

The Identification of Content Knowledge Tutors Possess During Chemistry Lessons in the Implementation of Gender Responsive Pedagogy: A Case Study

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ABSTRACT

The content knowledge tutors possess during chemistry sessions in the implementation of gender-responsive pedagogy was identified in this study. Eighteen (18) research participants made up the study's population. The study employed non-probability sampling approaches. For the study, quota sampling and a purposive sampling approach were used. Two (2) chemistry tutors and a vice-principal of the college were chosen using a purposeful sampling approach. Twenty percent (20%) of 38 females and twenty percent (20%) of 34 males were chosen for the study using quota sampling. The major data-gathering instruments were a self-constructed interview guide and structured observation checklists. Thematic content analysis was used to examine the qualitative data. The paper finds that St. Ambrose College of Education instructors displayed knowledge and awareness of gender pedagogy during chemistry sessions based on the findings. In many ways, this conclusion has policy implications. Gender-responsive pedagogy, for example, should be encouraged across the curriculum in all subject areas to expand its practice among teachers at the College. Mentors and Tutors should be mandated to apply gender-responsive pedagogy in their teaching in the continuous capacity-building programme organised by the Ghana Education Service and the Ministry of Education, by consciously including its application in the basic school and Colleges of Education curriculum.

Keywords: Chemistry, Content knowledge, Gender, Implementation, Pedagogy.

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I. INTRODUCTION

Discussions about teachers' content knowledge (TCK) and teachers' pedagogical knowledge (TPK) have recently gotten a lot of attention from various change agents in the educational institutions. It is a reality that any country attempting to attain greatness should equip pupils with highly educated teachers with sufficient content and pedagogical knowledge, as well as ethics and other measures. It is therefore critical to raise awareness among practicing and pre-service teachers about the importance of treating girls and boys equally during the teaching and learning process (Abraha *et al.*, 2019). Gender-responsive pedagogy refers to teaching and learning methods that take into account the unique learning needs of girls and boys. Teachers are expected to use a gender-inclusive approach to lesson design, teaching, classroom management, and performance as part of their practice. To educate teachers in the basic school, gender-responsive pedagogy has been included in Ghana's beginning teacher education programme (MoE 2017b; GES, 2018). Tutors in colleges of education have been urged to use gender-responsive pedagogy in their classes since 2015. Certain acts and tactics are intended to be displayed in the classroom as a manner of adopting gender-responsive pedagogy, according to the Gender handbook for practicing

mentors (GES, 2018). The aim of this study was to examine the content knowledge tutors at St. Ambrose College of Education Ghana have on gender-responsive pedagogy in chemistry classes.

A. Research Question for the Study

What content knowledge do the tutors possess on gender-responsive pedagogy during chemistry lessons?

II. LITERATURE REVIEW

Gender-responsive school environments are essential to give all students equal opportunity to express their feelings and to motivate them to participate actively in their learning. According to David (2011), a gender-fair educational organisation is one in which the academic, social, and physical environment, as well as the surrounding community, take equal consideration of the requirements of male and female students. This means that teachers must have the opportunity to treat all learners equally. Additionally, research that focuses on students' knowledge in specific subject areas is gaining ground among education researchers worldwide and revolutionising political decisions about educational systems. In view of that, there have been calls from science educators for a more refined analysis of gender

differences that comprise other social categories such as race, ethnicity, socio-economic status, religion, and sexuality.

