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IN-SERVICE TEACHERS' PERCEIVED REASONS FOR CHEMISTRY CONTENT DIFFICULTY IN SCHOOL CURRICULUM

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Abstract
This study aimed to investigate the perceived reasons for the difficulty of chemistry content in the senior secondary school curriculum among in-service teachers. A multi-stage sampling technique was used to select a total of 120 teachers from various secondary schools who were participants in this research. The data collected with a structured questionnaire was subjected to statistical analysis to draw meaningful insights. The findings revealed that in-service teachers ranked their perceived multiple factors contributing to the complexity of chemistry content in senior secondary education. Notably, wrong deployment of teachers leading to handling of chemistry by biology teachers (WDT) was ranked first as the primary reason for difficulty while non-currency of teachers was ranked last. Furthermore, no significant difference was found in the perception of teachers in respect of chemistry content difficulty based on their gender. Recommendations were made based on the findings of this study that more qualified chemistry teachers should be recruited by the government. This will forestall the deployment of wrong teachers who were not pedagogically trained to teach chemistry. Similarly, regular trainings should be provided for update of teachers' knowledge and skills.
Keywords: In-service, Teachers, Perceived Reasons, Chemistry, Difficulty and Curriculum

INTRODUCTION

Chemistry is a fundamental subject within the senior secondary school curriculum and teachers' play a crucial role in imparting scientific knowledge and fostering critical thinking skills among students. Chemistry is a main subject that has a connection with other science subjects (Ana Luiza De Quadros et al., 2011). However, educators often encounter challenges when teaching chemistry content, which can impact students' comprehension and overall academic performance (Frey et al., 2018). Understanding the reasons behind these difficulties is essential to improve teaching methods, curriculum design, and ultimately enhance the learning experience for students. Among the numerous indices of this challenge is the growing students' low interest in chemistry as a subject (Wiyarsi et al., 2017), interest is key to ameliorating the challenge of the difficulty because it is a psychological matter. Chemistry students should possess an acquaintance with this concept, which should simultaneously spark their enthusiasm for delving into any realm of chemistry such as organic chemistry (Davis, 2017).
Despite the important roles played by science education globally, Nigeria's government has not been able to perform as expected in science education (Badmus & Omosewo, 2018), including chemistry, in the senior secondary school curriculum. Chemistry equip students with a

foundational understanding of matter, reactions, and the natural world. However, teachers play significant roles in translating the curriculum content into a meaningful result in the learners. According to Davis et al (2003), Amie-Ogan et al (2020) and Siagian et al (2023), teacher quality enormously influences students' learning outcomes. This presupposes that the quality of teachers must not be compromised at any stage. Olorundare et al (2004) and Leino et al (2022) emphatically noted that educational products are not only determined by the quality of the materials impact (knowledge, skills etc.) but also by the quality of those who implement and supervise those inputs (i.e. the teachers). Therefore, when difficulties are experienced in learning and teaching, achievement becomes frustrating.

Educators have frequently observe that students encounter obstacles when grappling with chemistry concepts. These challenges can be attributed to a variety of factors, such as the abstract nature of the subject, inadequate teaching resources, teacher preparedness and the complexity of the content itself. One of the issues that any education programme addresses seriously is the levels and bases for observed difficulty in course content. Nneji (1998) stated that; to achieve any course's goal, the content's difficulty level must match its clients' development level .This align with the findings of Treagust et al., (2018) that teachers' knowledge gap account for difficulty in chemistry concepts. However, where the source of knowledge and to whom it is imparted experience difficulties, little or no knowledge would be gained. To this end, possible reasons for such an experience must be identified.

In-service teachers, who are actively engaged in teaching chemistry to senior secondary school students, possess valuable insights into the specific reasons that contribute to the perceived difficulty of chemistry content. Their experiences and perspectives offer a unique vantage point for identifying the underlying issues that hinder effective learning. By examining these perceived reasons, educational stakeholders can work towards implementing targeted strategies to address the challenges, optimize teaching methods, and improve learning outcomes.

