

Very Difficult Senior High School Organic Chemistry Topics: Students and Teachers Perception

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Abstract: West Africa Examination Council (WAEC) Chief Examiners for chemistry has reported that, most Senior High School (SHS) students do not attempt organic chemistry questions in West Africa Secondary School Examination (WASSCE) chemistry papers. The few students who attempt organic chemistry questions answer them poorly. The students' difficulty in answering organic chemistry question may be due to a number of factors, including the nature of the topics the SHS Students teachers and students teach and learn respectively. The purpose of the study was to identify organic chemistry topics students find difficult to learn and those that teachers find difficult to teach. To achieve this, a descriptive cross-sectional survey design was used to determine how difficult the SHS organic chemistry topics are, to both SHS chemistry teacher and students and teacher. The sample for the study consisted of 13 chemistry teachers and 235 students. Organic Chemistry Topics Assessment Tool for students and Organic Chemistry Topics Assessment Tool for teachers were used to collect data from students and teachers. The study found that three topics are easy and 14 topics are difficult for chemistry teachers to teach. The students found it difficult understanding eight topics and very difficult understanding nine organic chemistry topics. A negative correlation was found to exist between teachers views on how easy it is to teach the organic chemistry topics and students rating of how well the teachers taught the organic chemistry topics.

Index Terms - Organic, chemistry, difficult, topics, perception

I. INTRODUCTION

Senior High School (SHS) chemistry students in Ghana are expected to have a good understanding of the organic chemistry aspect of the SHS chemistry syllabus. Organic chemistry constitutes just about 20% of the chemistry syllabus. Though small, it is important for the SHS students to study organic chemistry. A good understanding of organic chemistry helps the students to see chemistry in food, medicine, detergents, etc. Organic chemistry is also a pre-requisite for studying medicine, biochemistry, nutrition, and pharmacy. Those who train to become teachers cannot do without organic chemistry either. They are required to study organic chemistry so that will effectively educate students to understand organic chemistry. Unfortunately, organic chemistry is one of the difficult sections in the SHS Chemistry syllabus. It has been reported by West Africa Examination Council (WAEC) Chief Examiners for chemistry that organic chemistry topics are skipped or poorly answered by students in West Africa Senior Secondary School Certificate Examination (WASSCE) (WAEC, 2015).

At a symposium for publishers and chemistry educators organized by America Chemical Society in San Diego, United State of America, the two groups opposed the idea that organic chemistry is in crisis (Halford, 2016). According to Halford (2016), the publishers were of the view that, it is incorrect to say organic chemistry is in crisis because there are a huge stock of organic chemistry textbooks, databases, electronic study guides and several thousands of questions available to chemistry teachers and their students. But the chemistry educators argued that availability of organic chemistry resources does not mean there cannot be crisis with organic chemistry. The educators answered no to this question (Halford, 2016). Organic chemistry is difficult for student and though it is hardly mentioned, difficult for teachers too (O'Dwyer & Childs, 2011). At the symposium, the two groups appeared to have viewed the crisis with different ways. The publishers were using 'no decline' in enrolment of students into programs and professions that require the study of organic chemistry, and availability of teaching resources to make their case for 'no crisis'. The educators on the other hand used the ease of grasping organic chemistry concepts to defend their claim (Halford, 2016). From the educators' perspective, there has been and still is a crisis with teaching and learning organic chemistry.

To understand organic chemistry concepts, students and teachers alike must do three-dimensional thinking. Students and teachers must move back and forth through macroscopic, microscopic and symbolic domains (Johnstone, 2009; Wu, 2003). If a piece of aspirin is dropped into a test tube, it is observed with the senses in its tangible and visible form (macroscopic). In that sample of aspirin, are for example, molecules which are not perceivable by the senses (microscopic), and then there is the artistic chemical symbols, formulae, and equations drawn to represent the formation of aspirin (symbolic). Navigating through these three domains appear to the students and, possibly, teachers as moving through a labyrinth. While the teachers are able to easily find their way through the labyrinth, the students very easily get lost or stuck and complain that organic chemistry is difficult. Sirhan (2007) suggest that to reduce students' frustration and difficulty, teachers must explicitly teach the link between the sub-microscopic, macroscopic

and symbolic levels. To Shirhan (2007) an additional instruction in linking the sub-microscopic level to macroscopic and symbolic has been experimentally found to be effective facilitating students' understanding of chemistry concepts.

