Gender Influence on Learner Attitude towards Biology: A Pedagogical Focus on Science Process Skills

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ABSTRACT

Learners of both genders are expected to perform better in Biology examinations if and when the right heuristic teaching methodologies and approaches are adopted during Biology instruction. There has been continued gender disparity in learner performance in examinations which in part could be attributed to methodologies that are gender-biased. This study aimed at determining the influence of gender on attitude of form two students in Gucha South Sub-County. The study was guided by two null hypotheses: HO_1: There is no significant gender difference in learner' attitude towards Biology practical work; and HO_2: There is no significant gender difference in learner' attitude towards Biology practical process skills. The study adopted the Cognitive consistency theory by Frizer Heider (1958). The study adopted the Solomon four-group non-equivalent control group design. Four co-educational County level secondary schools were purposively sampled. The respondents were form two students from the sampled schools. Data was collected using Biology Attitude Questionnaire for Students (BAQS). Split-half was used to determine reliability which resulted into a coefficient of 0.89. Means and standard deviations were used to compare the group performances. Independent samples t-test at $\alpha = 0.05$ significance level was used to determine the effect of BPPSTA on learner attitude by gender. The study found out that the BPPSTA influence on learner attitude did not vary by gender. The study findings may provide insights to the biology teachers on the appropriate improvement in the administration of practical activities in Biology lessons and methodologies that are not gender-biased such as BPPSTA.

Keywords: Gender, Attitude, Biology, Biology Practical Process skills, Performance

INTRODUCTION

Gender as a factor has continually had a great effect on many aspects of education. One such aspect is learner attitude. Gender influence on learner attitude is a key determinant on learner attainment in science and hence Biology. Gender is an attribute that varied roles are socially assigned for feminine and masculine (Okoye, 2016). Gender is a determinant of social outcome and cannot be delineated from the field of Biology or from other economic, cultural, and ethnic class (Kashu, 2014; Owoewe & Agbaje, 2016). Gin (2011) observes that in contemporary context of our society partriachial values predominate; it is a world where there is belief that women are inferior to men. Nwona and Akogun (2015) noted imbalance against women in Science, Technology Engineering and Mathematics (STEM). Gender, as a concept, has attracted a great interest among educators in Kenya and beyond. This interest is in part attributed to the continued campaign and emphasis for gender equity in many quotas (Figona & Sababa, 2017).

According to IFAD (2014), gender equity implies fairness in treatment of both boys and girls, according to their respective requirements and concerns not only in education matters but in all life aspects. This may include equal treatment or treatment that is not similar but which is perceived as equivalent in terms of rights, needs, benefits, obligations and opportunities. In education, this means the recognition by all stakeholders including policy makers and educators of the inherent differences of both girls and boys in terms of ability and circumstances and acting accordingly to ensure that no one is undermined or disadvantaged. Kashu (2014) posits that, the aspect of gender equity can be seen in a number of views. Firstly, there is a moral reason to ensure that one of the sexes is not disadvantaged compared to the other. The disadvantage may be the end result of many years of treatment

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based on culture, religion and tradition. The second imperative to raising the performance of one of the sexes to be similar to the other is the concomitant increase in economic and social benefits that this will bring.

For many years the international community has laid a lot of priority and emphasis on eliminating differences in education between boys and girls. Odagboyi, (2015) posits that gender equality is one of the millennium development goals (MDGs) that countries worldwide aspired to achieve. The MDGs target was to eliminate gender disparity in primary and secondary education, preferably by 2005, and in all levels of education not later than the year 2015. This has greatly been supported by institutions like the United Nations and the World Bank. According to the World Bank, there is no investment more effective for achieving development goals than educating girls. Equality of educational opportunities between men and women or boys and girls is also acknowledged in the Universal Declaration of Human Rights of 1948. It has been suggested that educating girls and achieving the MDG on gender equity will lead to a range of improved outcomes for developing countries where Kenya falls, including higher economic growth (Abu- Ghaida and Klasen, 2004). Unfortunately it is now in the year 2021; six years past the set year yet just a few strides have been made implying that the objective has not been fully attained.

