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# An assessment of vertical continuity of chemistry-related topics identified in the revised Junior Science Curriculum and the new curriculum in Nigeria.

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**Abstract**

In Nigeria, the attention of stakeholders is often focused on how the implementation of the lower basic science curriculum influences the students' learning outcomes at the upper basic level. The question unanswered in the recent past is how sufficient the curriculum being implemented at the basic level prepare students for science learning at the post-basic level over the years. This is critical given the changes that the curriculum of science at the basic level in Nigeria has gone through over the years. Hence, this study determined if the changes in the chemistry-related topics in the revised basic science and technology curriculum affected the vertical continuity of chemistry concepts. The two curricula analysed were the old integrated science and the revised basic science and technology. The study concluded that the revision of the Basic science and technology curriculum had led to a reduction in the representation of chemistry-related concepts and the chemistry content represented has insufficient depth of coverage, which is in turn affecting the preparedness of the pupils for chemistry at the post-basic level. Hence, there is a need to develop a new curriculum that ensures that chemistry content is adequately covered in the Basic science and technology curriculum.

***Keywords:*** Assessment, Vertical continuity of chemical-related topics, Revised Junior Science Curriculum; New Junior Science curriculum.



## 1. Introduction

Chemistry as a subject in senior secondary school is one of the core science subjects that is compulsory for all science students. Students' performance has not been encouraging in this important subject even in developed nations (Wuttiprom et al., 2016; Taber, 2013). In Nigeria, the experience is the same. The West African Examinations Council (WAEC) Chief Examiner's Report revealed a spread of scores obtained by students who took chemistry examinations between 2009 and 2019. The standard deviation obtained between those years is 16.6, 09.27, 09.59,15.72, 15.72, 16.94 15.62, 15.36, 16.0, 13.78, and 14.46 respectively.

Several studies have investigated the causes of learning difficulties in chemistry in Nigeria and outside Nigeria (Osuafor, 1999; Aghadiuno, 1999; Osborne et al.,2003). The findings of the listed studies attributed poor method of instruction, teachers' and students' attitudes, laboratory inadequacy, teacher characteristics, misconceptions, retention, teacher characteristics, and classroom factors, attitudes towards science, and poor science background in junior school to poor students' achievement in chemistry Osuafor (1999), (1999), Osborne, Simon, and Collins (2003), Okegbile (1996), Bajeh (1997) , Adeyegbe (2005), Okegbile and Adegbija (2021), Okegbile and Adegbija, (2018), Abdul, Bica, and Abdullah (2015), Osborne, Simon, and Collins (2003), Akani (2014), Bamiro (2015), Boris (2020), Okwuduba and Ebele (2018), Omwirhiren, (2015), Oshokoya (1998) and Adesoji (1999). Many of the interventions carried out to remediate the identified causes primarily focused on the improvement of classroom interaction and instructional delivery for better classroom practices (Wolfgang, 2001; Hughes & Chen, 2011; Jaakkola, 2011; Edomwonyiotu & Avaa, 2011). The chemistry knowledge that students gain due to their exposure to the basic science and technology curriculum during the first nine years of basic education seems to be a factor that is often neglected.

In a curriculum that lacks cohesiveness and continuity, students may find themselves revisiting a certain task at various levels without a meaningful escalation in difficulty. This repetition can occur within the same context and involve identical procedures if continuity is not considered during implementation (Secondary *et al.,* 1987; Jarman, 1990; House of Commons Education Committee, 1995; Galton *et al.,* 1999; Morrison, 2000). Unfortunately, pupils in such systems personal journey through education are often more disjointed and discontinuous (Lee *et al.,*1995; Galton *et al.,* 1999; Nicholls & Gardner, 1999). The poor performance of students in chemistry at the senior secondary school in Nigeria has not driven researchers to seek if such disjointedness and discontinuity exist in Nigeria's basic science and technology curriculum, since the curriculum was reviewed.

