

Influence of Coaching Teaching Style on Biology Examinations in Public Secondary Schools in Molo Sub-County, Kenya

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Abstract

This study sought to determine the influence of coaching teaching style on students' achievement in biology examinations in public secondary schools in Molo Sub-County, Kenya. The study was anchored on constructivist theory by Lev Vygotsky and adopted randomized pre-test, post-test with control quasi-experimental design. The target population was 2800 students and 139 biology teachers in 39 public Sub-County secondary schools. A sample of 191 students was purposively selected from the population of form two students from four secondary schools. The schools were randomly assigned into either experimental group or control group with students being in their intact classes. A biology theory assessment test (BTAT), biology practical assessment test (BPAT) and questionnaires were used to collect data from the students. The validity of the instruments was assessed through expert judgment while reliability was examined using the split-half method. The calculated r was .865 for the BTAT and .823 for the BPAT which was reliable. The BTAT and BPAT were given to all students under study before they underwent a six-weeks lesson on the topic Transport in Animals with purpose to establish the students' baseline knowledge and skills on this topic. The experimental group was taught using Coaching Teaching Style while the control group was taught using the conventional lecture and demonstration methods. The BTAT and BPAT were again given to the students at the end of the six weeks lesson to establish the knowledge gained. Results revealed that students taught using the coaching method had a statistically significant higher mean score in both the BTAT and BPAT than their counterparts taught using the conventional methods. From findings, the study concludes that coaching improves students' achievement in both theory and practical biology examinations. The study recommends that the teacher service commission should integrate coaching in the teacher professional development modules and hire more biology teachers in order to reduce class size.

Keywords

Coaching Teaching, Biology, Achievement Test, Secondary School, Kenya

1. Introduction

1.1. Background of the Study

There are growing concerns regarding the achievement in science subjects especially in biology by secondary school children in Kenya in recent years. As **Table 1** shows, students' achievement in biology in KCSE shows a positive deviation of less than 10 points in average over a period of five years. Less than one percent of students who sat for the biology examination in 2019 managed to score an A (Alneah, 2019).

The massive failure in the biology subject is a major problem especially in a country like Kenya where there are striking gaps in the healthcare professions (Miseda, Were, Murianki, Mutuku, & Mutwiwa, 2017). The failure in the biology subjects has also compromised other professions such as agriculture, forestry, and biotechnology, which also demand knowledge of this discipline. Molo Sub-County scored an average of 2.91 points in biology on a numeric 12-point scale in the last five years. This implies that the Sub-County's mean score for the last five years has been below the half-way mark. The biology has also recorded the lowest average mean score of the three science subjects as shown in **Table 2**.

Table 1. Performance in KCSE biology examinations nationally 2018-2022.

Year	Mean Score	Standard Deviation	Candidature
2018	51.38	23.26	589,900
2019	51.38	23.26	618,654
2020	53.03	29.50	651,236
2021	57.01	32.98	710,533
2022	57.37	32.39	752,154

Source: KNEC Report, 2022.

Table 2. Comparison of biology performance with other science subjects.

Year/Subject	Subject Mean		
	Biology	Chemistry	Physics
2018	2.79	2.92	3.29
2019	2.86	2.72	3.69
2020	3.20	3.72	4.38
2021	3.07	3.53	3.95
2022	2.65	3.48	3.40
Average	2.91	3.27	3.74

Source: SDE, Molo Sub County, 2022.

To address the failure in biology, there is a need to do studies on what may change the achievement. Student coaching provides a potential solution for turning around the achievement of biology students at the secondary school level. Coaching is an instructional method that seeks to inspire learners to actively engage in learning, thereby offering an authentic learning environment that encompasses flexible, interactive, and inquiry-based learning (Fazel, 2013). The coaching strategy emphasizes on student focused activities that promote independence, positive behavioral management, and positive classroom environment. It relies on classroom activities such as setting learning goals, active listening, providing learners with challenges and support that will lead to realization of goals, asking questions, receiving and giving feedback, and supporting the learning of others (Briggs & Newburgh, 2011). In this instructional strategy, student-educator relationships are characterized by frequent interaction, collaboration, and trust that leads to positive student outcome (Leana, 2011).

