UNIVERSITY OF EDUCATION, WINNEBA

TEACHERS' PEDAGOGICAL CONTENT KNOWLEDGE IN INCLUSION OF DEAF STUDENTS IN REGULAR BASIC SCHOOL.

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(202114205)

A thesis in the Department of Special Education in the Faculty of Educational studies, submitted to the School of Graduate Studies in partial fulfilment

of the requirements for the award of the degree of Master of Philosophy (Special Education) in the University of Education, Winneba.

APRIL, 2023

DECLARATION

Student's Declaration

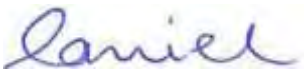
I, ARNOLD KAMWINENANG KON – ANGNA, declare that this thesis, with the exception of quotations and references contained in published works which have all been identified and duly acknowledged, is entirely my own original work, and it has not been submitted, either in part or whole, for another degree elsewhere.

SIGNATURE…….

DATE……..

Supervisor's Declaration

I, DR. DANIEL FOBI, hereby declare that the preparation and presentation of this work was supervised in accordance with the guidelines for supervision of thesis as laid down by the University of Education, Winneba.

Signature 

Date 25.11.2023

DEDICATION

To my daughter, my mother, and in memory of my late father.

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ABSTRACT

This study focused on teachers Pedagogical Content Knowledge (PCK) in teaching deaf students at the Unipra South Inclusive School, Winneba. Specifically, the study examined the PCK of teachers, factors that influence teacher's PCK, how teachers acquire PCK and the views of teachers on the impact of PCK on deaf students. This was a pragmatic study which adopted a mixed method approach and explanatory sequential design to collect and analyse data. Census sampling was used to select 38 teachers for the quantitative study and purposeful sampling was used to select six teachers for the qualitative study. The study revealed that, teachers generally had high level of PCK and teachers PCK are influenced by their gender, teaching experience and area of specialization. The study also revealed, in service training, seminars, workshops and personal development training helped in teachers' PCK acquisition and impacted positively on students' learning outcomes. The study recommends that the Effutu Municipality Educational Directorate in collaboration with the heads of schools should organize periodic in-service training and workshops so that all teachers will develop a better understanding and aptitude of the importance of pedagogical content knowledge.
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CHAPTER ONE

INTRODUCTION

1.1 Background to the Study

The study aimed at examining the Pedagogical Content Knowledge (PCK) of teachers teaching deaf students at the Unipra South Inclusive School, Winneba. Though, access to education is a basic right of every child regardless of his or her ability, however, studies have shown that most deaf children are out of school in many developing countries because of some teachers' socio-cultural beliefs and practices (Ozoji, 2020). It is for this reason that inclusive education has been advocated in most countries. The inclusion of deaf children in public schools has been a central issue for most educational systems in the world (Ainscow, 2011). In several countries, therefore, the issue of educational inclusion and the role of the teacher is a key topic for educational policies (Ozoji, 2020).

In Ghana, studies have shown that deaf children face difficulties in the regular classrooms across the country (Hayford, 2007). In order to have effective teacher preparation programme towards inclusive education, the programme must be geared towards the understanding and appreciation of diversity of learning needs by the individuals in the classroom (Fobi. 2021; Schumann & Vaughn, 2015). One of the requirements for effective implementation of inclusive education is that teachers must have adequate pedagogical content knowledge (Moore & Gilbreath, 2008; Schumann & Vaughn, 2015). This can be accomplished by providing experiences which could provide prospective teachers the ability to develop creative ways with regard to their instructional process. Teachers are to view situations from different perspectives since they are key to educational change and school improvement and that teachers do not merely deliver the curriculum, they develop, define and interpret it too (Ainscow,

2007). It is what teachers think, believe and do in the classroom that ultimately shape the kind of learning that their students get (Bice & Tang, 2022; Sun & Zhang, 2022). There is a growing consensus that Pedagogical Content Knowledge is not a fixed trait but rather a dynamic and evolving construct that develops overtime. It is widely recognized that teachers can enhance their Pedagogical Content Knowledge through targeted training and experiential learning opportunities (Ayinde, 2021). The key hope from an educational improvement perspective is that the gains in teacher PCK may lead to learning gains in students' achievement. Pedagogical Content Knowledge is the interaction of the subject matter and effective strategies to help students learn the content. It requires a thorough understanding of the content to teach it in multiple ways, drawing on the cultural backgrounds and prior knowledge and experiences of students (Neumann et al., 2019).

Shulman (1986) first introduced the concept of PCK, since then, a larger number of concepts has arisen as researchers have taken an interest in it and have attempted to make it clear. Shulman (1986) proposed a special domain of teacher knowledge that they termed PCK. What provoked broad interest was the suggestion that there is content knowledge unique to teaching (a kind of subject-matter-specific professional knowledge). The continuing appeal of the notion of PCK is that it bridges content knowledge and the practice of teaching. Thus, a teacher who is a subject specialist but lacks pedagogical skills is as deficient as a teacher who has pedagogical skills but is not knowledgeable in the content area. This underscores the need for teachers to have knowledge in both content and pedagogy to become professionally useful as teachers. Therefore, teachers must possess PCK of their content area in order to facilitate students' learning (Filgona et al., 2020). Sepulveda-Escobar and Morrison (2020) showed that a lack of subject knowledge can lead to teaching difficulties, and teaching

difficulties may lead students to develop a negative attitude towards learning a subject. This may in turn lead to underachievement in school subject.

Unipra South Basic School, is one of the pilot schools for having deaf and hearing students learn in the same classroom and relevant supports like sign language interpreting provided (Fobi & Oppong, 2019). This has given teachers in this school the opportunity to teach deaf and hearing students in the same classroom. However, despite the fact that teachers teach deaf and hearing students in the same classrooms, little is known about teachers PCK in teaching deaf students in this context.

Lewis (2019) asserted that variations in teachers' pedagogical knowledge are fundamental to both the practice and research in education. Therefore, it is vital for educational practitioners to understand the cause for disparities in PCK to practice and undertake real research. Several current studies have shown that there is a positive and significant correlation between teachers' PCK and students' academic performance (e.g Agbenyega, 2012; Florian, 2013; Nind & Wearmouth, 2016). Mcmillan (2018) emphasized that studying teachers' PCK is important as it provides an indication of how their PCK influences their classroom practices and by a long stretch, students' academic performance. This study raises a concern on the pedagogical content knowledge teachers have and how they affect the performance of deaf students in Unipra South Inclusive School.

1.2 Statement of the Problem

It is recognized that Ghana, as a country, has ratified various conventions on disabilities and mainstream schools in the country are inclusion of children with exceptional needs. This ratification has made way for policies possible through the Education Strategic Plan, 2003-2015 (also reviewed 2018-2030) by the Ministry of Education, the adoption

of the Disability Law (Act 715, 2006) and the Inclusive Education Policy 2015. The ultimate aim of these policies is to re-define and manage the delivery and management of educational services to respond to the diverse needs of all children within the framework of a uniform design for learning and child friendly school concept.

However, most research indicates that Ghanaian teachers have little PCK in teaching students who are deaf (Adera & Asimeng-Boahene, 2018; Agbenyo, 2022; Mensah et al., 2022; Nkrumah et al., 2021). Teachers, most often, do not have the requisite PCK needed for teaching deaf children and this dire situation has often led to poor academic performance by students who are deaf (Agbenyega, 2012; Mcmillan, 2018).

Anecdotal evidence obtained by the researcher through discussions and observations at the Unipra South Inclusive Basic School affirmed Adera and Asimeng- Boahene's (2018) assertion. The researcher observed that teachers at the Unipra South Inclusive Basic School had difficulties in synthetizing their content knowledge and pedagogical competences in a way that will promote deaf learners understanding of instructions and facilitate their inclusion in classrooms and this significantly leads to poor academic performance of students. Pedagogical content knowledge has been explored in numerous studies such as mathematics, science, social studies and language arts (Smith & Lytle, 1999; Grossman, 1990; Smith, 2001; Wilson & Wineburg, 1993). However, studies on teachers' PCK base in teaching deaf students in inclusive settings is an understudied area (Liu, 2013). There is an appearance to be a non-existence of studies and dearth of insight into teachers' PCK in inclusive schools especially in Ghana. Therefore, the researcher deemed it necessary to examine the PCK of teachers in the inclusion of deaf students in the Ghanaian context.

1.3 Purpose of the Study

The purpose of the study was to examine teachers' pedagogical content knowledge in the inclusion of deaf students in regular basic school.

1.4 Objectives of the Study

The objectives of the study were to:

1. Identify the pedagogical content knowledge of teachers of the deaf at the Unipra South Inclusive School.
2. Examine some of the factors that influence the pedagogical content knowledge of teachers of the deaf at the Unipra South Inclusive School.
3. Explore the acquisition of pedagogical content knowledge by teachers of the deaf at the Unipra South Inclusive School.
4. Explore teachers' views on the impact of their pedagogical content knowledge on deaf students' academic performance at the Unipra South Inclusive School.

1.5 Research Questions

The following research questions guided the study:

1. What pedagogical content knowledge do teachers of the deaf possess in teaching deaf students at the Unipra South Inclusive School?
2. What are some of the factors that influence the teacher's pedagogical content knowledge in teaching deaf students at the Unipra South Inclusive School?
3. How do teachers of the deaf at the Unipra South Inclusive Basic School acquire their pedagogical content knowledge?
4. What views do teachers have on the impact of their pedagogical content knowledge on deaf students' academic performance at the Unipra South Inclusive School?

1.6 Significance of the Study

This study is important for a number of reasons. In the first place, findings of the study would reveal the dimensions of PCK possessed by teachers to facilitate the learning of deaf students in inclusive settings. This would help determine whether teachers in inclusive schools possess the requisite knowledge and competences to support deaf learners. Findings of the study would also inform universities and colleges of education responsible for training teachers about the kind of knowledge that teachers need to meet the unique needs of deaf learners in inclusive schools. This would help the GES to develop appropriate pre-service and in-service training programmes for teachers.

Again, findings of the study would expose the factors that influence teachers' PCK. This would help identify the factors that are likely to improve the PCK of teachers in inclusive schools. Thus, teachers can engage such factors to help increase their PCK so that they can effectively support deaf learners in inclusive schools.

Findings of the study also bring to light the ways employed teachers acquire their PCK. This would help other teachers who will want to expand their PCK about deaf learners in inclusive settings use similar means. In addition, the findings of the study would indicate the impact that teachers' PCK have on deaf learners' understanding in inclusive settings. This is important because teachers as well as teacher training institutions will recognize the need to develop teachers' PCK. Thus, the necessary measures would be put in place to ensure that teachers gain the pre-requisite knowledge and skills in dealing with deaf students in inclusive classrooms. Finally, the study would contribute to existing body of literature especially in the areas of PCK and inclusive education. This will assist other researchers who would want to do a study in this area.

1.7 Delimitations

The study focused on the PCK of teachers at the Unipra South Inclusive Basic School in Winneba in the Central Region of Ghana because that was where the researcher identified the problem. The study also focused on the factors that influence the pedagogical content knowledge of teachers of the deaf. The study also looked at how these teachers acquire their pedagogical content knowledge. The study was also narrowed down to the impact of pedagogical content knowledge of teachers on deaf learners' performance.

1.8 Limitation

Several notable challenges arose during this research, influencing the study's outcomes. Initially, the teachers involved displayed reluctance to participate, assuming that the researcher aimed to pinpoint flaws in their teaching. This hesitation led to a delay in data collection as the researcher needed time to reassure each teacher individually that the research intended to support and enhance Inclusive Education rather than criticize their efforts. This reluctance might have affected the gathered responses. Moreover, the study focused solely on Unipra South Inclusive School in Winneba, Central Region, Ghana.

Consequently, the study's findings cannot be generalized to encompass other inclusive schools in the region or across the country.

1.9 Operational Definition of Terms

1. **Deaf students:** Students who have hearing loss in which hearing is insufficient for comprehension of auditory information, with or without the use of hearing aid.
2. **Inclusion:** This means the transformation of schools, adaptation of curriculum and provision of resources to cater for all learners.

3. **Pedagogical Content Knowledge:** This refers to the integration of content knowledge and pedagogical strategies in a way appropriate for teaching a specific subject.
4. **Content Knowledge:** This refers to the Knowledge of subject matter that teachers should teach and students should learn.
5. **Pedagogical Knowledge:** It is a term for knowledge of how to teach that which is applicable across a range of teaching areas
6. **Teachers:** This means professionals responsible for educating deaf learners in inclusive settings.

1.10 Organization of the Study

The study is organized into five chapters. Chapter one covers sub-headings like background to the study, statement of the problem, purpose of the study, objectives, research questions, significance of the study, delimitation, limitation and operational definition of terms. Chapter two reviews related literature and chapter three presents the methodology used in carrying out the study. Chapter four presents the analysis of data and findings and chapter five presents the summary of the study, conclusions drawn and the recommendations made.

CHAPTER TWO

LITERATURE REVIEW

2.1 Overview

This chapter provides the review of related literature on teacher preparation towards inclusive education from different countries. The literature is reviewed under the following sub-headings:

1. Theoretical Framework (Rollnick's Tailored Model)
2. Teachers' Pedagogical Content Knowledge of teaching deaf students
3. Some factors that influence the pedagogical knowledge of teachers
4. Acquisition of Pedagogical Content Knowledge
5. Impact of Pedagogical Content Knowledge on students' performance

2.2 Theoretical Framework (Rollnick's Tailored Model) for PCK.

Shulman's seminal address which led to the invention of the term, "Pedagogical Content Knowledge", a rich collection of theories, models, and measures of it has grown in different subjects such as Mathematics (Depaepe et al., 2013), English (Kultsum, 2017) and Science (Rollnick et. al., 2008). However, work to date has focused on regular education teacher development. Current models of knowledge for teaching include little about the knowledge base of teachers in inclusive schools in general and deaf education in particular. Therefore, there is a need for examples, theory of teachers' PCK in the context of inclusive education.

