Global Journal of Guidance and Counseling in Schools: Current Perspectives

Volume 9, Issue 3, (2019) 095-105

www.gjgc.eu

The effect of practical work to enhance ninth grade achievement in biology class: The case of diaspora secondary school, Ethiopia

Asrat Dagnew*, College of Education and Behavioral Science, Bahir Dar University, Post Box No: 79, Bahir Dar, Ethiopia
Chekula Sitotaw, Diaspora Secondary School, Post Box No: 120, Bahir Dar, Ethiopia

Suggested Citation:

Dagnew, A. & Sitotaw, C. (2019). The effect of practical work to enhance ninth grade achievement in biology class: The case of diaspora secondary school, Ethiopia. *Global Journal of Guidance and Counseling in Schools: Current Perspectives*, *9*(3), 095–105. https://doi.org/10.18844/gjgc.v9i3.4253

Received from January 05, 2019; revised from June 05, 2019; accepted from December 02, 2019.
Selection and peer review under responsibility of Prof. Dr. Kobus Maree, University of Pretoria South Africa.

Abstract

The aim of this study was to investigate the effects of practical work enriching instruction of biology lessons on ninth grade students' attitudes towards biology lessons and their achievement based on students' success. Attitude pre-test, attitude post-test, achievement pre-test and achievement post-test are employed for all participants in addition to interviewing four students randomly selected from the total participants. The test was applied to students in two different times. According to the research results, it was found that the experimental teaching method was more effective in the attitude and achievement level of students in some biology lessons, and attitude and achievement have a positive correlation. Therefore, the study recommends that high school biology teachers should plan their lessons in a more practical way to boost (enhance) learners' attitude as well as achievement. All stakeholders including curriculum planners should take part in the planning process.

Keywords: Achievement, attitude, effect, practical work, teaching method.

* ADDRESS FOR CORRESPONDENCE: **Asrat Dagnew,** College of Education and Behavioral Science, Bahir Dar University, Post Box No: 79, Bahir Dar, Ethiopia. *E-mail address*: asratboza@ yahoo.com

1. Introduction

Practical work is an essential part of science education. In science lessons, we are trying to extend students' knowledge of the natural world and develop their understanding of the ideas, theories and models, which scientists have found useful in explaining and predicting its behaviour. Teaching science naturally involves showing learners things, or putting them into situations where they can see them for themselves (Abraham, 2009).

It is unnecessary to mention the central role of practical work in the curriculum and its essential nature for science learning. Specifically, practical work has a key role in teaching science subjects such as biology in secondary school. However, practical work faces several challenges, including how to ensure that it is effective in helping to learn science. Some research into the teaching and assessment of practical work has been done. For example, projects such as getting practical have shown the importance of analysis in the planning of activities and supporting hands-on, mind-on approach to teaching (Needham, 2014). But, more research is needed. Most commonly, the challenge of practical work is to find ways to make it more effective as a teaching and learning strategy than it often is at present. The possible measure to make it practical work more productive includes identification of learning objectives, informed analysis of the learning demand of tasks and the design and presentation of tasks to assist students in thinking about their actions and their data in the way it is intended. According to Abraham (2009), improvement is not a matter of doing more practical work, but of doing better practical work.

Most of the students consider practical work as an important part of learning biology, an interesting activity during biology lessons and an easy part of learning biology (Hinneh, 2017). The question is does students' attitude about the importance of practical work significantly influence their achievement in biology while their attitude concerning interest and difficulty of practical work do not significantly influence their achievement in biology. It can be concluded that even though students demonstrate some level of positive attitude towards practical work in biology in terms of its importance, the experienced students gain from doing practical work in the biology lessons do not motivate them to want to pursue a career in biology beyond secondary school. A possible explanation could be the manner in which practical work is carried out in secondary school negatively influences their achievement in the subject.