Coaching is often associated with training of adults particularly in professional or organizational set-up. This concept has however found application in the education of non-adult and supporting learning in basic education setup. Passmore and Brown (2009) found that coaching was an effective tool for enhancing examination achievement and address social disadvantage that limit the academic achievement of children from low socioeconomic backgrounds. Key features of the coaching strategy include setting specific learning goals, giving tasks aimed at helping students develop the desired knowledge and skills, soliciting feedback, encouraging learners to critique themselves, and displaying empathy (Kissel et al., 2011). It emphasizes on developing trust in the learner, being present whenever the learners need to inquire, listening actively, clarifying, empathizing, being succinct, asking the best questions, and giving feedback (Fazel, 2013).

Dorrington and Nieuwerburg (2015) argued that one of the features that make coaching a successful instructional strategy is the quality of the relationship between the instructor and the learner. Coaching emphasizes the creation of a relationship of trust, commitment, and mutual respect between the coach and the learner. This relationship tends to increase motivation for learning. Feedback is another vital component of the coaching instructional strategy (Hattie, 2009). Teachers are required to furnish their students with information regarding their achievement so as to facilitate improvement and prepare them for further challenge. Feedback should not necessarily come from the teacher as the coaching approach may be designed in a way that students evaluate each other's work and provide feedback (Dorrington & Nieuwerburg, 2015).

Apart from evaluating peer work, students may also assume the coaching role. The practice of student-to-student coaching is gaining impetus in the USA where students are equipped with skills to work together, reflect on their learning goals, share ideas, and teach each other how to solve problems (Kissel et al., 2011). Another vital feature of coaching is the use of formative assessment. The assessment should assess learning progress and provide information on how

learning activities should be adjusted in order to move the student closer to the intended goals.

Coaching differs from the traditional methods of teaching such lecture and demonstration in that it is cyclical rather than a straight-line activity that seeks to nurture a particular skill or know-how among students (Orr & Sonnadara, 2019). This means that coaching is only used when there is a precise and specific goal. For instance, it may be used to help a student understand a specific topic in biology that he or she is having difficulties. This differentiation implies that coaching is hand-on personalized approach of teaching that requires the teacher to adjust instructions according to the individual needs of each student (Walpole, McKenna, Zarain, & Lamitina, 2010). This is because students have difficulties in different areas and thus the teacher must focus on each student, identify his or her area of difficulty, and help him or her achieve the required mastery. This aspect also suggests coaching requires teachers to build personalized and strong relationship with learners that will foster openness and collaboration.

Most traditional methods of teaching use one-way model of communication where information mainly flow from the teacher to the students (Coburn & Woulfin, 2012). On the other hand, coaching uses two-way model of communication that is characterized by symmetrical exchange of information between the students and the teacher. The teacher gives instructions to the students and also obtain feedback from them that he or she uses to inform subsequent instructions (Czajka & McConnell, 2016). Traditional methods also focus on introducing new knowledge and ideas while coaching focuses on helping students to unlock and utilize the knowledge and ideas that they already possess in different ways.

Coaching may target different stakeholders within the learning institution including students, teachers, administrators, and parents. The current study focuses on coaching directed to students. Student coaching or academic coaching focuses on examining the students learning style, working habits, and existing difficulties and then creating strategies for overcoming the difficulties, build new skills, refine and expand existing skills, and reflect on their learning goals (Timonen & Ruokamo, 2021). It emphasizes on heightening the students' awareness and creating supportive relationships. The ultimate goal of any student coaching program is to institutionalize reflective practices and offer continuous improvement among learners.

Students' coaching has become a popular instructional strategy for promoting the development of secondary school students in many parts of the globe. In the United States of America (USA), numerous private agencies have been established to provide one-on-one coaching to students especially during the transition from secondary school to college. According to Devine, Meyers, and Houssemand (2013), several students coaching approaches have been successfully applied in the (USA) and the United Kingdom (UK). The most common coaching approaches observed in these regions include behavioural coaching, solution-focused coaching, cognitive coaching, and peer coaching. Behavioural coaching is mainly applied in the UK education sector mainly to minimize students' anxiety, in-

crease test achievement, and managing stress (Short, Kinman, & Baker, 2010).