In this study, Rollnick's et. al. (2008) tailored model for PCK was used as the theoretical framework to guide data collection, analysis and discussion of what and how teachers' PCK manifest into classroom practices in inclusive schools in Ghana. There are two main parts of the tailored model for PCK which are domains of teacher

knowledge and manifestations of teacher knowledge. The domains of teacher knowledge form the lower part of the model (see Figure 1) and include knowledge of subject matter, knowledge of students, general pedagogical knowledge and knowledge of contexts. Rollnick et, al. (2008) considers PCK to be an amalgamated product of these domains which then produces directly observable products in the classroom which they referred to as manifestations. The manifestations which form the upper part of the theory include representations, subject specific instructional strategies, curricular saliency and assessment, amongst others.

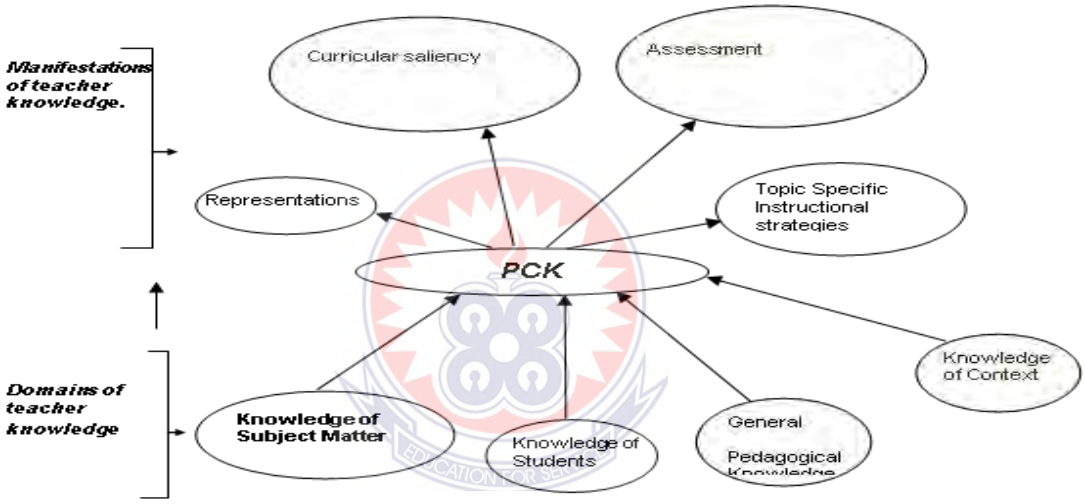

Figure 1: Tailored model for PCK, adapted from Rollnick et. al. (2008)

Knowledge of subject matter refers to the raw untransformed subject matter knowledge possessed by the teacher. General pedagogical knowledge connotes the general understanding of what counts as good teaching, the best teaching approaches in a given context, informed by knowledge of applicable learning theories whereas knowledge of students involves appreciation of students' prior knowledge, how they learn, their linguistic, reading and writing abilities as well as interests and aspirations. Finally, knowledge of context deals with all contextual variables that influence the teaching situation such as the availability of resources, class size, type of school, students'

socioeconomic background, curriculum, the situation in the country, classroom conditions and time available for teaching and learning (Rollnick et. al., 2008). Representations refer to the powerful analogies, representations, models and illustrations used by the teacher in the classroom (Shulman, 1986). Curricular saliency connotes to the teacher's understanding of the place of a topic in the curriculum and the purpose for teaching it. This is manifested in the classroom through strategic choices made by the teacher on sequencing or presentation of the content (Rollnick et. al., 2008). Assessment involves all formative and summative assessment techniques employed by teachers to determine the level of mastery of content students have attained. Lastly, topic specific instructional strategies are strategies specially designed to teach specific topics to the understanding of learners. Rollnick's et. al. (2008) tailored model for PCK was employed in this study because of its emphasis on context, knowledge of learners, and manifestations. This study focused on deaf learners in an inclusive school, therefore, teachers' knowledge of context, in this case, inclusive education, and deaf students' characteristics and how these transform into observable inclusive classroom practices (products) were among the matters of enquiry.

2.3 Related Themes to the Study

2.3.1 Development of Pedagogical Content Knowledge

Pedagogical content knowledge is constructed for teachers and is a special form of an educator's professional knowing and understanding. It comprises integrated knowledge of representing teachers' accumulated wisdom with respect to teaching practice such as pedagogy, students, subject matter and curriculum. PCK must be addressed within the context of a diverse pedagogy. It is deeply connected in teacher's everyday work. It encompasses theory learned during teacher preparation and also experience gained from ongoing schooling activities (Postholm, 2012). The development of pedagogical

content knowledge is influenced by factors related to teacher's personal background and the context in which a person works. The experiences and assets of students, their families and communities are the key to pedagogical content knowledge. Teachers' action will be determined by the depth of the pedagogical content knowledge making this an important component of their ongoing learning. It also links knowledge on teaching with knowledge about learning, which is a powerful knowledge base to shape teaching expertise (Von Frank, 2008).

The process of pedagogical reasoning and action (Fig 2.1) attempts to link theory to content and to practice and pedagogy. The ultimate concept of PCK is "teaching as comprehension and reasoning, as transformation and reflection" (Shulman, 1987). The emphasis is in teacher education whose goal is to educate teachers to reason soundly about their teaching as well as to perform skilfully (Shulman, 1987).

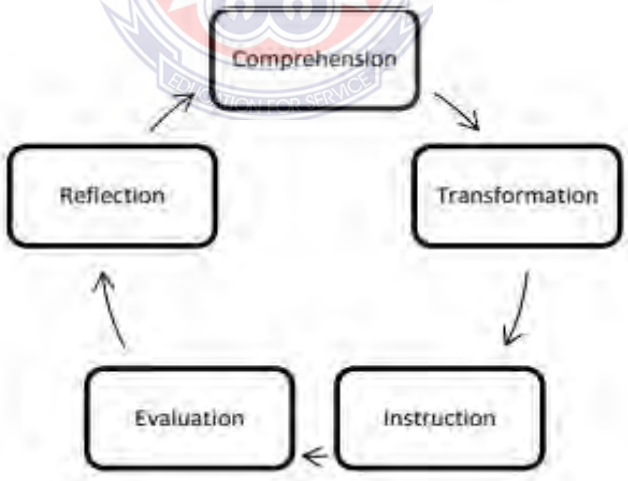

Fig 2: Model of Pedagogical Reasoning

In order to plan instructions, teachers before-hand have to comprehend the learned materials and make connections. They also need to understand the purposes of education and teaching. Besides, teachers need to be aware that they are not just teaching the texts, but also shaping their student's world views. At the meantime, the teachers are building other educational purposes, such as fostering individual

excellence to be achieved in the process (Shulman, 1987). As in the transformation stage, teachers move from their own comprehension to other comprehension which relates to pedagogical reasoning. The transformation process also involves teachers understanding of students' backgrounds and students themselves at various levels, cultures, motivational levels, prior knowledge and attitude. It is expected that teachers adapt to different needs of students accordingly which is very context-specific (Shulman, 1987). The instructions and evaluation are the parts that are more widely studied and covered in past studies in terms of effective teaching as those processes can be observed in classrooms.

When teachers are not able to deliver some parts of the content they feel uncertain and eventually feel a sense of anxiety. They feel vulnerable and tend to give up which affects their teaching. On the other hand, teachers with good professional preparation and knowledge interact with and engage student in the learning process serves as good teaching practice (Shulman, 1987). Evaluation takes place to examine one's own teaching of the materials and activities, which progress to the next step which is reflection. Reflection helps one to learn from experiences and sharing. Shulman notes that comprehension, transformation, instruction, evaluation and reflection are not fixed process and can go on any order. The process can occur at various times, and some might occur more frequently than others, depending on the context teachers are in. It can never be once denied that the key to determine the knowledge base of teaching is on the intersection of content and pedagogy, and how effectively they interplay with other knowledge bases in teaching (Shulman, 1987). Comprehension alone is not sufficient and needs to be coupled with action whereby Shulman (1986) describes as "those who can, do; those who understand, teach". Simply testing teachers on their basic skills and subject matter and observing their classroom teaching are not sufficient

to claim or look deeply into the knowledge and skills they really possess for effective teaching. Shulman (1986) clarifies the direction towards the knowledge base approach for future research needs to include the voice of practitioners through studying case by case and the nature of the complexities of the pedagogical process.

2.3.2 Factors Influencing Pedagogical Content Knowledge of Teachers

The curriculum is designed based on a job title and plays an important role in producing skilled and semi-skilled manpower. Therefore, the effectiveness and the quality of the education system should be given priority to ensure the production of human capital fulfils the requirement of job market and industries. Alexander (2008) found that most improvement agenda related to training effectiveness and its quality did not emphasize on education processes such as teaching and learning. The study done by Ahmed (2010) found that among the causes of poor inclusive system is its low quality of instructors, limited professional development program to improve content knowledge and pedagogical techniques as well as no control done over the quality of expertise. UNESCO-UNEVOC reported similar problem found in Malaysian inclusive system where pedagogical aspects were not given emphasize in training of novice instructors (Ehlers, 2010). In order to improve the quality of instructors, improvement to the professional development program is necessary by evaluating the current performance of instructors.

Past studies showed that there are several factors that have influence on one's knowledge. The knowledge gained varied across gender, teaching experience, faculties and specializations but no significant difference detected between age or teaching levels (Koh, Chai, & Tsai, 2010; Shin & Cummings, 2010). Based on Harris and Hofer (2011), knowledge is also influenced by contextual factors, cultural, socio-economic status, and organizational factors.

2.3.3 Acquisition of Pedagogical Content Knowledge of Teachers

Backfisch et al. (2020) more closely investigated the quality of technology-integration, by applying a lesson-plan scenario. The authors required mathematics teachers (N = 94) differing in their teaching expertise (i.e., pre-service teachers, trainee teachers, and in-service teachers) to answer a test measuring their professional knowledge regarding the basic components of TPACK (i.e., CK, PCK, TK), and report their motivation to integrate technology (i.e., self-efficacy, utility value). The authors found that teachers having undergone in-service training and higher levels of expertise (i.e., trainee teachers, in-service teachers) provided lesson plans in which technology was used to better enhance teaching.

The study of Gutierez (2016), she examined the influence of an intensive chemical demonstration workshop on fostering pedagogical content knowledge growth among science teachers identified as novice chemical demonstrators. The two-week summer workshop was designed around four training elements considered important to effective teacher in-servicing: theory, modelling, practice, and feedback. Clinical interviews served to probe various aspects of novice demonstrators' pedagogical content knowledge prior to and after the workshop. The interview protocols were analysed using the methods of taxonomic, componential, and theme analysis. Differences in pre- and post-workshop clinical interview responses suggested growth in novices' representational and adaptation repertoires for demonstrating fundamental topics in chemistry. This growth was reflected in the increased number of chemical demonstrations and demonstration variations on each of the target chemical concepts that the novice demonstrators discussed after the in-service intervention. The research

findings suggest that science teachers' pedagogical content knowledge in chemistry can be enhanced through intensive, short-term in-service programmes.

The study of McNeill and Knight (2013), examined how three professional development workshop series grounded in authentic practice impacted 70 elementary, middle, and high school teachers' pedagogical content knowledge (PCK) for scientific argumentation. Data sources included pre- and post-surveys, videotapes of the workshops, artefacts produced by the teachers, and samples of student writing. Results from the analysis suggest that the workshops were successful in teachers' development of PCK for argumentation in relation to the structural components of students' science writing. However, the teachers also had a number of challenges. Specifically, teachers struggled with analysing classroom discussions for both structural and dialogic characteristics of argumentation, had difficulty applying the reasoning component of argumentation to classroom practice, and found designing argumentation questions to be challenging. Finally, elementary teachers connected argumentation to other disciplines whereas high school teachers focused more on the science content. These challenges and differences between teachers should be considered in the design of future professional development and preservice teacher education.

2.3.4 Impact of Pedagogical Content Knowledge of Teachers on Students' Academic Performance

Several studies report that teachers' content knowledge influences students' performance in mathematics (Wayne & Youngs, 2003). In a study, Janeiro (2012) found a positive relationship between social economic class of the students and teachers content knowledge.

Studies have also shown that pedagogical content knowledge, remains overwhelmingly teacher-centred with greater emphasis being placed on lecturing and textbook than on

helping students think critically across subject area and applying their knowledge to real world situations (Butty, 2001). In some instances, analyses of pedagogical content knowledge for teaching have posted many challenges for teachers in various dimensions for example knowledge for teaching versus knowledge for oneself (Borko, 2004) and lesson structure knowledge versus subject matter knowledge (Leinhardt, 1990) and also knowledge for teaching (Brousseaus, 2007). Gender is another learner characteristic that has been shown to exert considerable influence on students' learning outcomes especially in mathematics which has been seen as male dominated. Gender differences in educational outcomes are well known phenomena (Ifamuyiwa, 2012). Abundant evidence in literature shows that sex is a strong predictor of human conduct and a determining factor in students' achievement.

