

What Students Say About Senior High School Organic Chemistry

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ABSTRACT

West African Examination Council's (WAEC) Chief Examiners for chemistry have observed that most Senior High School students exhibit poor mastery of concepts in organic chemistry. The Chief Examiners recommended that chemistry teachers start teaching organic chemistry early and give more practice questions to students. In order to understand the challenges students have, regarding the organic chemistry, the study aimed at finding out what students say about teaching and learning organic chemistry in Senior High Schools in Ghana. The survey employed a mixed methods approach to seek the views of students on the organic chemistry aspect of the Senior High School chemistry syllabus. The population for the study was 348 students. The students were, science and mathematics students at Foso College of Education, level 100 students at the faculty of Science and the Department of Science and Mathematics Education at University of Cape Coast and students attending remedial classes at Secondi/Takoradi Metropolis. The sample consisted of 32 remedial students at Secondi/Takoradi Metropolis, 132 Mathematics and Science students at Foso College of Education, Assin Foso, and 71 level 100 students in the faculty of Science and the Department of Science and Mathematics Education of University of Cape Coast. Two instruments were used to collect data from the sample. The instruments were a focus group interview schedule, which was used to collect qualitative data, and a Senior High School Organic Chemistry Perception Assessment Tool. The students said, though they have a negative perception about organic chemistry aspect of the Senior High School chemistry syllabus, organic chemistry does not make them nervous nor bored, because they find organic chemistry interesting. They are also said they want to study organic chemistry, and even do it on their own, not for the reason of passing exams but for life. However, teachers' ill affinity towards organic chemistry seriously affected their understanding of organic chemistry. Chemistry teachers would have to understand organic chemistry and see the organic chemistry aspect of the Senior High School chemistry syllabus as an essential component of chemistry education, if they want their students to learn organic chemistry with ease.

KEYWORDS

learning organic chemistry, teaching organic chemistry, perception, Organic chemistry

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Introduction

Ghanaian Senior High Schools has an important role to play in the preparation of Senior High School students for continued tertiary education, paid employment, self-employment and life in their respective community (Anamuah-Mensah, Asabere-Ameyaw & Dennis, 2007). It does this through the study of subjects Ghana Education Service has approved that the Senior High School students should learn. One of the subjects taught in Senior High Schools is chemistry. Students who learn chemistry are expected to grasp concepts in the subjects so that they can apply them later.

Unfortunately, West African Examination Council's (WAEC) Chief Examiners for chemistry have observed that most Senior High School students exhibit poor mastery of concepts in organic chemistry, an aspect of the chemistry studied at the Senior High School level. According to WAEC (2006), the Chemistry Chief Examiners reported in the 2006 May/June Chemistry Chief Examiners' Report 'that one of four weaknesses of students identified in the Chemistry 2B paper was that 'Candidates are weak in organic chemistry and therefore do not attempt questions from that part of the syllabus' (p. 79). As a remedy to this weakness, the report advised teachers to start teaching the organic chemistry aspect of the chemistry syllabus early and give their students more exercises. The question 3 (ii) of the 2006 chemistry 2B paper, for example, required students to draw the structural formula and one isomer of 3-methyl but-1-yne. Many candidates could neither draw the structure nor give the isomer. Very few candidates attempted the organic chemistry questions because they found them very difficult to answer (WEAC, 2006, 2009). In the June 2005 chemistry 2B paper, the compound $\text{OHCH}_2\text{CH}_2\text{NHCOCH}_3$ was given and student were to draw the full structure, showing all bonds, and name the functional groups presents. The chief examiners' comment on this question indicated that, candidates lacked in-depth knowledge in organic chemistry. The few candidates who attempted the question could not write the full structure and also identify the functional groups (WEAC, 2005). There is no doubt that there are challenges with the teaching and learning of organic chemistry at the Senior High School. However, the chief examiners only report students' weakness and suggest to teachers to give exercises, start teaching organic chemistry in and asked that teachers encourage their students to learn organic chemistry, without questioning what students' challenges and perception of organic chemistry are.