Only a hand full of research is available on how poor preparation of students at the lower level could invariably translate into poor quality of science education, specifically in the preparation of pupils for the core sciences at senior secondary schools in Nigeria (Oshokoya, 1998 and Adesoji, 1999). The implementation of the basic science curriculum, specifically the contents of the basic science theme that prepares students for chemistry at the upper level, could also influence student learning of chemistry content and could, in turn, improve the academic performance of pupils in chemistry. This might be one of the causes of difficulties in learning chemistry that must be resolved so that other efforts to improve students' performance in chemistry can yield a great result. Therefore, it is germane to look into the curriculum content of basic science before looking into its' implementation because it is the intended curriculum that determines what is implemented (Thijs & van den Akker, 2009; van den Akker, 2003).

Following the introduction of the nine years of compulsory basic education in Nigeria, many reforms took place, which affected the subjects offered at the basic level of education. especially the basic science and technology. The present basic science curriculum, which is the national standard, came from various revisions to the previous integrated science and basic science curriculum. The most recent revision is the reduction in the number of subjects that students offer. This revision made many subject curricula at the basic level become Broadfield curricula. The curriculum of basic science and technology is one of the broad field curricula that was developed through the integration of several subjects that previously existed as separate disciplines. The subjects merged were basic science, basic technology, physical and health education, and information technology. These subjects became themes in the new curriculum. The philosophy of the subject is that it will expose the child to the fundamental unity of the core sciences and provide pupils with the fundamental knowledge needed for further studies of the core sciences at the senior secondary level (omilani *et al.,*2022).

Before this revision, Nigeria's science curriculum had undergone several changes. For a long time, primary science was a nature study in the 1950s (Ogunniyi, 1986). In the 1970s, elementary science replaced nature studies (Federal Ministry of Education, 1980; Amen-Anegbe, & Adeoye, 2010), and at that time, science at junior secondary school was integrated science (omilani et al., 2022). Later, students at both levels offered basic science. The curriculum content during these two eras was mainly an integration of core sciences: biology, chemistry, and physics. Presently, the narrative is different because of the introduction of basic technology, physical and health education, and information and communication technology as integral parts of science at the basic level. As a result of this reform, the core sciences no longer enjoy space in the curriculum as they did in the past (Omilani et al., 2022).

Several changes have been made to the basic science and technology curriculum (BSTC), which is meant to prepare pupils for the core sciences (chemistry, physics, and biology) at senior secondary schools in Nigeria. This is not peculiar to Nigeria's basic science and technology curriculum because it is the usual practice globally (Verzosa & Vistru-Yu, 2019; Morales, 2017; Okabe, 2013; Nebres, 2009). These modifications have impacted the content of the basic science and technology curriculum, particularly the basic science theme that prepares pupils for chemistry, biology, and physics in senior secondary school. Since the revision of the basic science and technology curriculum, research has concentrated on nature (Onwuachu & Okoye. 2012; Chima 2021: Chima & Mbaegbu, 2021), structure (Igbokwe, 2015), creation (Awofala & Sopekan, 2013), and interpretation (Osokoya. 2013; Bukunola, & Idowu, 2012 & Ogundele. et al. 2020) of the curriculum.

Investigations have not been conducted to determine the level of preparation the chemistry-related content in the basic science and technology curriculum offers learner who desires to learn chemistry at the post-basic level. As a result, it is important to identify the changes in topics and determine if they affect the vertical continuity of chemistry concepts. Therefore, this study was embarked upon to identify the changes in topics as a result of the revision and also to determine if the revision affected the vertical continuity of chemistry-related topics. Similarly, to understand the impact of the revision that the curriculum had gone through on the chemistry-related content of the basic science and technology curriculum.

The following were the research questions for this study:

**RQ1:** What are the changes in the chemical-related topics identified in the revised curriculum?

**RQ2:** Based on the changes identified, is there a vertical continuity in the topic identified in the new curriculum?

## 2. Method

This study aimed to examine the new basic science and technology curriculum to look into the changes in the chemical-related topics as identified in the revised curriculum and determine if there is vertical continuity in the contents identified in the new curriculum. It is a descriptive-evaluative study and a qualitative approach was adopted to analyze the chemistry-related contents of the two curricula (Basic Science and Technology and Chemistry. The research employed the criteria for curriculum evaluation outlined by Glatthorn, Boschee, and Whitehead (2005), specifically emphasizing the evaluation of vertical continuity. The chemical-related topics in the revised Junior Science Curriculum and the new curriculum in Nigeria were also compared.