2.3.5 Academic Achievement of Deaf Students

Achievement represents specific learning (Ugwu, 2011). According to Goldman (as cited in Ugwu, 2011), achievement means that knowledge, skills, and understanding, which result from a particular course in school. The author further said that these learning are not readily acquired without a specific school or out of school experiences with a particular subject matter. Achievement tests are designed to measure the outcome of the level of accomplishment in a specified area or occupation, which a student had undertaken in the recent past (Ugwu, 2011). Academic achievement is determined by the students' test achievement scores. According to Ali (2013), academic achievement is a measure of the degree of success in performing specific tasks in a subject or area of study by students after a learning experience. It is the outcome of education that indicates how well a student or class of students is/are doing academically. Nja et al. (2020) defined students' academic achievement as the extent to which students achieve their short or long-term educational goals. Academic achievement can be defined as

excellence in all academic disciplines, in class as well as extracurricular activities (Kpolovie et al., 2014). Rivkin et al. (2005) refer to academic achievement as a student's ability to successfully achieve short- or long-term goals. According to Ganai and Mir (as cited in Stofile, 2017), academic achievement also refers to the knowledge that students have acquired and the skills that they have developed into a learning institution. Academic achievement is observed to be the direct outcome of learning. It is the main indicator that learning has occurred. Driscoll (2005) describes learning as a persisting change in academic performance or academic performance potential that results from experience and interaction with the world. Even though 'performance' is a broad-based concept, in an academic setting, performance can be referred to as 'academic performance', often used interchangeably with academic achievement. Academic achievement is used in the school to refer to students' success in learning specified curriculum content as revealed by continuous assessment and examination. This is commonly measured through external or internal examination as well as continuous assessment in the form of tests, assignments, projects, and debates, practical as well as term papers. According to Adediwura and Tayo (2007), academic achievement is designated by test and examination scores or marks assigned by the subject teachers. It could also be said to be an expression used to represent students' scholastic standing. Because, as opinionated by Levin et al. (2011), the academic achievement of students at secondary school level is not only a pointer of the effectiveness of schools, but also a major determinant of the well-being of youths in particular and the nation in general. Educationists hold that achievement tests are designed to assess student level of accomplishment in a specified subject area (Eze-Odurukwe, 2002). The results of these tests can be used for diagnostic or predictive purposes. Averring this assertion, Maduabum as cited in Ugwu (2011), opined that

results of achievement tests provide a predictive basis for the teacher performance as well as students' outcomes as the ultimate product of the teacher performance. The ultimate test of teacher effectiveness should be its consequence for students. A reason why Ugwu (2011) asserts that the two generally accepted desirable consequences of science education are increasing achievement and improvement in students' attitude towards science and these outcomes could serve as criteria for effective teaching. To achieve is to produce valid results. An achiever can be an individual or a group of people engaging in a collaborative effort. Elger (2006) suggested that achievement depends on six components: context, level of knowledge, levels of skills, levels of identity, personal factors, and fixed factors. It is the process of accomplishing an action under particular conditions.

For instance, a student's achievement in the school may determine the student's future career. Achievement has two aspects – behaviour being the means and its consequence being the end, and this as the dual purpose of arranging situations so that individuals can do their best. Its purpose is to achieve specifically defined results for people so that they achieve their goals and objectives. It is the process of accomplishing an action and a process that is observed under particular conditions. Aka (2005) perceived academic achievement as the index of general mental abilities which are responses to the test of different kinds. Achievement is a journey and not a destination, the location in the journey is defined by the level of achievement and each level is characterized by the effectiveness or quality of performance (Abdullahi, 2014). The level is measured by improvement in conduct, fastness, and thoroughness. In the words of Elger (2006), it indicates the ability to produce more effective student learning, research and culture, the ability to get higher quality results within a shorter time, deeper skills development, and more connection with the discipline and learning varied roles quicker and making

a meaningful impact. The academic achievement of students is a yardstick for the education itself. It is the indices for testing educational quality and thus is a challenge for schools to aspire to maintain a high-level achievement in internal and mostly external examinations. According to Angbing and Okunloye (2014), measuring achievement is a significant part of the education process and it informs educators of students' ability and progress toward educational goals. Yusuf and Adegun (2010), Lydiah and Nasongo (2009) noted that the achievement of students in any academic task has always been of special interest to the Government, educators, parents, and society at large. Academic achievement is a major issue for teachers, students, parents, and guardians as well as other stakeholders in the education industry. This concern cuts across all school subjects and all levels in the education system, including primary, secondary, and tertiary. High academic achievement for any class of students is an indication of teaching/learning effectiveness while poor academic achievement, on the other hand, is an indication that the teaching/learning process is everything but effective (Abdullahi, 2014).

2.4 Empirical Studies and Theoretical Literature

2.4.1 Pedagogical Content Knowledge of Teachers

Danisman and Tanisli (2017) explored the mathematics teachers' pedagogical content knowledge of probability in Turkey. Probability-related pedagogical content knowledge (PCK) of secondary school mathematics teachers in terms of content knowledge, curriculum knowledge, student knowledge, and knowledge of teaching methods and strategies were used. Case study design, a qualitative research model, was used in the study, and the participants were 30 secondary school mathematics teachers. Data collected via observations and semi-structured interviews were analysed using a deductive approach. Findings indicate that the PCK of these secondary school

mathematics teachers about probability is insufficient; furthermore, teachers' beliefs were the most important factors impacting their PCK. In addition, one of the results is that professional experience has a partial effect on PCK. It was recommended that probability as a topic should be given adequate time and not to rush.

Tsafe (2013) investigated teacher pedagogical knowledge in mathematics: a tool for addressing learning problems in Sokoto State, Nigeria. The study attempt to give a pedagogical role a classroom teacher is supposed to play in disseminating and imparting mathematical knowledge. To achieve this, the paper focuses on the concept of teacher pedagogy, pedagogical knowledge, and pedagogical content knowledge (PCK), and mathematical pedagogical knowledge. The researcher found out that most preservice mathematics teachers in Sokoto State lack adequate pedagogical and content knowledge of most mathematics topics. Problems encountered by teachers as a consequence of mathematical pedagogy have been closely looked at, and possible solutions offered. Tsafe recommended that mathematics laboratories should be well equipped with teaching apparatus so that teachers can use their pedagogical skills in the process of imparting the knowledge.

Usak et al. (2013) explored the pedagogical content knowledge of prospective primary school teachers on the subject of phase transitions of matter consisting sample of 41 prospective primary school teachers in Turkey. Content knowledge test, pedagogical knowledge Questionnaire and semi-structured interviews were used to collect data. This study showed that primary student teachers had various problems related to the phase transitions of matter as well as teaching. The main problems of student teachers were insufficient content knowledge, misconceptions and lack of knowledge about instructional strategies, assessment and evaluation. The results of this study impressed that prospective primary school teachers had different methods of using technology for

teaching about the phase transitions of matter. This research suggests the view that pedagogical content knowledge supported by subject matter knowledge and pedagogical knowledge should be taught during teacher training.

Lankford (2010) examined the pedagogical content knowledge and practice of experienced secondary school biology teacher in Missouri, USA. The purpose of the study was twofold: first, to make explicit the pedagogical content knowledge (PCK) for teaching diffusion and osmosis held by experienced biology teachers and, second, to reveal how topic-specific PCK informs teacher practice. The study was conducted in Missouri USA. Data sources included observations of two consecutive lessons, three semi structured interviews, lesson plans, and student handouts. Data analysis indicated five of the six teachers held a constructivist orientation to science teaching and engaged students in explorations of diffusion and osmosis before introducing the concepts to students. Three potential learning difficulties identified by the teachers included: (1) understanding vocabulary terms, (2) predicting the direction of osmosis, and (3) identifying random molecular motion as the driving force for diffusion and osmosis. Participants used student predictions as formative assessments to reveal misconceptions before instruction and evaluate conceptual understanding during instruction. The study recommended that teachers should go for more training and workshop from time to time to expose them to current trends in the teaching and learning process.

Penso (2010) examines the pedagogical content knowledge of student teachers of Biology during their teaching practice in school in Haifa Israel. The research focuses on the assessment of the teachers' ability to identify their students' learning difficulties and characterize their presumed sources. Diaries, kept by 40 student teachers in the course of the two stages of their teaching practice, provided the data for a qualitative and quantitative analysis of the findings. A difference between the two stages was found

only with regard to the identification of difficulties: the student teachers identified learning difficulties in most of the lessons they observed, but only in half of the lessons they taught. Their characterization of the sources of the pupils' difficulties and their recurrence were similar during both stages. The sources of the difficulties were defined according to four categories: the learner's cognitive and affective characteristics, the type of content, the teacher's methods, and factors inherent in the lesson. The characteristics of the pupil were considered the most frequent source of the difficulties. The study recommends the need to increase the teacher educators' awareness of the important role of didactic processes, aimed at exposing the student teachers to their pupils' learning difficulties and help them deal with them effectively.

Ball et al. (2008) investigated pedagogical content knowledge for teaching at Michigan University, USA. The study indicated that teacher educators should provide opportunities for pre-service teachers to evaluate their understanding and knowledge of teaching and learning Maths during their teacher preparation programs. The researcher designed an introductory methods course for elementary pre-service teachers with that intention. The author assigned a permutation project for the pre-service teachers in which they first tried to learn about permutations themselves, then watched a teacher (Deborah Ball) helping a student to explore the idea, and finally tried to help a child or an adult learn about permutations. The scholar asked pre-service teachers to pay attention to what they were thinking, doing, and feeling during each phase of the project. The researcher introduced the topic with a challenge and then let them work with manipulatives to explore the permutation concept. The researcher used several tasks and established questioning techniques to teach the concept of permutations to a child. Ball noted that many of the pre-service teachers tried to model her when teaching that concept to someone else. In the end, the researcher noted that the pre-service

teachers became aware that knowing mathematics for themselves is different from knowing it to teach others, and they learned that there is more than one way to represent or explain a mathematical concept.

Ozden (2015) investigated the effect of the amount and quality of content knowledge on pedagogical content knowledge (PCK). The chemical content of phases of matters was used as an example. The study adopted the survey research design. The research sample consisted of 28 science student teachers. The lesson preparation task, content knowledge test, and semi - structured interview were used to collect data. This study shows that science student teachers have basic knowledge, few misconceptions, and certain inadequacies at the conceptual level. Science student teachers had understanding difficulties about the relationship between concepts affected by their previous experiences. It has been seen that most student teachers had consistent content knowledge. The results of this study emphasize that content knowledge had a positive influence on pedagogical content knowledge. Content knowledge also influenced effective teaching practice. Udogu (2015) evaluated the pedagogical skills of science technology and mathematics teachers (STM) in secondary schools in Anambra State. The perceptions of 15 science teachers were sought and a modified classroom observation schedule was used to evaluate the level of the usage of pedagogical skills. T-test statistic was used to analyze the data. The result of their the study indicated that pedagogical skills were never used by the STM teachers adding that instructional practices of STM teachers appear to be didactic approach which leaves the learners to learn by memorization of fact.

Turnuklu and Yesildere (2007) examined the pre-service primary mathematics teachers' competency of pedagogical content knowledge in mathematics in Turkey. The study adopted a survey research design. The data were collected using four open-

ended problems from the participation of 45 primary mathematics teacher candidates. Teacher candidates' responses were analysed based on pre-determined criteria. According to findings, it was found that having a deep understanding of mathematical knowledge was necessary but not sufficient to teach mathematics. This finding pointed out the connection between knowledge of mathematics and knowledge of mathematics teaching. It was suggested that primary mathematics teacher candidates should be educated both from "mathematics knowledge" and "pedagogical content knowledge" aspects.

2.4.2 Factors Influencing Pedagogical Content Knowledge of Teachers

In the paper Koh et al. (2010), they examined the profile of Singaporean pre-service teachers in terms of their technological pedagogical content knowledge (TPACK). A total of 1185 pre-service teachers were studied with a TPACK survey. An exploratory factor analysis found five distinctive constructs: technological knowledge, content knowledge, knowledge of pedagogy, knowledge of teaching with technology and knowledge from critical reflection. The participants of this study did not make conceptual distinctions between TPACK constructs such as technological content knowledge and technological pedagogical knowledge. There were some differences in their TPACK perceptions by gender. However, the influence of age and teaching level were not strong. The methodological and theoretical implications for the development of TPACK surveys were discussed.

The study of Ergen et al. (2019) used a meta-analysis method to examine whether there is a significant difference in the effect size of the Technological Pedagogical Content Knowledge (TPACK) according to gender. For this purpose, it was examined whether both Technological Pedagogical Content Knowledge and the knowledge types related to TPACK shows a statistically significant difference by gender. A total of 29 studies

conducted both in Turkey and abroad between 2007 and 2017 and meet the inclusion criteria were synthesized by the meta-analysis method. “Cohen’s d” was chosen as the effect size index in order to examine the knowledge types related to TPACK by gender. Since the studies were obtained from the literature, primary studies were combined according to the Random Effects Model. It was concluded as a result of the analysis that there is a significant difference between the knowledge types about TPACK by gender, and in the sub-group analysis, technology knowledge, technological pedagogical knowledge and technological pedagogical content knowledge have a significant effect size in favour of male; on the other hand, content knowledge, pedagogical content knowledge, and technological content knowledge have an insignificant effect size in favour of male and pedagogical knowledge has an insignificant effect size in favour of female.

Kind (2009) discusses pedagogical content knowledge (PCK), since its inception as teacher-specific professional knowledge, has been researched extensively. Drawing on a wide range of literature, this paper seeks to clarify how the potential offered by PCK could be utilised to further develop science teacher education. An analysis of PCK models proposed by various researchers, together with methods of elucidating PCK in experienced and novice teachers, is provided. The paper argues that making PCK more explicit in the teacher education process may help novices adjust to teaching, as well as aiding experienced teachers in developing more reflective practices.

Chua and Jamil (2012) discuss technology application and integration in teaching and learning processes which demanded high technological knowledge. The aim of this study is to assess the level of competency among TVET instructors by evaluating their professional knowledge based on the TPACK model. A mixed method study on 300 TVET instructors in Malaysia was carried out to identify the level of TPACK and the

factors influencing their knowledge. Major findings are discussed from demographical, personal, and organizational perspectives to give an overview and better understanding on instructor performance and quality.

Adulyasas (2017) asserted that one of the major frameworks for assessing the knowledge of integrating technology with the pedagogy and content in the classroom is Technological Pedagogical and Content Knowledge (TPACK) framework. His study aimed to measure mathematics teachers' TPACK in three southernmost provinces, Thailand and to study on factors influencing their TPACK. A quantitative study was carried out with 210 secondary level mathematics teachers in the three southernmost provinces, Thailand which were random by two stage sampling technique. Data were collected by using a questionnaire to identify the level of mathematics teachers' TPACK and the factors influencing their TPACK. Descriptive statistics, Pearson product moment correlation and multiple regression analysis were used for analysing data. Findings reveal that the mean score of mathematics teachers' TPACK is 3.33 which is in the medium level and the three factors which have positive correlation at .05 level of significant with the level of TPACK are teaching experience factor, individual specialization factor and personal & organization factor. However, there are only two factors influencing mathematics teachers' TPACK. The two factors are individual specialization factor and personal & organization factors. These give better understanding on mathematics teachers' knowledge in integrating technology with the pedagogy and content which will be the important information for improving mathematics teachers' TPACK.