The lack of gender-responsive education was linked to negative classroom conditions where females may experience aggression, exploitation, or corporal punishment, as well as insufficient female teachers (David, 2011). When students and teachers in schools come from societies that promote gender-biased social and cultural norms, gender bias is likely to be present in their teaching and learning activities (David, 2011). For example, pedagogical practices that favour males, such as lessons that focus on memorizing abstract information rather than open-ended and process-oriented activities, lead to male dominance in classroom interactions, marginalising female participation and strongly impacting subject choice. As a result, females frequently choose or are encouraged to choose "feminine disciplines" such as languages, history, and literature, while males choose "hard/masculine" courses such as mathematics, physics, and technology. Furthermore, assessment methodologies favour males, such as multiple-choice questions, whereas females are known to excel in coursework, marker bias that gives males higher marks, and teachers' low expectations of females, all of which are exacerbated by females' low self-esteem and self-concept. UNESCO (2012), in its report *Gender and Education for All*, stated that some teachers expressed negative or stereotypical attitudes about female academic potential; that there are few female teachers' role models and counselors for females; that females have unequal access to textbooks or writing materials; and that females are harassed by male classmates. Researchers have found that when teachers employ gender-responsive pedagogy effectively, it can lead to a variety of benefits, including empowerment and better educational achievements for both boys and girls (Kahamb *et al.*, 2017). It can, for example, help to avoid gender stereotypes. Gender-responsive teachers who use a gender-responsive pedagogy encourage students to rethink gender roles and attitudes (Kahamba *et al.*, 2017). A curriculum devised for the Sistema de Aprendizaje Tutorial, a secondary school programme in Honduras aimed to encourage instructors to employ non-discriminatory approaches, is a good example of how to teach both boys and girls, according to Nabbuye (2018). For example, after participating in a gender-responsive pedagogy course, some teachers began to equally engage both girls and boys in their classes. This curriculum encourages students to talk about preconceptions, limitations, and ways to overcome them, perhaps leading to empowerment. Gender-responsive teachers can point out prejudices and disparities even when the curriculum is gender-blind. It can help both girls and boys participate more actively in the classroom. Students are encouraged to participate in learning equitably and actively in gender-responsive pedagogy, which enhances performance, goal attainment, and ability to educate themselves (Nabbuye, 2018). They engage in group discussions, debates, field study visits, project-based learning, and presentations and participate equally. In Malawi, Tanzania, Ethiopia, Gambia, and Zambia, a gender-responsive programme undertaken by the Forum for African Women Educationalists (FAWE) resulted in a shift in teachers' attitudes and practises, increasing girls' access to and involvement in school, enrolment, and retention

(Nabbuye, 2018). It also aids in the development of skills to cope with and compete in the workplace. These abilities are essential for bridging the gap between what students learn in the classroom and what employers want (Kreitz-Sandberg, 2016). Gender Equity Movement in Schools, a Mumbai-based project, demonstrated that gender-responsive instruction may also prepare all students for problems outside of school. Girls get practice thinking through problems, making arguments, and responding to different points of view by sharing their ideas and insights. These are talents that are needed both in and out of school, according to a study (Nabbuye, 2018).

David (2011) however, noted that there is little information on how issues of gender impact on students' learning, attitudes toward science, achievement, and/or participation in science lessons. Studies conducted by (Eminah 2007; T-TEL, 2017; Abraha *et al.*, 2019) have shown that teachers who have content knowledge in gender inclusion and responsive approaches are able to encourage their students, especially ladies to assume leadership positions in their schools. The fundamental purpose of Ghana's Ministry of Education's teacher education reform is to increase the capacity of tutors at Colleges of Education (CoEs) to develop inspiring and motivating teachers. Every teacher should be able to ensure equity and inclusion in their classroom, with a focus on girls and other vulnerable groups, according to the National Teachers' Standards (MoE, 2017a). The primary goal of Ghana's Ministry of Education's teacher education reform is to strengthen tutors' capacity to generate inspiring and motivating teachers at Colleges of Education (CoEs). According to the National Teachers' Standards, every teacher should be able to ensure equity and inclusion in their classroom, with a focus on girls and other vulnerable groups (MoE, 2017a). Tutors went through a number of teaching strategies, including gender pedagogy, during professional development sessions (PDS). During one of the sessions, it was revealed that most tutors disregard issues of gender inclusiveness when delivering instructional lectures. This has had a negative impact on the interest and performance of most pre-service females performance in chemistry. This study was undertaken in order to determine the topic knowledge tutors possess during chemistry lectures in order to implement gender-responsive pedagogy during chemistry lessons.

The goal of the study was to find out what subject knowledge tutors at St. Ambrose College of Education have on gender-responsive pedagogy in chemistry classes.

A. Conceptual Framework

This study adopted Abraha *et al.* (2019) conceptual framework for the study. Abraha *et al.* (2019), conceptual model was adopted for the study because, the study research question bears similar themes to their conceptual framework. One of the weaknesses of the Abraha *et al.* (2019) which was identified in the conceptual framework was the socio-cultural background of the research participants. This weakness was addressed during the design and pilot testing of the instruments.