In other words, students' general attitude towards practical work is positive but would it influence their achievement in biology. There is clearly an overall positive attitude towards practical work and there are some good examples but there are also several messages that need to be addressed. There is well-documented evidence, in secondary schools in general and diaspora secondary school in particular, about the shortcomings of equipment funding, particularly in secondary schools; the need is to ensure that those who make decisions in these matters are well-informed. There are currently no serious threats to practical science from health and safety requirements, but the situation needs to be kept under review. Locally, in some secondary schools, pupils' behaviour and a lack of technical expertise may result in significant reductions in practical science. The current assessment demands are damaging practical science.

According to Bell (2008), although many teachers are dissatisfied with the amount of time and resources for practical science and some have experienced falls in the provision, the time devoted to it is still substantial. Mentoring of inexperienced teachers can build confidence in practical science. Opportunities for training and professional development, particularly for secondary teachers and for technicians, are inadequate. Frequent use of live organism in biology lessons and/or practical works may increase students' interest towards biology (Prokop, 2007).

Attitudes towards science involve the students' affective behaviours, for example, preference, acceptance, appreciation and commitment. While students' negative attitudes towards science are related to a traditional approach in science instruction, their positive feelings are associated with

constructivist science classrooms (Hacieminoglu, 2016). Teaching science with the past approach and traditional teaching methods can affect students' academic achievement in science education. The central source of the students' interest is experimenting in science. Traditional teaching and over-dependence on textbooks could be responsible for the increasing negative student attitudes about science. Students with positive attitudes towards science tend to have higher scores on the achievement measures. This result showed that students having a more positive attitude towards science preferred to undertake meaningful learning rather than rote learning, resulting in the achievement of higher scores (Hacieminoglu, 2016). As the above research states that the findings show a quarter of students have no interest in biology. There is no statistically significant difference between attitude towards biology and students' biology achievements (Hinneh, 2017).

As the above research shows that students have a positive attitude towards science as well as biology in different countries. But, in our country, there is no sufficient study on the effect of practical work on students' attitude towards biology lessons on the specific topic of osmosis and diffusion. Therefore, the study focuses on the effect of practical work on enhancing attitude of students towards biology lessons particularly on osmosis and diffusion particularly in diaspora secondary school, Ethiopia.

Making the teaching-learning process more practical helps teachers to build a positive attitude towards the subject they are teaching and to enhance learners' achievement. There is a range of purposes for practical science, indeed there are several purposes for science education as a whole (e.g., science as general education as well as training for future career paths). Ample evidence is available that indicates the existence of a positive attitude that teachers and pupils have to practical science. Although the evidence of pupil attitudes is equivocal, more research in the issue would benefit the effectiveness of practical work. Bell (2008) argues that teachers' and other stakeholders' have positive attitudes based on their answer to the question 'how important is practical work in science education'. As one head of science put it 'it is vital and teaching science without practical work is like swimming without water' (Bell, 2008). Hence, implementing more practical work in science education improves learners' attitudes as well as their achievement in biology.

In the majority of Ethiopian secondary and preparatory schools, science laboratories are not available or the available ones are not furnished and fully equipped so as to conduct practical activities. Teachers in developing countries do not perform practical activities in the classroom because of different reasons even if they understand the role of practical work to enhance students' attitudes towards the subject. In diaspora secondary school learners enthusiasm for science subjects becomes lower and their achievement also, as different scholars saying science teaching is effective when it supported by practical activity. But, as my observation science teachers in diaspora secondary school mostly use traditional teaching methods. That is why the study plan to implement practical work particularly hands-on activities (experimental method) to enhance ninth grade students' attitudes towards the study of biology lessons.

The aim of this study is to investigate the effects of practical work enriched instruction of biology lessons on ninth grade students' attitudes towards biology lessons and their achievement. This study compared the effectiveness of the practical work enriched instruction related to osmosis and diffusion with the first principle of designed instruction on ninth grade students' achievement and attitudes towards biology. Specifically, the study is designed to examine how practical work affects learners' attitudes towards the study of biology, to improve the implementation of practical work in laboratories and to assess how learners' attitudes enhance their achievement.