2.4.3 Acquisition of Pedagogical Content Knowledge of Teachers

Jacob et al (2007) studied the effects of improving teachers' pedagogical content knowledge of practice: concept-map implementation in the mathematical teacher

professional development in Pamplona, Spain. It is believed that this method is effective in assisting teachers during lesson content and activity design and reflection of teaching practice. This research found that the concept-map learning method was effective in different experience levels of teachers, range from master-level to student teachers. The effectiveness of this method was found in assisting teachers when communicating teaching ideas during professional development discussion groups, this method also greatly aided in strengthening their knowledge of teaching practice. This study recommended that Pedagogical Content Knowledge should be taught during teacher training. Lee et al. (2007) investigated the development of PCK among novice secondary science teachers and found the development of PCK to be driven by teaching experience coupled with reflection.

2.4.4 Impact of Pedagogical Content Knowledge of Teachers on Students' Academic Performance

Indeed, recent studies have provided strong, representative evidence that teacher subject-matter knowledge affects their instructional practice and students' achievement gains. Carpenter et al. (2018) conducted a study that investigated 40 first-grade teachers' pedagogical content knowledge of children's solutions of addition and subtraction word problems. Most teachers could identify many of the critical distinctions between problems and the primary strategies that children used to solve different kinds of problems. But this knowledge generally was not organized into a coherent network that related distinctions between problems, children's solutions, and problem difficulty. The teachers' knowledge of whether their own students could solve different problems was significantly correlated with student' achievement.

Moreover, Carstens (2012) on the question of Geography teacher proficiency advocates that Geography teachers should have a repertoire of Geography subject-specific terms

to promote literacy in Geography; so that learners can attain Geography literacy optimized. Research on teacher knowledge of subject matter (CK and PCK) has been driven by the assumption that this knowledge is at the heart of their professional competence (Hoy - Woolfolk, Davis & Pape, 2006).

Hill et al. (2008) found that elementary teacher Mathematical Knowledge for Teaching (MKT) was substantially associated with students' gains in Mathematical understanding. Additionally, drawing on data from a longitudinal extension to the 2003 cycle of the Organization for Economic Cooperation and Development's Programme for International Student Assessment (PISA) in Germany, Baumert et al. (2010) showed that PCK affects students' attitude towards learning. Furthermore, PCK had a decisive impact on key aspects of instructional quality. It has been recognized that the foundation of science PCK is thought to be the amalgam of a teacher's pedagogy and understanding of content such that it influences their teaching in ways that will best stimulate student learning for understanding (Jang et al., 2009). This emphasis on PCK is justified based on the assumption that PCK can make a significant impact on the quality of instruction that the students receive and thus the quality of learning and the students experience in the classroom (Grossman in Lucenario et al., 2016; Park & Oliver, 2008).

Juttner et al. (2013) observed that a good and effective teacher possesses a mix of good content knowledge, knowledge of students' prior content knowledge, and a mastery of different teaching strategies and methods. The teacher knows that once a child learns a basic fact, this can be incorporated into a future lesson for teaching some subsequent fact. The knowledgeable teacher is constantly looking for better, more effective methods. He/she uses the new procedure and assesses its effects.

Hill et al. (2008) argued that pedagogical content knowledge is an essential and critical element in determining a teacher's success in handling the teaching and learning process and further produces effective teaching-learning outcomes. Teacher subject-matter knowledge, teaching skills, dedication to teaching, and openness to new ideas, all can play a significant role in determining the success in the classroom (Waseka, et al., 2015).

Akinsolu (2010) investigated whether there is a relationship between the quantity and quality of teachers' and students' academic performance in Osun State, Nigeria. Among the study, the findings were that teachers with authentic knowledge about the relevant subject were significantly related to students' attitudes and academic performance. According to Mhonyiwa (2014), these qualities make a student acquire an interest in a lesson, hence aspires for success. The preceding assertions underscore the PCK prowess of the teacher in promoting quality teaching in order to stimulate students' attitudes towards learning and consequently improve their academic achievement.

Lucenario et al. (2016) enunciate that it is important that teacher education and professionalism be aligned with students' perspectives of learning. This is perhaps the rationale why Ball et al. (2003) contend that PCK enables a teacher to predict complications that may be faced by students and thus prepare themselves with methods, explanations including useful and suitable analogies or representation, and symbols in expressing certain lesson topics. Knowledge of the subject matter and the knowledge of teaching the subject matter are variables that influence teacher quality and also affect students' attitude and achievement. Students understand the lesson more and with keen interest when the lesson is taught by a teacher who masters his or her subject matter very well.

Ehindero cited in Lucenario et al., (2016) confirmed that teacher's teaching is influenced by the level of the acquired pedagogical content knowledge of the subject matter. Teachers today must have a good grasp of the subject matter if he or she is to command respect from the learners and improve their attitude and academic achievement towards the subject.

Odumosu et al. (2018) investigated teachers' content and pedagogical content knowledge on students' achievement in Algebra in Lagos State Nigeria. Using a test re-test quasi-experimental design with a 3x3x2x2 factorial matrix, the researchers purposively sampled 421 senior secondary school II students and 12 mathematics teachers from eight (8) public and four (4) private schools in Education District 5 of Lagos State. The three instruments were used, data were analysed using graphs and ANCOVA. Results revealed that all categories of the subject were equally affected by TCK in algebraic achievement after exposure to teachers' pedagogical content knowledge.

Olasehinde-Williams et al. (2018) investigated the predictive value of teachers' depth of subject content knowledge and depth of pedagogical knowledge on students' academic achievement in English Language and Mathematics in Kwara State, Nigeria. The research design adopted for the study was a descriptive survey. The sample comprised 78 English Language and Mathematics teachers from 32 randomly selected secondary schools in Kwara State, and the intact SS II classes taught by the teachers. Quantitative data were collected through tests, observations, and vignette. Data were analysed using descriptive and inferential statistics. Findings showed that teachers with B.Sc. demonstrated the deepest depth of subject content knowledge, depth of pedagogical knowledge, and depth of subject content and professional knowledge. Also, pedagogical and subject content knowledge of teachers were found to be

significant predictors of students' academic achievement. Significant differences were observed between the depth of subject content knowledge and depth of pedagogical knowledge of the English Language and Mathematics teachers in favour of Mathematics teachers.

Pinamang and Coffie (2018) investigated pre-service teachers' content and pedagogical knowledge in teaching geometric transformation in Colleges of Education in the Ashanti region of Ghana. The study was a quantitative study that employed a survey as a strategy of inquiry. Eighty-two pre-service teachers from two Colleges of Education in the Ashanti region of Ghana constituted the sample size. Geometric Transformation Achievement Test (GTAT) was used as the instrument for data collection. The GTAT was given to pre-service teachers to identify how knowledgeable they are in content and pedagogical knowledge in geometric transformation. Both descriptive and inferential analyses were used to analyse the data collected. The results indicated a high level of content knowledge but a low level of pedagogical content knowledge among the pre-service teachers in geometric transformation. A correlation analysis was also performed to identify the relationship between pre-service teachers' content and pedagogical knowledge in geometric transformation and the results indicated a weak positive significant relationship between pre-service teachers' content knowledge and pedagogical content knowledge, $r\ (82) = .044$, $p < .05$, two–tailed. It was therefore recommended that geometric transformation content and pedagogical courses at the Colleges of Education be made more practical and that pre-service teachers should be given ample opportunity to practice what they are going to teach at the basic level.

Lucenario et al. (2016) investigated the effectiveness of Pedagogical Content Knowledge-Guided Lesson Study (PCKLS) as an intervention to develop PCK competencies among teachers and consequently enhance students' achievement in

terms of conceptual understanding and problem-solving skills in Chemistry in the Philippines. Using quasi-experimental design, teacher competencies, and students' achievement in the PCKLS group and the conventional group were compared. Analyses of data showed that there was a significant difference in the science teacher competencies of the PCKLS group teacher respondents compared to those of the conventional group. Also, student respondents showed a significant increase in mean scores in terms of conceptual understanding and problem-solving skills. Therefore, it was concluded that PCKLS was an effective method to develop the teachers' PCK competencies and student achievement in terms of conceptual understanding and problem-solving. The study recommends that this intervention be used across chemistry topics and in other science classes such as Biology, Earth and Environmental Science, Physics, and Mathematics

Hashim et al. (2015) examined the relationship between teachers (PCK) and the student achievement of al-Quran tajweed in Special Class on Reading and Memorizing Al-Quran Skill (KKQ) at Wilayah Persekutuan Kuala Lumpur, Malaysia. This research is quantitative research in the form of a survey method. The study was implemented by involving a group of the respondent which consist of 134 students in (KKQ). The data of the respondents was collected using a survey questionnaire verified by a panel of experts. The level of alpha Cronbach reliability for the overall division of the survey was high (0.7). The quantitative data for the survey was analysed in an inferential manner by using Statistical Package for Social Science (SPSS) version 20 to get the relationship between the variables involved. The results of the study show, there was a lower significant relationship between the teachers' PCK and the student achievement of tajweed al-Quran in KKQ. Therefore, the KKQ teachers must know this knowledge

because it is one of the factors that will determine the effective learning besides, it will affect the students' achievement in Tajweed al-Quran subject in KKQ.

Lange et al. (2012) explored whether elementary science teachers' pedagogical content knowledge (PCK) in the content area "states of matter and changes of state" contributes to gains in elementary students' understanding of related concepts in Germany. The cross-sectional study had a quasi-experimental design comprising 1,326 fourth graders. The paper reports on value-added study with a sample of 60 fourth-grade classrooms and their science teachers. Teachers' PCK and student achievement concerning the mentioned scientific topic were directly assessed with tests. Multilevel regression analyses were conducted to analyse the significance of teachers' PCK for students' progress in elementary science classrooms. Results showed that teachers' PCK was significantly related to student achievement in elementary science after controlling for key student- and teacher-level covariates. The study concluded that it might be possible to improve students' learning gains in science by improving teachers' PCK.

Ngo (2012) also found a positive effect of mathematics teachers' PCK on third-grade student achievement in Cambodia. PCK was measured through a questionnaire about teachers' knowledge of student tasks, knowledge of student misconceptions, and instructional practices.

Chapter Summary

This chapter delved into the pivotal role of Pedagogical Content Knowledge (PCK) in educational settings. Various studies from diverse regions underscore its influence on teachers' efficacy and students' academic achievements. PCK's impact spans subjects like mathematics, science, and language, emphasizing its predictive power on student outcomes. From algebra to Quranic studies, PCK emerges as a key factor in teachers'

preparation and students' learning, showcasing its universal importance in shaping effective teaching practices.

CHAPTER THREE

METHODOLOGY

3.0 Introduction

This chapter presents the methodology of the study. The chapter is organized under the following headings: philosophical paradigm, research design, research setting, population, sample and sampling techniques, research instruments, pilot study, data collection, data analysis procedures and ethics considerations.

3.1 Philosophical Paradigm

The philosophical paradigm which underpinned this study was the pragmatic paradigm. This was because questionnaire and interviews were used sequentially to collect and analyse data on teachers PCK in teaching deaf students in Unipra South Inclusive School. The pragmatic paradigm implies that the overall research approach is mixing multiple data collection instruments (questionnaire and interview) and analyses within the research process (mixed-method approach). It draws on many ideas, including using "what works," using diverse approaches, and valuing both objective and subjective knowledge (Molina-Azorin & Fetters, 2020). According to Reed (2021), the pragmatic worldview is not committed to any one system of philosophy and reality, and as such, it applies to mixed methods research where inquirers draw liberally from both quantitative and qualitative assumptions when they engage in their research. Thus, for the mixed methods researcher, pragmatism opens the door to multiple methods, different worldviews, and different assumptions, as well as different forms of data collection and analysis.

This paradigm is based on the idea that people make their reality by the meanings and interpretations they give to their experiences and that there are multiple truths, and in essence, the reality is a result of our own making (Kelly & Cordeiro, 2020). From this

paradigmatic understanding, the researcher can ask the questions, how can I know the participants' world or experiences, or how can I gain knowledge of the perception of their experiences? The search for the answers to these questions about how the participants experience their world will constitute the approach and design to be used by the researcher. This study was conducted in a school setting where learners and teachers interacted freely and in a structured manner. In the classroom environment, teachers and learners were familiar with each other and classroom interactions were seen as natural. In order to effectively ascertain and describe teachers' pedagogical content knowledge in the inclusion of deaf students, it was imperative to gather both quantitative and qualitative data. This philosophical approach therefore enabled the researcher to develop a thorough understanding of teachers' pedagogical content knowledge in the inclusion of deaf students.

3.2 Research Approach

A mixed method was used for collecting, analysing and integrating both quantitative (questionnaire) and qualitative (interview) data. For this study, the quantitative data were collected from all teachers in the selected school of study. The data collected enabled the researcher to explore teachers' pedagogical content knowledge in the inclusion of deaf students. On the other hand, the qualitative data were collected from some selected teachers. This information enabled the researcher to have an in-depth knowledge and understanding of teachers' pedagogical content knowledge in the inclusion of deaf students. A mixed method enables the researcher to understand better the research problem than either quantitative or qualitative method alone (McKim, 2017).

With the mixed method approach, the data collected consists of statistical scores on the research instruments in line with research questions. The quantitative approach's benefit is measuring attitudes, behaviours, opinions, observation checklists, and performance instruments (Flynn & Korcuska, 2018). On the contrary, Kelly and Cordeiro (2020) noted that qualitative data analysis (words, text or behaviours) typically follows the path of aggregating it into categories of information and presenting the diversity of ideas gathered during data collection. This makes mixed-method approach suitable for this study because it is easier to understand and corroborate while offsetting the weaknesses inherent to using each approach by itself by mixing both quantitative and qualitative research and data.

The mixed method can provide a complete and comprehensive understanding of teachers' pedagogical content knowledge in the inclusion of deaf students than quantitative or qualitative approaches alone. This is akin to Palermo and Wilson (2020), who noted that a mixed-method could provide a strategy for developing better, more context-specific instruments and help to explain findings or how causal processes work. On the other hand, the mixed-method critics argue that the research design can be very complex, time-consuming and requires more resources to plan and implement (Gegenfurtner et al., 2020). Others opined that it might be challenging to design and implement one method by drawing on another's findings (Motahary & Laghai, 2020; Siponen et al., 2020). Also, it may be unclear how to resolve discrepancies that arise in interpreting the findings (Benuto et al., 2020).