Behavioural coaching is easy to teach and learn and hence it's wide application. Solution-focused coaching is mainly used to develop life-skills among students (Green, Grant, & Rynsaardt, 2007). It is usually blended with other coaching approaches to enhance students' problem-solving skills. Cognitive coaching focuses on developing students' reflection, self-evaluation, and self-analysis capability (Palmer & Szymanska, 2007). Peer coaching involves students learning from colleagues through observation, modelling, feedback, and reflective dialogue (Knight, 2009). Peer coaching is common in the UK where older students assume the responsibility of coaching younger students. Peer coaching is not only of benefit to the coachee but also benefits the student coach by enhancing his or her study skill, communication competence, leadership capabilities, self-confidence, and emotional intelligence (Dorrington & Nieuwerburgh, 2015). Sezer (2016) explains that in coaching, the educator relates with the learner as a partner rather than as an authority, healer, or expert. The role of the coach is to support the learners' construction of knowledge by inquiring the learners' problems and directing him or her in exploring probable solutions.

In Africa, the concept of coaching in the education sector has mainly been limited to the professional development of teachers (Namamba & Rao, 2017). The coaching process is viewed as professional development strategy rather than a teaching methodology. It mainly targets teachers rather than students with the view of improving the teachers' instructional practices. In Malawi, a five-month intervention for literacy teachers that encompassed directive coaching, workshops, and complementary teaching and learning materials resulted in changes in attitudes and beliefs about their teaching abilities, though no shifts in instructional practices were observed (Sailors et al., 2014). Other targeted areas were the teachers' engagement with their students and teaching practices, but no significant differences were observed between the intervention and control groups in these aspects. In Ethiopia many efforts were put in place towards improving student-centred pedagogy with the teacher coaching programme increased learning outcomes modestly, it failed to increase student-centred pedagogical practices.

In Kenya, there is increased emphasis on shifting from the traditional British-modelled curriculum and pedagogy especially in science education (Anderson et al., 2015). However, the system that is current in use in secondary schools is still teacher-centred and overly exam driven. Teacher coaching is one of the approaches that have been explored in effort to transition the teaching practices in Kenyan education set-up. Several teacher coaching programmes have been implemented in the country such as the Kenya Primary Math and Reading Initiative and the Tusome programmes that sought to improve delivery of reading and mathematics instructions in primary schools (Piper & Zuilkowski, 2015). Student coaching is however a limited practice in Kenyan learning institutions. It is in this light that the study sought to examine the influence of introducing coaching as teaching style on the achievement of secondary school students in

biology examination in Molo Sub-County.

1.2. Research Hypotheses

The following hypotheses were tested at the .05 level of significance

H_{01} : There is no statistically significant relationship between coaching as a method of teaching biology and students' achievement in theory biology assessment test in secondary schools in Molo Sub County.

H_{02} : There is no statistically significant association between coaching as a method of teaching biology and students' achievement in practical biology assessment test in secondary schools in Molo Sub-County.

2. Methodology

2.1. Research Design

A randomized pre-test post-test with control quasi-experimental design and survey design was used in this study. Two research designs were necessary because one design could not address all research questions. Randomized pre-test post-test control research is an experimental design that focuses on creating two groups (treatment and control), taking measurement of the outcome variable before the onset of the study, administering the intervention to the treatment group, taking measurement of the outcome variable for the second time, and comparing the difference between the experimental and control group based on the measurement (Johnson & Christensen, 2014). The study was carried out in four secondary schools in Molo Sub-County in Kenya.

2.2. Target Population

The population consisted of all form two students doing biology and all biology teachers in Molo Sub-County. According to the Molo Sub-County Director of Education, there was an average of 2800 form-two students taking biology in Molo Sub-County and 134 biology teachers spread across 39 secondary schools. **Table 3** presents a summary of the target population.

2.3. Data Collection Instruments

Three data collection instruments were used: biology theory assessment test (BTAT), biology practical assessment test (BPAT), and questionnaire for students.

Table 3. Target population.