1.1. Literature

1.1.1. Students' attitude towards biology

Biology lessons are interesting, not difficult, but still revealed medium positive attitudes (Prokop, 2007). Nigerian secondary school students have a positive attitude towards science lessons (Sakariyau, Taiws & Ajagbe, 2016). Slovak students have also a positive attitude towards biology lessons and

biology lessons were most popular among younger students and girls (Prokop, 2007). There is a positive relationship between students' attitudes towards learning and their academic performance. When learning is able to provide interesting activities for students and the way those activities are engaged, and even the participation of students in school decisions have an influence on how students feel about learning and how they react to school life (Amir, 2016). While more Greek students carry a negative view about biology 26.4% of secondary school students are not interested in biology, in contrast to 32.8% of them are interested. Due to intrinsic motivation to learn biology, interest in biology and perceived difficulty of biology and students' views about the way biology is taught (Evangelia, Helena & Maargarita, 2012).

1.1.2. The status of practical activity in Ethiopia

According to Abraham (2009), the status of biology practical activities in secondary and preparatory schools in Ethiopia and the result showed the frequency of practical activities in all schools. Accordingly, out of the total respondents, 70% replied that they were not used practical activities available on their book at all while 8.8% of them responded as they always use practical activities. There was inadequate availability of instructional materials (laboratory equipment) in majority secondary schools. This result indicated that most laboratories in secondary schools are not performing their laboratory activities based on objectives set on the curriculum (Ashebir, 2016). Finally, practice-based education is not efficient in almost all of the schools under study.

1.1.3. Factors hindering practical activity in Ethiopia

According to Tolessa **and** Mohammed (2016), the following gaps observed in secondary and preparatory schools in Ethiopia. Almost all secondary and preparatory schools have common laboratories, but school laboratories are not well equipped and shortage of chemicals. There is no facility except a few secondary schools in which there are some facilities but laboratories are not functional. Equipment and chemicals are simply stored in non-ventilated stores due to the absence of skilled laboratory technicians and cooling systems in schools under the study area of the Amhara region, Ethiopia. Similarly, poor standards of laboratories and design in the school, the existence of one common laboratory room for all sections (grade 9–12 in most schools) creates an overcrowding and clashing of laboratory programs and hence, there is limited period to carry out laboratory activities based on the schedule of each science discipline and this restricts teachers and students to perform laboratory session on an extended period of time. The hindering factors identified in the current study in diaspora secondary school make students disappointed in laboratory practices.

1.1.4. Practical work, students' attitude and achievement

An interest in biology influences performance, because it provides the drive within students to participate in the learning process. Good attitude and better interest learners display particularly in biology serve as encouragement even to the teacher (Owino, 2015). Practical work has a significantly positive effect on learners' performance (Israel, 2014). Teaching science without practical activities has effect on student's interest towards science disciplines which results in less student enrolments in science class.

2. Research design

The design considered appropriate for this study was experimental design since the aim of this study is to assess the effect of practical work on attitude and achievement of grade ninth students towards biology lesson. Hence, data regarding students' attitude and achievement were collected before and after the experiment. Assessing learners' attitude towards the subject from all participants' requires the use of quantitative and qualitative data. Thus, quantitative data were obtained from experiment and qualitative data were obtained from interview of sample students.

For this purpose, one topic from the students' textbook – cell and its environment (osmosis and diffusion) – was selected before the intervention. Then, the plan was developed on how to teach the topic – cell and its environment – practically (by selecting appropriate practical activities to teach specific topics that found under the cell and its environment). The study used the principle of instructional design (problem-based learning) to plan the lesson, i.e., by giving the whole task problem for students before starting the lesson and using materials found in the environment to perform selected practical activities. The intervention was then made. Then, an assessment of the effect of practical activity to enhance students' attitude towards biology and their achievement level was conducted.