It has been reported that of the three domains, the symbolic domain poses a greater threat (Bodner and Domin, 2000; State Examinations Commission, 2013; Childs & Sheehan, 2009; Graulich, 2015). As pointed out by Ayalew & Ochonogor (2015), organic molecules are usually three-dimensional, however, they are drawn in textbooks and on chalkboards as two-dimensional structures. The students and teachers have the task of visualizing the two-dimensional structures in their three-dimensional forms for better understanding. Many students are not able to effectively do this transformation mentally and are left with no option than to learn a large vocabulary of molecules by rote. In a case study by Anderson and Bodner (2008), they found that organic chemistry is difficult for Parker (Pseudo name for a brilliant student who failed organic chemistry) because he got stuck at the symbolic domain. Parker's principal challenge was visualizing and interpreting molecules and reactions.

Considering that students find many organic chemistry topics difficult, the West Africa Examination Council (WAEC) chemistry chief examiners' report is not surprising. The fact is that navigating across the three domains (sub-microscopic, macroscopic and symbolic) demand high-level thinking. Due to this demand many students and teachers are not ready to spend time and energy doing high cognitive activity, when there are other aspects of the chemistry syllabus that require less effort and time. WAEC Chemistry Chief Examiners' reports have consistently stated that most students who attempt organic chemistry questions in papers 2 and 3 do not perform well in the organic chemistry questions (WAEC 2004, 2006, 2009, 2012). Organic chemistry questions are not compulsory, neither are they many (not up to 15%) and so students can decide not to answer organic chemistry questions and still obtain a respectable grade in chemistry. This situation is not peculiar to WASSCE chemistry. The reports from the Irish Chemistry State Examination Chief Examiner, for example, is not different. According to O'Dwyer and Childs (2015), the chief examiner of Ireland's Chemistry Leaving Certificate Examination has reported that candidates exhibit relatively poor attempt and performance in organic chemistry. O'Dwyer and Childs (2015) also stated that it is not compulsory for students to answer organic chemistry questions and so the students can avoid organic chemistry if the organic chemistry questions are difficult for them to answer.

No wonder it has been reported for several decades that organic chemistry topics are difficult to teach and learn (Green, 1930; Zoller, 1990; Ellis, 1994; Bodner & Domin, 2000, Mahajan & Singh, 2005). Studies into difficult organic chemistry topics have found that many of the organic chemistry topics are perceived to be difficult. Childs and Sheehan (2009) found that organic synthesis, organic reaction mechanisms, organic formulae, preparation and reactions of organic compounds are difficult organic chemistry topics. O'Dwyer & Childs (2011) listed the top five difficult organic chemistry topics as instrumentation, organic mechanism, organic reactions, organic synthesis and natural products. According to Ayalew & Ochonogor (2015), functional group, organic reaction, stereochemistry and reaction mechanism are difficult. The purpose of the study was to identify organic chemistry topics in the SHS Chemistry Syllabus teachers and students perceive very difficult to teach and learn respectively..

II. METHODOLOGY

A descriptive cross-sectional survey design was used to identify difficult organic chemistry topics in the SHS Chemistry syllabus. The population for the study was 348 students and 27 chemistry teachers in the Cape Coast metropolis, Sekondi/Takoradi Metropolis and Assin North Municipality. Apart from the remedial students who were purposively sampled, all other students were sampled using simple random sampling. The sample for the study is as shown in Table 2.1.

Table 2.1: Sample for the study

| S/N | Participants | Number |
|-----|---|--------|
| 1 | SHS Chemistry Teachers | 13 |
| 2 | Mathematics and Science students of Foso College of Education, Assin Foso, Ghana | 132 |
| 3 | First year students in the faculty of Science and the Department of Science and Mathematics Education of University of Cape Coast | 71 |
| 4 | remedial students attending remedial classes at Sekondi/Takoradi Metropolis | 32 |

Three groups of students were used in order to obtain a comprehensive students' perception of organic chemistry topics. Three groups of students were used in the study. They are University Students, College of Education Students and Remedial students were used. In Ghana, entry requirement for universities is higher than that of Colleges of Education and those who fail or have weak passes in some subjects attend remedial schools to study such subjects and re-write those subjects. The university students represent the high ability, the college of education students represented the mid ability students and the remedial students were the low ability students.