The most important people in secondary education who are seldom heard in education are students (Wright, 2013). The prime aim of education is to train students to fit well into society. Yet the voice of the students is not usually heard in the process (Powell & Kusuma-Powell, 2011). The students are not given chance to speak about the topics, content and the teachers teaching the content. The teachers assume an expert posture, expecting students to always been the listeners. Teaching and learning activities are crafted by the supposedly expert teaches who know methodologies that works and can predict the behavior of students. This posture creates a gap in the learning process between what the students on one hand and the teachers on the other thinks about the teaching and learning process. This study looks at this gab, and its effect on students' learning on students as it reports on Senior High School students' perception of teaching and learning organic chemistry.

Senior High School students expect an array of characteristics to be displayed by their chemistry teachers. These characteristics may differ from one student to another and from one school to another. According to Morton (2012), irrespective of the student and the school, Senior High School chemistry teachers are expected to be knowledgeable, active and interesting, direct learning towards life and listen to and address students' concerns. The chemistry teachers are expected, at all times, to show mastery over the subject-matter content knowledge of what is taught. He is expected to know, so that he/she can clearly and effectively facilitate teaching and learning. he/she should facilitate the acquisition of knowledge in a manner that makes learning interesting. Students expect teachers to direct teaching and learning towards preparation for life and not examination. Teachers are sometimes too concerned with bragging about their students' performance in examination, that they forget why they are teaching. As indicated by Rosenthal and Boser (2012), a listening teacher has the potential of bringing out the best in students since such a teacher gets know the needs and aspirations of the students and direct teaching and learning towards the realization of such dreams. Chemistry teachers would not exhibit these characteristics if they are concerned about their convenience.

In many chemistry classrooms, things are done to the convenience of chemistry teachers. Chemistry teachers can re-order the topics in the syllabus in a way that makes teaching easier for them or even skip those they feel are unimportant or difficult to handle. In the selection of methodologies, chemistry teachers can select only methods they are comfortable with, without minding whether they would yield meaningful learning in students or not. For example, a teacher may drop the activity method for demonstration when he/she thinks getting the class organized for the activities would be time consuming. A teacher can drop interactive pedagogy for lecture, when he/she feels the lecture method would be more convenient to him/her. By considering only what is convenient, the chemistry teacher limits the opportunities students need to be able to learn effectively.

Students needs can only be meet fully if they are known to teachers. Normally, teachers determine students' needs in one of three ways; through the content to be studied, assessments, and students' behavior in class. These ways do not give a true picture of students' needs. When teachers assess students and the students fail to perform well in a particular area, teachers tend to conclude that, that is the area in which the students need help most. When students behave in a certain way, teachers make judgement of that behavior to diagnose the needs of the students. In most of these situation teachers tend to think that the students are learning, or have phobia for the subject, but that may not be the case. It may well be the teachers is not teaching well, the teachers are not knowledgeable in that area of the syllabus or are not making lessons interesting. If students' needs are assessed through these means, a lot of students needs remain hidden.

Many of the researches into high school organic chemistry have failed to reveal what students truly want, in order to grasp the organic chemistry concepts. This is because many of the researches on students' poor performance in have failed to listen to the voice of the students (Hrin, Milenković & Segedinac, 2016; Diegelman-Parente, 2011; Own, Chen & Chiang 2010; Arrey,

2005; Lyubartseva, 2013; Arrey, 2009; Bhukuvhani, Zezekwa, & Sunzuma, 2011; Hickey & Pontrello, 2016; Milenković & Segedinac, 2016; Vachliotis, Salta, Vasiliou, & Tzougraki, 2011). Studies into teaching and learning of organic chemistry have listed personal, home and environmental factors related to the student or proposed teaching approaches that work. Studies have focused on approaches and factors, leaving little or no attention to teacher characteristics and what the students' say their problems truly are. This possibly is the reason why teaching and learning organic chemistry has remain a problem for decades.

According to Halford (2016), there is no such thing as current crisis in teaching and learning organic chemistry, since the teaching and learning has always been in crisis (Beasley, 1980; Mahajan, & Singh, 2005; Mahajan & Singh, 2003; Johnstone, 2006; Jimoh, 2005; Jegede, 2007; Harvey, 2002; Garkov, 2006; Childs & Sheehan, 2009; Anders & Berg, 2005; Adesoji & Arowosegbe, 2004). Halford (2016) suggested that, the problem has existed because teachers are unaware of how unprepared students are when they come to organic chemistry class. What else is there that organic chemistry teachers are unaware of. By studying students' perception of organic chemistry, this study sort to find out from students' perspective what they think about teaching and learning of Senior High School organic chemistry.