The chemistry-related contents of the two curricula were encoded and structured followed by quantifying and systematically making comparisons (Chi, 1997; Prasad, 2008; Astalin, 2013). More specifically, the study attempted to describe how the most recent revisions affected the continuity of the content of the new basic science and technology curriculum, especially the contents that prepare pupils for chemistry at the upper level. To fully understand the changes in the current basic science and technology curriculum, a comparison was made between the revised curriculum and the previous curriculum; integrated science curriculum using the Discrepancy Evaluation Model (DEM) of (Provus,1969). This model is considered relevant for the evaluation studies that intend to provide information on program development and assessment.

In This study used four steps to identify the discrepancy between the two curricula. The steps were adopted from the work of Ryan (2020). The steps are:

a. establish program design standards, b. plan the evaluation, c. implement plans to collect information, d. identify discrepancies, and e. plan what to do next.

2.1. Establish program design standards

The study revisited the previously used curriculum in the junior secondary school in Nigeria before the recent revision. The content of the two curricula was analyzed and compared to the chemistry principle in the senior secondary. Only the chemistry-related content of the two curricula (integrated science and basic science and technology) was compared to the 10 chemistry principles. The 10 chemistry principles were standard with which the topics of integrated science and the new basic science theme of basic science and technology curriculum were compared.

2.2. Plan the evaluation

The evaluation in this study focuses on the content that prepares pupils for chemistry at the upper level in the two curricula, such as the integrated science and the basic and technology curricula. The curriculum analysis was informed by the typology model of a qualitative approach. This evaluation model informed this research on the identification of gaps since the revision of the curriculum. The strengths and weaknesses of the revised curriculum were identified. Also, areas that need improvement were highlighted. This was possible by comparing the contents identified with the chemistry principles.

2.3. Implement plans to collect information

The chemistry-related content of the two curricula was analyzed and compared to the 10 chemistry principles. The contents were mapped out to check its alignment with the principles of learning chemistry. The chemistry principles are the particulate nature of matter, chemical combination, periodicity, the qualitative aspect of chemical reaction, organic chemistry, metals and their compounds, non-metals and their compounds, industrial chemistry, chemical thermodynamics, and environmental chemistry.

The contents identified in the revised curriculum that align with a principle are grouped according to the principle that they prepare the pupils for. This was to provide opportunity to identify gaps in content, redundancies, misalignment in the learning competencies, reoccurring contents and recommendations for improvement in the next curriculum revision in Nigeria.

Similarly, vertical coherence was examined in the revised curriculum. All the chemistry-related content in the revised curriculum was mapped out to check the vertical coherence with topics in the subsequent level, i.e., how learning competencies are arranged across levels.

2.4. Identify Discrepancies

Curriculum mapping was employed to determine if discrepancies exist between the two curricula. Similarly, the two curricula were compared to the principles of learning chemistry at the upper level. Secondly, a comparison matrix was employed to have a clear view of the discrepancy between the chemistry-related content of the old curriculum and the new curriculum.

2.5. Plan what to do next

The final stage of this analysis framework provides ground for improvement of the revised basic science and technology. Similarly, the strengths and discrepancies of the curriculum were identified identified.

## 3. Results

### *3.1. Answering research question 1: What are the changes in the chemical-related topics identified in the revised curriculum?*

Results indicated that as elementary science from primary school and integrated science from junior secondary school were combined to become basic science and technology as a subjects in basic classes, the information relevant to chemistry drastically diminished (Omilani et al, 2022), and those present are not thoroughly covered.

