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Students' perceived science inquiry process skills in relation to school type and gender

Abstract

Seventeen years after the end of the Liberian civil war, which is partly blamed for the waning of the standard of education, the country is still grappling with providing a competency-based science educational experience that will enhance the science inquiry process skills of its youth. In this paper we used the constructivist theoretical perspective to compare the science inquiry process skills of Grade 11 students in government and private schools. The study employed a descriptive survey design and the quantitative research method. Six high schools were selected by cluster random sampling, and a total of 360 students constituted the study sample. This study found that government school students have significantly higher perceived science inquiry process skills than their private school counterparts and that an average of 42% of private school students cannot demonstrate any skills related to experimental design, data representation, communication and presentation. Male students indicated having significantly higher science inquiry process skills compared to their female counterparts. However, a varying majority across study groups practise the science inquiry process skills occasionally.

Keywords: *data representation, experimental design, science education, science laboratories, science process skills*

1. Introduction

Science is learnt as a process and a product although these two are not always accorded equal attention in the learning process. Science inquiry process skills are activities that students carry out in scientific investigations to enable the acquisition of scientific knowledge and skills (Abungu *et al*., 2014). It is fundamental to the understanding and application of scientific investigations (Sheba, 2013), and constitutes the core idea in an inquiry-based approach to teaching and learning science. According to Çalık and Coll (2012), Harlen (2005) and Huppert *et al*. (2002), learning science has become synonymous with acquiring the science inquiry process skills and the applications of those skills in scientific investigations.

High schools in Liberia can be broadly categorised into four; public schools, community schools, private schools

and mission schools (LSF, 2012). Public schools are established, run and fully financed by the government. Community schools are established and run by communities for a brief period before the government fully takes over the running and funding. Mission schools are established by religious bodies. They do not depend on the government for support. Private schools are established by individuals or groups of individuals with no declared religious affiliation. For the purpose of this study, we based our classification on the government's financial support to schools. Therefore, we have two groups of schools which are government schools (comprising public schools and community schools) and private schools (mission schools and private schools). Just more than half of all (53.9%) schools in Liberia are government-owned schools (MOE, 2016).

Liberia has a peculiar recent history of a fifteen-year civil war, which significantly hampered the educational system to the point where school facilities – including science laboratories – were looted and destroyed. Since then, and because of the loss of learned Liberians in the war years, education in post-war Liberia is characterised by enormous challenges. According to the World Bank (2019), the quality of teaching has fallen to very low levels because of the shortage of schools and qualified teachers. As a result, the government realised the need for skilled labour to rebuild the country and wanted a quick fix. In this desperate effort, a policy to relax academic standards was adopted in 2006 (Gberie & Mosley, 2016), which resulted in large high school student populations that would translate into correspondingly large numbers of high school and university graduates in order to meet the demands of the workforce for national service.

According to the Liberian Science Foundation (LSF, 2012), 84.2% of all schools in Liberia had no science laboratories. Moreover, subject matter content and pedagogical skills are mostly lacking in teachers of mathematics and science. The report also indicates that only 6% of science teachers have excellent science laboratory-related skills while 32% are said to have poor skills. In a more recent report, the World Bank (2019) revealed that out of the 640 junior and senior high schools in the country, only 15% have functioning science laboratories. In the few schools that have science laboratories, it is common to see the teacher on a raised platform demonstrate experiments while students merely watch (Chan *et al.,* 2015). As such, the students are missing out on concrete science inquiry process skills that are acquired through hands-on activities. This mode of learning may not be unconnected to the unsatisfactory pass rate in the West African Senior Secondary Certificate Examinations (WASSCE). The only available comparison of high school students' academic performance by gender is found to be in the Liberian Senior High School Certificate Examinations between 2012 and 2017 shown in Table 1.1. This table indicates that female students are more adversely affected by the aforementioned factors.

Table 1: Candidates' percentage pass rate by gender in the Liberian Senior High School Certificate Examinations for five years

Year	Male (%)	Female (%)
2012	43.10	29.85
2013	40.05	31.43
2014	26.31	20.51
2016	22.10	18.25
2017	31.27	26.71

Source: WAEC (2017)

Perhaps a better indication of the level of challenges faced by the education system, particularly in the high schools, was demonstrated in 2013, when all 25000 candidates who sat for the University of Liberia entrance examination failed after the university authorities decided to stick to acceptable academic standards. These challenges are perennial and have still not been addressed. The World Bank (2019) report further stated that although the system of education is generally faced with challenges, senior high schools face the most challenges due to little government support.