LITERATURE REVIEW

Gender and Learner Attitude

The interrelationship between learner attitude and gender is a subject of concern to many if not all educators. This subject has drawn many studies to determine the direction and extend of the relationship. Sadhana (2017) observes that attitudes are mental predispositions towards people, objects, and events. Learner attitude towards practical lesson would be expected to influence their participation in science and hence achievement. According to Nwona and Akogun (2015), in many countries in sub-Saharan Africa the participation of girls in science subjects compared to that of boys is low. In another study by Prokop et al. (2007) it was found out that female learners showed a higher level of interest in Biology than their male counterparts. Furthermore, the study revealed that the interest of young learners towards Biology was relatively higher compared to the elderly ones. Gender and grade were also found from the study to be significantly correlated. Therefore, generally Slovak learners have a more positive attitude toward Biology subject and that girls and younger Slovak learners like Biology more. As learners progress through school, their interest towards Biology declines. The learners claimed they liked Biology more when it involved interaction with live animals and plants during the lessons. This is a study that was carried out in Slovakia and considered learners of different grades hence different ages. In the described study the gap that is identified is in terms of methodology and the sample used. The present study singled out form two students whose age is relatively within a narrow bracket of 14 to 19 years and subjected them to pretest and posttest questionnaires for empirical comparison.

In an exploratory survey study by Ferreira (2004) to determine whether secondary school students had certain attitudinal preferences regarding the Biology they study at school and whether learners in co-educational or single-sex schools hold the same opinions. The study employed survey schedule as the key data collection instrument. The study findings showed that male and female learners in single sex schools were more contended with the quantity of practical lessons carried out. However, male learners in co-educational schools opined that the quantity of practical lessons they had been exposed to were not sufficient. The preference was dependent on gender in that, male learners irrespective of their school type enjoyed practical lessons whose content was about animals while female learners had a liking of practical lessons that was about flowers. The present study fills this gap by focusing on biology content from plants only.

Gender and Practical Work

Suzuki (2007) found out that in most areas boys and girls held similar interest but it was found that boys had a greater interest in Biology topics which relate more to the world outside of them like the role of Biology to the society. On the other hand, girls had a tendency to prefer topics which relate to human interaction such as body structure and functioning and how it works. Such conflicting findings made it necessary for the present study to be carried out to come out with a clear standpoint position on gender attribute on attitude of Biology students. Kashu (2014) on this subject posits that, in an attempt to encourage a larger proportion of women into STEM-

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related fields, appropriate interventions must be put in place so as not only to focus on academic achievement of the women but also on the best ways to make STEM-related professions more interesting to young women. Such an intervention should commence early enough when learners are in the basic education level, since their interest and attitude in science begins at such a time. When learners perceive that their teachers provide emotional, social, or instructional support that is appropriate, they achieve higher levels of success in attitude, practical engagement and attainment (Sandlin, 2019). The present study addressed this gap by mainly focusing on learners at the basic education level precisely form two students.

The expectations of girls themselves, their parents, their families and peer groups impart stereotypes that some subjects are for boys while other subjects are for girls. Furthermore some courses and professions such as mechanics, engineering among others are perceived as a reserve for males only. In addition interaction is biased towards girls which results into feminization and masculination of academic achievement. Equally, socialisation and biological factors contribute to the gender stereotyping. These stereotypes ultimately impacts on their attitude towards practical work and it may result into poor performance if not addressed in time. Furthermore, the findings indicated that, learner performance was varied across top performing schools countrywide: whereby it was found that the performance of boys was much better than that of the girls in practical work. These results are in conformity with those by Dania (2014).

The reviewed literature in this section indicate the impact that learners' attitude has on attainment, however it is not clear whether gender influences the learner attitude towards Biology. This repositions the present study in revealing whether there is such an influence. The present study therefore sought to find out whether gender influenced learner attitude towards biology in Gucha south sub-County, Kisii County, Kenya.