2.1. Source of data and collection method

Primary data were used for this research. Students of grade ninthE in diaspora secondary school were the sources of data. Data before intervention and after intervention were collected regarding the students' attitude towards biology lesson and their achievement. Sequential mixed methods data collection strategies involve collecting data in an iterative process whereby the data collected in one phase contribute to the data collected in the next. The data were gathered primary using questionnaire (attitude questions) developed and modified by the researcher and achievement test developed by the researcher, which contains 10 multiple-choice questions. The questionnaire was distributed for 59 students of grade ninth E. Interview with four students was also conducted to collect qualitative data.

2.2. Sampling design

All ninth grade students taking biology courses at diaspora secondary school were the target population. Simple random sampling was used to select $F = 23$ $M = 26$ $T = 59$ grade ninth E students from the total of $F = 223$ $M = 205$ $T = 482$ students. A list of all ninth grade students was obtained and a lottery method was applied to select the sample respondents.

2.3. Data analysis methods

The data so collected were analysed by using different methods. Data from the questionnaire were analysed using the help of SPSS software. Descriptive data analysis, correlation and paired sample *t*-test were used in analysing data. Paired sample *t*-test was used to compare the results before and after intervention. Paired sample test is used to compare groups that are related in some way. The data from the interview were analysed by inserting it in its appropriate place. It was used to reinforce the data analysis from the questionnaire.

3. Results of the study

How does practical work affect learners' attitude towards biology?

Table 1. Descriptive statistics of the data collected

Descriptive Statistics									
	N	Minimum	Maximum	Mean	Std. Deviation	Skewness		Kurtosis	
	Statistic	Statistic	Statistic	Statistic	Statistic	Statistic	Std. Error	Statistic	Std. Error
Attitude pre test	59	5.00	20.00	11.39	2.06	0.62	0.31	5.33	0.61
Attitude post-test	59	10.00	22.00	15.05	3.14	0.60	0.31	−0.62	0.61
Achievement pre test	59	0.00	7.00	4.10	1.61	−0.83	0.31	0.89	0.61
Achievement post-test	59	4.00	10.00	6.7458	1.39	0.55	0.31	0.40	0.61
Valid N (list wise)	59								

Table 1 shows the descriptive statistics of the sampled students. It shows measures of central tendency, variation and shape. Thus, the pre- and post-treatment scores are presented in terms of minimum, maximum, average, standard deviation, skewness and kurtosis. Looking at the pre-test attitude, the minimum value and the maximum value are 5 and 20, respectively. The average score is 11.39, whereas the standard deviation is 2.06. The post-treatment, minimum, maximum, average and standard deviation scores are 10, 22, 15.05 and 3.14, respectively. It is, therefore, possible to conclude that there is an improvement in the attitude of students towards lessons in biology. The variation in the scores of students is relatively small as measured by the standard deviation.

Table 2. Teaching strategy and effect of practical work

Items	Before intervention		After intervention	
Preferred teaching strategy	Practical	Conventional	Practical	Conventional
	49(83.1%)	10(16.9%)	54(91.5%)	5(8.5%)
How does practical work affect learning	Positively	Negatively	Positively	Negatively
	50(84.7.5%)	9(13.7%)	55(93.2%)	4(6.8%)

As can be clearly observed from Table 2, the students' preferred teaching strategy is found to be practical before and after intervention. Surprisingly, enough about 83% of the students preferred practical work as their learning strategy. This may be due to the fact that practical work is not often used in teaching lessons for various reasons. For this reason, students might prefer to have more practical teaching. But there is also an improvement in their preference even after intervention. About 92% of the respondents preferred practical teaching over conventional teaching strategy. Hence, a practical teaching strategy is popular among the students with or without intervention. Moreover, most students believe that practical work affects learning positively. The proportion of students who think that practical work would positively impact learning has increased from 85% before treatment to 93% after intervention.

3.1. To what extent the implementation of practical work improve the students' attitude?

Table 3. Paired sample statistics

		Paired Samples Test					T	df	Sig. (2-tailed)
		Paired Differences							
		Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference				
					Lower	Upper			
Pair 1	Attitude pre-test attitude post-test	−3.66	2.68	0.35	−4.36	−2.96	−10.5	58	0.000

The differences between the pre- and post-test of attitude and achievement tests following the treatment (exposure to practical activities in the experimental research were determined by a series of *t*-tests for the two measures (repeated measure *t*-test) samples.