No.	Category	Target Population
1	Teachers	139
2	Students	2800
3	Schools	39

Source: Molo Sub-County Director of Education (2022).

2.3.1. Biology Theory Assessment Test (BTAT)

A theory BTAT prepared by the researcher was used to collect data regarding effect of coaching on achievement of biology students. The test focused on assessing improvement in the students' knowledge and skill on form two topic of Transport in Animals. The test was administered before and after the six-week lesson focusing on this topic.

2.3.2. Biology Practical Assessment Test (BPAT)

Later on, practical tasks were administered separately. The test focused on assessing in the students practical skills related to the topic of Transport in Animals after the six-week lessons. The pre-test is the base test. The test was administered before and after the six-week lessons.

2.3.3. Questionnaires for Students

In addition to the achievement test, a questionnaire was administered among the students who were taught using the coaching methods to assess their feelings and experiences during the lesson. The questionnaires had a Likert scale where respondents were given a set of statement and asked to rate on five point scale. The Likert scale enabled the respondents to choose quickly rather than spend much time thinking reading many missing answers. It also made it easy to analyse the data. Data from the questionnaires was analysed using means and standard deviation.

2.4. Validity and Reliability of Instruments

2.4.1. Validity of the Instruments

Validity expresses the degree to which a measurement measures what it purports to measure (Cohen et al., 2018). Validity of research instrument was enhanced through expert judgement where the researcher consulted the university research supervisors and other faculty members who have deep expertise in the subject area. The researcher asked the supervisors and faculty members to assess the relevance, accuracy, and comprehensiveness of the items included in the instruments. The supervisors and faculty members agreed that both the BTAT and BPAT were relevant and comprehensive in testing the students' understanding of the topic. They also agreed that the questionnaire were adequate.

2.4.2. Reliability of the Instruments

Reliability refers to the degree to which an instrument can give consistent results when used to measure the same object in similar circumstances. Reliability of the instruments was assessed by assessing the pilot study data using the test-retest method. This method entailed administering the researcher instrument to the same respondents twice in a span of two weeks in line with the recommendation by Paiva, Borroso and Lopez (2014) that two-weeks is often considered an appropriate time interval for test-retest. The results of the first wave to that of the second wave of data collection were compared using the Pearson correlation method (Berchtold, 2016). The set criterion was that a coefficient of .7 or above

would indicate that the instrument is reliable. The analysis was done using the Statistical Program for Social Sciences (SPSS). The theory BAT test had a correlation coefficient of .865 while the practical was .823. Since the coefficients were above the .7 criterion, the tests were considered to be reliable. The reliability of the questionnaire was tested using the Cronbach alpha test, which yielded an alpha of .796 against the set criterion of .7 and thus had also met the reliability threshold.

2.5. Data Analysis

Data that was collected through the assessment test was sorted, coded, and entered into the Statistical Packages for Social Science (SPSS) software version 25.0 where it was analysed using descriptive and inferential statistics. Inferential statistics were used to examine the influence of coaching on students' achievement in the BTAT and BPAT. The independent sample t-test was used to conduct the inferential statistics. The mean score gain for the treatment group were then compared with that of control group using the independent sample t-test. The independent sample-test also compared the net score of female and male students that were taught through coaching. The hypotheses of the study were tested at the .05 level of significance.

3. Results and Discussion

A total of 191 students completed the study, who were classified into either the experimental (2 schools, n = 93) or the control group (2 schools, n = 98) with the students being in their intact classes.

3.1. Influence of Coaching on Students Achievement on the BTAT

Students in both the control and experiment groups took the BTAT on the topic of transport in animal at the onset of the study. The test was marked out of a highest possible score of 20, which were converted into percentage to make comparison easily understood. **Table 4** presents students' scores in the pre-test.

Table 4 shows that students in the experimental group had a mean score of 21.29 percent in the theory pre-test while the control group had mean score of 15.97 percent. The independent sample t-test shows that the difference in the mean scores of the two groups is not statistically significant ($t = 2.653$, $p = .588$). This implies that students in the experimental and control group had the same baseline knowledge on the topic of Transport in Animals before the six-week lesson. Establishing the baseline knowledge that students in each group had was essential in determine gain in knowledge after the six-week lesson. Students in the experimental group were taught the topic of Transport in Animals using the coaching method while those in the control group were taught using the conventional methods of lecture and demonstration. After the six weeks students were given the same test and their scores registered. **Table 5** presents a summary of the students' performance in the theory post-test.