Two instruments based on the SHS Organic Chemistry Topics were used to collect data from students and teachers. The SHS Chemistry Syllabus had outlined 17 major organic chemistry topics to be studied. The 15 topics were the topics used in the Organic Chemistry Topics Assessment Tool for Students and Organic Chemistry Topics Assessment Tool for Students. The students were required to rate the topic from very easy to understand to did not understand and then from very well taught to not taught at all. These Likert scale type instruments were used to solicit from students, their understanding of the topics and how their teachers taught the topics. From the teachers' perspective, they were required rate the topics according to their ease of teaching the topics, and how easy they think their students understood the topics as they taught.

Items in all two questionnaires were coded for easy analysis. The coding was done according to the item format of the various sections of the Organic Chemistry Topics Assessment Tools. In Organic Chemistry Topics Assessment Tool for students, very easy to understand, easy to understand, understood after much effort, and did not understand were coded 4, 3, 2, and 1. Also in the same section, the options very well taught, well taught, not well taught and not taught at all which were coded 4, 3, 2, and 1 respectively. In the Organic Chemistry Topics Assessment Tool for Teachers, very easy to teach, easy to teach, difficult to teach and very difficult to teach, were coded 4, 3, 2, and 1 respectively. Also the options students understand very easily, students understand easily, students find difficult to understand and students find very difficult to understand were respectively coded as 4, 3, 2, and 1. Mean scores of the responses were used to determine the difficulty level of the topics. Mean scores below two meant that the topic was very difficult to understand or teach. Topics with mean scores from 2 to 2.9 were considered difficult to understand or teach and topics with mean scores from three to four were considered easy to understand or teach.

III. RESULTS

3.1 Organic Chemistry Topics SHS Students Find Difficult to Understand

The 17 organic chemistry topics outlined in the SHS chemistry teaching syllabus were listed, and students were to indicate how easy it is for them to learn and understand the topics. The mean of students' views on their difficulty to understand each of the seventeen organic chemistry topics was determined. Also, the mean scores of teachers' responses on how easy their students understand the topics was also determined. The mean scores of the students have been presented in Table 3.1.

Table 3.1: Mean Scores of Students' Views on the Difficulty to Understand SHS Organic Chemistry Topics

| No | Topic | Mean | Std. Deviation |
|----|---|------|----------------|
| 1 | Carbon compounds description and classification | 2.5 | 0.75 |
| 2 | Identification of organic compounds | 2.2 | 0.79 |
| 3 | Structure and properties of organic compounds | 2.1 | 0.78 |
| 4 | Reactivity of organic compounds | 1.8 | 0.79 |
| 5 | Characteristics and representation of organic reactions | 2.1 | 0.79 |
| 6 | Alkane | 2.4 | 0.86 |
| 7 | Petroleum | 1.9 | 0.85 |
| 8 | Alkenes | 2.3 | 0.81 |
| 9 | Alkyne | 2.2 | 0.83 |
| 10 | Benzene | 1.9 | 0.85 |
| 11 | Alkanols | 2.0 | 0.82 |
| 12 | Alkanoic acids | 1.9 | 0.79 |
| 13 | Alkanoic acid derivatives | 1.8 | 0.83 |
| 14 | Amino acid functional groups | 1.8 | 0.84 |
| 15 | Natural and synthetic polymers | 1.9 | 0.87 |

From Table 3.1, the standard deviations for the topics were from 0.745 to 0.871. These standard deviations indicate that the scores were to some extent clustered around the mean. By implication, the views of the individual students on the difficulty of each of the organic chemistry topics did not differ so much from one another.

Nine topics had mean scores below 2.00. Carbon compounds description and classification had the highest mean score and Alkane had the best mean score while alkanoic acid derivatives, amino acid functional groups, and reactivity of organic compounds had the least mean (1.8). Teachers' views on the topics students find difficult to understand have been presented in Table 3.2.