Research Methodology

The study employed a mixed methods approach to seeks the views of students on teaching and learning Senior High School organic chemistry. The population for the study was 348 students. The students were, science and mathematics students at Foso College of education, level 100 students at the faculty of Science and the Department of Science and Mathematics Education at University of Cape Coast and students attending remedial classes at Secondi/Takoradi Metropolis. The sample consisted of 32 remedial students at Secondi/Takoradi Metropolis, 132 Mathematics and Science students at Foso College of Education, Assin Foso, and 71 level 100 students in the faculty of Science and the Department of Science and Mathematics Education of University of Cape Coast. Apart from the remedial students, all other students were sampled using simple random sampling. Class prefects, their assistants and secretaries of all four science and mathematics classes were purposively sampled to participate in a focus group interview.

Instruments

Two instruments were used to collect data from the sample. The instruments were a focus group interview schedule, which was used to collect qualitative data, and a Senior High School Organic Chemistry Perception Assessment Tool.

Initial discussions with three Senior High School chemistry teachers and some teacher trainees who have studied organic chemistry informed the statements that were used in developing Senior High School Organic Chemistry Perception Assessment Tool. From the discussions, three sub-scales emerged. They were; organic chemistry instruction, self-efficacy and chemophobia. Statements were then constructed under each sub-scale. The constructed items were shown to two experts in education research, two Master of Philosophy students in Department of Science and Mathematics Education, University of

Cape Coast, and three Senior High School chemistry teachers. They corrected errors and recommended the removal and modification of some items in the Organic Chemistry Questionnaire for Students. The format for the Senior High School Organic Chemistry Perception Assessment Tool was Likert scale type items. The students were to select one option from strongly agree, agree, undecided, disagree and strongly disagree. The options strongly agree, agree, undecided, disagree and strongly disagree in Senior High School Organic Chemistry Perception Assessment Tool were coded 5, 4, 3, 2, and 1 respectively for all positive statements. For negative statements, the order of the weighting was reversed. The analysis of the data for the instrument was done using percentages and the overall mean scores of the students.

The Organic Chemistry Focus Group Interview Schedule was developed as a follow-up to items in Organic Chemistry Questionnaire for Teachers and Organic Chemistry Questionnaire for Students. The stages that were involved in the development of the Organic Chemistry Focus Group Interview Schedule were constructions of items, validation of items and pre-testing of items.

The items in the Organic Chemistry Focus Group Interview Schedule were constructed by looking at the key issues in the Senior High School Organic Chemistry Perception Assessment Tool. The constructed items were shown to two experts in education research and two Master of Philosophy students in Department of Science and Mathematics Education, University of Cape Coast. They corrected errors and recommended the removal and modification of some items.

Research Result

For easy analysis and reporting, this section has been organized into two parts. The first part reports the result obtained from the Senior High School Organic Chemistry Perception Assessment Tool while part two of this section is on what students said about Senior High School Organic Chemistry in the focus group interview.

Senior High School Organic Chemistry Perception Assessment Tool

Table 1: Students' Perception of Senior High School Organic Chemistry

No	Statement	SA	A	U	D	SD
		%	%	%	%	%
1	I was taught organic Chemistry better than inorganic Chemistry.	25.9	30.5	10.5	24	8.8
2	My chemistry teacher rushed through the organic Chemistry.	12.1	17.6	15.9	34.3	20.1
3	I did not like the way my chemistry teacher taught organic chemistry.	19.7	29.7	13.4	26.4	10.9
4	I did not understand the organic Chemistry topics I was taught.	18.8	31	13.8	28	8.4
5	Organic chemistry is boring.	18.4	18	23.4	29.7	10.5
6	Organic chemistry topics are difficult than other chemistry topics.	27.2	26.4	16.7	22.6	7.1