**Changes in Chemical-Related Topics Identified in The Revised Curriculum**

**Table 1.0 : Number of Topics as contained in the two curricula**

| S/N | Integrated Science Curriculum | Basic Science and Technology Curriculum |
|---|---|---|
| 1 | Air pollution; effect and prevention | Environmental Pollution |
| 2 | Noise pollution; safety and prevention | Air, water, and soil pollution |
| 3 | Disposal of sewage | Causes and consequences of pollution |
| 4 | What is matter made of? | Control measures |
| 5 | Particles in solid, liquid, and gas | Meaning, identification, and classification of matter |
| 6 | Changes in state | States of matter |
| 7 | Evaporation | Metals and non-metals |
| 8 | Melting point and boiling point | Chemicals; meaning, classes, safety measures when using chemicals |
| 9 | Effect of heat on substances | Crude oil and petrochemicals |
| 10 | Properties of air | Meaning of crude oil and petrochemicals |
| 11 | Component of air | Refining crude oil |
| 12 | Purification of water | Uses of crude oil and petrochemicals |

| | | |
|---|---|---|
| 13 | Filtration, distillation, and fractional distillation | Importance of crude oil and petrochemicals |
| 14 | Separation of substances, chromatography, distillation, application of fractional distillation | Mineral resources (Gold, coal, limestone, tin, etc.) |
| 15 | Elements and compounds, mixture | Radioactivity |
| 16 | Destructive distillation of coal | |
| 17 | Preparation of oxygen, catalysts | |
| 18 | Preparation of hydrogen, properties of hydrogen | |
| 19 | Electrolysis of water | |
| 20 | Condition of rusting | |
| 21 | Rusting and burning, preventing rusting | |
| 22 | Element, mixtures, and compounds | |
| 23 | Balancing chemical equations | |
| 24 | Structure of an atom | |
| 25 | Dalton Atomic theory | |
| 26 | Atomic Models | |
| 27 | Acid in nature, Test for acid | |
| 28 | Common reactions of bases (neutralization reaction) | |
| 29 | Metals and non-metals | |

Table 1 above shows that the integrated science curriculum contained more chemistry-related content than the revised curriculum. The integrated science curriculum contained twenty-nine chemistry-related content, while the revised curriculum contained fifteen.

The integrated science curriculum exposes the learner to more chemical-related topics that are essential to the study of chemistry at the upper level than the new basic science and technology. Some of the essential topics previously covered were electrolysis of water (to show that water has two hydrogen atoms and one oxygen atom), rusting conditions, rusting and burning processes, methods to prevent rusting, understanding elements, mixtures, and compounds, as well as the essential skill of balancing chemical equations. Additionally, students were introduced to fundamental concepts like the structure of an atom and Dalton's Atomic theory.

This discrepancy in content implies that students exposed to the old curriculum will possess knowledge of certain concepts that the revised curriculum did not offer the student presently. For instance, students exposed to the previous curriculum will have learning experiences on how to balance simple chemical equations, and those under the revised curriculum will not be opportune to have such a learning experience. The importance of balancing chemical equations and skill of balancing chemical equations are very fundamental for chemistry learning at the post-basic level of education. Unfortunately, students introduced to this present curriculum until they transition to senior secondary school. The curriculum is not synchronized with the chemistry curriculum. This suggests that students who are exposed to the previous curriculum will have an advantage in terms of foundational knowledge and skill development compared to their counterparts under the revised curriculum in the contents areas identified.

**Table 1.1: Comparing the two curricula with the principles of the Chemistry Curriculum**

| **The principles of the Chemistry Curriculum** | **Chemistry-related content in the two curricula** | |
|---|---|---|
| | **Integrated Science** | **Basic science and technology** |
| **Particulate Nature Of Matter** | What is matter made of?<br>Particles in solid, liquid, and gas.<br>Changes in state<br>Evaporation<br>Melting point and boiling point<br>Effect of heat on substances<br>Structure of an atom<br>Dalton Atomic Theory<br>Atomic model | Meaning, identification, and classification of matter<br>Metals and non-metals<br>. |
| **Chemical Combination.** | Elements, Mixture, and compounds,<br>Balancing chemical Equations. | Meaning of chemicals.<br>Classes of chemicals.<br>Using chemicals.. |
| **Periodicity** | Elements, Mixture, and compounds | |

