboratory practice, during laboratory practice (actual laboratory) and after laboratory practice (report writing and the like).

As can be seen from table 3, average laboratory practices in Damot (Mean=2.29. sd=0.23, t(42))=-5.81, p<0.05) and in Jiga is too far from the average laboratory practice (Mean=1.90. sd=0.16, t(40)=-23.3, p<0.05) were significantly lower than the expected mean (2.5) therefore, the trend of laboratory practice in both schools were found to be unsatisfactory and this was true in all the three of laboratory practice namely before, during and after laboratory practice.

However, in specific look to items (Appendix-B) under activities 'before laboratory practice', grouping and arrangement of students in Damot is (M=2.58, SD= 0.73, t(42)=.07, p=.06) at average level as expected, whereas, the situation in Jiga is (M=2.24, SD=0.73, t(40)=-2.23, p=0.06) below the expected mean. Hence, grouping and arrangements of students before laboratory practice is satisfactory in Damot whereas, it is not good in Jiga high school.

In addition, with deep look to items (Appendix-B) under 'during laboratory practice', in Damot high school item 12 (setting up apparatus and arrange chemicals) with M=2.64, SD=0.73, t(42)= 2.80, p=0.057) and item 15 (teachers' interest to perform activities) with M=2.63, SD=0.7, t(42)=1.83, p=0.074) were significantly above the expected mean (2.5). In contrast, in Jiga high school item 12 with M=1.95, SD=0.60, t(40)=-5.96, p=0.00 and item 15 with M=2.02, SD=0.65, t(40)=-4.67, p=0.00 they were observed significantly below the expected mean. This implies that chemical arrangements and teachers' interest during laboratory practice in Damot high school is more than the expectation whereas, it was below expectation in case of Jiga high school.

Aggregate Result of Equipment Availability and Practice of Lab in Two Schools

Aggregate Analysis of Availability of Equipment in Two Schools

Total availability of laboratory equipment in Damot and Jiga secondary school were analyzed. The analysis result has been shown below.

Table 4: Availability of Equipment in Two Secondary Schools

#	Item	Damot and Jiga					
		N	Mean	Sd	Test value =2.5		
					t	df	Sig (2-tailed)
1	Physical facility	84	2.09	0.41	-6.95	83	0.00
2	Availability of chemicals	84	2.47	0.61	-5.99	83	0.00
3	Laboratory apparatus	84	1.68	0.61	-7.73	83	0.00
4	Average of equipment	84	2.09	0.41	-9.19	83	0.00

P<0.05

As revealed in table 4, the aggregate average of laboratory equipment availability was (M=2.09, SD=0.41, t(83)=-9.19, p=.000) significantly lower than the expected mean (2.5). In specific look to each item: physical facility with M=2.09, SD=0.41, t(83)=-6.95, p=.000; availability of chemicals with M=2.47, SD=0.61, t(83)=-5.99, p=.000 and laboratory apparatus with M=1.68, SD=0.61, t(83)=-7.73, p=0.00 shows that all were significantly below average level.

Aggregate Result of Laboratory Practice in the Two Schools

Cumulative laboratory practice of Damot and Jiga secondary school were analyzed. The analysis result has been shown below.

Table 5: Laboratory Practice in Two Secondary Schools

#	Item	Damot and Jiga					
		N	Mean	Sd	Test value =2.5		
					t	df	Sig (2-tailed)
1	Before lab practice	84	2.07	0.41	-9.58	83	0.00
2	During lab practice	84	2.13	0.37	-8.91	83	0.00
3	After lab practice	84	2.10	0.38	-9.54	83	0.00
4	Average of practice	84	2.10	0.28	-12.9	83	0.00

P<0.05

As can be seen from table 5, all the laboratory practice i.e. before laboratory practice (Mean=2.07, sd=0.41, t(83)=-9.58, p<0.05), during laboratory practice (Mean=2.13, sd=0.37, t(83)=-8.91, p<0.05) and after laboratory practice (Mean=2.10, sd=0.38, t(83)=-9.54, p<0.05) were far below the test value indicates laboratory practice are implemented below what are expected as the level. This far apartness of the laboratory practice from the average value or test value indicate laboratory activities in both schools was not given any attention even if it is the core for natural science students.