7	Organic chemistry is difficult to learn.	22.2	31.4	16.7	23.8	5.9
8	Organic chemistry requires the learning of too many unrelated facts.	25.9	36	17.2	16.3	4.6
9	I don't like organic chemistry because it makes me nervous.	15.5	23	19.2	31	11.3
10	Organic Chemistry is easy to understand.	7.1	18	13.8	35.1	25.9
11	I don't see the relevance of studying organic Chemistry.	13.8	18	15.5	33.1	19.7
12	Organic Chemistry is abstract.	15.5	28.5	23.4	23.4	9.2
13	It takes a lot of time to read and understand organic Chemistry topics compared to other chemistry topics.	32.2	40.6	11.7	12.1	3.3
14	My chemistry teacher did not allow us to ask questions in organic chemistry class.	18.8	18.8	13.4	30.5	18.4
15	My class teacher told us organic chemistry is not difficult to study.	9.6	18.4	14.2	32.2	25.5
16	Learning organic chemistry is time consuming.	18.8	30.1	18.4	24.3	8.4
17	I did not understand organic chemistry topics because of the way my class teacher taught organic chemistry.	21.3	23	16.7	25.9	21.3
18	I found organic Chemistry interesting.	12.6	28.9	21.3	24.3	13
19	Structures of organic compounds are difficult to remember.	25.9	33.5	13.4	22.6	4.6
20	My chemistry teacher skipped a lot of organic Chemistry.	26.4	21.8	20.9	19.7	11.3
21	My chemistry teacher did not mind whether the class understood the organic chemistry or not.	19.7	23.4	17.2	24.3	15.5
22	My chemistry teacher taught organic Chemistry topics as if we have learnt them before.	19.7	24.7	16.7	27.2	11.7
23	Organic chemistry questions are difficult to answer.	23.4	37.7	19.2	15.5	4.2
24	Organic chemistry questions demand a lot of recall of facts.	33.1	47.7	10	6.3	2.9
25	Organic chemistry should not be studied at the Senior High School.	20.1	15.5	13	28	23.4
26	I did not answer organic chemistry questions in class test, mock exams and WASSCE chemistry paper.	28	20.1	8.4	24.3	19.2

As shown in Table 1, the students were of the view that their chemistry teachers taught inorganic chemistry topics better than organic chemistry topics. A total of 56.4% of students agreed to while 10.5% could not tell whether or not their teachers inorganic chemistry topics better than organic chemistry topics.

For the 10.5%, their chemistry teachers might have taught organic chemistry topics the same way they taught inorganic chemistry topics. The assertion that chemistry teachers taught inorganic chemistry topics better could account for the teachers skipping a lot of organic chemistry topics. Almost 21% of the students were not sure whether or not organic chemistry topics were skipped. For these students, they might not have been aware of the organic chemistry topics or were not taught organic chemistry at all. While 26.4% strongly agreed, 11.3% strongly disagreed that organic chemistry topics were not skipped. Skipping organic chemistry topics suggest that the topics were either irrelevant to the teachers or were too difficult for the teachers to teach.

Students who were taught organic chemistry topics had issues with how they were taught. For the teachers who taught organic chemistry, a good number of their students indicated that the teachers either did not mind whether the class understood the topics and also the chemistry teachers taught organic chemistry topics as though the students were revising the topics. For about 43% of the students, their chemistry teachers did not mind whether or not the class understood the organic chemistry topics. The same percentage of students (19.7%) strongly agreed that, their chemistry teachers were unconcerned about their progress in organic chemistry topics and taught organic chemistry as if the students already had a good understanding of the organic chemistry topics. However, 1.3% more agreed that organic chemistry topics were taught as if the students have learnt them before.

Interestingly, the students said, chemistry teachers did not rush through the topics. Though chemistry teachers skipped organic chemistry topics and saw organic chemistry classes as some kind of revision, they did not rush through the organic chemistry topics. Considering some responses obtained from the students, one would easily conclude that the chemistry teachers rushed through the organic chemistry topics but they did not. For example, if a teacher teaches as though the students are revising, that teacher's lessons are likely to be fast paced. As many as 54.4% of students did not think their teachers were in a rush. Even questions were allowed in organic chemistry classes. While 30.5% disagreed, 18.4% strongly disagreed that their chemistry teachers prevented them from asking questions in organic chemistry classes. This notwithstanding, chemistry teachers did not teach organic chemistry topics to the likeness and understanding of their students. With 49.4% not liking the way they were taught organic chemistry topics; it was obvious students would not understand organic chemistry. More students (49.8%) did not understand organic chemistry topics.