| | | |
|---|---|---|
| **Qualitative Aspect Of Chemical Reaction** | Acid in Nature<br>Test for Acid<br>Common reactions of bases (Neutralization reaction) | |
| **Organic Chemistry** | Destructive Distillation of coal | |
| **Metals And Its Compounds** | Metals and non-metals | Identification and classification of matter.<br>States of matter. . |
| **Non-Metals And Its Compounds** | Metals and non-metals | Identification and classification of matter.<br>States of matter. |
| **Industrial Chemistry** | Filtration, distillation, and fractional distillation<br>Separation of substances, chromatography, distillation, application of fractional distillation<br>Preparation of oxygen, catalysts<br>Preparation of hydrogen, properties of hydrogen<br>Electrolysis of water. | Meaning of crude-oil.<br>Refining crude-oil.<br>Uses of crude-oil and petrochemicals.<br>Importance of crude-oil and petrochemical.<br>Mineral resources (Gold, coal, limestone, tin, etc.)<br>Extraction |
| **Chemical Thermodynamics** | Condition of rusting<br>Rusting and burning<br>Preventing rusting | |
| **Environmental Chemistry** | Air pollution; effect and prevention<br>Noise pollution; safety and prevention<br>Disposal of sewage<br>Properties of Air<br>Component of Air<br>Purification of Water | Air pollution, causes and consequences.<br>Soil pollution causes and consequences.<br>Water pollution causes and consequences. Control measures<br>Depletion of Oxone layer.<br>Chloro-flouro carbon. (CFC).<br>Meaning of radioactivity.<br>Radioactive element.<br>Types of a radioactive element<br>Uses and danger of radioactive elements. |

From Table 1.1, it is clear that some topics overlap with multiple principles as they can encompass more than one concept; such topics include metals and non-metals, Elements, Mixture, and compounds. Although, most of the content in the revised curriculum seemed to be stated in six out of the ten chemistry principles. The principles that the revised curriculum prepares people for include the particulate nature of matter, chemical combination, metals and its compounds, non-metals and its compounds, industrial chemistry, and environmental chemistry. However, the other four principles: periodicity, qualitative aspects of chemical reactions, organic chemistry and chemical thermodynamic, all these the pupils are not prepared to have foundational knowledge in the present curriculum. Also, pupils exposed to the old curriculum would be able to balance simple chemical reactions in their third year of upper basic education. Balancing chemical equations is not included in the new curriculum, and students' first exposure to it is in senior secondary school.

Despite Even though the six principles covered by the new basic science curriculum were also included in the old curriculum, the old curriculum gave more depth than the new curriculum. For instance, the former curriculum's content on the particulate nature of matter covered topics like particles in solids, liquids, and gases as well as changes in state like evaporation, distillation, fractional distillation and boiling and melting points. However, in the new curriculum, the content covered is limited to meaning, identification, classification, and state of matter, thereby causing a reduction in the chemistry-related content. This is not an isolated case; it is the same for other contents. Another related example is that pupils exposed to the old curriculum could balance simple chemical reactions in their third year of upper basic level. Balancing chemical equations is not included in the new curriculum, and students' first exposure to it is now in senior secondary school, and they might start losing interest in chemistry learning because of an overload of contents (Snider, 2004).

The old curriculum went in-depth on several concepts that were not included in the new one. For instance, the quantitative aspect of chemical reactions. Topics such as extraction of colour matter from plant, production of oxygen, test for acid, test for base/alkali, and common reaction of bases all prepares pupils for qualitative aspects of chemical reactions. Concepts like Dalton Atomic theory, Atomic model, test for Acids, uses of acid were all left out of the new curriculum. Learners learn content deeply and more readily if the topics and sub-topics are presented to them in conceptually connected ways over the school year (Reeves & McAuliffe, 2012).

In a curriculum developed to actively prepare pupils for further studies in their upper-level education, little attention seemed to be paid by its developers to writing content that reflects the overall continuity and relationship to the content of the chemistry curriculum entirely. Interestingly, some aspects were not mentioned and might look totally strange to the pupils at the senior secondary level upon encounter, therefore causing a disjoint curriculum (Galton, 2009).

The inference we can draw from this report is that chemistry-related content is inadequately represented in the basic science theme of the basic science and technology curriculum. The Integrated science chemistry-related content follows a careful sequencing of learning content (Briggs & Peck, 2015), putting into consideration the cognitive level of student development (Tran, Reys, Teuscher, Dingman & Kasmer, 2016).