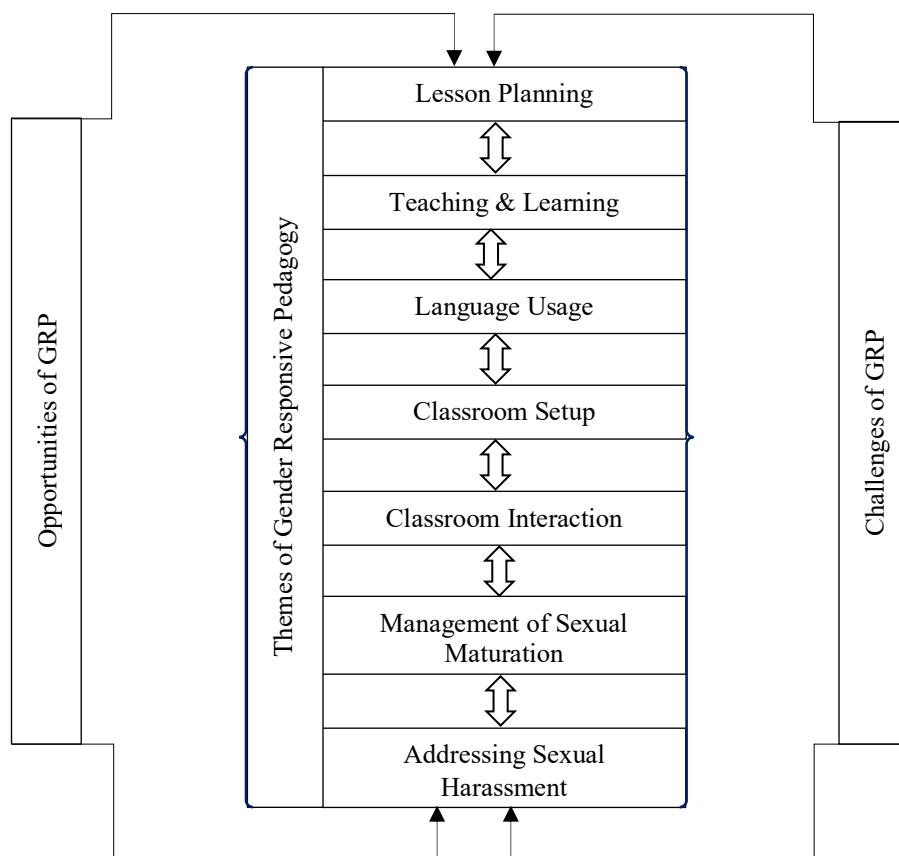


Fig. 1. Elements of GRP Framework. Source: Abraha *et al.* (2019).

instruments employed were interviews and an observations checklist.

III. MATERIALS AND METHODS

A. Study Design

A Case study design was used for this study. When a researcher wants to experimentally analyse a phenomenon in its real-life setting utilising numerous sources of information, a case study design is ideal, especially if the study involves a "bounded system" (Pieters, 2010 p.16). The term "bound system" refers to a study that takes place inside a geographical border that is constrained by the number of informants who provide data for the investigation. As a result, the bounded system can be a single person, a classroom of learners, or a specific mobilisation of professionals.

The case under research in this study is St. Ambrose College of Education in Dormaa-Akwamu, Ghana's Dormaa East area. Interviews and observation checklists were used to gather qualitative data.

B. Study Sample and Sampling

The study's available population was eighteen people (18). Seventy-two students were enrolled (72). For the study, twenty percent (20%) of 38 females and twenty percent (20%) of 34 males were conveniently sampled. Convenience sampling, according to (Dörnyei, 2007), is a type of non-probability or non-random sampling in which members of the target population are chosen for the study if they meet certain practical criteria, such as geographical proximity, availability at a specific time, easy accessibility, or willingness to volunteer. Vice-principal and the two (2) chemistry tutors were purposively sampled for the study. Data collection

C. Data Collection Procedures

The researcher performed a face-to-face interview with participants to collect their thoughts on tutors' content understanding throughout the deployment of gender-responsive instructional approaches in chemistry sessions. The interview guide and observation checklist were created and given to a science department colleague tutor for face and content validity checks. The tools were pilot tested at Foso College of Education, which is associated with the University of Cape Coast and has many of St. Ambrose College of Education's characteristics. Before the research began, ethical considerations and the relevant permissions were addressed. The vice-principal, chemistry tutors, and research participants were all interviewed. During these sessions, audiotapes were recorded for each research participant. Every interview session lasted 30 minutes for each participant to express their viewpoints on the issue under discussion. Transcriptions of recorded interviews were completed by listening to the tape conversation again and meticulously writing down each interviewee's responses.

The researcher studied the field notes, made comments, and re-examined the categories multiple times before assigning pseudonyms to each participant's answers to the interview questions, noting similarities and discrepancies.