HYPOTHESES

The study was guided by two null hypotheses:

HO_1: There is no significant gender difference in learner' attitude towards Biology practical work

HO_2: There is no significant gender difference in learner' attitude towards Biology practical process skills

THEORETICAL FRAMEWORK

This study was guided by the Cognitive consistency theory as proposed by Heider (1958). The consistency theory proposes that there is consistency between individual attitudes and behaviours. The main focus of the theory is on both the positive and negative attitude of the learners. When the individual feels unbalanced, the theory proposes that he will restore balance by changing cognitive attitudes. Heider further notes that when there exists an unbalanced state of attitude it creates tension and produces a force to restore balance; for a balanced state, it means that the perceived individual coexists with the feelings of the emotion without pressure. When individuals' attitudes and behaviours are balanced, the tension can be released. Specifically, the theory of consistency assumes that individuals will strive to guide their beliefs and feelings, consistent with behaviours (Hsu & Huang, 2018). The behaviour includes positive attitude, improved practicing of the skills, being able to apply the skills in real life situations and even academic attainment. The Biology Practical Process Skills Teaching Approach (BPPSTA) were expected to have an influence on learner attitude towards biology. However, the study was to reveal whether the influence on attitude varied by gender.

METHODOLOGY

This study adopted the quasi-experimental research design using the Solomon Four Non-Equivalent Control Group Design, (Gall, Borg & Gall, 1996). In order to identify and select all the four co-educational County level secondary schools in Gucha south sub-County, purposive sampling technique was used. Solomon Four Non-Equivalent Control Group Design dictated the selection of the four schools. The four schools were then categorized into two experimental groups and two control groups. Purposive sampling technique was then used to select all the form two learners in the four sampled schools. Data for this study was collected using the Biology Attitude Questionnaire for Students, (BAQS). The learners in the experimental groups were taught via the

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BPPSTA while the control groups were taught via the conventional methodologies. The learners in the four study groups were then subjected to a posttest questionnaire to determine their attitude.

Pilot study was conducted before the actual study in one of the County level co-educational schools. The BAQS was validated by senior education experts in the department of curriculum, instruction and media of Kisii University. Reliability of the questionnaire was determined through split-half method (Gall et al., 2007) to a sample of form two students who did not take part in the study. A coefficient of r = 0.89 was obtained which implied that the reliability level of the BAQS was high. Both descriptive and inferential statistics were used to analyse data that was collected on a 5-point Likert scale in the BAQS. On the scale 1-strongly disagree, 2-disagree, 3-undecided, 4-Agree while 5- Strongly agree. Descriptive statistics and Independent Sample t-test were used to analyse the attitudinal means of learners from the various groups on the basis of gender aided by the Statistical Package for Social Sciences (SPSS) version 22. These means were then used to make a deduction on the attitude level of the male and female learners in the various study groups.

RESULTS AND DISCUSSION

The study intended to determine whether there were any gender differences in attitude between male and female learners after having undergone instruction using BPPSTA. The Biology Attitude Questionnaire for Students (BAQS) was used to collect data to test this hypothesis. The questionnaire was structured to collect data at two levels; Biology practical lessons and Biology practical process skills. The analysis and results therefore shall be presented and discussed in these three key areas. To address the two objective the questions were pooled in two groups.

Gender influence on Learner Attitude Towards Biology Practical Work

The data obtained from the BAQS was analysed with the aid of the SPSS software (version 22) so as to facilitate a comparison of the learners' attitudinal mean responses of the male and female participants. Descriptive statistical analysis was conducted with an aim of comparing the attitudinal means of students in the four study groups by gender. The mean and standard deviation of the various groups were determined. Table 1 presents the descriptive statistical analysis output.