3.3 Research Design

The explanatory sequential mixed method was used in this study because quantitative data was first collected, analysed and the results generated was used to form qualitative data instrument. The explanatory sequential mixed method is a research design in which

the researcher first conducts quantitative research, analyses the results and then builds on the results to explain them in more detail with qualitative research (Creswell & Creswell, 2017). It is considered explanatory because the initial quantitative data results are explained further with the qualitative data. In this study, a survey was first conducted to gather quantitative data in order to have a general understanding of teachers' pedagogical content knowledge in the inclusion of deaf students. Creswell and Creswell (2017) postulated that a survey study can be done in a short time where the researcher administer a survey (questionnaire) to a sample or to the entire population of people in order to describe the attitudes, opinions, behaviours or characteristics of the population. Survey was thus deemed appropriate for the study as the current understanding and knowledge of teachers were needed to be sampled and described. Creswell (2014) however noted that, survey data is self-reported information, reporting only what people think rather than what they do. Therefore, issues arising out of the quantitative phase helped to develop qualitative instrument (interview guide) in order to deeply understand teachers' pedagogical content knowledge in the inclusion of deaf students.

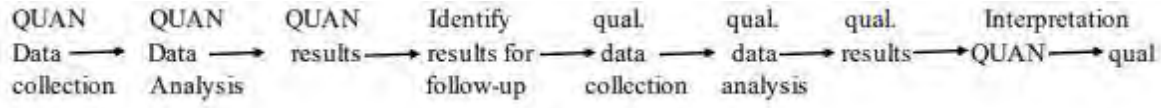

Fig 3: Explanatory Sequential Mixed Methods Design Model (Creswell & Creswell, 2017)

Fig 3 shows that the explanatory sequential design occurs in two distinct interactive phases. The design first starts with the collection, analysis and results of quantitative data, which has the priority for addressing the study's questions. This first phase is followed by the subsequent collection and analysis of qualitative data. The second,

qualitative phase of the study is designed so that it follows from the results of the first, quantitative phase.

3.4 Study Area

The study was carried out in the Effutu Municipality in the Central Region of Ghana. The Effutu Municipality is situated between latitudes 5°16' and 20.18'N and longitudes 0°32' and 48.32'W of the eastern part of the Central Region. The municipality lies between the Gomoa East District to western, northern, and eastern flanks. On the southern flank is the Gulf of Guinea as shown on Figure 4. The population of the Effutu Municipality is 68,592, which accounts for 3.1% of the population of the Central Region and 0.3% of the population of Ghana (Ghana Statistical Service, 2014). The administrative capital is Winneba, a town renowned for its major specialized institutions of higher learning such as the University of Education, Winneba, and the Community College of Nursing, Winneba. The municipality has three educational circuits which are well spread among the rural and urban communities.

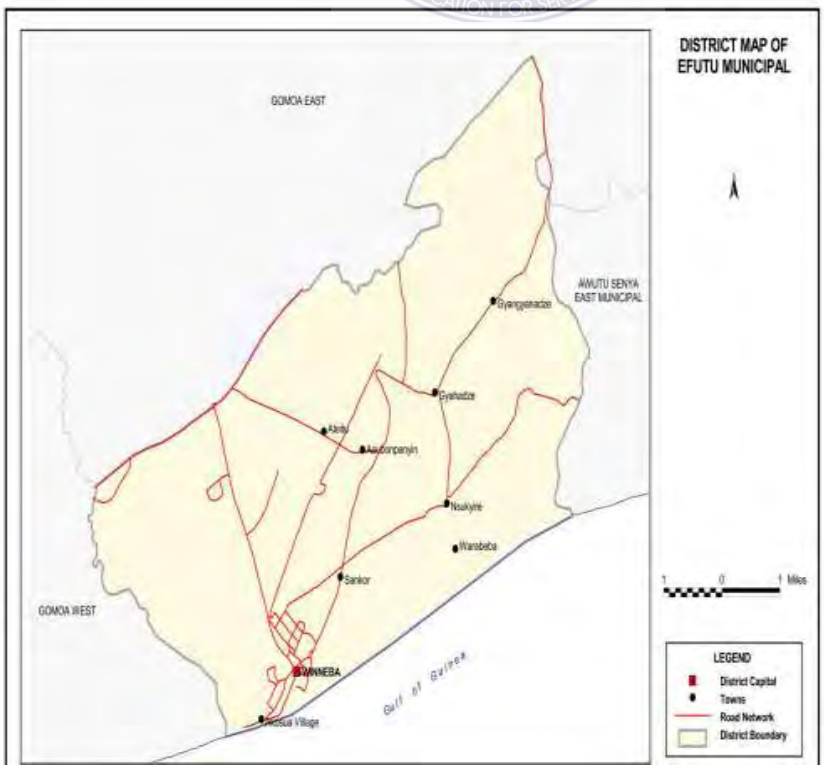

Fig. 4: Map of Study Area (Effutu Municipality)

Source: Ghana Statistical Service (2014)

3.5 Population

The target population was all teachers found in the Unipra South inclusive schools in Effutu Municipality and accessible population was all teachers in the Unipra South Inclusive School, totalling 38. Thibaut (2020) defined a population as the entire aggregation of cases that meet a designated set of criteria. Thibaut further differentiates between two types of population, the target population and accessible population. The target population is the total group of subjects to which a researcher would like to generalize the results of a study and accessible population is the group of subjects that is accessible to the researcher for a study from which the study sample can be drawn (Thibaut, 2020).

3.6 Sample Size

The study used a sample size of 38 teachers. Twenty were females and 18 were males. Twenty-four of the teachers were Senior Superintendents, 11 were Principal Superintendents, and three were Assistant Director I. Eighteen of these teachers had B. Ed. / B.Sc. qualification, 16 had Diploma, and 4 had M. Ed/ M.Phil. qualification. Eighteen teachers taught in the primary and eighteen teachers taught in the JHS sectors of the school. Twenty-four teachers had been in the teaching profession between 1-10 years and the other 14 had been in the teaching profession between 11-20 years. Out of the study's sample, six of the teachers were purposively selected for the qualitative study. These six teachers had over ten (10) years of teaching experience and were accessible for the study in the Unipra South Inclusive School.

3.7 Sampling Technique

The study used census sampling and purposive sampling techniques in the selection of the study sample. The researcher used census sampling to select all the thirty-eight (38) teachers in the school. A census sampling technique is used if the entire population is very small, or it is reasonable to include the entire population (Buntin, 2020). The sample of teachers used for the quantitative study was thirty-eight (38). Out of the study's sample, six of the teachers were purposively selected for the qualitative study. These six teachers had over ten (10) years of teaching experience and were accessible for the study in the Unipra South Inclusive School. The researcher was of the view that they could provide the most productive data needed for the qualitative phase of the study.

3.8 Data Collection Instruments

Two instruments were used to collect relevant data to the study. These were a structured questionnaire and a semi-structured interview guide (Appendix A and B respectively).

3.8.1 Questionnaire

The study adapted a structured questionnaire. The researcher identified the key issues relating to teachers' pedagogical content knowledge in the inclusion of deaf students and adapted the Pedagogical Content Knowledge Instrument developed by Gyamfi (2020). Gyamfi's (2020) Pedagogical Content Knowledge Instrument was created and used in the Asuogyaman District in the Eastern Region of Ghana to explore business management teachers' pedagogical content knowledge and students' academic performance in business management. Gyamfi's questionnaire consisted of twenty-nine (29) items. Appropriate revisions were then made to Gyamfi's questionnaire to suit teachers' pedagogical content knowledge in the inclusion of deaf students. The questionnaire was divided into five sections. Section A of the questionnaire was made

up of five (5) items which gathered data on the demographics of the respondents. Section B of the questionnaire consisted of nine (9) with measurement scales 'Strongly Agree, Agree, Undecided, Disagree, and Strongly Disagree' sought to find teachers' pedagogical content knowledge of teachers of the deaf. Section C consisted of four (4) items with measurement scales 'Strongly Agree, Agree, Undecided, Disagree, and Strongly Disagree', focused on the factors that influence the teachers' pedagogical content knowledge of teachers of the deaf. Section D of the questionnaire consisted of four (4) items with measurement scales 'Strongly Agree, Agree, Undecided, Disagree, and Strongly Disagree' sought to elicit information on how teachers of the deaf acquire their pedagogical content knowledge. Section E of the questionnaire consisted of eight (8) items with measurement scales 'Strongly Agree, Agree, Undecided, Disagree, and Strongly Disagree' sought to elicit information on the impact the pedagogical content knowledge of teachers has on deaf students' academic performance.

3.8.2 Semi-structured Interview

An interview is a survey in which the researcher orally asks participants questions (Mitchell, & Jolley, 2010). Thomas (2013) describes interviews as an effective means of eliciting responses from participants in a research study. They provide elaborate responses and a forum for sincere participation in a study. Mitchell and Jolley (2010) opined that there are three main types of interviews namely; structured, semi-structured and unstructured interview. Mitchell and Jolley (2010) explained that the structured interview is a type in which all respondents are asked a standard list of questions in a standard order. The semi-structured interview, like the structured interview is constructed around a core of standard questions. However, the interviewer may expand on any question in order to explore a given response in greater depth. Finally, Mitchell and Jolley, postulated that with the unstructured interview, the interviewers have

objectives that they believe can be best met without an imposed structure. The interviewer is free to ask what he/she wants, how he/she wants to, and the respondent is free to answer how he/she pleases.

The researcher conducted a semi-structured interview with six (6) teachers in the school. This interview guide which contained five (5) items was designed by the researcher to explore teachers' pedagogical content knowledge in the inclusion of deaf students. The interviewees were pre-notified a week on a plan to administer the interviews on them. Semi-structured interview allows flexibility in the interview process. Johnson et al. (2020) asserted that semi-structured interview offers interviewees the opportunity to express their views, feelings and experiences freely and the interviewers the freedom to divert from the items or questions in schedule to seek clarification. However, it is time-consuming and inconvenience respondents compared to questionnaires that respondents can answer on a later date convenient to them (Corwin & Clemens, 2020).

3.9 Validity and Reliability of the Questionnaires

3.9.1 Validity

Validity is concerned with whether the measuring instrument measures the behaviour or quality that it is intended to measure and is a measure of how well the measuring instrument performs its function (Surucu & Maslakçi, 2020). The focus of validity is not on the instrument itself but the interpretation and meaning of the scores derived from the instrument (Ary et al., 2019). To establish the validity of the research instruments, the face and content validity were done.

3.9.1.1 Face Validity

Face validity refers to researchers' subjective assessment of the presentation and relevance of the measuring instrument as to whether the items in the instrument appear to be relevant, reasonable, and unambiguous.

After developing the research instruments, a group of graduate students from the University of Education, Winneba and other teachers from some basic schools in the Effutu Municipality were requested to scrutinize and assess the instrument for its relevance and face validity carefully and systematically. The feedback from the graduate students and teachers were factored into the final preparation of the instrument. Issues such as length of the items and general format of the questionnaire were some of the concerns pointed out to the researcher. For instance; participants noted that certain items seemed overly complex, suggesting a need for simplification. Additionally, the questionnaire's layout received feedback for being overwhelming, prompting adjustments to enhance clarity and ease of completion. These insights from both graduate students and practicing teachers contributed significantly to refining the instrument, ensuring its alignment with the intended purpose and suitability for the study's participants.

3.9.1.2 Content Validity

Content validity is defined as the degree to which elements of an assessment instrument are relevant to and representative of the targeted construct for a particular assessment purpose (Yusoff, 2019). According to Yesilyurt and Capraz (2018), evaluation by more than one referee is a method of obtaining content validity. Yesilyurt and Capraz also buttressed that in obtaining objective results in the calculations to be made for determining the content validity, the quality and number of experts have significant importance. Based on this knowledge, the researcher used suggestions from his

supervisor to validate the instruments. The suggestions made by the supervisor sought to examine:

(a) whether items of the instruments were related to the research questions;

(b) whether the items would elicit the appropriate responses from the respondents;

(c) whether the vocabulary structure of the items of the instruments were appropriate;

(d) whether the items were arranged correctly;

(e) if items fitted into sections they had been placed in; and

(f) whether any of the items were ambiguous and misleading. These suggestions were used to improve the instrument.

3.9.2 Reliability

Rose and Johnson (2020) described reliability as related to internal consistency. Internal consistency meant that data collected, measured, or generated remained the same under expert trials.

3.9.2.1 Pilot Test

A reliability analysis using Cronbach's Alpha statistics was performed to determine the internal consistency of the items on the questionnaire instrument. The internal consistency of the questionnaire was determined using the Statistical Product for Services Solution (SPSS) version 26. The reliability measurements for the instrument were calculated, and the result was 0.88. Sijtsma and Pfadt (2021) argued that any scale with Cronbach's alpha less than 0.7 could not be considered reliable. Based on this, the value of .88 can be considered as highly reliable.

To determine the strength and weakness of the questionnaire, a draft was pilot tested at another inclusive school, Diamond Kids School Complex in Oparekrom in the Nsawam, Adoagyire Municipality. According to Connelly (2007) as cited in (2017), extant literature has suggested that a pilot study sample should be 10% of the sample

projected for the larger parent study. Given Connelly's assertion, the researcher used four (4) teachers who represented 10% of the sample projected for the study (38 teachers). The sample of four (4) teachers were conveniently sampled for the pilot-test. The researcher used this sampling technique after taking into consideration time and other resources at his disposal. The researcher chose the district because it was deemed to have exhibited similar characteristics as the district of interest to the researcher.

3.9.3 Trustworthiness of the Semi-structured Interviews

The aim of trustworthiness in a qualitative inquiry is to support the argument that the inquiry's findings are worth paying attention to (Polit & Beck, 2012). To bring about trustworthiness, the researcher incorporated four aspects of trustworthiness into the study: credibility, dependability, confirmability, and generalizability.