According to Gberie and Mosley (2016:5) **"**Liberia has virtually no record of quality research or knowledge production. It has no national library to collect, consolidate and preserve local publications and research findings". Despite this assertion, a literature search through various research databases including ERIC, EBSCO, Google Scholar, ProQuest and Research 4 Life, resulted in an observation that there is limited published data on Liberian high school education, and these omit science inquiry process skills. This observation informed our resolve to gauge the students' opinion on science inquiry process skills, the outcome of which might serve as the basis for further research and future educational reforms.

1.1 Specific objectives

- To compare the mean scores of perceived science inquiry process skills for Grade 11 students in government and private schools.
- To compare the mean scores of perceived inquiry process skills for male and female Grade 11 students.
- To examine Grade 11 students' pattern of response indicating frequency of use of science inquiry process skills.

1.2 Hypotheses

H_{01}: There is no significant difference between the mean scores of perceived science inquiry process skills for Grade 11 students in government and private schools of Bong County.

H_{o2}: There is no significant difference between the mean scores of perceived science inquiry process skills for male and female Grade 11 students in Bong County.

The need for learners to develop science inquiry process skills is aligned with the tenets of the constructivist learning perspective. Constructivism, which has John Dewey as its founding father, with latter modifications by Jean Piaget and Lev Vygotsky, emphasises learners' participation and interaction in the knowledge construction process (Yilmaz, 2009). It holds that knowledge is not constructed from an authoritative source, but rather co-constructed through a discourse between and among the parties involved in the learning process. Constructivist teachers create hands-on and minds-on learning activities and strategies that develop learners' science inquiry process skills. Because this theory presents learners as being intellectually generative, they should be made to ask their own scientific questions, design experiments, perform experiments, collect and present data, and draw conclusions with appropriate guidance (Maclellan & Soden, 2004). A classroom that provides this kind of learning opportunity is bound to enhance learners' science inquiry process skills, conceptual understanding, increased motivation and interest in science (Akinbobola & Afolabi, 2014).

1.3 Literature review

Plenty of empirical evidence support the need for learners' acquisition of science inquiry process skills. Findings include that it is positively correlated with enhancement of conceptual understanding (Aktamis & Ergin, 2008; Feyzioglu *et al*., 2012) and problem-solving abilities (Monhardt & Monhardt, 2006). With respect to the effects of teaching strategies on learners' science process skills, Af'idayanii *et al*. (2018) found that inquiry-based instructional methods enhance learners' science inquiry process skills significantly. In a similar study, Ogan-Bekiroğlu and Arslan (2014) experimented with two versions of inquiry-based approaches on science process skills; where the experimental group employed using models while the control group did not. While the authors found no significant difference in the overall science inquiry process skills, the control group was found to have significant increases in identifying variables and stating hypotheses. Conversely, the experimental group showed significant increases in these two as well as in operational definitions and data and graph interpretations.

There is a belief in many cultures that boys are academically superior to girls, especially in mathematics and the sciences. However, research findings by Klapproth *et al*. (2013) and the Program for International Student Association (PISA) competence tests show the contrary. According to this research, girls outperformed boys (OECD, 2013). Hannover (2004) believes that the more disruptive tendencies in boys like hyperactivity and bullying could be partly to blame for their lower scholastic achievements as such behaviours divert their mental energy and negatively affect attention management. Such tendencies include aggressiveness and hyperactivity.