Statement of the Problem

Levels of difficulties experienced by teachers and students in chemistry have been addressed by some researchers, Kehinde (2001) and Alake (2005). The Nigeria Education Research and Development Council (NERDC) (1993) extensively researched perceived difficulty in chemistry content by teachers, students and Chief Examiners and the reasons identified. To offer similar suggestions on why students and teachers perceive problems in chemistry content, it is instructive that a good knowledge of reasons associated with observed difficulty be provided. Okpara et al., (1988), working with 1086 physics teachers in Nigeria, observed that one physics teacher out of every three perceived 25 physics topics out of 56 topics sampled to be challenging to teach in the Senior Secondary School Physics curriculum. The stated reasons for the levels of difficulty as perceived by the teachers include the level of mathematics required for a thorough understanding and hence effective teaching of topics in different sections of the WASSC physics syllabus.

Researching the perceived reasons for chemistry content difficulty among in-service teachers in the senior secondary school curriculum in Nigeria can shed light on the root causes of the problem. This exploration can guide educational policymakers, curriculum developers, and teacher training programs in devising evidence-based solutions to enhance the quality of chemistry education,

provide better support to teachers, and enable students to develop a stronger grasp of this vital scientific discipline.

Research Objective

The primary aim of this study is to investigate in-service teachers' perceptions of the factors contributing to the complexity of chemistry content in senior secondary schools within Ekiti State. Specifically, the study seeks to examine how gender, teachers' qualifications, and teaching experience influence the perceived reasons associated with complex chemistry content within the senior secondary school curriculum in Ekiti State. By focusing on these variables, the study intends to shed light on the various factors that educators believe contribute to the challenges students face when engaging with intricate chemistry concepts at the senior secondary school level in Ekiti State.

Research Questions

The following research questions are raised to guide this study:

1. Will in-service teachers' gender influence their perceived reasons for chemistry content difficulty?
2. Will in-service teachers' qualifications impact their perceived reasons for chemistry content difficulty?
3. Will in-service teachers' years of experience influence their perceived reasons for chemistry content difficulty?

Hypotheses

Based on the above, three research hypotheses were formulated.

HO1: There is no significant difference in the perceived reasons for chemistry content difficulty based on teachers' gender.

HO2: There is no significant difference in the perceived reasons for chemistry content difficulty based on professional qualification of chemistry teachers.

HO3: There is no significant difference between experienced teachers' perceived reasons for chemistry content difficulty and their non-experienced colleagues.

LITERATURE REVIEW

Teachers Gender and chemistry content difficulty

Teachers' gender might inadvertently influence students' perceptions of difficulty due to societal stereotypes and biases. Research has shown that gender stereotypes can impact how students perceive the abilities of male and female teachers. If students hold biases that associate males with higher competence in certain subjects like chemistry, they might perceive chemistry content taught by a female teacher as more difficult. Inyang and Ekpenyong (2000) conducted a survey of the influence of ability and gender grouping on senior secondary school chemistry students' achievement on the concept of redox reactions. They discovered that based on gender, there was no significant difference in students' achievement. There are other studies which seem to indicate that there were substantial differences in the performance of students based on gender. Surprisingly, research has been carried out regarding knowing and identifying topics perceived as problematic by students and teachers (Rahimi & Asadollahi, 2012). Still, more needs to be researched to determine the reasons for perceived difficulty.

Male and female teachers might have different teaching styles, which could influence how students engagement with the content (Rahimi & Asadollahi, 2012). For instance, a teacher's approach to explaining complex concepts, using examples, or encouraging student participation might affect students' understanding and perception of difficulty. The research findings of Rahimi and Asadollahi (2012) indicate a noteworthy trend in teaching styles, highlighting that female teachers tend to gravitate towards an extroverted, sensing, and feeling approach to their teaching methods when compared to their male counterparts. This insight underscores the diversity of teaching styles within the educational landscape and the influence of gender-related factors on pedagogical preferences. Another study conducted by (Suwandi, Tri. Padmasari, Ayung Candra. Sriwulan, 2019) established a difference of perception between male and female gender in respect of some concepts in chemistry. This implies that on the basis of gender, perception of difficulty level of concepts is not the same.