Table 1: Descriptive Statistics for the BAQS for the Various Groups by Gender

Group	Pretest/Posttest	Gender	N	Mean	SD	STD. Error
Experimental -1(E1)	Pretest	Male	64	3.199	1.305	.162
		Female	55	3.155	1.398	.189
	Posttest	Male	64	3.708	1.263	.158
		Female	55	3.564	1.316	.177
Control -1 (C1)	Pretest	Male	32	2.836	1.312	.232
		Female	32	3.058	1.199	.213
	Posttest	Male	32	3.021	1.294	.138
		Female	32	3.044	1.171	.217
Experimental -2 (E2)	Posttest	Male	50	3.418	1.275	.180
		Female	63	3.516	1.316	.166
Control – 2 (C2)	Posttest	Male	50	3.003	1.366	.193
		Female	55	2.976	1.365	.184

Table 1 provides results from which it can be observed that the highest attitudinal mean out of the four study groups was 3.708 by the females in the E1 posttest group while the least was 2.838 by the males in the C1 pretest group. The study group whose learners had the responses greatly dispersed away from the mean was the females in the E1 pretest with a standard deviation of 1.473. From the same Table it can further be observed that, the least standard deviation was recorded as 1.19 by the females of the C1 pretest group. To determine whether the differences in the attitudinal mean of the learners were significant, independent samples t-test analyses were conducted to compare each set of data in the various study groups by gender. This will reveal whether the behaviors are consistent with the learner attitudes in line with the consistency theory. To start off the gender comparison, the data for E1 pretest group was analysed. An independent samples t-test was used for comparison

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so as to determine whether the attitudinal means of male and female learners in E1 pretest group were significantly different. Table 2 displays the output from the analysis.

The attitude of the participants was sought in relation to Biology practical work by gender. This analysis was carried out for each of the study groups so as to determine whether the learners' attitude towards Biology practical varied by gender. To that effect, an independent samples t-test was done so as to reveal whether this variation in the attitudinal mean of males and females was significantly different. The results are presented in Table 2.

Table 2: An Independent Samples t-test for the BAQS for the Experimental Group - 1 Pretest by Gender for Question Items 6 to 14

Gender	N	Mean	SD	df	t-value	p-value
Male	64	3.166	1.383	117	1.147	.372
Female	55	3.221	1.486			

Table 2 presents information that indicate that there is no significant difference in the attitudinal mean of male learners in E1 pretest group (M=3.166, SD=1.383) and the attitudinal mean of female learners in the same group (M=3.221, SD=1.486) for the attitude in the BAQS; t(117)=1.147, p=.372. Since the p-value of .372 obtained was > .05 it shows that the difference between the attitudinal mean of the male students and the female students in the E1 pretest group for BAQS is not significant. The attitude of male and female learners in the E1 pretest group did not significantly vary. Therefore, the results indicate that for these nine question items, the attitudinal mean for the female learners is not significantly different from that of the male learners in the E1 pretest group.

Another comparison was done on gender attitudinal mean for the E1 posttest group in relation to question items 6 to 14 which pertains the learner attitude towards Biology practical. An independent samples t-test was then conducted so as to reveal whether the difference was significant. Table 3 presents the analysis.

Table 3: An Independent Samples t-test for the BAQS for the Experimental Group - 1 Posttest by Gender for Question Items 6 to 14

Gender	N	Mean	SD	df	t-value	p-value
Male	64	3.788	1.360	117	1.536	.272
Female	55	3.893	1.299			

Table 3 presents results that indicate that there is no significant difference in the attitudinal mean of male learners in E1 posttest group (M=3.788, SD=1.360) and the attitudinal mean of female learners in the same group (M=3.893, SD=1.299) for the attitude in the BAQS; t(117)=1.536, p=.272. Since the p-value of .272 obtained was > .05 it indicates that the attitudinal mean of male and that of female learners in this E1 posttest group are not significantly different. Therefore, it shows that the BPPSTA did not influence the attitude of the leaners differently on the basis of gender; gender as a variable had no influence on learner attitude towards Biology practical after the intervention had been administered.