Students' understanding of organic chemistry topics cannot only be associated with teachers. Students' perception of the discipline could be a factor. The students indicated that, compared to other aspects of chemistry, it takes more time to more time to learn and understand organic chemistry topics. While 15.4% disagreed that more time is required, to 72.8%, learning organic chemistry topics is time consuming, relative to other aspects of chemistry. To 59.4% of the students, it is difficult memorizing organic chemistry structures. This is because to the majority of students (44%), organic chemistry is abstract. It is not therefore surprising that, 53.6% perceived organic chemistry topic as topics that are very difficult to learn. According to 61.9% of the students, organic chemistry topics are difficult because the concepts are unrelated. Only 4.6%

strongly disagreed that organic chemistry topics are unrelated. These 4.6% may be right in so saying so. Organic chemistry concepts are to a large extent related. However, many students said organic chemistry concepts are unrelated because their teachers skipped topics and so the students lacked the pre-requisite knowledge to understand other organic chemistry topics. Topics would become difficult to learn if they appear to be made up of unrelated concepts. This explains why the majority of students (48.1%) did not answer organic chemistry questions when they were assessed in chemistry.

It does not mean, the students hated organic chemistry topics. Even the lessons they did not understand were interesting to 41.5%, not boring to 40.5% and relevant to 51.4%. Though the students said organic chemistry topics are difficult, 51.4% were of the view that organic chemistry topics should be studied in Senior High Schools. About 35.6% opposed this view. To the 35.6%, the organic chemistry topics ought not be part of the Senior High School chemistry syllabus, may be, because of their difficulty level. The major issue the students might have had, is that their chemistry teachers found organic chemistry difficult to handle than other aspect of chemistry, and so the teachers wanted their students to read aspect of chemistry other than organic chemistry. A majority of the students (57.7%) reported that their chemistry teachers actually told them organic chemistry is difficult. While teachers might be preparing the minds of the students towards the task ahead, it is possible they shifted the students' attention other aspect of chemistry, just like they (the teachers) had put their weight on topics other than organic chemistry. As a result, despite the interest, the excitement they have studying organic chemistry and their knowledge of the importance of organic chemistry they still find organic chemistry difficult.

The research question was formulated to determine how Senior High School students perceive the teaching and learning of organic chemistry. It sought to determine whether students' perception of organic chemistry is positive, neutral or negative. The mean of the responses given to statements in Senior High School Organic Chemistry Perception Assessment Tool was calculated and used as the basis of saying that the students have a positive, negative or neutral perception of the teaching and learning of Senior High School organic chemistry. A mean value of 3.0 meant that the perception was neutral. Values from 0 to 2.9 meant a negative perception and values ranging from 3.1 to 5 shows a positive perception.

The mean of responses to the Senior High School Organic Chemistry Perception Assessment Tool was found to be 2.83. Students' perception of the teaching and learning of Senior High School organic chemistry was therefore negative.

These mean values indicate that all the three groups of students who completed the Senior High School Organic Chemistry Perception Assessment Tool had a negative perception of the teaching and learning of Senior High School organic chemistry. Even though the university students found three topics to be very difficult to understand, and the teacher trainees indicated that they found eight topics very difficult to learn, the perception of the university students did not differ from that of the teacher trainees. This gives an indication that students' negative perception of the teaching and learning of organic

chemistry is not only as a result of their understanding of the organic chemistry topics.

Focus group interview

A focus group interview was conducted using twelve students. The twelve students were made up of class prefects and their assistants. The focus group interview was conducted about an hour after the organic chemistry questionnaire for students have been administered. The one-hour period was allowed because the students had to go for lunch. With permission from the Head of Science Department of Foso College of Education, the interview was conducted at the Chemistry laboratory. The chemistry laboratory was chosen instead of a classroom in order to reduce interruptions and disruptions from other students who might want to learn in the classroom. The focus group interview which was a follow-up to the Senior High School Organic Chemistry Perception Assessment Tool, lasted for approximately 35 minutes. All twelve students responded positively to the interview. The group discussed most of the issues relating to organic chemistry raised in the Senior High School Organic Chemistry Perception Assessment Tool; how teachers taught organic chemistry, students' difficulty in understanding organic chemistry topics, the relevance of organic chemistry, and challenges of learning organic chemistry topics.