Table 3.2: Mean Score of Chemistry Teachers' Views on Students' Difficulty in Understanding Organic Chemistry Topics

| No | Topic | Mean | S. Deviation |
|----|---|------|--------------|
| 1 | Carbon compounds description and classification | 2.8 | 0.44 |
| 2 | Identification of organic compounds | 2.5 | 0.52 |
| 3 | Structure and general properties of Organic compounds | 2.8 | 0.44 |
| 4 | Reactivity of Organic compounds | 2.5 | 0.52 |
| 5 | Characteristics and representation of Organic reactions | 2.4 | 0.51 |
| 6 | Alkanes | 2.9 | 0.28 |
| 7 | Petroleum | 2.7 | 0.48 |
| 8 | Alkenes | 2.8 | 0.44 |
| 9 | Alkynes | 2.5 | 0.52 |
| 10 | Benzene | 2.3 | 0.48 |
| 11 | Alkanols | 2.6 | 0.65 |

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|----|--------------------------------|-----|------|
| 12 | Alkanoic Acids | 2.5 | 0.52 |
| 13 | Alkanoic Acids derivatives | 2.3 | 0.48 |
| 14 | Amino Acid functional groups | 2.2 | 0.44 |
| 15 | Natural and Synthetic Polymers | 2.3 | 0.48 |

From Table 3.2, teachers did not find any of the seventeen topics very difficult for students to understand. All topics had mean scores between 2.0 and 3.0 hence the chemistry teachers had the view that all the topics were difficult for students to understand. The students indicated in Table 3.1 that Carbon compounds description and classification was relatively less difficult to understand. The teachers shared the same view with the students since Carbon compounds description and classification had the highest mean from both Table 3.1 and Table 3.2. However, the students and chemistry teachers differed on the topics that was relatively very difficult for students to understand. From Table 3.1, alkanoic acid derivatives, amino acid functional groups, and reactivity of organic compounds had the least mean score while in Table 3.2 amino acid functional groups had the least mean (2.2).

The Relationship between Teachers' views on how well students understand organic chemistry topics and students' views on how well they understood the SHS organic chemistry topics was investigated using Pearson Product Moment Correlation Coefficient. The correlation co-efficient is shown in Table 3.3.

Table 3.3: Correlation of Teachers' views and Students' views on how well Students Understood the SHS Organic Chemistry Topics

| | Students | Teachers |
|-----------------------------------|-----------|----------|
| Pearson Correlation | 1 | .126 |
| Sig. (2-tailed) | | .979 |
| Sum of Squares and Cross-products | 18839.172 | 3.000 |
| Covariance | 79.156 | -.273 |
| N | 235 | 12 |

There was a weak positive correlation between the teachers' perception of students' understanding and students' understanding of SHS organic chemistry topics. The positive correlation suggests that teachers know the topic students find difficult to understand and the topics students understand easily. This does not mean that there were no differences in the views of the chemistry teachers and students. While chemistry teachers had the view that none of the topics was very difficult for students to understand, the students indicated that nine topics were very difficult for them to understand.

3.2 Organic Chemistry Topics SHS Chemistry Teachers find Difficult to Teach

The mean scores used to determine the teachers' views on the teaching of organic chemistry topics has been presented in Table 3.4.

Table 3.4: Mean Score SHS Chemistry Teachers' views on the difficulty of Teaching Organic Chemistry Topics

| No | Topic | Mean | Std. Deviation |
|----|---|------|----------------|
| 1 | Carbon compounds description and classification | 3.1 | 0.28 |
| 2 | Identification of organic compounds | 3.0 | 0.41 |
| 3 | Structure and general properties of Organic compounds | 2.9 | 0.28 |
| 4 | Reactivity of Organic compounds | 2.5 | 0.52 |
| 5 | Characteristics and representation of Organic reactions | 2.6 | 0.51 |
| 6 | Alkane | 3.1 | 0.28 |
| 7 | Petroleum | 2.8 | 0.44 |
| 8 | Alkenes | 2.9 | 0.28 |
| 9 | Alkynes | 2.9 | 0.38 |
| 10 | Benzene | 2.4 | 0.51 |
| 11 | Alkanols | 2.9 | 0.28 |
| 12 | Alkanoic Acids | 2.5 | 0.52 |
| 13 | Alkanoic Acids derivatives | 2.4 | 0.51 |
| 14 | Amino Acid functional groups | 2.5 | 0.52 |
| 15 | Natural and Synthetic Polymers | 2.6 | 0.51 |

As shown in Table 3.4, the mean scores ranged from 2.4 to 3.1. Mean scores of three and above were for the topics Carbon compounds description and classification, structure and general properties of organic compounds and alkanes. These topics were considered easy for teachers to teach since they had means above 2.9.