A further analysis of gender difference in attitudinal means led to the comparison of males and female learners' attitudinal means in the E2 posttest group. The output from the analysis of this group attitudinal mean were to enable the researcher to rule out the possibility of the pretest as having influenced the outcome. The data on attitude for learners in this group was analysed by gender. An independent samples t-test was conducted on this data and the output from the analysis is presented in Table 4.

Table 4: Independent Samples t-test Analysis for the BAQS for the Experimental Group - 2 Posttest by Gender for Question Items 6 to 14

Gender	N	Mean	SD	df	t-value	p-value
Male	50	3.911	1.270	111	1.589	.256
Female	63	3.873	1.329			

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Table 4 results show that there is no significant difference in the attitudinal mean of male learners in E2 posttest group (M=3.911, SD=1.270) and the attitudinal mean of female learners in the same group (M=3.873, SD=1.329) for the attitude in the BAQS; t(111)=1.589, p=.256. Since the p-value of .256 obtained was > .05 it indicates that the attitudinal mean of the male learners is not significantly different from that of the female learners after undergoing instruction using the BPPSTA. The intervention under study did not influence differently the male and female learner' attitude towards Biology practical lessons. This reveals the inconsistency between learner behaviours and their attitudes thus showing an unbalanced stste as postulated by the consistency theory. Gender as a variable was therefore found not to be influencing the learners' attitude towards Biology practical lessons. It was necessary to carry out another comparison between the males and females of the control group – 1 pretest. To ascertain if the attitudinal mean difference was significant, an independent samples t-test was done. Table 5 presents the output from the analysis.

Table 5: Independent Samples t-test for the BAQS for the Control Group - 1 Pretest by Gender for Questions 6 to 14

Gender	N	Mean	SD	df	t-value	p-value
Male	32	3.344	1.352	62	1.023	.383
Female	32	3.667	1.233			

Table 5 presents the analysis which show no significant difference in the attitudinal mean of male learners in C1 pretest group (M=3.344, SD=1.352) and the attitudinal mean of female learners in the same group (M=3.667, SD=1.233) for the attitude in the BAQS; t(62)=1.023, p=.383. Since the p-value of .383 obtained was > .05 it implies that there is no significant difference between the attitudinal mean of the males and that of the females in the C1 pretest group for BAQS. These responses were made before the participants in this group had undergone instruction via the conventional instructional methods. These results imply that the attitude of both male and female learners in this group were not significantly different before the instruction was done. Similar findings had been found from a study by Imanda, Omwenga, Andima and Obuba (2020). It was therefore necessary to carry out another comparison of attitude between the males and females of the C1 posttest group. This was to help reveal any consistency (Heider, 1958). The attitudinal responses that the learners in the C1 group gave from the BAQS that was administered after they had undergone instruction via the conventional methods formed the basis of this analysis. To ascertain if the attitudinal mean of the males and females in the C1 posttest group were significantly different, an independent samples t-test was conducted. The output from the analysis is presented in Table 6.

Table 6: An Independent Samples t-test for the BAQS for the Control Group -1 Posttest by Gender for Question Items 6 to 14

Gender	N	Mean	SD	df	t-value	p-value
Male	32	3.764	1.434	62	1.479	.387
Female	32	3.972	1.351			

Table 6 presents output from which it can be observed that there is no significant difference in the attitudinal mean of male learners in C1 posttest group (M=3.764, SD=1.434) and the attitudinal mean of female learners in the same group (M=3.972, SD=1.351) for the attitude in the BAQS; t(62)=1.479, p=.387. Since the p-value of .387 obtained was > .05 it means that the attitudinal mean for males and that of females towards Biology practical in C1 posttest BAQS are not significantly different. This is after the participants had undergone instruction through the conventional methods. These results imply that the instructional method used in the C1 group did not influence male learners differently as compared to how it influenced female learners. The attitude of the learners in C1 group before and after instruction through the conventional methods did not differ by gender.

It was also necessary to analyse the results from the participants in C2 group; this was the second control group whose members were not subjected to the pretest BAQS. The attitude of the participants in the C2 group was also analysed to establish the existence of a gender difference that is significant in the learner attitude. To that effect an independent samples t-test was conducted to unveil this difference in case there was. Table 7 presents the output from this analysis.