Table 4. Paired sample statistics

		Paired Samples Test					T	df	Sig. (2-tailed)
		Paired Differences							
		Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference				
					Lower	Upper			
Pair 1	Attitude pre-test attitude post-test	−3.66	2.68	0.35	−4.36	−2.96	−10.5	58	0.000

Table 4 shows means, standard deviations and the *t*-test value for the practical work efficiency and for the importance of perception (the group of students who had been exposed to the use of practical work in the teaching of the substance transportation, osmosis and diffusion).

To test the hypothesis that the pre-attitude test (*M* = 11.39 standard deviation (SD) = 2.07) and post-attitude test (*M* = 15.05 SD = 3.15) were equal at a dependent sample *t*-test was performed. And paired sample *t*-test shows (*M* = 3.66 SD = 2.68) and (*t*(58) = 10.48 *p* = 0.00 with DF = 58). The figure shows that extremely statistically significant difference between pre- and post-attitude results.

Table 5. Pre-test correlation

Correlations			
		Attitude pre-test	**Achievement pre test**
Attitude pre test	Pearson Correlation	1	0.210
	Sig. (2-tailed)		0.111
	N	59	59
Achievement pre test	Pearson Correlation	0.210	1
	Sig. (2-tailed)	0.111	
	N	59	59

Table 5 shows the means and standard deviations for students' efficiency in the test administered to them before and after the experiment (intervention), and the value of the *t*-test. A significant improvement occurred in the achievement of those students who had been exposed to practical teaching (experimentation). To test the hypothesis that the pre-achievement test (*M* = 4.10 SD = 1.61) and post-achievement test (*M* = 6.74 SD = 1.39) were equal a dependent sample *t*-test was performed. And paired sample *t*-test shows (*M* = 2.64 SD = 1.59) and (t(58) = 12.78 *p* = 0.00) this result also shows a statistically extremely significant difference between pre- and post-achievement test results.

Pearson correlation test was conducted to determine the relationship between students' attitude lessons in biology and their achievement. This is done in two different tests. One test is done to check the relationship between pre-test attitude and achievement and another test is conducted to determine the relation between post-experiment attitude and achievement. These tests are presented in Table 5.

The data in Table 5 show that there is a weak positive correlation between pre-test attitude and achievement of students. The Pearson correlation coefficient (*r* = 0.21) coupled with *p* = 0.11 indicates that there exists a significant positive relationship between pre-test attitude and achievement of students. However, the correlation is weak as the correlation coefficient is close to zero.

4. Discussion of the results

Whether practical activities or laboratory teaching affect the students' attitude towards lessons in biology was one of the questions this study has tried to answer. For this purpose, a questionnaire designed and administered on a sample of 59 students. Attitude towards lessons in biology was measured using such items as interest in biology, future career in biology, importance of biology, possibility of becoming a biology teacher, level of difficulty in learning and use of equipment. The questionnaire was designed in such a way that each of these items is measured using a set of questions.

As can be clearly seen from the presentation of the results in Table 2 of chapter four, there is an improvement in all measures of attitude both in number and percentage terms after the experiment. There is an improvement in the interest of students towards learning because of the intervention. For example, the liking of biology has increased from 36% before intervention to about 87% liking after intervention. Another indicator of improvement in attitude is the students are found to be interested in taking frequent lessons in biology. Moreover, the students have found that using living organisms in their lessons as interesting as evident from an improvement from pre-test percentage of 86% to 92%

after-treatment. The students' interest in picking up biology as their future career has also shown improvement. Some 97% of the sampled students have shown interest in taking up biology as their career option. After the treatment, biology is found important in helping to understand other subjects for 93% of the respondents; improve the conceptual skills for 92% and improves the quality of life of another 93% of the students. In addition, there has been an improvement in the liking of biology teachers with the experiment and an increasing number of students' perceived their biology teachers as role models. Practical activities have helped with 83% of the students to consider biology as an easy subject. This is probably because practical activities have made students to understand the lessons.