If the students were not taught organic chemistry, they would not be able to respond to the questions. The students were therefore asked first whether they were taught organic chemistry. All the students responded affirmatively. The success of the focus group interview depended on the students being taught organic chemistry. The students said that they were taught organic chemistry topics. However, the organic chemistry topics were the last topics they were taught before writing WASSCE chemistry paper. The students said that they were taught organic chemistry in Third year second term. Students write WASSCE in the third term of the third year and so much teaching does not occur in this term. By implication, less than one term was used to teach organic chemistry topics. Did this in any way affect their performance in WASSCE chemistry examination? According to the students the time they were taught organic chemistry topics negatively affected their performance in Chemistry exams. The students explained that:

Organic chemistry is broad and so since teachers do not start teaching it early they are not able to finish. (Students)

Even though chemistry teachers did not start teaching organic chemistry topics when they were actually supposed to, they did not give organic chemistry topics as reading assignments. What the chemistry teachers did was that they skipped a lot of the topics. According to the students, the topics they skipped were reactivity of organic compounds, petroleum, benzene, alkanolic acid derivatives, amino acid functional groups, natural and synthetic polymers, natural polymers and synthetic polymers. According to the students, the chemistry teachers knew:

Questions are usually not set on these topics in WASSCE, and so there was no need teaching them. (Students)

The teachers might have studied the trend of questions in past WASSCE chemistry paper 2 and noticed that questions were likely not to be set on some

topics, because questions are either not set from those topics or questions had already been set on those topics in the recent WASSCE exams. Did the student skip the topic too? The students said they learned the skipped topics on their own or they asked their colleagues who understood the topics to teach them. According to the students

Those that you don't understand, you make up your mind that if questions are asked on them in WASSCE you won't answer. (Students)

According to the students, some topics were taught to their understanding while other were not. Carbon compounds description and classification, identification of organic compounds, structure and general properties of organic compounds, alkanes, alkenes and alkynes were the topics that chemistry teacher taught to the understanding of students. Alkanols and alkanolic acid were not taught to the understanding of students. According to the students, chemistry teachers did not teach these topics to their understanding because:

The teachers did not understand the topics and so did not teach the topics into details. Also, they were not able to explain the content of the topics well (Students).

The students were asked, "The Senior High School organic chemistry is difficult and should have been studied at the university. What do you think about this suggestion?" Students were of the view that organic chemistry should be taught at the Senior High School level, however they felt that the content of the topics are loaded and so must be reduced. They also were of the view that the number of organic chemistry topics should also be reduced. Topics such as alkanolic acid, alkanolic acid derivatives and amino acid functional groups should be reserved for higher levels like the university.

When asked about the challenges associated with the teaching and learning of the Senior High School organic chemistry. The students gave the under listed as the challenges of teaching and learning of Senior High School organic chemistry:

1. Inability of chemistry teachers to teach the organic chemistry to students understanding.
2. The organic chemistry topics are loaded, meanwhile, the time for teaching them is short, and so the teachers rush through them.
3. The notion that organic chemistry is difficult.

Discussion

Educationists want to have to improve practice so that there would be high students' attainments, yet, they hardly listen to students. The students' voice can help chemistry teachers organize their organic chemistry lessons in a manner that promotes learning and stimulates interest. By asking students to share their views on how their chemistry teachers handled Senior High School organic chemistry topics, have revealed a number of issues Senior High School chemistry teachers have, possibly, taken for granted. As they expressed their views on their likes and dislikes about organic chemistry and how their chemistry teachers taught organic chemistry topics, the students raised a

number of concerns which must be addressed, if chemistry teachers and WAEC Chief Examiners for chemistry want to erase the 'crises tag' on organic chemistry in Senior High Schools.

Senior High School science students understand the need to study organic chemistry. The students have interest in studying organic chemistry to the extent that even where chemistry teachers have failed to teach organic chemistry topics, they learn the topics on their own. They do this because they are not nervous when organic chemistry is being taught and also when they are learning organic chemistry topics on their own. According to the students, they have interest in organic chemistry. Perhaps the direct bearing the topics have on substances they see and use, like soaps and perfume and petroleum products kindle an enthusiasm for organic chemistry. The students know they will need knowledge in organic chemistry if they want to make good grades in WASSCE chemistry, and also when they pursue chemistry in higher institutions. This brings to attention that, as chemistry teachers are looking at the organic chemistry aspect of the Senior High School chemistry syllabus as something students can do without, the students are looking at using the organic chemistry concepts in WASSCE and beyond. The students see organic chemistry as something they cannot do without, that is why they said the organic chemistry should not be removed entirely.