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Table 7: An Independent Samples t-test for the BAQS for the Control Group -2 Posttest by Gender for Question Items 6 to 14

Gender	N	Mean	SD	df	t-value	p-value
Male	50	3.151	1.457	103	0.932	.398
Female	55	3.095	1.486			

From the output in Table 7 it can be observed that there is no significant difference in the attitudinal mean of male learners in C2 posttest group (M=3.151, SD=1.457) and the attitudinal mean of female learners in the same group (M=3.095, SD=1.486) for the attitude in the BAQS; t(103)=.932, p=.398. Since the p-value of .398 obtained was > .05 it implies that the attitude of male and that of female learners towards Biology practical are not significantly different for the participants in the C2 posttest group. These results are interpreted to indicate that the male learners' attitude and that of the female learners after the treatment did not show a significant difference. The attitude of the male and female learners towards Biology practical lessons was influenced by the use of BPPSTA. This corroborates the findings from a study by Gisoi and Mugwiria (2025) experiential learning approach affords all students an equal access to the curriculum while maintaining their high expectations.

The results from the analysis of data from the various study groups indicate absence of a significant difference in learners' attitude by gender after instruction using the BPPSTA. From the results, it is equally observed that both male and female learners did not show a significant difference in their attitude towards Biology practical lessons after undergoing instruction via the conventional instructional methods. It is therefore deduced that the BPPSTA did not result in to varied attitude levels for male and female learners. Therefore, the study found out that the teaching approach used did not significantly influence differently the attitude of male and female learners towards Biology practical lessons. The method used should be one that results in to positive attitude to irrespective of the gender.

Gender Influence on Learner Attitude Towards Biology Practical Process Skills

Gender is a key determinant of many variables studied in education. In this section data was analysed so as to help determine whether gender was a factor that influenced the attitude of learners towards the Biology practical process skills. The key data analysed was emanating from the question items 15 to 23 in the BAQS. The data of the various study groups was analysed with a keen focus on the trend of male participants' attitude in comparison to female participants' attitude but in the same study group. The first group to be compared was the E1 pretest group. An independent samples t-test analysis was done so as to determine whether the difference in the attitudinal means was significantly different. Table 8 presents these results.

Table 8: Independent Samples t-test for BAQS for the Experimental Group-1 Pretest by Gender in Question Items 15 to 23

Gender	N	Mean	SD	df	t-value	p-value
Male	64	2.986	1.383	117	1.120	.393
Female	55	2.854	1.400			

The result in Table 8 show that there is no significant difference in the attitudinal mean of male learners in E1 pretest group (M=2.986, SD=1.383) and the attitudinal mean of female learners in the same group (M=2.854, SD=1.400) for the attitude in the BAQS; t(117)= 1.120, p=.393. Since the p-value of .393 obtained was > .05 it implies that the difference between the attitudinal mean of the male and female learners of the E1 pretest group is not significant. The attitude of male and that of female learners towards Biology practical process skills is not significantly different for the learners in the E1 group. At this point of administration of the BAQS, the participants had not been subjected to the intervention. After the participants in E1 group had responded to question items in the pretest BAQS, they underwent an intervention which involved instruction for four weeks via BPPSTA. After the intervention, the learners were again subjected to a BAQS so as to respond to it. To ascertain whether the attitudinal mean differences between the male and female learners of E1 posttest group was significant, a t-test analysis was done. Table 9 presents the output from the analysis.