Teachers Professional Qualification and Chemistry Content Difficulty

Research has shown a notable connection between teachers' professional qualifications and the perceived difficulty of chemistry content in secondary schools (Adu-gyamfi & Asaki, 2022). Generally, teachers who possess higher levels of education, specialized training in chemistry, and relevant teaching certifications tend to handle complex chemistry concepts more effectively. This, in turn, often leads to a reduced perception of difficulty among students. A professionally qualified teacher by default is expected to adopt different method to simplify the subject for the students. Anim-Eduful & Adu-gyamfi (2022) reiterated in their study that when practicals are conducted, it simplifies the subject. Teachers who are well-qualified in chemistry are better equipped to break down intricate concepts, explain abstract ideas, and provide real-world applications. Their deeper understanding of the subject matter allows them to adapt their teaching methods to suit various learning styles, making the content more accessible and engaging for students (Chinda & Pepple, 2021).

Conversely, if teachers lack a solid background in chemistry or proper professional qualifications, they might struggle to convey the subject's nuances and intricacies. This can result in students perceiving the content as more challenging, as they might not receive adequate explanations or support to grasp difficult concepts. In schools where chemistry teachers lack sufficient qualifications, students might encounter issues like misunderstanding fundamental concepts orchestrated by inaccurate or incomplete explanations by underqualified teachers. Advanced topics in chemistry, which often build upon foundational knowledge, can become even more challenging for students if their teachers lack expertise.

However, Chinda and Pepple (2021) did not find any relationship between professional qualification and students' academic achievement. This implies that having a professional certificate is not the determinant of students' success academically.

Also, Students are less likely to be engaged and interested in the subject if it is not presented in an engaging and knowledgeable manner. Underqualified teachers might struggle to source and create effective teaching materials, leading to a lack of supplementary resources that could aid understanding.

Reasons for Chemistry Contents Difficulty

A significant difference was observed among teachers on the level of difficulty of chemistry content. Dwyer and Childs' study revealed that chemistry teachers' perceptions of content difficulty

can be subjective. While a majority (63%) found organic chemistry relatively easy to teach, this indicates that the ease or difficulty of teaching a particular topic can vary depending on individual's perspectives, teaching styles, and experiences (Dwyer & Childs, 2017). However, unambiguous description of topics in the syllabus, overload of content and instrumentation contribute to difficulty of chemistry contents (Dwyer & Childs, 2017).

Another critical factor contributing to the difficulty of chemistry content is the lack of unambiguous descriptions of topics in the syllabus. Chemistry, being a complex and multifaceted subject, often suffers from unclear or vague language in curriculum guidelines and textbooks. This ambiguity can make it challenging for teachers to understand and effectively communicate concepts to their students.

Chemistry is notorious for having a vast amount of content to cover. The sheer volume of information that teachers are expected to convey to students can be overwhelming (Jomuad et al., 2021). This content overload can lead to rushed teaching and superficial understanding, which can hinder students' grasp of fundamental principles. Chemistry involves abstract concepts and mathematical calculations that can be challenging for both teachers and students to comprehend. The abstract nature of many chemical principles can make it difficult to bridge the gap between theory and practical application.

Another aspect contributing to the difficulty of teaching chemistry is the incorporation of instrumentation. Many chemistry concepts are intimately tied to laboratory work and the use of specialized equipment. Teachers often face challenges in providing students with hands-on experience due to limited resources, safety concerns, and the technical proficiency required to operate these instruments.
Chemistry often builds on prior knowledge (Bayram-Jacobs et al., 2019), and students may struggle if they lack a strong foundation in prerequisite subjects such as mathematics and physics. Teachers must invest extra effort in addressing gaps in students' foundational knowledge. Students have diverse learning styles and abilities, making it challenging for teachers to cater to the individual needs of every student in a classroom (Bayram-Jacobs et al., 2019). Adapting teaching methods to accommodate these differences can be demanding and time-consuming.