Two topics had the least mean score (2.4). The topics with this mean score were alkanolic acid derivatives and benzene. The mean score for alkanolic acid derivatives and benzene gives an indication that these two topics were the topics chemistry teachers found most difficult to teach. In Table 3.1, alkanolic acid derivatives and benzene were among the topics that students found very difficult to understand. From the students' point of view alkanolic acid derivatives was among the topics teachers found very difficult to teach. The views of students on the chemistry teachers' difficulty in teaching the 17 organic chemistry topics are shown in Table 3.5.

Table 3.5: Students' Views on Chemistry Teachers' Difficulty in Teaching Organic Chemistry Topics

| No. | Topic | Mean | Std. Deviation |
|-----|---|------|----------------|
| 1 | Carbon compounds description and classification | 2.5 | 0.75 |
| 2 | Identification of organic compounds | 2.5 | 0.79 |
| 3 | Structure and properties of organic compounds | 2.4 | 0.76 |
| 4 | Reactivity of organic compounds | 2.1 | 0.80 |
| 5 | Characteristics and representation of organic reactions | 2.3 | 0.80 |
| 6 | Alkane | 2.6 | 0.78 |
| 7 | Petroleum | 2.1 | 0.90 |
| 8 | Alkenes | 2.5 | 0.79 |
| 9 | Alkyne | 2.4 | 0.84 |
| 10 | Benzene | 2.1 | 0.86 |
| 11 | Alkanols | 2.3 | 0.84 |
| 12 | Alkanoic acids | 2.1 | 0.82 |
| 13 | Alkanoic acid derivatives | 1.9 | 0.83 |
| 14 | Amino acid functional groups | 2.0 | 0.90 |
| 15 | Natural and synthetic polymers | 2.0 | 0.93 |

The students' views on chemistry teachers' difficulty in teaching organic chemistry topics differed slightly from the views of the chemistry teachers. According to the chemistry teachers, three topics were easy to teach and none of the topics was very difficult to teach. The students, however; held the view that none of the topics was easy for the teachers to teach. Also, only alkanolic acid derivatives natural and synthetic polymers were very difficult for the teachers to teach.

The relationship between how teachers found the teaching of organic chemistry topics and students' views of how well organic chemistry topics were taught was investigated using Pearson Product Moment Correlation Coefficient. The correlation matrix has been shown in Table 3.6.

Table 3.6: Correlation of Teachers' Views and Students' Views on Teachers' Difficulty in Teaching Organic Chemistry Topics

| | | Teachers | Students |
|----------|-----------------------------------|----------|----------|
| Teachers | Pearson Correlation | 1 | -.190 |
| | Sig. (2-tailed) | | .554 |
| | Sum of Squares and Cross-products | 150.769 | -54.750 |
| | Covariance | 12.564 | -4.977 |
| | N | 13 | 235 |

The correlation co-efficient showed that there was a weak negative correlation between how teachers found the teaching of organic chemistry topics and students' views on how well organic chemistry topics were taught. It implies that the topics that teachers said they were easy to teach, the students said they were not well taught and the topics that teachers said were difficult to teach, the students said the teachers taught them well.

IV. DISCUSSION

From the results of the study, the teachers did not perceive any of the SHS Organic chemistry topics very difficult to teach while students' perceived Reactivity of organic compounds, Petroleum, Benzene, Alkanoic acids, Alkanoic acid derivatives, Amino acid functional groups, Natural and synthetic polymers very difficult topics to understand. Topics in the SHS syllabus are arranged from simple to complex. It was therefore not surprising that the first five topics were well understood by the students except reactivity of

organic compounds. Among the first five topics listed, reactivity of organic compounds was the topic that students indicated they did not understand. Students found it very difficult understanding topics from benzene to natural and synthetic polymers.

These topics generally contain complex concepts. This to some extent explains why students found it difficult understanding them (Abimbola & Danmole 1995). Another factor that might have accounted for students' inability to understand topics was how the chemistry teacher who taught these topics taught them. Tekkaya, Özkan and Sungur (2001) explained the cause of the problem of difficult topics using the amount of subject matter in relation to the available time. They contend that since there are so many topics to deal with in a short period of time the topics are not studied deeply and also students turn to memorize concepts rather than learning them meaningfully. Hence, students are unable to realize the interdependency of the topics.