Analysis of Availability of Equipment and Laboratory Practice in Damot and Jiga Secondary Schools

Availability of laboratory equipment and laboratory practice in Damot secondary school and Jiga secondary school were analyzed. The analysis result has been shown below.

Table 6: Availability of Average Equipment and Laboratory Practice Secondary Schools

#	Item	Damot						Jiga					
		N	Mean	Sd	Test value =2.5			N	Mean	Sd	Test value=2.5		
					t	df	Sig (2-tailed)				t	df	Sig (2-tailed)
1	Average of equipment	43	2.33	0.35	-3.08	42	0.04	41	1.83	0.28	-14.6	40	0.00
2	Average of practice	43	2.29	0.23	-5.81	42	0.00	41	1.90	0.16	-23.3	40	0.00
3	Average of equipment and average of practice	43	2.31	0.22	-5.50	42	0.00	41	1.87	0.15	-25.5	40	0.00

P<0.05

As can be seen from table 6, the mean average availability of equipment and average of laboratory practice (Mean=2.31, sd=0.22, t(42)=-5.5, p<0.05) in Damot secondary school and (Mean=1.87, sd=0.15, t(40)=-25.5, p<0.05) in Jiga secondary school both are less than the test value. This suggested that both availability of equipment and laboratory activity practice are much far from the mean expected. when we consider two secondary schools average of equipment availability and average laboratory practice (Mean=2.31, sd=0.22, t(42)=-5.5, p<0.05) in Damot is to much better than average of equipment availability and average laboratory practice (Mean=1.87, sd=0.15, t(40)=-25.5, p<0.05) in Jiga secondary school. From the table in Damot secondary school average equipment availability (Mean=2.33, sd=0.35, t(42))=-3,08, p<0.05) is better than the laboratory practice (Mean=2.29, sd=0.23, t(42)=-5.81, p<0.05) in Damot secondary school. In all parameter (Average of equipment availability and average laboratory practice), Damot secondary schools is better than Jiga secondary school.

Analysis of Total Availability of Equipment and Laboratory Practice

Total availability of laboratory equipment and laboratory practice in Damot and Jiga secondary school were analyzed. The analysis result has been shown below.

Table 7: Total Availability of Equipment and Laboratory Practice

#	Item	Damot and Jiga					
		N	Mean	Sd	Test value =2.5		
					t	df	Sig (2-tailed)
1	Average of laboratory equipment availability	84	2.09	0.41	-9.20	83	0.00
2	Average of laboratory practice	84	2.10	0.28	-12.94	83	0.00
3	Average of equipment and average of practice	84	2.09	0.29	-12.53	83	0.00

P<0.05

As can be seen from table 7, total average equipment availability and total average laboratory practice (Mean=2.09, sd=0.29, t(83)=-12.53, p<0.05) is far from the test value (2.5). This suggested that in both Damot secondary schools and in Jiga secondary school the average equipment availability and laboratory practice are less than average or the test value.

Comparison of Laboratory Equipment Availability and Laboratory Practice Between Damot and Jiga Secondary Schools

Comparison was made between Damot and Jiga High Schools with regard to availability of laboratory equipment and laboratory practice. The analysis result has been shown below.

Group Statistics					Levene's Test for Equality of Variances		t-test for Equality of Means				95% Confidence Interval of the Difference	
Item	School	N	Mean	Std. Dev	F	Sig (2-tailed)	t	df	Sig (2-tailed)	Mean diff	Lower	Upper
Average of equipment	Damot high school	43	2.33	0.354	0.818	0.368	7.006	82	.000	0.4959	0.3551	0.6367
	Jiga high school	41	1.84	0.289								
Average of practice	Damot high school	43	2.29	0.231	4.61	0.035	8.995	75.71	.000	0.3910	0.3044	0.4776
	Jiga high school	41	1.90	0.163								
Average of equipment and practice	Damot high school	43	2.31	0.221	3.43	0.068	10.611	82	.000	0.443	0.3596	0.5272
	Jiga high school	41	1.87	0.158								