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Table 9: Independent Samples t-test for the BAQS for the Experimental Group - 1 Posttest by Gender for Question Items 15 to 23

Gender	N	Mean	SD	df	t-value	p-value
Male	64	3.255	1.493	117	.568	.595
Female	55	3.111	1.495			

The result in Table 9 shows that there is no significant difference in the attitudinal mean of male learners in E1 posttest group (M=3.255, SD=1.493) and the attitudinal mean of female learners in the same group (M=3.111, SD=1.495) for the attitude in the BAQS; t (117) = 1.568, p=.595. Since the p-value of .595 obtained was > .05 it therefore indicates that the difference between the attitudinal means of male and female learners in E1 posttest group is not significant. The attitude of males and that of females towards Biology practical process skills is not significantly different for the participants in the E1 posttest group. Therefore, for both the pretest and posttest BAQS there was no difference in the attitude of male and female learners. As Papert's (1991) constructionism theory postulates as discussed in section 1.9 that learning in situ leads to meaningful acquisition of knowledge and skills. Therefore, it is evident that both the male and female learners benefit equally when an appropriate instructional approach such as BPPSTA is used.

There was need to further carry out an analysis on the attitudinal responses of the students in the E2 group. Learners in this group had not been subjected to the pretest BAQS. The essence of having this additional group was so as to rule out any unforeseen effect of pretesting on the outcome of E1 group (Imanda et al., 2020). The data from the E2 group therefore were compared by gender. The attitudinal means of male and female learners of the E2 group were analysed using the independent samples t-test. Table 10 presents the output from the E2 group responses analysis.

Table 10: An Independent Samples t-test for the BAQS for the Experimental Group - 2 Posttest by Gender in Question Items 15 to 23

Gender	N	Mean	SD	df	t-value	p-value
Male	50	3.922	1.268	111	.921	.495
Female	63	3.776	1.426			

In Table 10, presented is the output from which it can be observed that there is no significant difference in the attitudinal mean of male learners in E2 posttest group (M=3.922, SD=1.268) and the attitudinal mean of female learners in the same group (M=3.776, SD=1.426) for the attitude in the BAQS; t(111)= .921, p=.495. Since the p-value of .495 obtained was > .05 it implies that the difference between the attitudinal mean of male and female learners in the E2 posttest group is not significant. This is interpreted that gender did not influence the learners' attitude after having undergone instruction through the BPPSTA. These results indicate that after the learners undergoing instruction via the BPPSTA, their attitude did not significantly vary by gender. The results from this group clearly confirm the results earlier obtained in the E1 group for posttest BAQS. That the absence of significant difference in the E1 group is not indeed as a result of the prior exposure of learners in E1 to the pretest BAQS. Therefore, gender as a factor did not affect change in learner attitude after the intervention. Similar findings by Suzuki (2007) from a study on attitude of Japanese students in relation to school Biology were obtained. The study found out that male and female learners' attitude towards Biology did not differ. Conversely Cherian and Shumba, (2011) found that boys had a more positive attitude towards science as compared to girls in South Africa. However, their study generally focused on science unlike the present study that specifically focused on biology subject.

There was need to further determine whether there was a gender difference in the attitudinal means for learners in the C1 pretest group. This would reveal whether the learners' attitude towards Biology process skills in C1 pretest group was different by gender. The data was analysed using the independent samples t-test and the output from the analysis is as presented in Table 11.

Table 11: An Independent Samples t-test for the BAQS for the Control Group - 1 Pretest by Gender in Question Items 15 to 23

Gender	N	Mean	SD	df	t-value	p-value
Male	32	3.010	1.331	62	1.003	.390
Female	32	2.920	1.170			

In Table 11, presented is the output from which it can be observed that there is no significant difference in the attitudinal mean of male learners in C1 pretest group (M=3.010, SD=1.331) and the attitudinal mean of female learners in the same group (M=2.920, SD=1.170) for the attitude in the BAQS; t(62)= 1.003, p=.390. Since the p-value of .390 obtained was > .05 it implies that there is no significant difference between the male learners' attitudinal mean and that of the female learners in the C1 pretest group. Male and female learners' attitude towards Biology practical process skills did not differ significantly for BAQS posttest. At the onset of the study, both male and female learners in C1 did not have an attitude that varied significantly.

The learners in C1 group then underwent instruction through the conventional instructional methods and after which they were subjected to a BAQS again. The purpose was to find out if there had been any change in the attitude after undergoing instruction through the conventional methods. The data from the BAQS was then subjected to an independent samples t-test analysis. Table 12 presents an output from the analysis.