3.9.3.1 Credibility

The significance of credibility stresses on multiple accounts of social reality is evident in the trustworthiness criterion of credibility. Shufutinsky (2020) asserted that, if there can be several possible accounts of an aspect of social reality, it is the credibility of the account that a researcher arrives at that is going to determine its acceptability to others. To ascertain credibility, the researcher used both a questionnaire and a semi-structured interviews to generate data that addressed the research questions, Also, the researcher made available to participants' transcripts from the data generated for them to confirm whether the transcriptions accurately reflected their opinions.

3.9.3.2 Dependability

To ascertain qualitative reliability (dependability), the researcher provided a detailed description of the research design, data collection procedure, and data analysis. According to Little and Green (1998), this description may transport readers to the setting and give the discussion an element of shared experiences. As a parallel to reliability in quantitative research is the concept of dependability. Dependability indicates that the researcher's approach is consistent across different researchers and projects (Lemon & Hayes, 2020).

3.9.3.3 Confirmability

Similar to objectivity in quantitative research is the idea of confirmability. Confirmability is a measure of how well the study findings are supported by the collected data (Connelly, 2016). This aspect of trustworthiness is concerned with the connection between the data and the results. Triangulation is a general approach to check and establish both credibility and confirmability of qualitative findings by analysing a research question from more than one perspective. Triangulation can be categorized into four classical types: methodological, data, investigator, and theoretical triangulation, along with a growingly important and prevalent fifth one called environmental triangulation (Amin et al., 2020). A methodological triangulation was used in this study. With this frequently used approach to triangulation, the researcher used a combination of methods to compensate for the limitations of one approach with the strengths of another, aiming to improve the confirmability of the findings when these are broadly convergent. The researcher used a triangulation of questionnaire and interview to conjoint the use of quantitative and qualitative methods.

3.9.3.4 Transferability

Transferability describes the degree to which research findings will be applicable to other fields and contexts (Connelly, 2016). According to Kyngäs et al. (2020), it is important to note that transferability is not the same as generalization in quantitative research because transferability is also concerned with how readers will extend the results to their own situations, whereas generalization covers the extension of results from a sample to a broader population. Transferability, is therefore, affected by every stage of research, including the choice of research context and topic. To achieve this, the researcher provided thick description of the participants used in the study by providing their demographic data (excluding their names). The researcher also compared the findings of this study to that of other related studies in different contexts to identify similarities and differences.

3.10 Data Collection Procedure

According to Brittain et al. (2020), respecting the site where the research takes place and gaining permission before entering a site is paramount in research. A letter of introduction was taken from the Department of Special Education, University of Education, Winneba, to seek permission from the GES Directorate of the Effutu Municipality to undertake this study. The Educational Director subsequently gave a permission letter to the researcher to have access to the participants. A copy of the permission letter was given to the head of the school of study where the data collection was to be carried out to have access to the teachers.

3.10.1 Administration of Questionnaire

For the quantitative data, the researcher administered the questionnaires to thirty-eight (38) teachers. At the school, the researcher sought permission from the head of the school and was allowed to meet with the teachers. The respondents were met in their

respective classrooms. The researcher made a brief self-introduction to explain the purpose of the study to the respondents before the questionnaires were distributed to them. The researcher stayed with them and had interactions with them. This motivated the respondents to attend to the questionnaire and asked for further clarification on some of the items they needed more information on. The researcher appealed to all the respondents to take their time to read the questionnaire and respond to it appropriately. The researcher visited the school at different times and distributed the questionnaires to the respondents. The researcher took the questionnaires the same day it was administered. The researcher was able to retrieve all questionnaires, representing a 100% return rate. The researcher used seven weeks to administer the questionnaires.

3.10.2 Administration of Interview

For the qualitative data, the researcher used a semi-structured interview guide to gain an in-depth understanding of teachers' pedagogical content knowledge on the inclusion of deaf students. It was a one-on-one interview. The proceeding of the interview was audio-taped and transcribed subsequently.

3.11 Data Analysis Procedure

In explanatory sequential mixed-method design, the analysis of data involves the analysis of both quantitative and qualitative data (McNabb, 2020). Each data set was analysed using the appropriate method; quantitative data were analysed quantitatively, and qualitative data were done qualitatively.

3.11.1 Quantitative Data

The responses from the questionnaire items were coded (Strongly Disagree = 1, Disagree = 2, Undecided = 3, Agree = 4, Strongly Agree = 5) with the help of Statistical Product for Service Solution (SPSS) software version 26. The SPSS software was chosen for the data analysis because it is reasonably user friendly and does most of the data analysis one needs as far as quantitative analysis is concerned.

The following describes how data was analysed for each question:

1. **Research Question 1:** What pedagogical content knowledge do teachers of the deaf possess at the Unipra South Inclusive School?

In order to answer this question, the Section B of the questionnaire had its scales of measurement reduced/recoded from five Likert-type scale to three Likert-type scale (Figure 2) for easy analysis of the data.

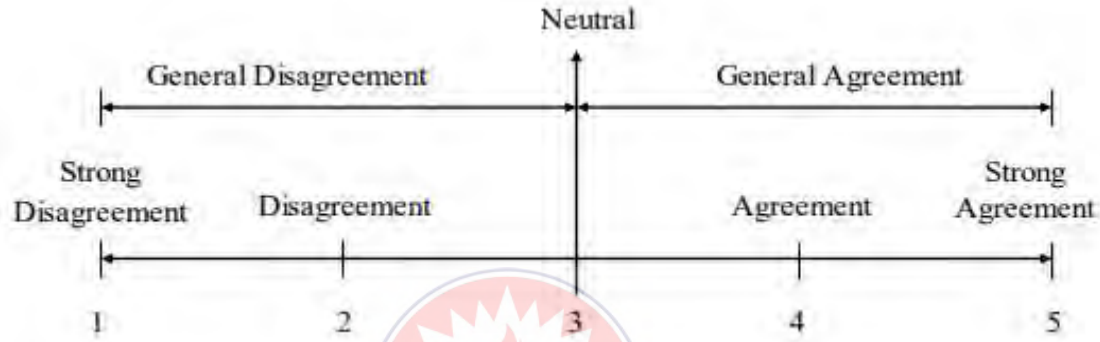

Fig 5: Neutral position on the five-point Likert scale

The responses of the respondents in the Section B of the questionnaire were analysed using descriptive statistics (frequencies and percentages) were calculated to determine teachers' levels of agreement or disagreement with factors and the items that loaded on each factor. A mean of means score was calculated on the mean score values of the items in the section and the result was 4.20. A mean of means scores above or below 4.20 was considered agreed or disagreed respectively, while a mean score equal to 4.20 was considered neutral. It must be noted that a mean value above or below the mean of means score does not imply that all respondents had agreed or disagreed to how an instructional resource was used but that majority of them had. The instructional resource was, therefore, considered on a majority basis. The standard deviation of the items also indicated the extent to which participants agreed or disagreed with the items.

Research Question 2: What factors influence the pedagogical content knowledge of teachers of the deaf at the Unipra South Inclusive School?

In order to answer this question, the Section C of the questionnaire had its scales of measurement reduced/recoded from five Likert-type scale to three Likert-type scale for easy analysis of the data. **[The responses of the respondents in the Section C of the questionnaire were analysed using descriptive statistics (frequencies and percentages) were calculated to determine teachers' levels of agreement or disagreement with factors and the items that loaded on each factor**. A mean of means score was calculated on the mean score values of the items in the section and the result was 4.34. A mean of means score above or below 4.34 was considered agreed or disagreed respectively, while a mean score equal to 4.34 was considered neutral. It must be noted that a mean value above or below the mean of means score does not imply that all respondents had agreed or disagreed to how an instructional resource was used but that majority of them had. The instructional resource was, therefore, considered on a majority basis. The standard deviation of the items also indicated the extent to which participants agreed or disagreed with the items.

Research Question 3: How do teachers of the deaf at the Unipra South Inclusive School acquire their pedagogical content knowledge?

In order to answer this question, the Section D of the questionnaire had its scales of measurement reduced/recoded from five Likert-type scale to three Likert-type scale for easy analysis of the data. The responses of the respondents in the Section D of the questionnaire were analysed using descriptive statistics. Frequencies and percentages were calculated to determine teachers' levels of agreement or disagreement with factors and the items that loaded on each factor. A mean of means score was calculated on the

mean score values of the items in the section and the result was 4.23. A mean of means score above or below 4.23 was considered agreed or disagreed respectively, while a mean score equal to 4.23 was considered neutral. It must be noted that a mean value above or below the mean of means score does not imply that all respondents had agreed or disagreed to how an instructional resource was used but that majority of them had. The instructional resource was, therefore, considered on a majority basis. The standard deviation of the items also indicated the extent to which participants agreed or disagreed with the items.

Research Question 4: What views do teachers have on the impact of their pedagogical content knowledge of teachers on deaf students' academic performance at the Unipra South Inclusive Basic School?

In order to answer this question, the Section E of the questionnaire had its scales of measurement reduced/recoded from five Likert-type scale to three Likert-type scale for easy analysis of the data. The responses of the respondents in the Section E of the questionnaire were analysed using descriptive statistics. Frequencies and percentages were calculated to determine teachers' levels of agreement or disagreement with factors and the items that loaded on each factor. A mean of means score was calculated on the mean score values of the items in the section and the result was 4.34. A mean of means score above or below 4.34 was considered agreed or disagreed respectively, while a mean score equal to 4.34 was considered neutral. It must be noted that a mean value above or below the mean of means score does not imply that all respondents had agreed or disagreed to how an instructional resource was used but that majority of them had. The instructional resource was therefore considered on a majority basis. The standard deviation of the items also indicated the extent to which participants agreed or disagreed with the items.

3.11.2 Qualitative Data

The primary method of analysis for all the research questions with regard to the qualitative interview in this study was thematic analysis. Thematic analysis is a method of identifying, analysing and reporting themes or patterns within data set (Lindgren et al., 2020). An interpretive analytic approach was applied on the interview data set. The audio-taped recordings were transcribed after serval played backs. Individual transcripts were read and re-read a number of times. As part of the writing process, meaning units were grouped together and eventually organized into themes and sub-themes.

3.12 Ethical Consideration

Ethics is the standard of the researcher's behaviour concerning the rights of those who become the subject of a research project or who are affected by it (Bell & Wynn, 2020); hence every study requires the researcher to adhere to the ethics concerning research. The researcher took due cognizance of ethical responsibility in collecting and analysing data and reporting the information. Permission to conduct the study was obtained from the Effutu Municipality Directorate of GES. The researcher encouraged the respondents' voluntary participation and ensured that the respondents' rights to be informed, right to privacy, and right to choose was respected by maintaining the confidentiality of all the information given to aid this study. All the respondents were assured of their anonymity. This was done by ensuring that their names and other forms of identification were excluded from the data collection, and the purpose of the study was clearly explained to the participants. Again, the respondents were given a chance to drop out of the study if they wished. Finally, all authors cited have been duly referenced in the reference section.

3.13 Chapter Summary

The researcher used an explanatory sequential mixed method design to find out pedagogical content knowledge of teachers in the Unipra South Inclusive School. The study was carried out in the Effutu Municipality in the Central Region of Ghana. A sample size of thirty-eight (38) teachers was obtained using the census sampling technique out of which six (6) were purposively sampled for the qualitative study.

CHAPTER FOUR

RESULTS AND FINDINGS

4.0 Overview

The chapter is organized under three major sub-sections, A, B, and C. The first part (Section A) presents the results of the questionnaire. The second (Section B) presents the results of the interview. Finally, Section C presents a discussion on the findings and a summary of the chapter. The purpose of this study was to examine teachers' pedagogical content knowledge in the inclusion of deaf students at the Unipra South Inclusive Basic School in Winneba. Specifically, the study sought to identify the pedagogical content knowledge of teachers, examine the factors that influence the pedagogical content knowledge of teachers, explore the acquisition of pedagogical content knowledge by teachers, and finally, explore teacher's views on the impact of their pedagogical content knowledge on deaf students' academic performance.

4.1 Section A: Questionnaire Results

4.1.1 Demographic Data of Respondents

A questionnaire was administered to the teachers in the Unipra South JHS in Winneba in the Central Region of Ghana. The demographic characteristics of the respondents centred on their gender, nature of school, circuit, rank, educational qualification, class taught, and the number of years they had been teaching as at the time for the study. Frequencies and percentages were used to present the demographic data. Results obtained are presented in Table 4.1.

Table 1: Demographic Data of Respondents

Demographic factor	Information	Frequency	Percentage (%)
Gender	Male	18	47.4
	Female	20	52.6
Total		**38**	**100**
Rank	Senior Superintendent	24	63.2
	Principal Superintendent	11	28.9
	Assistant Director I	3	7.9
Total		**38**	**100**
Educational Qualification	Diploma	16	42.1
	B.Ed./B.Sc.	18	47.4
	M.Ed./M.Phil.	4	10.5
	PhD	0	0
Total		**38**	**100**
Class Taught	Primary	19	46.3
	JHS	19	46.3
Total		**38**	**100**
Number of years in teaching	1-10	24	63.2
	11-20	14	36.8
Total		**32**	**100**

Source: Field Data- Questionnaire (2022)

Table 4.1 showed that the majority of respondents 20 (48.8%) were females whiles the minority 18 (43.9%) were males. This suggested that the number of females in the study outnumber the males. As such, the findings generated by the study is likely to reflect more on female perspective as opposed to males because their number outweighs them. Also, the majority 24 (58.5%) were senior superintendents while Assistant Superintendents II recorded the least numbers of 3 (7.3%) with principal superintendents being 11 (26.8%). This suggested that most of the respondents were quite new to the teaching field. Table 4.1 furthermore, showed the number of respondents with B. Ed. / B.Sc. qualification was the highest with 18 (47.4%) and respondents with Diploma and M. Ed/ M.Phil. qualification being 16 (42.1%) and 4 (10.5%) respectively. This suggested that many of the respondents had participated in further schooling to upgrade their certificates from Diploma to B. Ed certificates. Table

4.1 also indicated an equal number of respondents taught in the primary (19, 46.3%) and JHS (19, 46.3%) sectors of the schools. Twenty four (58.5%) teachers represented the highest numbers who had been in the teaching profession between 1-10 years and the other being 14 (34.1%) represented the number of respondents who had been in the teaching profession between 11-20 years.