Topics teachers indicated students have difficulty understanding correlated positively with those that the students themselves indicated they found difficult understanding. The correlation was, however, weak. The Teachers get to know some of the topics students have difficulty understanding as they assess their students on the topics. The teachers may not know the extent to which the students struggled to learn and produce the responses. This is because the assessment mostly test their knowledge and not how difficult it was for students to learn and understand the organic chemistry topics. For teachers to monitor the process of work of students in organic chemistry teachers must not rely solely on assessment but speak to students about their progress of learning organic chemistry. By discussing students' progress with them, teachers will get to know the topic that are difficulty for students to learn.

None of the topics was found to be easy to understand by students. This affirms results of previous studies conducted on how students perception of organic chemistry. Mahajan & Singh (2005), Jomoh (2005) and O'Dwyer and Childs (2015) have all found that organic chemistry is difficult for students to understand. Childs and Sheehan (2009) also found that students at different levels of education found some organic chemistry topics difficult to understand. Eight topics were found to be difficult for students to understand, they are carbon compounds description and classification, identification of organic compounds, Structure and general properties of Organic compounds, characteristics and representation of organic reactions, alkanes, alkenes, alkynes and alkanols. The topics, reactivity of organic compounds, petroleum, benzene, alkanolic acids, alkanolic acids derivatives, amino acid functional groups, natural and synthetic polymers were considered very difficult for students to understand. This result is consistent with the findings of Ayalew & Ochonogor (2015) and O'Dwyer & Childs (2011). The key factor that may have accounted for this results is the inability of students to navigate through the three domains mentioned by Sirhan (2007). To help students overcome the problem of dealing with the macroscopic, microscopic and symbolic domains, teachers should make use of three-dimensional models, experimentations and computer simulation in their lessons.

As students found some topics difficult to understand and others easy to understand, teachers also find some topics difficult to teach and others easy to teach (Egun, 2007). The study did not find any topic very difficult for teachers to teach. Out of the 17 topics, chemistry teachers used in the study indicated three topics were very easy to teach. The topics were carbon compounds description and classification, identification of organic compounds and structure and general properties of organic compounds. The SHS chemistry teachers used in the study indicated, all the other topics were either easy to teach or difficult to teach. Topics which were difficult for the SHS chemistry teachers to teach are benzene, alkanolic acid derivatives, amino acid functional groups and natural and synthetic polymers. The remaining topics were to the chemistry teachers, easy to teach.

From the students' point of view, the first three topics (carbon compounds description and classification, identification of organic compounds and structure and general properties of organic compounds) were generally well taught or very well taught. It was challenging finding out from students whether topics were well taught or not well taught by their teachers. This is because students tend to judge lessons according to their ease of understanding the concepts taught. If the students lacks the pre-conceptions necessary for understanding the organic chemistry topics, they would still say the organic chemistry topic was not well taught. This was a major limitation of this study. In spite of this limitation, two of the topics students perceived as not well taught were perceived to be difficult to teach by the teachers. The most not well taught topic was reactivity of organic compounds. The students, indicated other topics like characteristics and representation of organic reactions, alkanolic acid derivatives and amino acid functional groups were not well taught. Topics found to be easy to teach by SHS chemistry teachers were carbon compounds description and classification, identification of organic compounds and structure and general properties of organic compounds, alkanes, alkenes and alkanols. The topics they found difficult to teach were reactivity of organic compounds, characteristics and representation of organic reactions, petroleum, alkynes, alkanolic Acids, alkanolic acids derivatives, amino acid functional groups, natural and synthetic polymers.

There was a weak negative correlation between how teachers perceived the teaching of organic chemistry topics and students' views of how well organic chemistry topics were taught. It implies that the topics that teachers said were easy to teach, the students said they were not well taught. It can be inferred from this that finding a topic easy to teach does not necessarily mean that one is more likely to teach it to the understanding of students. This weak negative correlation must be studied further to test the idea that organic chemistry topics that are easy to teach are not necessarily easily understood by students.

V. CONCLUSION

Studies conducted to identify difficult organic chemistry topics have found that students find organic chemistry topics difficult to understand. This study also found that the majority of organic chemistry topics in the SHS chemistry are very difficult for students to understand. Most of the organic chemistry topics found to be very difficult for students to understand required the application of knowledge in the microscopic and symbolic domains (reaction mechanisms and chemical formulae). It can be concluded that the students find it difficult dealing with concepts in the microscopic and symbolic domains. To help students to understand organic chemistry topics, chemistry teachers should use three-dimensional models, audio visuals and experimentations/demonstration in their lessons.

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