Students were given pseudo names like st1, st2, st3, and so on, up to st15. Tutor A and Tutor B were the names given to the tutors. Mr. Y was the vice principal's name.

It was triangulated utilising the observation technique after the interview conversation. The non-participant observation was utilised by the researcher, who avoided becoming involved in the setting and instead remained detached from the events and the setting, allowing the participants to become accustomed to the observer's presence in the setting. According to Creswell (2012), good non-participant observation necessitates extensive fieldwork in the environment, as well as the researcher establishing rapport and trust with participants so that data production may proceed with minimal disruption in the context. For data collection, an observation checklist was created and used. Lesson preparation, teaching and learning resources, language usage in class, classroom setup, classroom interaction, sexual maturation management, sexual harassment cases, and problems facing gender-responsive pedagogy implementation in the institution were among the topics covered. The researcher introduced himself to his colleagues during the first chemistry lesson and explained the purpose of the study to them. The researcher was able to witness the teachers' teaching styles, students' learning styles, interactions between teachers and male students, interactions between teachers and female students, and interactions between male and female students in the classroom. The researcher also studied the type of the seating arrangement, learning environment, and teacher learning resources used by the teachers, with specific emphasis paid to crucial girl-related situations such as the teachers' engagement or non-engagement.

IV. ANALYSIS

The qualitative analysis approach (Corbin & Strauss, 2008; Strauss & Corbin, 1998) was used to discover the content knowledge tutors hold during chemistry courses while gender-responsive pedagogy was being implemented. The main qualitative data sources for analysis were transcripts of observational notes taken during lessons, as well as transcripts from interviews with a cross-section of students, tutors, and the vice-principal. The researcher's field notes functioned as supplementary documentation, providing additional and multifaceted perspectives on the content knowledge tutors had during chemistry courses in the context of gender-responsive pedagogy implementation. This study's analysis included not only anticipated issues but also concerns that the researcher thought was essential. The participants' emergent themes were used to establish the data's reliability. Thematic content processes were used to arrange, code, and analyze the transcribed data. The researcher's selected quotes; the sampled students, chemistry tutors, and vice-principal that were of importance to the researcher included; performance and mastery expectancies intertwined to be discussed and interpreted to draw meaningful conclusions from them.

A. Results

1) Content knowledge tutors possess on gender-responsive pedagogy

For easy referencing, the chemistry tutors were hereby referred to as “*Tutor A*” and “*Tutor B*”. The first item in the

interview guide asked tutors to explain, with specific reference to the method, how tutors factor GRP principles in their lesson planning.

Tutor A: “I use interactive activities and teaching and learning resources that promote the learning by both sexes. As much as possible, I try to avoid gender-based stereotypical language before, during, and after lessons”.

Tutor B: I normally prepare and execute my lessons making sure that both male and female students get the chance to contribute to the lesson”.

Tutor A: I prepare teaching and learning materials to satisfy GRP by ensuring it can be easily used by both sexes without any gender-induced challenge and it is designed not to promote gender-based stereotyping”.

Tutor B: “Most the female students perceive chemistry as a difficult and abstract course so I design my teaching-learning materials in a way that elucidates the course with reference to the common things they are familiar with. This helps in making the subject less intimidating and therefore attractive to both sexes”.

The third item in the interview guide asked how tutors use language so as to satisfy GRP principles.

Tutor A: “I think unconsciously I tried to satisfy the GRP principles by avoiding the use of pronouns like he or she that references only one gender”.

Tutor B: I avoid the use of sensitive words that are not friendly to one gender or can negatively influence their confidence and demeanor in class”.

The fourth item solicited tutors' views on how they set up a classroom to satisfy GRP principles with emphasis on the description of a typical setup and how it satisfies GRP principles.

Tutor A: I don't set up my classroom with GRP in mind. I only try to ensure that both males and female students actively contribute to the lesson.

Tutor B: I don't specifically set up classrooms to satisfy GRP but rather try to encourage active participation of both sexes’

This shows that both tutors do not specifically set up their classrooms to satisfy GRP.

This is what Mr. Y also has to say:

Mr. Y, “The College organizes professional development sessions for tutors from time to time. During such sessions, tutors are exposed to lesson planning, group work, how students are encouraged to participate in the lesson process as well as preparation of teaching and learning materials that are gender-friendly. After this, tutors are monitored at their departmental level to ensure that the GRP principles are applied to their lessons’.