The above findings show that the use of practical activities (laboratory teaching) helps to improve the students' attitude towards biology. It helps improve their interest, understanding, motivation and ultimately their achievement. This result is consistent with the findings of **Kayani (2017**); Owino (2015); Ozlem (2011) and **Tolessa and Mohammed (2016**). Exposure to practical work improves students' perceptions of their learning efficiency and the importance of the subject and also enhances the students' achievement and their understanding lesson in biology. For example, Ozlem (2011) found that practical work (laboratory) teaching, if planned properly, and if they are effectively integrated into the learning of concepts, have potential to play an important role in students developing a deep and rich understanding of biological concepts. Laboratory sessions were found to promote thinking skills and to enable students to think more creatively. Moreover, students' attitudes towards science subjects; how students learn science best, what students like about science, and how their understanding of science is found to be directly affected by labs and experiments. Kayani (2017 found that the liking of students improved from 56% before treatment to 77% after treatment and 88% of the students said that what they liked best about science was the labs. Tolessa and Mohammed (2016) in his study in the Afar region also found out that lack of interest in science subjects is because of a lack of practical activities in teaching them.

Importantly, the students' attitude towards biology was grossly measured pre- and post-experiment as presented in Table 1 in chapter four. The descriptive statistics table clearly shows the improvement in attitude towards biology lessons measured both using average and standard deviation. The average score of pre-test attitude is 11.39, whereas it is 15.05 after treatment. The standard deviations before and after treatment are 2.06 and 3.14, respectively. It is, therefore, possible to conclude that there is an improvement in the attitude of students towards lessons in biology. The variation in the scores of students is relatively small as measured by the standard deviation. However, the extent of improvement is not significant.

Of course, practical teaching was found to be most preferred by students even before intervention compared to conventional teaching. About 83% of the students preferred practical work as their learning strategy. This may be due to the fact that practical work is not often used in teaching lessons for various reasons and the students wanted to have more of it. Obviously, things that are rare or not easily found are the most sought out. For this reason, students might prefer to have more practical teaching. Moreover, practical work develops learners' understanding of ideas, theories and models stimulate creativity, curiosity and critical thinking (Millar, 2004). The absence of any practical activity in science subjects due to laboratory facilities has an influence on students' scores in science and their future study (Seid, 2016). In addition to this implementation of instructional congruence in teaching science has a significant effect on improving students' interest towards science, especially in the aspects of practical work of science (Ahmad, 2010). Laboratory activities in science fields are paramount relevant to make science learning more practical and observable to internalise the theoretical knowledge about natural processes and phenomena. About 92% of the respondents preferred practical teaching over conventional teaching strategy. Hence, a practical teaching strategy is popular among the students with or without intervention. Moreover, most students believe that practical work affects their learning positively. The proportion of students who think that practical work would positively impact learning has increased from 85% before treatment to 93% after intervention.

Another issue of interest in this study was students' achievement. It is possible to speculate that if students have an interest in a subject, they are likely to exert more effort into it and ultimately achieve better results. This research tried to assess the students' achievements both in the descriptive analysis and using a correlation study. The analysis revealed that a significant difference exists in the achievement of students pre- and post-intervention. The students' achievement has improved after the treatment. The average score of students has increased from 4.10 pre-treatment to 6.74 after treatment. Moreover, the variation in achievement of students is relatively small measured by both range and standard deviation. Accordingly, the minimum and maximum achievement score are 0 and 7 pre-intervention and 4 and 10 after-treatment. The standard deviation of achievement has decreased from a pre-test value of 1.61 to 1.39 after-treatment. The possible generalisation from this is the intervention has resulted in to improvement in the achievement of students.