The students are not nervous when studying organic chemistry topics. It is the fear of not understanding or getting something wrong that usually make students nervous. The students are telling chemistry teachers, they [the teachers] are the ones who are afraid of organic chemistry and think students are afraid too. After all, if they were afraid of organic chemistry they would have shun it like their teachers. This suggests that chemistry teachers have an erroneous notion about how their students see organic chemistry. To the student, studying organic chemistry is interesting, not boring and so it does not make them nervous.

According to the students it is rather chemistry teachers who are nervous and not interested in organic chemistry. It is the chemistry teachers who tell their students organic chemistry is difficult. By telling students this, the teachers are suggesting that their reason for skipping or not teaching organic chemistry topics is that they are afraid of organic chemistry. The students reported that their chemistry teachers preferred teaching inorganic and physical chemistry to the organic chemistry aspect of the Senior High School chemistry syllabus. One may argue that the students thought so because the organic chemistry aspect consisted just about 20% of the topics in the Senior High School chemistry syllabus. The organic chemistry topics are spread over second and third years. if chemistry teachers do not find organic chemistry topics difficult, why do they wait till students are about to write their WASSCE examination, before they begin teaching some organic chemistry topics. This perception may or may not be true. But whatever the case may be, because it is the organic chemistry topics that suffer most from the selective process, the impression it creates is that chemistry teachers avoid organic chemistry topics, because they are not comfortable with the organic chemistry topics.

Again, according to the students, chemistry teachers who taught organic chemistry topics did not teach the topics to their understanding. From what the

students reported, the most probable cause of teachers' inability to teach organic chemistry may have something to do with teachers' understanding of or interest in organic chemistry topics. This was raised by the students in the Focus Group Interview, when the students said the teachers themselves appear not to understand the organic chemistry topics. They possibly skipped topics not just because questions on those topics have been set in recent WASSCE examinations but because they do not understand those topics too well. The teachers' inclination towards other subjects might have contributed to the students' negative perception of organic chemistry topics.

It is the teachers' posture towards organic chemistry topics that makes organic chemistry topics difficult for students. Though the teachers did not rush through organic chemistry topics, they did not teach the topics to the likeness of the students. If a student says he/she did not like the way a teacher taught, the major message it conveys is that he/she did not understand what was taught. This possibly explains the negative comments the students made about organic chemistry topics. The students were of the view that organic chemistry is abstract, and requires more time to learn, contains unrelated concepts and is difficult to comprehend. Skipping organic chemistry topics is to blame for these comments. Skipping topics leads to students not having some prerequisite concepts in place to be able to learn some topics. The organic chemistry concepts are related. For example, it is just about the same concepts that are used in naming alkanes, alkenes, alkynes, alkanols and alkanolic acids. If students would strive to teach organic chemistry to the understanding or likeness of students and decide not to skip topics, students' difficulties learning organic chemistry would be minimized.

The students are conveying a simple message to Senior High School chemistry teachers. They are saying that though they have a negative perception about the organic chemistry aspect of the Senior High School chemistry syllabus, organic chemistry does not make them nervous nor bored, since they find organic chemistry interesting. They are also saying they want to study organic chemistry, and even do it on their own, not for the reason of passing exams but for life. However, teachers' ill affinity towards organic chemistry is seriously affecting their understanding of organic chemistry. And so, Senior High School chemistry teachers should strive to understand organic chemistry well and teach organic chemistry the way they teach the other aspects of the Senior High School chemistry syllabus.

Conclusion

Senior High School organic chemistry is not in deep crises. It has been in troubling times, created by Senior High School chemistry teachers, for a long time. Chemistry teachers can eradicate the perceived difficulties by paying attention to what students say about organic chemistry. The students say, organic chemistry is relevant and interesting and so should not be removed from the Senior High School chemistry syllabus. The only problem they have is how teachers handle organic chemistry. Senior High School Organic chemistry, from the students' perspective, is unimportant and difficult for the chemistry teacher and so the chemistry teachers do not pay much attention to it. This is the cause of the perceived crises and difficulty of Senior High School students in studying organic chemistry. The solution to making organic chemistry attractive and easy

for students lies in the hands of chemistry teachers. Chemistry teachers would have to understand organic chemistry and see the organic chemistry aspect of the Senior High School chemistry syllabus as an essential component of chemistry education, if they want their students to learn organic chemistry with ease.

Disclosure statement

No potential conflict of interest was reported by the authors.

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