Enhancement of science inquiry process skills requires the manipulation of cognitive and physical structures in a purposeful and worthwhile active learning environment, and science laboratories serve to adequately provide this learning environment (Bilgin, 2006; Ercan & Taşdere, 2011; Harlen, 2000). Cognitive engagement in the form of questions has been greatly emphasised because it is a natural result of curiosity and the quest to learn. Appropriate questions generate knowledge and lie at the heart of a science inquiry process. Therefore, questioning and question formulation as a process in scientific inquiry should be emphasised in a science learning environment (Jesus *et al*., 2005; NRC, 2000; Zandvliet, 2013). Such learning environments have been found to excite learners; in fact, much of the pleasure associated with doing science is derived from the mastery of such process skills (Rezba, *et al*., 2003). Owing to the pleasure associated with it, learners tend to retain experiences in learning the science inquiry process skills even when the cognitive knowledge is forgotten (Akinbobola & Afolabi, 2014). Considering the size of effect, Koksal and Berberoglu (2014) reported greater positive effect of inquiry-based instruction on science inquiry process skills than the science concept achievement test. Therefore, science inquiry process skills may be considered the single most important contributor to retained learning and transfer of knowledge, and expectedly, some scholars have referred to it as the bedrock of scientific reasoning (Aktamis & Ergin, 2008; Ayodgdu, 2015). In one study, learners demonstrated enhanced science inquiry process skills, which included identifying scientific questions, interpreting data and over time, supporting claims (Kuhn & Pease, 2008). Buntern *et al*. (2014) found that there was a significant positive difference in science knowledge and science process skills of the experimental and control groups of subjects. These observations present science inquiry process skills as a compelling need for every level of science education, and as such should be emphasised in the curricula. As developing and developed countries alike gradually strengthen their science education programmes (Harlen, 2010), Liberia should endeavour to follow suit.

According to the World Bank (2019), only 40% of teachers meet the minimum qualification for teaching in Liberia, with science teachers being the least. Those who are trained are ill-motivated to teach and still carry out teaching practices as novices. Teaching and teachers cannot easily support students' hands-on science learning activities in schools. For the few schools that have science laboratories, a combination of limited laboratory equipment and supplies and overcrowded classes result in demonstrations as the ultimate mode of students learning through experiments. Therefore, the Liberian students are essentially left with rote memorisation as the predominant mode of learning, which may not enhance science inquiry process skills.

The relevance of gender to education is not peculiar to Liberia. The dropout rate from school seems to be an issue that cuts across the globe, although its prevalence varies across countries. Girls and young women's dropout rate from school has attracted development partners, especially the World Bank. Gender advocates seek equal, safe and secure learning environments for female learners. In Liberia the retention rate for female students is very low. According to the World Bank (2019), only 15 out of 100 girls who start school proceed to Grade 10. The report states that the dropout rate is even higher for girls in grades 10 to 12. Additionally, 36% of girls get married before 18 (UNICEF, 2018) and 30% of girls become pregnant by 18 (UNICEF, 2013). Thirty-two per cent of girls who drop out of school cite insecurity in the school environment as the reason for dropping out (World Bank, 2019).

2. Method

This study employed the survey design and quantitative research method. The one instrument called the Science Inquiry Process Skills Inventory by Bourdeau and Arnold (2009) was adopted. This instrument was developed in line with the Hand , Heart, Head and Health (4H) Inquiry-in Action model of science instruction by Bourdeau (2003). This model is shown in Figure 1 below.