Teachers Teaching Experience and Chemistry Content Difficulty
Research in the field of education often explores the relationship between teacher experience and student outcomes, including students' understanding of difficult subjects like chemistry. Experienced chemistry teachers often have a deeper understanding of the subject matter (Alex et al., 2020). They are more likely to have a solid grasp of the content and the ability to explain complex concepts in ways that students can understand. An experience teacher usually influence the students, use his experience to simplify difficult concepts for students (Chinda & Pepple, 2021). This can lead to a perceived reduction in content difficulty because experienced teachers can make challenging material more accessible. Over time, experienced teachers tend to develop better pedagogical strategies. They can use various teaching methods, resources, and classroom management techniques that can enhance students' learning experiences and reduce the perceived difficulty of the subject. Experienced teachers often have a better sense of how to engage students with the material. They can design lessons, experiments, and activities that make chemistry more interesting and relevant to students. This increased engagement can help students overcome the perception of difficulty. Experienced teachers are often more effective at assessing

students understanding and providing constructive feedback. This can help students identify areas of weakness and take steps to improve on such areas which can make chemistry content seem less daunting. On the flip side, teachers with extensive experience may sometimes face burnout or complacency, which can negatively impact their teaching quality. It's essential to consider the motivation and professional development of experienced teachers.

Methodology

Research Design

This study utilized a descriptive survey research approach of quantitative type, aiming to elicit the perceived reasons behind the perceived difficulty of chemistry content in the senior secondary school curriculum from senior secondary school teachers. Descriptive study examines conditions, practices, beliefs, processes, relationships, or trends of a particular phenomenon or incidence (Salaria, 2012). Descriptive survey allows researchers to analyse and interpret data for the purpose of generalization.

Target Population

The target population of this study is all chemistry teachers in a pool of 203 government owned secondary schools in Ekiti State, Nigeria. As at the time of conducting this study, only SS1, SS2 and SS3 chemistry teachers in government owned (public) secondary schools in Ekiti State formed the target population of this study.

Sample and Sampling Technique

This study adopted multi-stage sampling technique to draw its samples. Teachers in Ekiti state, Nigeria were stratified into Junior and Senior secondary school teachers with the aid of stratified sampling technique. Afterward, purposive sampling technique was adopted to select 120 chemistry teachers as the sample using simple random sampling technique from 40 government owned senior secondary schools in Ekiti State, Nigeria.

Instrument

The primary data collection instrument employed for the study was a researcher-constructed questionnaire. The questionnaire consisted of two sections: Section A: This section sought information regarding the teachers' gender, qualifications, and teaching experience. Teachers possessing at least a first degree in chemistry education or chemistry with PGDE were classified as qualified. Teaching experience was categorized as experienced for those with six or more years of teaching chemistry, while those with 0-5 years were categorized as non-experienced. On the other hand, Section B included a list of 10 reasons associated with chemistry content difficulty, as identified by reputable sources such as the Nigerian Educational Research and Development Council (NERDC) in 1992, along with the work of Kehinde (2001). Teachers were requested to indicate the reasons they believed contributed to the perceived difficulty of the content.

Validity and Reliability

The self-constructed questionnaire underwent validation by four experienced experts in science education, who provided feedback on its face and content validity. Face validity is confirmed through the assessment or tool's content review by an experienced panel, gauging its suitability and relevance in measuring the intended concept (Angelo et al., 2015; Daud et al., 2021; Mason et al., 2020). It is determination of whether a research tool actually measures what it is designed for.

The content validity of a testing tool is also acquired by relying on the assessment of a proficient panel, which conducts a thorough evaluation of the test item contents (Angelo et al., 2015). The received comments were meticulously incorporated into the final version of the questionnaire. In the pilot study, conducted after a four-week interval, the questionnaire demonstrated a reliability coefficient of 0.75.

Data Collection

The researcher personally delivered copies of the questionnaire to the chemistry teachers in the schools. These were completed on-site, affording the researcher the opportunity to address any challenges faced by the teachers while filling out the questionnaire. A total of 120 in-service chemistry teachers successfully completed the questionnaire.

Data Analysis

Statistical analysis included computing the mean, standard deviation, and t-test for factors such as teachers' gender, qualifications, and experience. These analyses aimed to provide insights into the characteristics of the participating in-service teachers and their potential influence on the perceived reasons for chemistry content difficulty.