V. DISCUSSION

A. Content Knowledge that Tutors Possess on Gender Responsive Pedagogy

The results of this study (on subject knowledge tutors have on gender-responsive pedagogy during chemistry lectures) were limited to science student teachers at St. Ambrose College of Education in Ghana during chemistry lessons. Nonetheless, the findings of this study corroborated those of several other studies, which found that content knowledge tutors possess during the implementation of gender-responsive approaches was effective at various institutional levels, course areas, and geographical locations in Ghana and beyond.

Kahamba *et al.* (2017) did a study, and their findings indicated a number of gender-sensitive strategies that most teachers do not use. They found that around 90% of instructors did not bother to identify the problems that students with bad grades face, and that about 80% did not pay special attention to students with specific needs, such as pregnant or disabled students. Again, 82.9% did not try to give male and female pupils equal attention in class when answering questions.

Similar findings were found in another study by Ananga (2021). According to (Kahamba *et al.*, 2017), 75.6% of respondents do not ensure that male and female students are given equal attention in order to contribute to the class. Furthermore, approximately 88% of respondents stated that they had not considered establishing group projects in which each student would take on a variety of non-stereotypical roles and duties.

Instructors use these gender-sensitive strategies infrequently, yet they have an impact on learning outcomes. While it is known that some female students are shy in class and underrepresented in various group projects, supporting them by asking specific female students to answer questions or serve as group leaders would help them gain confidence and capacity. As a result, the level of bias in the chemistry class regarding gender-sensitive pedagogical teaching approaches would be reduced. However, the findings from interviews and observation schedules in this study contradicted one other. The following are some of the remarks made by research participants:

“The college organises professional development sessions for our tutors from time to time. We believed that it is during such sessions that tutors are also trained in competencies in lesson planning, managing students’ group work, making students take up leadership positions, and preparing teaching-learning materials that are gender-friendly”.

“Also, the heads of department, vice-principal, and even the principal do go round to check on tutors to ensure that the Gender Responsive Pedagogy principles are being applied to their lessons”.

Such remarks by the research participant appear to be in line with Ananga's (2021), which found that, as of the 2018 survey, male and female tutors' presentation of gender-responsive pedagogy had improved significantly. In 2015, just 1.8% of male tutors used gender-responsive pedagogy in their teaching, but by 2017, 46 % of male tutors used gender-responsive pedagogy in their teaching, and by 2018, more than half (68%) of male tutors used gender-responsive

pedagogy in their teaching. Improvements in the demonstration of gender-responsive pedagogy were also seen among female tutors, rising from 3.6% in 2015 to 64.4% in 2018. Both female and male tutors teaching English Language, Mathematics, and Science experienced considerable advances in the implementation of gender-responsive pedagogy.

The continual use of gender-responsive pedagogy by all tutors (male and female) would inspire more gender equality and sensitive teaching if gender sensitivity and equality were to be mainstreamed into beginning teacher education.

The findings of this study corroborate the findings of the Ananga (2021) study, which concluded that instructors should provide gender-responsive pedagogy compliant teaching and learning materials while avoiding gender stereotyping.

VI. CONCLUSION

This study looked at the content knowledge that tutors possess on gender-responsive pedagogy during chemistry lessons. The findings from the study conclude that St. Ambrose College of Education tutors demonstrated knowledge and understanding of gender-responsive pedagogy and that chemistry tutors saw its implementation during chemistry lessons.

This conclusion has a number of implications for policy statements. For example, the Ghanaian government may promote gender-responsive pedagogy across the curriculum in all subject areas, thereby deepening its practice among tutors in the country's colleges of education.

Mentors and tutors must therefore be regularly trained in the use of gender-responsive pedagogy in their teaching so that they may assist and guide student-teachers in doing so as well. Mentors and Tutors should be mandated to employ gender-responsive pedagogy in their teaching by consciously incorporating it into the basic school and College of Education curriculum as part of the Ghana Education Service and Ministry of Education's ongoing capacity-building initiative.

The textbooks used in schools are one area that demands significant change. It is critical that textbooks approved by the government for use in schools be examined with gender-responsive teaching and learning in mind. Gender-responsive pedagogy should also be implemented into teachers' guides and training manuals to guide teachers on how to teach the various subjects in the curriculum. It is important to note that tutors' misconceptions about aspects of gender-responsive techniques must be addressed, and student instructors must be prepared to deal with issues coming from cultural bias and stereotypes that students bring from home.

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CONFLICT OF INTEREST

In this work, the author declares no conflicts of interest.

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