Table 4. Theory pretest mean scores.

Group	N	Mean	SD	SE	t	p
Experimental	93	21.29	14.083	1.460	2.653	.588
Control	98	15.97	13.635	1.377		

Table 5. Theory post test mean scores.

Group	N	Mean	SD	SE	t	p
Experimental	93	64.95	14.083	16.126	20.742	.000
Control	98	18.27	13.635	14.976		

Table 5 shows that students in the experimental group had a mean score of 64.95 percent while those in the control group had a mean score of 18.27 percent. The independent sample t-test indicate that the difference in the mean scores of the two groups is statistically significant at the .05 level of significance ($t = 20.742, p < .001$). This implies that on average students in the experimental group had greater knowledge on the topic of Transport in Animals at the end of the six-week lessons than those in the control group. The researcher then obtained the deference between the pre-test and post-test score of the students to obtain the mean score gain by the student after the lessons. This difference represents the theory knowledge that the students have gained during the six weeks lesson. The independent t-test was conducted to determine whether the difference in mean score gain by students in the two groups is statistically significant. **Table 6** presents the results of the independent sample t-test.

Table 6 shows that students in experimental group had average mean score gain of 43.66 while those in the control group had an average mean score gain of 2.30. This statistics indicate that students in the experimental group had greater gain in knowledge after the six weeks lessons. The independent sample t-test shows that there is a statistically significant difference between the mean score gain of the experimental group (mean gain = 43.66) and that of the control group (mean gain = .46) at the .05 level of significance ($t = 17.545, p < .001$). This result leads to the rejection of the first hypothesis of the study, which stated that there is no statistically significant relationship between coaching as a method of teaching biology and students' achievement in theory biology assessment test in secondary schools in Molo Sub County. Results show that experimental group had a significantly higher mean score gain than the control group. This finding leads to the conclusion that coaching as a teaching method has a positive and significant effect on students' achievement in BTAT. This means that using of the coaching method to teach biology improves acquisition of biology theory knowledge.

The findings are congruent with [Madden et al. \(2011\)](#), who found that students taught using the coaching method were more engaged in classroom than those who were taught using conventional methods. They also found that coaching

Table 6. Comparison of theory mean score gain by experimental and control groups.

Group	N	Mean	SD	SE	t	p
Experimental	93	43.66	21.241	2.203	17.545	.000
Control	98	2.30	8.316	.840		

had a positive impact on other areas that may be indirectly connected to academic achievement such as creativity, teamwork, perseverance, love for learning, and curiosity. Current findings are also consistent with [Green et al. \(2007\)](#), who also found that coaching was associated with cognitive hardiness and hope in a sample of female high school students in the USA. Students in the coaching group had significantly higher levels of cognitive hardiness and hope, as well as, lower levels of depression than their peers in the control group.

On the other hand, the findings contradicts the [Kenny and Faunce \(2004\)](#) who found that elementary and secondary school students who had received out-of-school coaching performed equally as those who had not received the coaching in English, mathematics, and science tests. It is probable that there are factors that determine the effectiveness of the coaching method in enhancing the academic achievement of students and that one of these factors is the student's motivation. If coaching lead to greater motivation to learn, then the student is likely to record a positive change in academic achievement. This position is supported by questionnaire data presented in [Table 7](#).

[Table 7](#) shows that item 3B had a mean of 4.34, which indicates that on average, the students in the experimental group agreed with the statement that they found the class to be more interesting due to the use of the coaching method. Item 3C also had a mean of 4.13, which illustrates that students were in agreement that they were able to sustain interest in the subject for a longer period of time due to the use of coaching method. Students rating on these two items are an indication that one of the ways in which coaching enhances students' academic achievement in the biology theory examinations is by making lessons more interesting and enjoyable to the learners. This increases the love for learning as well as the motivation to learn.