Table 12: An Independent Samples t-test for the BAQS for the Control Group - 1 Posttest by Gender in Question Items 15 to 23

Gender	N	Mean	SD	df	t-value	p-value
Male	32	2.449	1.222	62	.664	.563
Female	32	2.431	0.938			

Table 12, presents output from which it can be observed that there is no significant difference in the attitudinal mean of male learners in C1 posttest group (M=2.449, SD=1.222) and the attitudinal mean of female learners in the same group (M=2.431, SD=.938) for the attitude in the BAQS; t(62)= .664, p=.563. Since the p-value of .563 obtained was > .05 it implies that, the difference between the attitudinal mean of male and female learners in the C1 posttest group is not significant. The attitude of males and that of females towards Biology practical process skills did not differ for BAQS posttest. Therefore, it implies that the attitude of the learners in this group was not significantly different after they underwent instruction via the conventional methods. Both before and after instruction via conventional methods in the C1 group, it is concluded that the gender attitudinal difference was not significant. This view resonates with the cognitive consistency theory in the sense that good methodologies result into positive attitudes irrespective of the gender.

Learners' attitude in the C2 posttest group were equally analysed to find out whether they varied by gender. An independent samples t-test was used for this analysis so as to bring out the comparison. Table 13 presents the output from the analysis.

Table 13: An Independent Samples t-test for the BAQS for the Control Group - 2 Posttest by Gender in Question Items 15 to 23

Gender	N	Mean	SD	df	t-value	p-value
Male	50	2.964	1.342	103	.867	.508
Female	55	2.855	1.360			

Table 13, displays the output after the analysis from which it can be observed that there was no significant difference in the attitudinal mean of male learners in C2 posttest group (M=2.964, SD=1.342) and the attitudinal mean of female learners in the same group (M=2.855, SD=1.360) for the attitude in the BAQS; t(62)= .664, p=.508. Since the p-value of .508 obtained was > .05 it therefore shows that the difference in the attitude of male and female learners in the C2 posttest group for BAQS is not significant. The overall results show that the attitude of the learners in the two control groups did not vary by gender irrespective of whether they had undergone instruction via BPPSTA or conventional methods.

The control groups were included in the study so that the results of learners in these groups would provide a base for comparison with those of the learners in the experimental groups. This comparison had a purpose of enabling the study to rule out any other factor other than the ones under study that might have caused a change in learners' attitude in the experimental groups. This was to rule out any chance occurrence outcome and attribute any change in the experimental group posttest results to only the intervention. This aim was achieved satisfactorily. It is therefore emanating from the results that the attitude of male and female learners under study were not influenced by the instructional approach which was BPPSTA.

CONCLUSION

The conclusion is drawn from the results in line with the three null hypotheses: There is no significant gender difference in learner' attitude towards Biology lessons, there is no significant gender difference in learner' attitude towards Biology practical work and there is no significant gender difference in learner' attitude towards Biology practical process skills. After testing the hypotheses on the basis of the set significance level $\alpha=0.05$, a decision was made not to reject all the three null hypotheses. There is no significant difference in attitude of males and female learners towards Biology when they undergo instruction via the BPPSTA as compared to when they undergo instruction via conventional methods. Gender did not significantly influence the learners' attitude towards Biology. Therefore, BPPSTA is an appropriate approach to use in Biology instruction since it will influence equally the learners' attitude irrespective of the gender. Once attitude is influenced positively, the academic achievement shall be positive.

RECOMMENDATIONS

Biology teachers should always yearn to explore classroom activities that involve both gender of learners so that both the male and female learners in the class can equally benefit when BPPSTA is in use. Such activities will ensure that both the attitude of male and female learners is positively impacted on. The study recommends further studies to interrogate the attitudinal impact on learners when taught using specific hands-on instructional methodologies. Future studies can also focus on the same topic as present study but a longitudinal in different study areas and different grade or class levels.

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