Previous research has reached similar conclusions. Practical work has a significantly positive effect on learners' performance (Israel, 2014). Teaching science without practical activities has effect on student's interest towards science disciplines which results in less student enrolments in science class. Ozlem (2011) established that hands-on activity, as opposed to traditional instruction, enriched students' achievement and attitude towards. He reported that their experimental group's achievements were statistically significantly better than those of the control groups in understanding environment concepts. Moreover, a statistically significant improvement was found in the achievements and efficiency of those students who were taking the lesson osmosis and diffusion practically. We can explain that by the fact that practical teaching can make the lesson livelier and make teaching and learning of science more enjoyable and interesting, leading to better understanding. Therefore, we suggest extending this strategy to other subjects in biology as well as to other science disciplines.

5. Implications of the results

The findings of this study suggest that practical teaching not only positively affects the attitude of students but also found to be the most preferred learning strategy. Practical work, group work or manual activity sessions are found to be useful as follow-up activities after the practical work sessions. Even without manual activity sessions, the practical work lessons are superior to regular lessons. Thus, we can conclude that practical work is useful for facilitating and developing learning, since they promote student interest in the lessons and provide teachers with a greater variety of pedagogical tools. Moreover, practical teaching is found to affect the achievement of students. The increased interest is often translated into effort and effort leading to better achievement.

The practical instructional method has a significant effect on improving students' attitudes towards science. Science teaching cannot be effective without students being interested in it. Thus, more practical secession is needed if science teaching has to be effective. Moreover, the way practical teaching is planned and conducted has to be well thought out so that it will boost the students' attitude.

The amount of practical work increases the quality of science subjects, students' view of science and their achievement. If secondary schools have to lay down the foundation for future scientist, doctors, engineers, teachers, etc., practical secessions have to be conducted as effectively and efficiently as possible.

Producing the required number and kind of manpower for the country's development especially in science heavily depends on the way we teach it in secondary schools. It is at this stage that students will develop their interest in science so that they will pursue it as a career later in their life.

The consequence of ignoring practical teaching is wide and far reaching. With such a little attention to practical teaching and laboratory work, it will be difficult to achieve progress in science and be competitive. This is because laboratory activities in science fields are paramount relevant to make science learning more practical and observable to internalise the theoretical knowledge about natural processes and phenomena

Secondary schools, therefore, must work hard to use more practical activities in teaching science disciplines. Laboratory facilities should fully equip and furnished; all necessary inputs should be made available; training should be given both to teachers and students; laboratory classes should be scheduled and properly conducted. For which the school administration, the concerned government bodies and NGOs must work together to ensure these facilities are available.

6. Major findings of the study

It would be understatement to say that practical work has a pivotal role in science learning. Specifically, practical work has a key role in teaching science subjects such as biology in secondary school. Teaching science naturally involves showing learners things, or putting them into situations where they can see them for themselves. However, practical work needs to be fully integrated as a major element of effective pedagogy in science in order to improve learning in science.

Practical teaching is carried out in most secondary schools with whatever facility, input and manpower that is available. However, to what extent such activities affect the attitude of students towards biology lessons and their achievement largely remains an open question. This particular study attempted to assess the impact of practical work on students' attitude towards biology lessons and their achievement in diaspora secondary school. It specifically tried to answer how practical work that affects learners attitude towards the study of biology; how to improve the implementation of practical work in laboratories and how learners attitude enhance their achievement.

This study is conducted by taking a random sample of 59 students from 482 of the total ninth grade students in diaspora secondary school. The intervention was an experimental teaching method for two weeks for all participants by randomly selecting topic osmosis and diffusion from the text. A questionnaire was designed to collect data about attitude of students before and after the treatment. Two tests were designed and conducted to measure students' achievement. The first test was applied before and the second test was applied after the intervention and general six interview questions were used to assess the students view of the teaching-learning process in diaspora seconder school.

7. Conclusions

Based on the data analysis and discussion, the following conclusions are drawn.