Also [Table 6](#) shows that respondents on average agreed that coaching method made it easier for them to understand concepts clearly and in details (mean = 4.13, SD = .837). In addition, respondents were in agreement that the coaching method helped them to understand difficult concept (mean = 3.94, SD = 1.275). According to Bloom's Taxonomy, understanding is one of the three lower levels learning that a student begins with before moving to high order thinking. Bloom's taxonomy defines understanding as the process of constructing meaning from oral, written, or graphic messages through interpretation, comparison, inferring, and explaining. It is the second layer of learning with the first one being remembering; which is the recollection is of information from long-term memory. This issue of memory is also captured in item 3H, where students on average agreed that the found it easy to remember concepts taught using the

Table 7. Experiences of students taught using the coaching method.

SN	Statement	N	Mean	S.D
3A	Coaching method made it easier for me to understand concepts clearly and in details.	93	4.13	.837
3B	I found the class to be more interesting due to the use of the coaching method.	93	4.34	1.027
3C	I was able to sustain interest in the subject for a longer period of time due to the use of coaching method.	93	4.13	.992
3D	The coaching method helped me to understand difficult concepts.	93	3.94	1.275
3E	The coaching method helped me to integrate the outside world into classroom learning.	93	3.76	1.237
3F	The coaching method helped me to relate theoretical and practical concepts.	93	4.09	1.090
3G	I was able to maintain high levels of attention during the lesson due to the coaching method.	93	4.05	1.126
3H	I find it easy to remember concepts taught using the coaching methods.	93	4.08	1.106

coaching method. These findings suggest that coaching help to promote low order learning in biology.

3.2. Influence of Coaching on Students' Achievement in the BPAT

The study also sought to establish the association between coaching as a method of teaching biology and students' achievement in biology practical assessment test (BPAT) in secondary schools in Molo Sub-County. The BPAT examined students' ability to make connection between abstract knowledge and real-world set-up through exploration and experiential learning. Similarly, students in both the experimental and control group were given the BPAT before the six-week topic on transport in animal. The BPAT was also marked out of a possible highest score of 20, which were converted into percentage to make comparison easily understood. **Table 8** presents students' scores in the pre-test.

Table 8 shows that students in the experimental group had a mean score of 11.56 percent in the practical pre-test while those in the control group had a mean score of 12.24. The independent sample t-test showed that the difference between these mean scores is not statistically significant at the .05 level of significance ($t = .495$, $p = .621$). These results indicate that there was no statistically significant difference between students in control group and those in the experiment group in the baseline practical skills in the biology topic of Transport in Animals. However, the fact that both group recorded a mean score of less than 15 percent shows that the topic was quite new to both groups. Students in the experimental group were taught using the coaching method while those in the control group were taught using the conventional lecture and demonstration

methods. After the six weeks, students were given the same test and their scores recorded. **Table 9** summarizes their achievement.

Table 9 displays that in the post-test, students in the experimental group had a mean score of 53.60 percent while those in the control group had a mean score of 12.24. The independent sample t-test shows that the difference between the mean scores of the experimental and control group is statistically significant ($t = 19.870$, $p = .000$). These results illustrate that students in the experimental group demonstrate greater practical skills on the topic of Transport in Animals than their counterparts in the control group at the end of the six-week period. The researcher then obtain the difference between the students' score in the practical pre-test and their score in their post-test in order to gauge the skills gain by students in both the experimental and control groups during the lessons. The independent sample t-test was used to examine whether the mean score gain by the experimental and control group are statistically different. This test was design to enable the study to determine whether the use of coaching as method of teaching biology would yield significantly higher students achievement in the BPAT. **Table 10** presents this information.

Results in **Table 10** shows that students in the experiment group had mean score gain of 42.04 in the practical pre-test after the six-week lessons while those in the control group had a mean score gain of zero. The independent sample t-test illustrates that there is a statistically significant difference between the mean score gain by students in the experiment group (mean gain = 42.04) and that of students in the control group (mean gain = .00) at the .05 level of significance ($t = 22.409$, $p < .001$). These statistics lead to the rejection of the second hypothesis of the study, which stated that there is no statistically significant association between coaching as a method of teaching biology and students' achievement in the BPAT in secondary schools in Molo Sub-County.