**Table 1.3 Contents per Topic in the two curricula.**

| **S/N** | **Level** | **Topic** | **Integrated Science Curriculum** | **Basic Science and Technology Curriculum** |
|---|---|---|---|---|
| 1 | **First year** | **Pollution** | Air pollution; effect and prevention | Environmental Pollution |
| | | | Noise pollution; safety and prevention | Air, water, and soil pollution |
| | | | Disposal of sewage | Causes and consequences of pollution |
| | | | | Control measures |
| | | **Matter** | What is matter made of? | Meaning, identification, and classification of matter |
| | | | Particles in solid, liquid, and gas | States of matter |
| | | | Changes in state | Metals and non-metals |
| | | | Evaporation | |
| | | | Melting point and boiling point | |
| | | | Effect of heat on substances | |
| | | | Properties of air | |
| | | | Component of air | |
| | | | Purification of water | |
| | | | Filtration, distillation, and fractional distillation | |
| 2 | **Second year** | **Separating technique** | Separation of substances, chromatography, distillation, application of | Chemicals; meaning, classes, safety measures when using chemicals |

| | | | | |
|---|---|---|---|---|
| | | | fractional distillation | |
| | | | Elements and compounds, mixture | |
| | | | Destructive distillation of coal | |
| | | | Preparation of oxygen, catalysts | |
| | | | Preparation of hydrogen, properties of hydrogen | |
| | | | Electrolysis of water | |
| | | | Condition of rusting | |
| | | | Rusting and burning | |
| | | | Preventing rusting | |
| | | **Crude oil** | | Crude oil and petrochemicals |
| | | | | Meaning of crude oil and petrochemicals |
| | | | | Refining crude oil |
| | | | | Uses of crude oil and petrochemicals |
| | | | | Importance of crude oil and petrochemicals |
| **3** | **Third year** | **Chemical** | Element, mixtures, and compounds | Mineral resources (Gold, coal, limestone, tin, etc.) |
| | | | Balancing chemical equations | Radioactivity |
| | | | Structure of an atom | |
| | | | Dalton Atomic theory | |
| | | | Atomic Models | |
| | | | Acid in nature | |
| | | | Test for acid | |
| | | | Common reactions of bases (neutralization reaction) | |
| | | | Metals and non-metals | |

From the table above table, it is clear that the old curriculum went in-depth on a number of concepts that were not included in the new one. For instance, pupils exposed to the old curriculum at the second level would already be exposed to elements and compounds. Mixture, Destructive distillation of coal, Preparation of oxygen, Preparation of oxygen, Preparation of hydrogen, Electrolysis of water and rusting and in the third year, pupils would be exposed to Balancing chemical equations, structure of an atom, Dalton Atomic theory, atomic Models, acid in nature, test for acid, common reactions of bases (neutralization reaction) and Metals and non-metal which were not included in the new curriculum. This is a point that the integrated science had it in contents that better prepares students for chemistry at the upper level than the new curriculum.

### *3.2. Answering research question 2: Based on the changes identified, is there a vertical continuity in the topic identified in the new curriculum?*

| S/N | Level | Basic Science and Technology Curriculum | Remark |
|---|---|---|---|
| 1 | **First year** | Environmental Pollution | Appears in the second year with a shift of focus to biology with topics like soil erosion, flooding, drainage etc. |
| | | Air, water, and soil pollution | |
| | | Causes and consequences of pollution | |
| | | Control measures | |
| | | Meaning, identification, and classification of matter | No reappearance |
| | | States of matter | |
| | | Metals and non-metals | |
| 2 | **Second year** | Chemicals; meaning, classes, safety measures when using chemicals | No reappearances |
| | | Crude oil and petrochemicals | No reappearances |
| | | Meaning of crude oil and petrochemicals | |
| | | Refining crude oil | |
| | | Uses of crude oil and petrochemicals | |
| | | Importance of crude oil and petrochemicals | |
| 3 | **Third year** | Mineral resources (Gold, coal, limestone, tin, etc.) | No Reappearances |
| | | Radioactivity | |

| | | | |
|---|---|---|---|
| | | Environmental Hazard | |

In an attempt to reduce the chemistry content of the basic science curriculum, the critical concepts were removed, and the principle of vertical continuity was not given the rightful place.