- Practical activities or laboratory teaching is found to positively affect the learners' attitude towards lessons in biology. More and effective practical work has led to a more positive attitude. In particular, it was found to enhance the students' interest in biology, future career in biology, importance of biology, possibility of becoming a biology teacher, level of difficulty in learning and the use of equipment.
- Practical teaching is found to be the most popular learning strategy compared to conventional teaching. Most students are found to prefer practical teaching more meaningful than the conventional one.
- The ways in which practical activities are conducted directly affect the attitude of students. Laboratory education that is carefully considered and planned to execute effectively with all the relevant equipment and inputs affects students' learning in varying levels and helps the students to be engaged in their learning both mentally and physically.
- A significant positive relationship was discovered between learners' attitude and their achievement. The results of this study clearly show that students having a more positive attitude towards their lesson are found to be better achievers.
- The findings show that the use of effective practical activities (laboratory teaching) helps to improve the students' attitude towards biology. It helped improve their interest, understanding, motivation and ultimately their achievement.

8. Recommendations

- The way teachers train should be changed and should make it active in teachers college.
- More attention and consideration should be given to practical teaching in secondary schools.
- There is an urgent need to re-think and re-focus current state of practical teaching in a way that enables effective teaching.
- Practical activities should be well planned, effectively conducted and made an integral part of the pedagogy.
- Additional resources for fully furnishing the laboratories, buying inputs and training should be made available.
- The school administration, teachers, relevant government bodies, NGOs and the community should work closely to make sure that the practical work is conducted effectively.

References

Abraham, R. M. (2009). Practical work: making it more effective. *Getting Practical*, 61, 59–64.

Ahmad, Z. M. (2010). The effect of instractional congruence on students interest towards learning science. *European Journal of Physics Education*, 1(1), 20–27.

Amir, K. M. (2016). Learners' attitudes and performance in science subjects in A-level in secondary schools. *The Journal of Educational Research*.

Ashebir, Z. G. (2016). The status of secondary school science laboratory activities for quality education in case of wolaita zone, Southern Ethiopia. *Journal of Education and Practice*, 7(31), 1–11.

Bell, D. (2008). *Practical work in science*. London, UK: Score Education Org.

Evangelia, M., Helena, K. & Maargarita, K. (2012). Greek secondary school students' views about biology. *International Journal of Environmental & Science education*, 7(2), 217–232.

Hacieminoglu, E. (2016). Elementary school students attitude towards science and related variables. *International Journal of Environmental and Science Education*, 11(2), 35–52.

Hinneh, J. T. (2017). Attitude towards practical work and students' achievement in biology. *IOSR Journal of Mathematics*, 13(4), 6–11.

Israel, K. (2014). Effect of practical work on grade 10 learners' performance in science in mankweng circuit, south africa. *Mediterranean Journal of Social Science*, 5(23), 1568.

Kayani, S. M. (2017). Improving students' attitude towards biology as a school subject. *Journal of Applied Environmental*, 7(1), 170–179.

Millar, R. (2004). *The role of practical work*. York UK: University of York, National Academy of Sciences, pp. 2–25.

Needham, R. (2014). The contribution of practical work to the science curriculum. *Perspectives on the Science Curriculum*, 95(352), 63–69.

Owino, A. O. (2015). The relationship between students attitude towards biology. *Pearl Research Journals*, 111–117.

Ozlem, J. C. (2011). Effect of hands on activity enriched. *Journal of Baltic Science Education*, 87–97.

Prokop, P. (2007). Slovakian students' attitudes. *Eurasia Journal of Mathematics, Science & Technology Education*, 3(4), 287–295.

Sakariyau, A. O., Taiws, M. O. & Ajagbe, O. W. (2016). An investigation on secondary school students' attitude towards science. *Journal of Education and Practice*, 7(28).

Seid, T. M. (2016). Factors affecting implmentation of practical work. *Amal Jyothi College of Engineering (AJCE)*.

Tolessa, M. D. & Mohammed, M. S. (2016). Factors affecting implementation of practical activities in science education in some selected secondery and preparatory schools of afar region. *International Journal of Environment and Science Education*, *11*(12), 5438–5452.