Table 8. Practical pretest mean scores.

Group	N	Mean	SD	SE	t	p
Experimental	93	11.56	8.109	.841	.495	.621
Control	98	12.24	10.772	1.088		

Table 9. Practical post-test mean scores.

Group	N	Mean	SD	SE	t	p
Experimental	93	53.60	17.436	1.808	19.870	.000
Control	98	12.24	10.772	1.031		

Table 10. Practical mean score gain after six-week lessons.

Group	N	Mean	SD	SE	t	p
Experimental	93	42.04	16.105	1.670	22.409	.000
Control	98	.00	8.465	.855		

This implies that students in experiment group, who were taught using the coaching method, recorded much greater improvement in practical skills related to the biology topic of Transport in Animals. The results suggest that on average, the practical skills of the students in the control group related to mentioned topic remain more or less the same after the six-week period. Results show that students in the experimental group have a significantly higher mean score gain after the six-week lesson than their counterparts in the control group. This results lead to the conclusion that the use of coaching as a method of teaching biology improves students' achievement in practical examination. This means that teaching secondary school biology using the coaching method improves acquisition of practical skills by students.

The findings are congruent with [Vlach and Carver \(2008\)](#), which found pupils who received observation coaching, looked at object more carefully and frequently when drawing. In addition, the children in the treatment group had significantly higher drawing scores than children in the control group. Current findings are also in line with [Vogel and Herendza \(2016\)](#), who found that clinical coaching programme with weekly structured teaching were more effective in imparting practical skills among physicians than other teaching methodologies. The effectiveness of the coaching method was attributed to its ability to provide real time guidance and feedback to learners. The findings also agree with [Becker et al. \(2019\)](#), who found that content-focused coaching had a positive and significant effect on acquisition of practical skills by cooperating teachers (a classroom teacher that provide oversight to teacher education candidate).

However, the findings are not congruent with [Guinn \(2018\)](#) where it was observed that assigning coaching roles to teachers creates a role conflict leading to exhaustions, burnout, and teacher turnover. These factors are likely to have a negative effect on students learning including acquisition of practical skills. It is probable that the teachers involved in this study did not find the coaching role exhausting because the coaching was done for a period of six-week. The survey with students in the experimental group also revealed other benefits that they associated with the use of the coaching methods. One these benefits is enhancing the students ability to integrate the outside world into classroom learning. This consistent with Lev Vygotsky constructivist theory, which contends that learning best takes place when students are able to connect classrooms activities with things that are taking place in their other spheres of life such as at home and in their neighbourhood/city/country.

4. Conclusions and Recommendations

From the findings, the study concludes that coaching has a positive and statistically significant influence on students' achievement in biology theory and practical tests. The study established that students who are taught using the coaching method record higher mean score gain in the BTAT and BPAT than those taught using the conventional lecture and demonstration methods. This implies

that the coaching method facilitates the construction of biology theory knowledge as well as practical skills among students. Consequently, coaching should be considered as an appropriate method for teaching biology theory and practical in secondary schools.

Universities and other institutions that train secondary school biology teachers should integrate coaching as a method of instruction into their teacher training curriculum. These institutions should equip biology trainee teachers with the knowledge and skills that they need to implement the coaching method of teaching. The teacher service commission (TSC) should incorporate coaching into biology teachers' professional development modules. TSC usually offers the teacher professional development (TPD) modules to teachers who are already at work with view of updating and improving their knowledge and skills. TSC should develop a module for training existing biology teacher on how to implement coaching as method of teaching biology to secondary school students.

Principals and head of departments in charge of the biology subject within the secondary schools can also organize internal training to equip biology teachers with the skills and knowledge needed to implement coaching in the teaching of biology. Equipping biology teachers with coaching skills should also be integrated into the Strengthening of Mathematics and Science in Secondary Education (SMASSE) programme and the School Based Teacher Support System (SBTSS).

This study was confined to public secondary schools in Molo Sub-County. To support the generalization of findings, future researcher should consider replicating this study in other sub counties. Future studies should also replicate the study in private secondary schools in facilitate comparison and generalization of findings to all secondary schools.

Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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