P<0.05

An independent t-test was conducted to determine if a difference existed between the mean score of Damot and Jiga high schools laboratory apparatus availability in the year 2013 E C. Laboratory apparatus availability in Damot high school is (Mean=2.31, SD= 0.221, n=43) had statistically significant difference from Jiga high school (Mean=1.87, SD=0.158, n=41), t(82) =10.611, p<0.05, Cohen's d=2.32. The 95% confidence interval lies between 0.35968 to 0.52727. In specific look to the analysis of each element of laboratory utilization different results were shown. In this regard, availability of equipment in Damot high school is (Mean=2.33, SD=0.354, n=43) had statistically significant difference from Jiga high school (Mean=1.83, SD=.289, n=41), t (80.116) =7.040, p<0.05, Cohen's d=1.52. The effect size was large and the observed power was 99.9%. The 95% confidence interval lies between 0.35511 to 0.63676. Besides, laboratory practice in Damot high school is (Mean=2.29, SD=0.231, n=43) had statistically significant difference from Jiga High School (Mean=1.90, SD=0.163, n=41), t (82) =8.923, p<0.05, Cohen's d=1.97 with the 95% confidence interval lies between 0.30443 to 0.47760.

The comparison results reveals that laboratory equipment availability and laboratory practice Damot senior secondary school (Mean=2.33) is significantly better than laboratory equipment availability and laboratory practice of Jiga senior secondary school (Mean=1.87).

Summary, Conclusions and Recommendations

Summary

The main purpose of this project work is to compare chemistry laboratory practice and laboratory equipment availability in those selected secondary schools (Damot and Jiga secondary schools) and to investigate the present status of chemistry practical practice and to assess the presence laboratory equipment availability in Damot and Jiga secondary school found in west Gojjam Administrative zone.

Therefore, this project has been designed to know the comparison between chemistry laboratory practice and laboratory equipment availability of Damot secondary school to chemistry laboratory practice and laboratory equipment availability of Jiga secondary school.

Thus, to accomplish the project: appropriate project methods, sampling techniques and instruments have been developed and employed. In this project quantitative research approaches and a descriptive survey study were implemented. As a sampling technique random and purposive sampling methods are used. From Damot secondary school all 13 chemistry teachers have been selected by purposive sampling techniques and 30 natural science students from Damot secondary school have been selected randomly. With the same technique all 11 chemistry teachers and 30 natural sciences students from Jiga secondary school were selected.

Conceptually the same questionnaires with different forms were prepared and dispatched to chemistry teachers and selected natural science students. Collected data were tabulated and analyzed and interpretation has made using statistical methods.

After the analysis and interpretation data, the following are the main findings of this project work. Chemistry laboratory equipment availability in both Damot secondary school and Jiga secondary school were found in very low level and much far less than the average availability of chemistry laboratory equipment. This finding supported by the analysis of one sample t-values and as it indicated the average availability of laboratory equipment are very much less than the test value and the p-value which is less than 0.05 indicating the presence of significant difference between the actual availability of equipment to the expected test value (2.5).

Chemistry laboratory practice in both Damot secondary school and Jiga secondary school were found in very low level and much far less than the average chemistry laboratory practice. This finding supported by the analysis of one sample t-values and as it indicated the average chemistry laboratory practice are very much less than the test value and the p-value which is less than 0.05 indicating the presence of significant difference between the actual chemistry laboratory practice to the expected test value.

From the data analysis, even if the average availability of laboratory equipment in both secondary schools are less than the average, the average availability of laboratory equipment of Damot secondary school is better than Jiga secondary school.

From the analysis even if the average laboratory equipment availability in both Damot and Jiga secondary schools is less than the test value, laboratory equipment availability of Damot secondary school is better than Jiga secondary school.

From the data analysis even if the average chemistry laboratory practice in both schools is less than the average, the average chemistry laboratory practice of Damot secondary school is better than Jiga secondary school.