Results

Table 1: Participants' Demographic Profiles

Variable	Categories	Frequency	Percentage %
Gender	Male	70	58.3
	Female	50	41.7
	Total	120	100.0
Professional Qualification	Qualified	88	73.3
	Not Qualified	32	26.7
Academic Qualification	Bachelor's Degree	92	76.7
	M.Ed	28	23.3
Teaching Experience	Below 5 years	57	47.5
	Above 5 years	63	52.5

Frequency and percentages

In Table 1, comprehensive demographic information about the participants is presented, providing insight into their gender distribution, professional and academic qualifications, as well as their teaching experience. Regarding the gender distribution of the participants, the majority were male, constituting 58.3% of the total sample, while the remaining 41.7% were female. This indicates a relatively balanced gender representation among the participants. In terms of professional qualifications, a significant proportion of participants (73.3%) were qualified, while the rest (26.7%) did not possess formal qualifications in the field. This distribution reflects a notable presence of qualified individuals within the surveyed group.

Moving on to academic qualifications, the majority of participants (76.7%) held a Bachelor's degree, whereas a smaller portion (23.3%) had obtained a Master's degree in Education (M.Ed).

This diversity in academic qualifications showcases the varying educational backgrounds of the participants. Regarding teaching experience, the data reveals that 47.5% of participants had less than 5 years of teaching experience, while 52.5% had accumulated more than 5 years in the field. This distribution indicates a balanced representation of participants with differing levels of teaching experience.

Overall, this demographic information provides a comprehensive overview of the participants, highlighting their gender distribution, professional and academic qualifications, as well as their teaching experience. The inclusion of such diverse characteristics contributes to a well-rounded understanding of the participant group and enhances the robustness of the study's findings and conclusions.

Table 2: Ranking of Teachers' Perceived Reasons for Chemistry Content Difficulty.

S/N	ITEM	N	Mean Score	Rank	Remark
1	Poor Mathematics skills (PMS)	120	3.13	9th	Less significant
2	Non-currency of teachers (NCT)	120	2.42	10th	Significant
3	Lack of commitment to the profession (LCP)	120	3.25	8th	Less significant
4	IlI-prepared teachers arising from deficiency in pre-service training (ITP)	120	3.53	5th	Significant
5	Lack of motivation of teachers (LMT)	120	3.82	3rd	Significant
6	Over loaded syllabus (OVS)	120	3.67	4th	Significant
7	Misconception of concepts by teachers (MIS)	120	3.89	2rd	Significant
8	Wrong deployment of teachers leading to handling of chemistry by biology teachers (WDT)	120	3.94	1st	Significant
9	Abstract nature of the concept (ANC)	120	3.45	7th	Significant
10	Low base/poor knowledge of subject matter (POK)	120	3.48	6th	Significant

Mean Score and ranked reasons.

Table 2 presents the ranking and assessment of perceived reasons for difficulty in chemistry content among in-service teachers in Ekiti, Nigeria. The primary reason identified as contributing to the perceived difficulty of chemistry content is "Wrong deployment of teachers leading to handling of chemistry by biology teachers (WDT)," ranking first with a mean score of 3.94. This reason is deemed significant based on its impact. The second most significant factor is the "Misconception of concepts by teachers (MIS)," ranked second with a mean score of 3.89. "Lack of motivation of teachers (LMT)" is ranked third (mean score: 3.82), further emphasizing its significant influence on the difficulty of chemistry content.

"Overloaded syllabus (OVS)" holds the fourth position with a mean score of 3.67, while "Ill-prepared teachers arising from deficiency in pre-service training (ITP)" ranks fifth (mean score:

3.53). Both of these reasons are considered significant contributors. The "Low base/poor knowledge of subject matter (POK)" ranks sixth with a mean score of 3.48, and the "Abstract nature of the concept (ANC)" ranks seventh with a mean score of 3.45. Both reasons are regarded as having a significant impact. "Non-currency of teachers" is ranked eighth (mean score: 3.25) and is perceived as significant in contributing to chemistry content difficulty. "Lack of commitment to the profession (LCP)" ranks ninth (mean score: 3.13), followed by "Poor Mathematics skills (PMS)" ranking tenth (mean score: 2.42). Both of these reasons are noted as significant factors in influencing the difficulty of chemistry content.