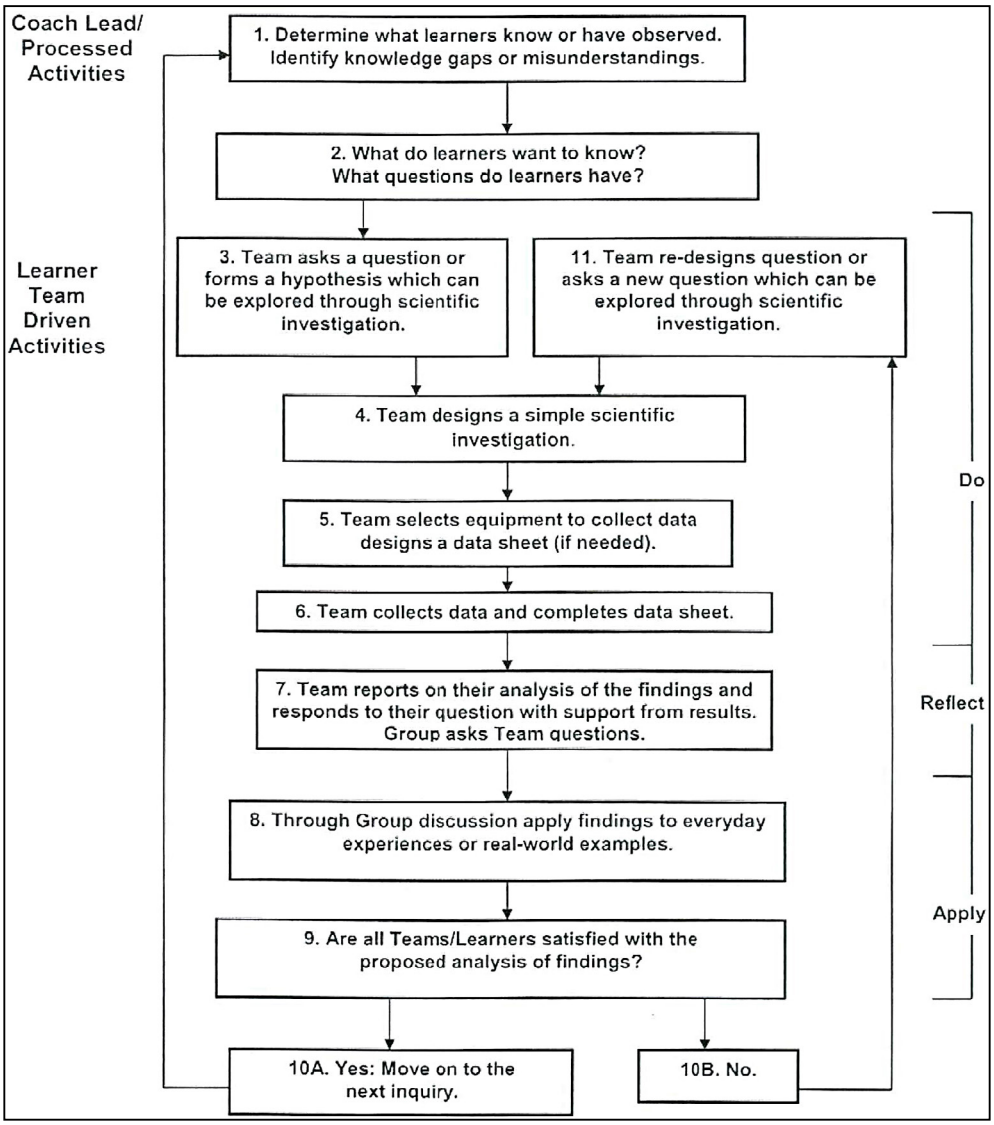

Figure 1: The 4-H Inquiry-in Action Model (Bourdeau, 2003)

The inventory comprises 11 items as shown in Appendix A, each of which measures an inquiry process skill. These skills include forming scientific questions, designing scientific procedures, collecting and recording data, analysing results, using models to describe results, and creating scientific presentations. The 4-H Inquiry-in-Action model is based on the cycle of science inquiry and represents the important steps of the complete science inquiry process (Arnold *et al*., 2013). According to its originators, this model encompasses the experiential and science inquiry learning processes and has a wide application to youth science development programmes.

To verify the suitability of this instrument for adoption and application to the Liberian context, the instrument was pilot tested with 40 Grade 11 students at one of the high schools

in Bong County. The Cronbach Alpha reliability was found to be 0.78, which according to Fraenkel *et al*. (2012), indicates satisfactory internal consistency. Using Cluster Random Sampling, six high schools were randomly drawn from a list of 30 in Bong County to constitute the sample of subjects in this research. Except for one government high school that had 250 Grade 11 students in the science stream alone, other schools in the elected clusters had all of their science stream Grade 11 students constituting the study sample, with a total of 360. The composite score of science inquiry process skills for each student was computed in Microsoft Excel for the study groups. Thereafter, the pattern of response for each student and group was also analysed to show how frequently students used the science inquiry process skills in doing science.

3. Results

Examination of Table 3.1 shows that the students of the two categories of schools have a difference of 4.621 in their perceived science inquiry process skills mean scores, and a difference of 1.167 in standard deviation of their individual scores. An independent samples t-test that was conducted to compare the mean scores of the students' perceived science inquiry process skills for significance of difference is shown in Table 3.2. The results show that there is a significant difference in the scores of science inquiry process skills between the government school students (M=27.921, SD=4.618) and the private school students (M=23.577, SD=5.786) indicated by t (322.813) = 8.310, p=.000. This result suggests that the students of government and private schools are significantly different on perceived science inquiry process skills.