4.1.2 Teachers' Pedagogical Content Knowledge

Items on Section B of the questionnaire sought to identify teachers' pedagogical content knowledge. Descriptive statistics (frequency, percentage, mean and standard deviation) were the analytical tools used to analyse the responses of the respondents. Results obtained are presented in Table 4.2.

Table 2: Teachers' Pedagogical Content Knowledge

No	STATEMENT	D f (%)	UD f (%)	A f (%)	M	SD
1	I use suitable approaches and strategies for teaching a concept	0 (0)	5 (13.2)	33 (86.8)	4.14	0.63
2	I address students' way of thinking about a concept	0 (0)	0 (0)	38 (100)	4.29	0.46
3	I address students' misconception about a concept	2 (5.3)	6 (15.8)	30 (78.9)	4.00	0.80
4	I explain a topic, concept or procedure	1 (2.6)	0 (0)	37 (97.3)	4.20	0.46
5	I identify aspects of tasks that affect its complexity	0 (0)	4 (10.5)	34 (89.5)	4.06	0.54
6	I illustrate ways to model a concept	0 (0)	5 (13.2)	33 (86.8)	4.01	0.52
7	I use resources available to support teaching	0 (0)	0 (0)	38 (100)	4.32	0.47
8	I discuss how topic fits into the curriculum	0 (0)	0 (0)	38 (100)	4.45	0.50
9	I discuss reasons why content is included in the curriculum and how it might be used	0 (0)	0 (0)	38 (100)	4.29	0.46

Source: Field Data- Questionnaire (2022)

KEY: No = Number, D = Disagree, UD = Undecided, A = Agree, f = frequency, % = Percentage, M = Mean, *SD* = Standard Deviation

The means and standard deviation of this ranged from (4.00 - 4.45) to (0.46 – 0.80) respectively. The mean of means calculated for this scale was 4.20. It can be deduced from the data in Table 4.2 that the statement 'I use suitable approaches and strategies for teaching a concept' resulted in (M=4.14, SD=0.63). This means that a majority of the respondents (86.8%) agreed that they used suitable approaches and strategies for teaching a concept. Moreover, the statement 'I address students' way of thinking about a concept' resulted in (M=4.29, SD=0.46). This means that a majority of the respondents (100%) agreed that they addressed students' way of thinking about a concept as the mean of 4.29 was greater than the mean of means of 4.20. Furthermore, the statement 'I address students' misconception about a concept' resulted in (M=4.00, SD=0.80). This means that a majority of the respondents (78.9%) agreed that they addressed students' misconception about a concept. Also, 37 respondents representing a majority of respondents (97.3%) agreed to the statement 'I explain a topic, concept or procedure. In addition, 34 respondents representing a majority of respondents (89.5%) agreed to the statement 'I identify aspects of tasks that affect its complexity'. Again, a majority of 33 respondents representing (86.8%) agreed to the statement 'illustrate ways to model a concept'. Finally, all the respondents (100%) agreed to the statements 'I use resources available to support teaching (M=4.32 SD=0.47), I discuss how topic fits into the curriculum (M=4.45, SD=0.50), and I discuss reasons why content is included in the curriculum and how it might be used' (M=4.29, SD=0.46). This suggested that all the respondents in the study used resources available to support teaching, discussed with their learners how the topic fits into the curriculum, and discussed the reasons why content is included in the curriculum and how it might be used.

4.1.3 Some Factors that Influence Teachers' Pedagogical Content Knowledge

Items on Section C of the questionnaire meant to examine the factors that influence teachers' pedagogical content knowledge. Descriptive statistics (frequency, percentage, mean and standard deviation) were the analytical tools used to analyse the responses of the respondents. Results obtained are presented in Table 4.3.

Table 3: Factors that Influence Teachers' Pedagogical Content Knowledge

No	STATEMENT	D f (%)	UD f (%)	A f (%)	M	SD
1	Gender Factor	1 (2.6)	1 (2.6)	36 (94.8)	4.22	0.61
2	Teaching Experience Factor	0 (0)	2 (5.3)	36 (94.7)	4.56	0.58
3	Individual Specialization Factor	0 (0)	1 (2.6)	37 (97.4)	4.44	0.54
4	Personal and Organization Factor	0 (0)	1 (2.6)	37 (97.4)	4.17	0.44

Source: Field Data- Questionnaire (2022)

KEY: No = Number, D = Disagree, UD = Undecided, A = Agree, f = frequency, % = Percentage, M = Mean, *SD* = Standard Deviation

The means and standard deviation of this ranged from (4.17 - 4.56) to (0.44 – 0.61) respectively. The mean of means calculated for this scale was 4.34. It can be deduced from the data in Table 4.3 that 36 of the respondents representing 94.8% agreed that gender influence their pedagogical content knowledge (M=4.22, SD=0.61). This implied that majority of the respondents were of the view that gender as a factor played a key role in influencing their pedagogical content knowledge. Also, 36 of the respondents representing 94.7% agreed that teaching experience influence their pedagogical content knowledge (M=4.56, SD=0.58). This implied that majority of the respondents were of the view that their teaching experience as a factor played was a necessary factor in influencing their pedagogical content knowledge. In addition, the

statement 'Individual Specialized Factor' resulted in (M=4.44, SD=0.54). This means that a majority of the respondents (97.4%) agreed that their areas of specialization also influenced their pedagogical content knowledge. Finally, the statement 'Personal and Organization Factor' resulted in (M=4.17, SD=0.44). This means that a majority of the respondents (97.4%) agreed that their personal factors and organization factors also influenced their pedagogical content knowledge.

4.2.4 Teachers' Acquisition of Pedagogical Content Knowledge

Items on Section D of the questionnaire meant to examine how teachers acquired their pedagogical content knowledge. Descriptive statistics (frequency, percentage, mean and standard deviation) were the analytical tools used to analyse the responses of the respondents. Results obtained are presented in Table 4.4.

Table 4: Teachers' Acquisition of Pedagogical Content Knowledge

No	STATEMENT	D f (%)	UD f (%)	A f (%)	M	SD
1	In-service training	0 (0)	0 (0)	38 (100)	4.50	0.50
2	Professional development training	0 (0)	0 (0)	38 (100)	4.11	0.31
3	Further schooling	0 (0)	3 (7.9)	35 (92.1)	4.00	0.39
4	Workshop and Seminars	0 (0)	5 (13.2)	32 (86.8)	4.31	0.69

Source: Field Data- Questionnaire (2022)

KEY: No = Number, D = Disagree, UD = Undecided, A = Agree, f = frequency, % = Percentage, M = Mean, *SD* = Standard Deviation

The means and standard deviation of this ranged from (4.00 - 4.50) to (0.31 – 0.69) respectively. The mean of means calculated for this scale was 4.23. It can be deduced from the data in Table 4.4 that 38 of the respondents representing 100% agreed in-service training enabled them to acquire their pedagogical content knowledge (M=4.50, SD=0.50). This implied that all the respondents were of the view that in-service training played a dominant role in their acquisition of pedagogical content knowledge. Also, 38 of the respondents representing 100% agreed that personal development training helped them in acquiring their pedagogical content knowledge (M=4.11, SD=0.31). This implied that all the respondents were of the view that the personal development training courses they participated in was a major factor in their acquisition of pedagogical content knowledge. In addition, the statement 'Further Schooling' resulted in (M=4.00, SD=0.39). This means that a majority of the respondents (92.1%) agreed that when they went back to school for further training and expertise, the skills they acquired shaped and influenced their perspectives thereby leading to new acquisition of pedagogical content knowledge. Finally, the statement 'Workshops and Seminars' resulted in (M=4.31, SD=0.69). This means that a majority of the respondents (86.8%) agreed that workshops and seminars also helped in their acquisition of pedagogical content knowledge.

4.2.5 Teachers' Views on the Impact of their Pedagogical Content Knowledge on Students' Academic Performance

Items on Section E of the questionnaire meant to examine teachers' views on the impact of their pedagogical content knowledge on students' academic performance**.** Descriptive statistics (frequency, percentage, mean and standard deviation) were the analytical tools used to analyse the responses of the respondents. Results obtained are presented in Table 4.5.

Table 5: Teachers' Views on the Impact of Pedagogical Content Knowledge on Academic Performance

No	STATEMENT	D f (%)	UD f (%)	A f (%)	M	SD
1	I present content using appropriate approaches that meet the diverse needs of learners	0 (0)	0 (0)	38 (100)	4.53	0.50
2	I know about pedagogies I have to use to enhance learning	0 (0)	0 (0)	38 (100)	4.08	0.27
3	I know about pedagogies I have to use to enhance teaching	0 (0)	0 (0)	38 (100)	4.84	0.37
4	I combine content and pedagogy effectively in the teaching and learning process	0 (0)	0 (0)	38 (100)	4.45	0.50
5	I have techniques in assessing students' understanding and diagnosing the level of understanding of concepts during teaching	0 (0)	0 (0)	38 (100)	4.66	0.48
6	I possess the essential characteristics required for the teaching of complex issues	0 (0)	0 (0)	38 (100)	4.11	0.31
7	I am able to establish a purposely learning atmosphere	0 (0)	11 (28.9)	27 (71)	4.01	0.77
8	I am able to foster critical thinking in students by relating content to students' lived experiences	0 (0)	9 (23.7)	29 (76.3)	4.02	0.71

Source: Field Data- Questionnaire (2022)

KEY: No = Number, D = Disagree, UD = Undecided, A = Agree, f = frequency, % = Percentage, M = Mean, *SD* = Standard Deviation

The means and standard deviation of this ranged from (4.01 - 4.84) and (0.31 – 0.77) respectively. The mean of means calculated for this scale was 4.34. It can be deduced from the data in Table 4.5 that 38 of the respondents representing 100% agreed to the statements 'I present content using appropriate approaches that meet the diverse needs of learners'(M=4.53, SD=0.50), 'I know about pedagogies I have to use to enhance learning'(M=4.08, SD=0.27), 'I know about pedagogies I have to use to enhance teaching'(M=4.84, SD=0.37), 'I combine content and pedagogy effectively in the teaching and learning process'(M=4.45, SD=0.50), 'I have techniques in assessing students' understanding and diagnosing the level of understanding of concepts

teaching'(M=4.50, SD=0.50), and 'I possess the essential characteristics required for the teaching of complex issues'(M=4.66, SD=0.48). This implied that all the respondents presented content using appropriate approaches that met the diverse needs of learners, knew about pedagogies used to enhance learning, knew about pedagogies used to enhance teaching, combined content and pedagogy effectively in the teaching and learning process, and had techniques in assessing students' understanding and diagnosing the level of understanding of concepts.

Also, 27 of the respondents representing 71% agreed to the statement that 'I am able to establish a purposely learning atmosphere' (M=4.01, SD=0.77). This implied that majority of the respondents were able to establish a purposely learning atmosphere. Finally, the statement 'I am able to foster critical thinking in students by relating content to students' lived experiences' resulted in (M=4.02, SD=0.71). This means that a majority of the respondents (76.3%) were able to foster critical thinking in students by relating content to students' lived experiences.

4.2 Section B: Interview Data Results

The aim of this section was to use semi-structured interview to collect qualitative data to help explain in greater depth the issues that were emerging from the quantitative phase of this research. The researcher invited the six purposively sampled teachers and conducted the interview on them. Although the number of participants in this qualitative phase was small (n = 6), Cohen et al. (2007) opines that this is not unusual in qualitative studies. The themes around which the qualitative data (interview) was collected were:

1. Teachers' Understanding of Pedagogical Content Knowledge
2. Teachers' Activities that Illustrate their Pedagogical Content Knowledge
3. Factors That Influence Teachers' Pedagogical Content Knowledge

4. Teachers' Acquisition of Pedagogical Content Knowledge

5. Teachers' Views on their Pedagogical Content Knowledge and Students' Performance

4.2.1. Teachers' Understanding of Pedagogical Content Knowledge

The Section analysis the quantitative aspect of the study employing excerpts from the interview with teachers are as follows. An emerging theme from the teachers' interviews was based on their understanding of pedagogical content knowledge. All the six teachers interviewed understood pedagogical content knowledge in varied ways as the methods teachers used in teaching deaf students. They stressed that teachers understanding of PCK would help in facilitating their teaching. Teachers expressed that pedagogical content knowledge involved the amalgamation of content knowledge and pedagogical knowledge during an instructional process. They indicated that for successful instruction to take place, a teacher could not do without either side of the amalgam. Hence, teachers are expected to have a suitable and appreciable level of competence in both content knowledge and pedagogical knowledge. The expressions made by these teachers revealed they had a good understanding of the concept of pedagogical content knowledge. They indicated:

I think, I believe pedagogical content knowledge is a constant that involves the amalgamation of content and pedagogy in presenting concepts to learners. It basically eeeerm implies how teachers combine their pedagogical knowledge and their content knowledge. This implies that Pedagogical content knowledge refers to how well a teacher understands a concept and how the teacher selects a suitable approach to teach that concept so that learners can understand (Tr.1).

I think that eer pedagogical content knowledge talks about the methods, measures and approaches that you use in teaching your pupils and also the knowledge we as teachers have from fields in education (Tr. 2).

I believe pedagogical content knowledge is the method I used to teach my subject for children to understand (Tr. 3).

My understanding is that eeerm pedagogical content knowledge refers to the approaches and methods you used to teach. It also dovetails into how well the teacher understands the approaches and content (Tr. 4)

My understand of pedagogical content knowledge is the methods that teacher uses to teach his learners and level of knowledge the teacher has with regards to what they are going to teach (Tr. 5).

I have always seen pedagogical content knowledge as a concept that integrates the methods and approaches the teacher uses in teachers in line with their eeeeerm content knowledge (Tr. 6).

The interview results indicates that the teachers had suitable knowledge and understanding on the concept of pedagogical content knowledge. This goes to confirm the questionnaire results.