In summary, this table provides insights into the perceptions of teachers regarding various reasons for the difficulty of chemistry content in Nigeria. It highlights that, factors such as teacher deployment, misconception of concepts, motivation of teachers, pre-service training, overloaded syllabus, and subject matter knowledge play significant roles in shaping the perceived challenges associated with chemistry education.

HO1: There is no significant difference in the perceived reasons for chemistry content difficulty among male chemistry teachers and their female counterparts.

Table 3: Difference in the perceived reasons for chemistry content difficulty among in-service chemistry teachers based on gender.

	Gender	N	Mean	Std. Deviation	Df	P	t	F	Cohen
Perceived Reasons	Male	70	3.37	.889					
					118	0.359	-1.413	8.16	0.7
	Female	50	3.57	.622					

An independent samples t-test was conducted to compare the perceived reasons of chemistry content difficulty for male teachers and female teachers. There was a significant difference in the perception of male teachers (M = 3.37, SD =0.889) and female teachers (M =3.57, SD =0.622), t (118) = -1.413, p = .359, two-tailed). The magnitude of the difference in the means (mean difference = -.206, 95% CI: -0.496 to 0.082 was high (Cohen's = 0.7).

HO2: There is no significant difference in the perceived reasons for chemistry content difficulty between qualified teachers and their unqualified chemistry teachers.

Table 4: Perceived Reasons for Chemistry Content Difficulty based on In-Service Teachers' Professional Qualification

	Professional Qualification	N	Mean	Std. Dev.	Df	P	T	F	Cohen
Perceived Reason	Qualified	88	3.42	.812					
					118	0.359	-.848	.848	0.7
	Unqualified	32	3.56	.738					

An independent-samples t-test was conducted to compare the perceived reasons of chemistry content difficulty for professionally qualified teachers and not professionally qualified teachers. There was no significant difference in the perceived reasons of professionally qualified teachers (M = 3.42, SD =0.812) and not professionally qualified teachers (M =3.56, SD =0.738), t (118) = -.848, p = .359, two-tailed). The magnitude of the difference in the means (mean difference = -.139, 95% CI: -0.463 to 0.186 was high (Cohen's = 0.7).

HO3: No significant difference exists between experienced In-service teachers' perceived reasons for chemistry content difficulty and their non-experienced colleagues.

Table 5: Perceived Reasons for Chemistry Content Difficulty based on Teachers' Years of Teaching Experience

	Categories	N	Mean	Std. Dev.	Df	P	T	F	Cohen
Perceived Reason	Less experienced	57	3.45	.805					
					118	0.934	-.887	.007	0.7
	Experienced	63	3.46	.788					

An independent-samples t-test was conducted to compare the perceived reasons of chemistry content difficulty for less experienced teachers and experienced teachers. There was no significant difference in the perception of less experienced (M = 3.45, SD =0.805) and experienced teachers (M =3.46, SD =0.788), t (118) = -.887, p = .934, two-tailed). The magnitude of the difference in the means (mean difference = .006, 95% CI: -.2.94 to 2.82) was high (Cohen's = 0.7)

Discussion of Findings

The study investigated ten perceived reasons that can contribute to content difficulty in the teaching and learning of chemistry curriculum in senior secondary school. The study revealed that nine out of the ten identified perceived reasons were upheld as contributing factors for perceived seasons for the content difficulty in chemistry. The upheld reasons included Poor Mathematics skills (PMS), lack of commitment to the profession (LCP), ill-prepared teachers arising from deficiency in pre-service training (ITP), lack of motivation of teachers (LMT), over loaded syllabus (OVS), misconception of concepts by teachers (MIS) wrong deployment of teachers leading to handling of chemistry by biology teachers (WDT), abstract nature of the concept (ANC), low base/poor knowledge of subject matter (POK). Only non-currency of teachers was less significant. According to Olorundare et al (2004) and Treagust (2018) what students at all levels know and achieve intellectually depends on what their teachers teach, how these are taught and the faithfulness at which the teaching job is conducted.