Table 3.1: Group statistics of government and private school Grade 11 students

Group	N	Mean	Standard Deviation	Standard error of the mean
Government Schools	190	27.921	4.619	.335
Private Schools	170	23.300	5.786	.444

Table 3.2: Independent samples t-test result for government and private school students

	Levene's test for equality of variances		t	Sig (2tailed)	t-test for equality of means		95% confidence interval of the difference	
	f	sig			Mean difference	Standard error difference	lower	upper
Equal variances assumed	9.569	.002	8.414	.000	4.621	.549	3.541	5.701
Equal variances not assumed			8.310	.000	4.621	.556	3.527	5.715

Table 3.3 displays the group statistics of male and female students. It shows a mean difference of 2.14 and a difference in the standard variation of perceived science inquiry process skills of 0.092 between these two groups. An independent samples t-test results to compare scores of the perceived science inquiry process skills of male and female students is shown in Table 3.4. An examination of these results shows that there is a significant difference

in the scores of perceived science inquiry process skills for the male (M= 26.839, SD = 5.832) and female students (M=24.695, SD= 5.925) conditions, t (358) = 3.458, p=0.001. These results indicate that the male students are significantly different than the female students in perceived science inquiry process skills.

Table 3.3: Group statistics for male and female students

Group	N	Mean	Standard Deviation	Standard error of the mean
Male Students	184	26.838	5.832	.428
Female Students	174	24.695	5.925	.449

Table 3.4: Independent samples t-test for male and female students

	Levene's test for equality of variances		t	Sig (2tailed)	t-test for equality of means		95% confidence interval of the difference	
	f	sig			Mean difference	Standard error difference	lower	upper
Equal variances assumed	.031	.860	3.458	.001	2.143	.620	.924	3.362
Equal variances not assumed			3.456	.001	2.143	.620	.924	3.363

Table 3.5 shows that while the effect size of the difference between the male and female students is only moderate (Pallant, 2005), the size of the difference in the mean scores of perceived science inquiry process skills between government and private school Grade 11 students is large enough for theoretical and practical relevance.

Table 3.5: Effect sizes of the differences in the science inquiry process skills

Study group	Cohen's d	Glass' delta	Hedges' g
Government and private schools	0.883	1.001	0.888
Male and female students	0.365	0.367	0.365

Moreover, analysis of the pattern of responses of government school respondents to each item regarding students' frequency of use of inquiry process skills is shown in Table 3.6. An average of 44.5% of students in government schools generally practise science inquiry process skills from time to time, with 68.0% of these related to item 2, which states "I can ask a question that can be answered by collecting data". On the other hand, only an average of 12.7% of government school respondents indicated that they never practise science inquiry process skills.

Table 3.6: Responses to items by students of government schools in Bong County

Item	Total	Never (%)	Sometimes (%)	Usually (%)	Always (%)
1	190	8	43	12	37
2	190	4	68	16	12

Item	Total	Never (%)	Sometimes (%)	Usually (%)	Always (%)
3	190	16	37	25	22
4	187	14	45	20	21
5	187	10	39	18	33
6	190	17	44	18	22
7	188	23	46	15	15
8	188	12	38	16	34
9	188	9	41	21	29
10	188	19	48	14	19
11	189	8	40	20	32
Percent Mean		12.7	44.5	17.7	25.1

Table 3.7 shows that unlike in government schools, students of private schools showed less of a particular pattern of response. Although on average the predominant response (38.9%) was "sometimes", a significant average percentage (30.9%) of respondents also indicated that they "never" practise skills related to items 3, 6, 7 and 10. The statements for these items are as follows;

3. I can design a scientific procedure to answer a question

6. I can use data to create a graph for presentation to others

7. I can create a display to communicate my data and observations

10. I can use models to explain my results

Unlike the government schools, the lowest percentage (11.0%) of the private school respondents say that they usually practise science inquiry process skills.