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Appendix A

#	Item	Damot secondary school						Jiga secondary school					
		N	Mean	Sd	Test value =2.5			N	Mean	Sd	Test value=2.5		
					t	df	Sig (2-tailed				t	df	Sig (2-tailed
1	Structured and well-equipped laboratory room	43	2.37	0.92	-0.90	42	0.37	41	2.05	0.77	-3.74	40	0.01
2	Availability of electric system in laboratory room	43	2.04	0.82	-0.46	42	0.046	41	1.80	0.71	-6.22	40	0.00
3	Availability of water system in laboratory room	43	2.26	0.76	-2.11	42	0.041	41	1.83	0.74	-5.81	40	0.00
4	Availability of laboratory chemicals are available	43	2.76	0.72	-2.20	42	0.063	41	1.8	0.75	-5.94	40	0.00
5	No interruption due to lack of lab equipment	43	2.23	0.89	-1.96	42	0.037	41	1.78	0.65	-7.06	40	0.00
6	Isolated bench to each student during laboratory activities	43	2.37	0.81	-1.02	42	0.31	41	2.37	0.62	-1.38	40	0.03
7	Chemicals are arranged in a logical order.	43	2.49	0.82	-0.09	42	0.93	41	1.83	0.63	-6.83	40	0.00
8	Laboratory apparatus are arranged in a logical order	43	2.30	0.74	-1.75	42	0.088	41	1.59	0.55	-10.7	40	0.00
9	Average of equipment availability	43	2.33	0.35	-3.73	42	0.04	41	1.84	0.29	-14.6	40	0.00

Appendix B

#	Item	Damot secondary school						Jiga secondary school					
		N	Mean	Sd	Test value =2.5			N	Mean	Sd	Test value=2.5		
					t	df	Sig (2-tailed				t	df	Sig (2-tailed
1	You test the experiments before your work with students	43	2.21	0.74	-2.57	42	0.014	41	1.71	0.56	-9.08	40	0.00
2	You give laboratory manuals to student before practical work	43	1.99	0.72	-1.15	42	0.25	41	1.71	0.52	-9.91	40	0.00
3	You group and arrange students before they are coming to laboratory room	43	2.58	0.73	-2	42	0.051	41	2.24	0.73	-2.23	40	0.03
4	You set up apparatus and arrange chemicals for activities	43	2.64	0.73	-2.80	42	0.057	41	1.95	0.60	-5.96	40	0.00
5	You follow and supervise students when they perform activities	43	2.50	0.7	-1.96	42	0.05	41	2.00	0.67	-4.77	40	0.00

6	You work with the lab technician during performing activity	43	2.35	0.71	-1.44	42	0.0156	41	2.20	0.71	-2.73	40	0.00
7	You are interested to perform activities?	43	2.63	0.7	-1.83	42	0.074	41	2.02	0.65	-4.67	40	0.00
8	You check appropriate accomplishment of your students' work	43	2.14	0.7	-3.33	42	0.002	41	2.12	0.51	-4.75	40	0.00
9	Check your students' interpretation, conclusion and recommendations	43	2.20	0.76	-0.90	42	0.037	41	1.78	0.65	-7.06	40	0.00
10	Give feedbacks to all your students work	43	2.16	0.72	-3.06	42	0.004	41	1.93	0.61	-6.04	40	0.00
11	Check whether the lab report is individual work or group	43	2.26	0.7	-2.06	42	0.045	41	1.78	0.65	-7.06	40	0.00
12	There is a time table to teachers to conduct laboratory activities.	43	1.9	0.64	1.77	42	0.008	41	1.68	0.61	-8.58	40	0.00
13	Wear safety goggles, eye goggles, and other safety equipment in doing so	43	2.1	0.7	-0.98	42	0.033	41	1.83	0.63	-6.83	40	0.00
14	Work again if your experiment is failed	43	2.00	0.73	-0.73	42	0.047	41	2.00	0.67	-4.77	40	0.00
15	Active participant during laboratory activity	43	2.44	0.7	-0.54	42	0.059	41	1.73	0.67	-7.3	40	0.00
16	Average of practice	43	2.3	0.23	-5.85	42	0.00	41	1.90	0.16	-23.4	40	0.00