The study also revealed a significant difference in the opinion of chemistry teachers in respect of chemistry content difficulty based on their gender. The study's findings highlight a gender disparity that exists within the field of chemistry education. This agrees with Rahimi and Asadollahi (2012) who identify differences in chemistry content difficulty on the basis of gender. This is not a unique issue to chemistry but is reflective of broader trends in science, technology, engineering, and

mathematics (STEM) fields. Historically, STEM fields have been dominated by men, and this dominance has resulted in various gender-related challenges and disparities. It's important to consider why these gender-based differences in opinions about the difficulty of chemistry content might exist. Several factors could contribute to this, including societal expectations, stereotypes, and biases. Teachers' perceptions of content difficulty can be influenced by their own experiences and how they perceive their students' abilities and interests. The study's findings have implications for how chemistry is taught and learned. If male and female chemistry teachers have different perceptions of content difficulty, it could influence their teaching methods, approaches, and expectations for students. This could inadvertently affect the learning experiences and outcomes of students, particularly those of different genders.

Also, the study also revealed that no significant difference existed in the opinion of the participants based on their professional qualification. The lack of a significant difference in opinions based on professional qualifications suggests that, within the context of this study, individuals with different levels of professional experience or expertise in chemistry education had similar perceptions of content difficulty. This could be seen as a positive outcome, indicating that regardless of one's professional background, there was a shared understanding of the subject matter's difficulty. This finding may imply that the curriculum and educational materials used in chemistry education are designed in a way that caters to a wide range of professional qualifications. In other words, the content may be accessible and comprehensible to both novice and experienced educators, indicating that the materials are designed with a certain degree of inclusivity and clarity. The outcome of this study disagrees with Chinda & Pepple (2021) who found a significant difference based on qualifications.

Limitations to the Study

1. The study relies on self-reported data from teachers. This introduces the possibility of social desirability bias, where participants may provide responses they believe are expected or socially acceptable rather than their true perceptions.
2. The study collected data at a single point in time, which limits the ability to capture changes in teachers' perceptions over time. Longitudinal data could provide a more comprehensive understanding of this issue.

Recommendations

The following recommendations are made to improve the teaching and learning of chemistry and to ease the perceived difficulties in the curriculum of the subject among the teachers especially.

1. Encouragement of the formation of peer learning communities among chemistry teachers will help eliminate gender difference among teachers of chemistry. These communities can meet regularly to discuss challenges, share teaching materials, and brainstorm effective strategies.
2. Collaboration between educators and curriculum developers to periodically review the senior secondary school chemistry curriculum. The synergy will help to ensure that the curriculum aligns with the needs and abilities of students and is updated to incorporate modern teaching techniques.
3. Effort should be made by concerned education stakeholders (government, parents' forum and school leaders) to ensure that schools have access to up-to-date laboratory equipment,

textbooks, and digital resources. Insufficient resources can hinder effective teaching and learning in chemistry.

4. Government should endeavour to organize regular professional development workshops and training sessions for chemistry teachers. These workshops should focus on innovative teaching methods, curriculum updates, and strategies to simplify complex concepts.
5. Education ministry should establish mentorship programmes where experienced chemistry teachers can guide and support their less-experienced colleagues. This can create a supportive environment for sharing best practices and addressing specific challenges.

CONCLUSION

This research delved into the involvement of chemistry educators and their perceived rationales for the challenges encountered when teaching chemistry in Nigerian senior secondary schools. Specifically, it examined the influence of gender, professional qualifications, and teaching experience among in-service teachers on the perceived difficulties faced by them in senior secondary school chemistry education. The findings highlighted that teachers' gender significantly affected these challenges.

It is anticipated that prospective chemistry teachers should develop an interest in mathematics to enhance their comprehension of chemistry concepts, while existing educators should continually update their knowledge through participation in seminars, workshops, conferences, and similar professional development activities. However, it's worth noting that this study did not explore teachers' engagement in such events or its impact on their teaching abilities. Therefore, future research should investigate the connection between teachers' participation in seminars, workshops, and conferences and the perceived challenges in chemistry education.

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