Table 3.7: Responses by Grade 11 students from private schools in Bong County

Items	Total	Never (%)	Sometimes (%)	Usually (%)	Always (%)
1	170	22	61	9	8
2	169	22	49	12	16
3	170	40	36	14	11
4	170	31	42	12	15
5	169	22	34	13	31
6	170	44	41	6	9
7	169	40	37	12	11
8	170	21	49	10	21
9	170	32	42	9	17
10	169	44	37	7	12
11	170	22	33	17	28
Percent Mean		30.9	38.9	11.0	16.3

Table 3.8 shows that for the male students too, the highest percentage of response across all the items is "sometimes". However, the lowest percentage mean response (16.4%) is "usually".

Table 3.8: Responses to items by Grade 11 male students in Bong County

Items	Total	Never (%)	Sometimes (%)	Usually (%)	Always (%)
1	186	14	46	14	26
2	186	8	63	13	15
3	186	24	34	23	19
4	183	23	39	19	18
5	184	11	32	18	39
6	186	28	38	12	22
7	185	29	41	15	16
8	184	9	40	15	36
9	184	17	39	15	28
10	184	30	44	13	13
11	186	12	34	23	32
Percent Mean		18.6	40.9	16.4	24.0

Table 3.9 also shows that the greatest mean percentage (44.9%) of female students "sometimes" practise science inquiry process skills and the lowest mean percentage (12.5%) of respondents "usually" practise the science inquiry process skills. This implies that female students hardly practise science inquiry process skills.

Table 3.9: Responses to items by Grade 11 female students in Bong County

Items	Total	Never (%)	Sometimes (%)	Usually (%)	Always (%)
1	174	16	56	7	21
2	173	17	55	14	13
3	174	30	39	15	16
4	174	21	47	14	18
5	172	20	41	12	27
6	174	30	48	13	10
7	172	33	41	14	12
8	174	24	45	11	19
9	173	23	43	15	20
10	173	32	40	9	18
11	173	18	39	13	29
Percent Mean		24.0	44.9	12.5	18.5

4. Discussion of results

4.1 Hypothesis testing

The null hypotheses were stated as follows:

H_{01}: There is no significant difference in the mean scores of perceived science inquiry process skills for Grade 11 students in government and private schools in Bong County.

The independent samples t-test results of the students' perceived inquiry process skills show a probability value, p < the level of significance (0.05). This implies that the null hypothesis is rejected in favour of the alternative hypothesis. Therefore, on statistical grounds, we claim that the difference in the mean scores of the two groups of students cannot be due to chance, and that there is a significant difference between the perceived inquiry process skills of Grade 11 students of government and private schools in Bong County.

H_{02}: There is no significant difference in the mean scores of perceived science inquiry process skills for male and female Grade 11 students in Bong County.

The independent samples t-test results of the students' perceived inquiry process skills show that the probability value, p < the level of significance (0.05). This means that the null hypothesis is rejected on statistical grounds. It means that the difference in the scores between the male and female students cannot be due to chance. Therefore, we claim that a significant difference exists between the perceived science inquiry process skills of the male and female Grade 11 students in Bong County.

The results show that the government school students have higher perceived mean scores on science inquiry process skill (27.921) than their private school counterparts (23.577). This outcome may be explained by the fact that most technical aid to schools, both external and local, ends up being directed to government schools. Typically, technical aids come from The American Peace Corps and the Nigerian Technical Aid Corps. These highly motivated professionals complement the teaching of science subjects in exclusively government schools in a bid to close the gap in the need for trained and qualified teachers. Additionally, government schools are indicated to have a greater number of science laboratories as well as a greater percentage of the trained and qualified teachers, because the government offers relatively better pay packages. It is reasonable to expect these teachers to be more extrinsically motivated to teach than their private school counterparts. Their students are better placed to learn and acquire science inquiry process skills through demonstrations of experiments with real or improvised laboratory resources.

Unlike the government schools, the running costs of most private schools are in most cases exclusively dependent on students' tuition charges. Therefore, being a business in a real sense, private schools charge comparatively higher tuition fees in order to cope with the running cost in the form of salary payments, developmental projects and other essential academic and administrative needs. Therefore, most private schools offer comparatively lower salaries to teachers, most of whom are untrained. Trained and qualified teachers in private schools are mostly disenchanted and less motivated to teach. The indication of private school students not being able to design experiments, represent the data in experiments and communicate the findings is evidence that little practical science work goes on in the private schools.