Although the new curriculum had established learning experience experiences that provided pupils with the content of increasing difficulties, the idea of repetition was not stressed in the curriculum. For example, environmental pollution was introduced to the learners at JSS1, and subsequently, it appears in JSS3 with topics like habitat, Adaptation of habitat, etc, which is directed toward biology. When continuity is absent or irregular, students may struggle to make connections between concepts, resulting in fragmented understanding resulting in the learners' inability to connect previously learned content to the new ones (Harden, 1999; Capilitan *et al.,* 2015; Drew, 2020).

## 4. Discussion

Based on the findings, the revised curriculum reduced the representation of chemistry-related content, and many of the topics removed are relevant for learning chemistry at the senior secondary school level. The revised curriculum emphasized the biological aspects of science more than chemistry and physics, which shows the lapses in the choices made at the revision level.

Although the few topics covered by the new curriculum were also included in the old curriculum, the depth of study is not the same. The depth is greater in the previous curriculum. For instance, the former curriculum's content on the particulate nature of matter covered topics like particles in solids, liquids, and gases and changes in state like evaporation, distillation, fractional distillation and boiling and melting points. However, in the new curriculum, the content covered is limited to meaning, identification, classification, and state of matter, but the effect of temperature in the form of evaporation, condensation, boiling, and melting were not given space.  thereby causing a reduction in the chemistry-related content.

The old curriculum went in-depth on several concepts that were not included in the new one. For instance, quantitative chemical reactions. Topics such as extraction of colour matter from plants, production of oxygen, test for acid, test for base/alkali, and common reaction of bases all prepare pupils for qualitative aspects of chemical reactions. Concepts like Dalton's Atomic theory, Atomic model, test for Acids, and uses of acids were all left out of the new curriculum.

In a similar study, Yulianti and Jannah (2019) investigated the coverage of chemistry topics in the Indonesian national curriculum. They found that the curriculum was heavily focused on basic concepts of chemistry, such as atomic structure and chemical bonding, and paid little attention to the more advanced topics, such as organic chemistry and biochemistry. Although the study of Yulianti and Jannah (2019) dependent measure is chemistry curriculum, but the pattern at which the representation of the certain contents in the curriculum is not adequately covered is consistent with the current findings of this study. This has open a discussion on how inadequate representation of certain contents interacts with student's preparedness for further studies.

## 5. Conclusions

The importance of continuity in education cannot be overemphasized. The changes that the curriculum has undergone have led to a reduction in the representation of chemistry-related concepts and those present are not thoroughly covered. This in turn affects the preparedness of the pupils for chemistry at the upper level. The inference we can draw from this report is that there is inadequate representation of chemistry-related content in the basic science theme of the basic science and technology curriculum

## 6. Recommendation

Based on the findings of this study, the following recommendations were made:

Educational policymakers need to conduct a thorough review of the revised curriculum, particularly in the area of science education. This review should aim to identify and address any gaps or deficiencies in the representation of chemistry-related content. Specifically, there is a need to revisit the topics removed from the curriculum and consider reintegrating them to ensure a comprehensive coverage of chemistry concepts.

To address the imbalance observed in the revised curriculum, educators should adopt an interdisciplinary approach to teaching science. By integrating chemistry concepts into other science subjects such as biology and physics, students can gain a more holistic understanding of scientific principles and their real-world applications.

It is crucial to establish mechanisms for continuous monitoring and evaluation of the curriculum implementation process. This includes regularly assessing student performance in chemistry and identifying areas of improvement. Feedback from teachers, students, and other stakeholders should be collected and used to inform ongoing curriculum revisions and improvements.

By implementing these recommendations, educational stakeholders can work towards ensuring that the curriculum adequately represents chemistry-related content and effectively prepares students for further studies in this field. This will ultimately contribute to the overall quality of science education and the academic success of students.

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