Although the findings are only expressed opinions, the male superiority epitomised in this study is not peculiar. These findings are corroborated by that of Widdina *et al*. (2018) and the OECD (2013). Across school types in this study, the male students expressed acquisition of more science inquiry process skills than female students. These results mirror the prevalent trend of academic performance in the Liberian Senior High School Certificate Examination (LSHSCE) by gender for five consecutive years shown in Table 1 (WAEC, 2017). The gender effect portrayed in this study and in the Liberian education system could be due to economic factors and social factors, which traditionally affect female students more than male students. As stated in the World Bank (2019), if 32% of girls get married at 18 years of age, this partly explains the figures that present them as trailing behind the male students. In most cases, the female students must reconcile the responsibilities that they assume as wives or mothers at home and their schoolwork. With these responsibilities come challenges in school attendance and attention span in the classroom, which in turn may affect the overall scholastic success of the female students.

As indicated for every item, the majority of students, irrespective of gender, opined that they "sometimes" practise the process skills. This implies first, that they acquired some basic skills at junior secondary school, where "scientific inquiry process" is an important topic in the Grade 9 General Science curriculum and examination. Therefore, "sometimes" could mean that students practise these skills whenever they have a teacher who is motivated enough to take them through the processes or whenever they gain admission to a different school where laboratory facilities are available as the schools vary widely in the quality of teaching and learning resources.

5. Conclusions

This study aimed to compare Grade 11 students' perceived science inquiry process skills for government and private schools, and for male and female students in Bong County. The study has indicated that government school students have significantly higher perceived science inquiry process skills than their private school counterparts. More specifically, a significant number of private school students were perceived not being able to design experiments, represent data, communicate and present data. Across school types, male students have significantly higher perceived science inquiry process skills than their female counterparts, but essentially all students expressed that they practise the science inquiry process skills only sometimes, probably when they are made to do so. Although the study did not explore the reasons behind the responses, the practice of these skills may largely depend on the teachers' level of training in pedagogy and the availability of laboratory facilities. The gender profile of science inquiry process skills mirrors the general picture of academic performance in the Liberian Senior High School Certificate Examinations, which puts male students ahead of their female counterparts.

6. Implications and recommendations

The implications of these findings are that high schools in Bong County need laboratory facilities and qualified science teachers for improvement in science inquiry process skills, although this need is more acute for private schools. Female students may be lagging behind in science and this may need to be addressed if women are to be empowered and made to compete with men in the Liberian society. Based on the aforementioned, we recommend that private school administrators institute in-service professional development programmes for

teachers in need, as well as enforce the minimum teacher qualification criteria for recruitment. In addition, school authorities may need to regularly organise science career day, on which women professionals in science will visit schools to give motivational talks that may get female students inspired to work hard in science classes. One limitation in this study is that its findings are wholly generated from students' opinions. A study that will observe and measure these skills is needed for future research to establish a baseline for high school students' science inquiry process skills in Bong County.

Declaration

We, as authors of this manuscript do honestly declare that the calculations and interpretations herein are correct to the best of our knowledge.

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APPENDIX A: SCIENCE INQUIRY PROCESS SKILLS INVENTORY (SIPSI)

Section 1: Background Information of Respondent

Age: ----------

Sex/gender (Circle the option applicable to you)

Male female

Name of school _____

Section 2: Attitude Measuring Scale

Below is a scale that has statements/sentences called items in the middle. Carefully read each statement and then circle (○) one of the options (**N, ST, U, A**) on the right of the scale that most appropriately applies to you under the response column. In the response column,

N = Never ST = Sometimes U **=** Usually A **=** Always

Item No	**Item**	**Responses**			
1	I can use scientific knowledge to form a question	N	ST	U	A
2	I can ask a question that can be answered by collecting data	N	ST	U	A
3	I can design a scientific procedure to answer a question	N	ST	U	A
4	I can communicate a scientific procedure to others	N	ST	U	A
5	I can record data accurately	N	ST	U	A
6	I can use data to create a graph for presentation to others	N	ST	U	A
7	I can create a display to communicate my data and observations	N	ST	U	A
8	I can analyze the results of a scientific investigation	N	ST	U	A
9	I can use science terms to share my results	N	ST	U	A
10	I can use models to explain my results	N	ST	U	A
11	I can use the results of my investigation to answer the question that I asked	N	ST	U	A