4.2.2 Teachers' Activities that Illustrate their Pedagogical Content Knowledge

Teachers good grasp of the concept of pedagogical content knowledge enabled them to use several activities that illustrated their pedagogical content knowledge. Many teachers used hands-on activities as they were of the opinion that it had the potential of relaying the content being taught in an easy to understand the learners and the pedagogy involved in the usage of hands-on activities made the process an easy-going one. Other teachers also stated that the use of storytelling and guiding learners to roleplay some instructional scenes were good approaches that enabled learners understand the concept taught. They indicated:

I usually engaging learners in hands on activities that connects them to the lesson. Anytime I use these hands-on activities, my learners tend to understand the concept better (Tr. 1).

I've realized overtime that the use Storytelling and role play helps my students understand the lessons better therefore these two techniques play an immeasurable role in my class activities (Tr. 2).

I sometimes utilize role play, dramatization, storytelling and puzzles (Tr. 3).

I usually use role play for children and also use stories related to the topic so that my students can understand the topic I am teaching (Tr. 4).

It wouldn't be any other thing apart from the teaching methods. Each and every teaching method has its own principle to follow. Hence the teacher has to look at readiness of the learner and resources available (Tr. 5).

I find that there is the need for role play in my classes so that the kids understand the lessons better. Sometimes I employ the use of demonstration too. When there is a challenging topic, I call in a resource person to assist me, Also, Role play and demonstrations play a key role in my lessons. I know that my learners grasp concepts better this way (Tr. 6).

The interview results indicates that the teachers used hands-on activities such as role play, dramatization and storytelling to illustrate their pedagogical content knowledge. This goes to confirm the questionnaire results.

4.2.3 Factors That Influence Teachers' Pedagogical Content Knowledge

Based on the activities used by teachers to indicate their pedagogical content knowledge, several factors came to play in this regard. The availability of teaching and learning resources primarily influenced their pedagogical content knowledge. Most teachers also paid attention to the background of learners as learners' background play a critical role in their academic achievement. Another critical factor was teachers' learning experience which almost every teacher sated was a dominant factor that influenced their pedagogical content knowledge. They indicated that:

Errrrm, I believe that the availability of the right teaching and learning resources influence my pedagogical content knowledge (Tr. 1).

Usually, I consider the age of my learners and I also look at their interest and level of understanding, and sometimes I tend to consider the background of learners. Also, Errrrm, the things that influence my pedagogical content knowledge might probably qualification as a teacher and my teaching experience (Tr. 2).

I believe my everyday experience and my teaching experience, and also the background of learners influences my pedagogical content knowledge (Tr. 3).

I like to think that my cumulative teaching experience influences my pedagogical content knowledge (Tr. 4).

I think eeeerm the background of the student and experience of the teacher together influence my pedagogical content knowledge (Tr. 5).

Many factors I think can influence any teachers' pedagogical content knowledge but primarily I believe my experience as a teacher counts the most (Tr. 6).

The excerpts from the interview data affirm the questionnaire results as teachers in the Unipra South Inclusive JHS stated that some of the factors that influenced their pedagogical content knowledge were educational qualification, the background of the learners, their teaching experience and the availability of resource materials.

4.2.4 Teachers' Acquisition of Pedagogical Content Knowledge

Teachers acquire pedagogical content knowledge in diverse ways. Many teachers acquired their pedagogical content knowledge through further schooling and a weekly professional learning community. They indicated that:

Through professional development training and further schooling, I do acquire pedagogical content knowledge (Tr. 1).

When I attend Inservice training and engage in Professional Learning Community every Wednesday where professionals take us through the challenging topics in our class, It tends to build up on my pedagogical content knowledge (Tr. 2).

In this school, teacher engage in weekly Professional Learning Community (PLC) where we have discussions Weekly Plc and Inservice training. This helps us as teachers deliver the best of we have to our students (Tr. 3).

Educational training, Inservice training, reference books, and further studies help build my pedagogical content knowledge (Tr. 4).

The PLC and consistent Inservice trainings give us teachers a better grasp of what and how we should teach (Tr. 5).

The Ghana Education Service through the various educational directorates has mandated teachers to engage in professional learning communities which we do as teachers here. This develops us professionally too. In-service trainings have always been the primary resort to garner pedagogical content knowledge. I also believe if a teacher engages in further studies, that upgrade defines their perspectives on some major concepts with regards to their teaching (Tr. 6).

The excerpts from the interview data affirm the questionnaire results as teachers in the Unipra South Inclusive JHS stated that some of the ways through which they acquired their pedagogical content knowledge were in-service trainings, professional learning communities, workshops and seminars, and further schooling.

4.2.5 Teachers' Pedagogical Content Knowledge and Students' Performance

Teachers' pedagogical content knowledge invariably affects learners' academic achievement. They indicated:

By aligning the appropriate pedagogy with the right content, it invariably affects learners' performance. I know if I fully understand my content and use a suitable pedagogy, my learners are able to give good feedback during assessment (Tr. 1).

We assess pupils' performance through our pedagogical content knowledge through class test, oral assessment, end of term exams (Tr. 2).

I basically use exams, test and oral assessment to ascertain learners' level of understanding (Tr. 3).

Ooh yes….. I should know my learner hence the Universal Design for Learning (UDL). If I know that the learner by seeing, I should provide an avenue for that child. If the child learns by observing, I should provide a pedagogical content knowledge for that too. If the child learn by doing, same I should provide a pedagogical content knowledge for that also (Tr. 4).

By having a major grasp on my pedagogical content knowledge, my learners so well when I ask oral questions and engage them in written exercises (Tr. 5).

I use oral assessment and class exercises to know if I got to understand what I taught well based on my pedagogical content knowledge (Tr. 6).

The excerpts from the interview data affirm the questionnaire results as teachers in the Unipra South Inclusive JHS explained that by aligning suitable pedagogy with the appropriate content during instructional activities, learners were able to understand the concepts, thereby resulting in an improvement in their academic performance which could be confirmed through oral and written exercises.

4.3 Section C: Discussion of Findings

4.3.1 Teachers' Understanding of Pedagogical Content Knowledge

The findings of the study related to teachers' understanding of pedagogical content knowledge, in general, indicated that teachers had a suitable knowledge and understanding on the concept (Table 4.2). The findings of the study showed that respondents in the study used resources available to support teaching, discussed with their learners how the topic fits into the curriculum, and discussed the reasons why content was included in the curriculum and how it might be used. These are wholly

supported by the study of Von Frank (2008) who asserted that teachers' action will be determined by the depth of the pedagogical content knowledge making this an important component of their ongoing learning. It also links knowledge on teaching with knowledge about learning, which is a powerful knowledge base to shape teaching expertise. Rollnick et al. (2008) in their tailored model defines the teachers use of resource, how topic fits into the curriculum and the discussion of content included in the curriculum as a manifestation called Curriculum saliency and subject specific instructional strategy that spans from the Domain of Knowledge of Subject matter and knowledge of context.

The findings in Table 4.2 also indicated that teachers used suitable approaches and strategies for teaching a concept and they addressed students' conceptions and misconceptions about a topic. This was wholly supported by the study of Schartz (2008) who noted that PCK must be addressed within the context of a diverse pedagogy. It is deeply connected in teacher's everyday work. It encompasses theory learned during teacher preparation and also experience gained from ongoing schooling activities.

4.3.2 Factors that Influence Teachers' Pedagogical Content Knowledge

The findings in Table 4.3 and the interview results indicated that respondents were of the view that gender, teaching experience, individual specialized factor, personal and organization factor played key roles in influencing their pedagogical content knowledge. This was affirmed by the findings of Schartz (2008) who noted that the development of pedagogical content knowledge is influenced by factors related to teacher's personal background and the context in which a person works. The experiences and assets of students, their families and communities are the key to pedagogical content knowledge. The findings were also affirmed by the studies of Lee et al. (2007) who investigated the development of PCK among novice secondary

science teachers and found out that the development of PCK to be driven by teaching experience coupled with reflection.

4.3.3 Teachers' Acquisition of Pedagogical Content Knowledge

The findings of Table 4.4 indicated that in-service training and workshops and seminars enabled them to acquire their pedagogical content knowledge. Also, respondents were of the view that personal development training and further schooling helped them in acquiring their pedagogical content knowledge. Results from the interview data also affirmed that teachers acquired their pedagogical content knowledge through in-service training programs, further schooling and professional learning communities. These findings are supported by Kaohsiung (2007) studied the effects of improving teachers' pedagogical content knowledge of practice: concept-map implementation in the mathematical teacher professional development in Pamplona. This research found that the concept-map learning method was effective in different experience levels of teachers range from master-level to student teachers. The effectiveness of this method was found in assisting teachers when communicating teaching ideas during professional development discussion groups, this method also greatly aided in strengthening their knowledge of teaching practice.

4.3.4 Teachers' Pedagogical Content Knowledge and Students' Performance

The results in Table 4.5 indicated that all the respondents presented content using appropriate approaches that met the diverse needs of learners, knew about pedagogies used to enhance learning, knew about pedagogies used to enhance teaching, combined content and pedagogy effectively in the teaching and learning process, and had techniques in assessing students' understanding and diagnosing the level of understanding of concepts. These findings are in line with the research findings of Baumert et al. (2010) which showed that PCK affects student attitude towards learning.

Furthermore, PCK had a decisive impact on key aspects of instructional quality. It has been recognized that the foundation of science PCK is thought to be the amalgam of a teacher's pedagogy and understanding of content such that it influences his/her teaching in ways that will best stimulate student learning for understanding (Jang et al., 2009). Also, respondents were able to establish a purposely learning atmosphere. Finally, the statement fosters critical thinking in students by relating content to students' lived experiences. This is in line with the study of Lucenario et al. (2016) which placed emphasis on PCK as justified based on the assumption that PCK can make a significant impact on the quality of instruction that the students receive and thus the quality of learning and the students experience in the classroom.

CHAPTER FIVE

SUMMARY, CONCLUSION AND RECOMMENDATION

5.0 Overview of the Study

This chapter presents the summary of the study and reports on major findings. It highlights the conclusion of the study and its implications for practice. The implications were based on the major findings in the study. It further outlines some recommendations and suggestions for further research.

5.1 Summary of the Study

The study sought to examine teachers' pedagogical content knowledge in the inclusion of deaf students, a case study at the Unipra South Inclusive Basic School in Winneba. Ghana has ratified various conventions on disabilities and mainstream schools in the country are inclusive of children with exceptional needs. This ratification has made way for policies possible through the Education Strategic Plan, 2003-2015. The Ghana Education Service (GES) curriculum known as the Common Core Programme for Junior High School (JHS) and Senior High School first year (SHS 1) students incorporates and emphasises creative and inclusive pedagogies that are anchored on authentic and enquiry-based learning, collaborative and cooperative learning (MoE, 2020). These competences are part of the dimensions of PCK in which teachers must be proficient to provide quality instructions for learners including those who are deaf in both mainstream and inclusive settings. However, most researches indicate that Ghanaian teachers have little pedagogical content knowledge in teaching students with disabilities (Adera & Asimeng-Boahene, 2018). Teachers, most often, do have the requisite pedagogical content knowledgeable needed for teaching children with exceptional needs. This dire situation has often led to poor academic performance by students with disabilities. Therefore, the researcher deemed it necessary to examine the

pedagogical content knowledge of teachers in the inclusion of deaf students in the Ghanaian context. A total of thirty-eight (38) respondents were sampled using census sampling out of which six (6) were purposively sampled. The instruments used were a questionnaire and an interview guide. The data that emanated from the questionnaire were analysed mainly using frequencies, percentages, means and standard deviations whiles the data that emanated from the interview was thematically analysed.

5.2 Key Findings

5.2.1 Research Question 1: What pedagogical content knowledge do teachers of the deaf possess at the Unipra South Inclusive Basic School?

The study revealed that:

A majority of the respondents agreed that they addressed students' way of thinking about a concept.

A majority of the respondents agreed to the statement that they could illustrate ways to model a concept.

Finally, all the respondents agreed to the statements they could use resources available to support teaching.

5.2.2 Research Question 2: What factors influence the pedagogical content knowledge of teachers of the deaf at the Unipra South Inclusive Basic School?

Findings from the study suggested that:

a. The majority of the respondents were of the view that gender as a factor played a key role in influencing their pedagogical content knowledge.
b. A majority of the respondents were of the view that their teaching experience as a factor played was a necessary factor in influencing their pedagogical content knowledge.

c. A greater number of the respondents agreed that their areas of specialization also influenced their pedagogical content knowledge.
d. Finally, a greater number of the respondents agreed that their personal factors and organizations factors also influenced their pedagogical content knowledge.

5.2.3 Research Question 3: How do teachers of the deaf at the Unipra South Inclusive Basic School acquire their pedagogical content knowledge?

The findings indicated that:

a. All the respondents were of the view that in-service training played a dominant role in their acquisition of pedagogical content knowledge.
b. All the respondents were of the view that the personal development training courses they participated in was a major factor in their acquisition of pedagogical content knowledge.
c. A majority of the respondents agreed that when they went back to school for further training and expertise, the skills they acquired shaped and influenced their perspectives thereby leading to new acquisition of pedagogical content knowledge.
d. A majority of the respondents agreed that workshops and seminars also helped in their acquisition of pedagogical content knowledge.

5.2.4 Research Question 4: What views do teachers have on the impact of their pedagogical content knowledge on deaf students' academic performance at the Unipra South Inclusive School?

The findings indicated that:

a. All the respondents presented content by using appropriate approaches that meet the diverse needs of learners.
b. A majority of the respondents were able to establish a purposeful learning atmosphere.
c. A majority of the respondents were able to foster critical thinking in students by relating content to students' lived experiences.

5.3 Conclusion

The study revealed that the teachers generally had a high level of pedagogical content knowledge as they were able address students' way of thinking about a concept and use resources available to support teaching. This implied that teachers valued the need for an appreciable level of pedagogical content knowledge as a basis for successful teaching and learning. The study also revealed that several factors such as gender, teaching experience, areas of specialization, personal and organization factors also influenced teachers' pedagogical content knowledge. By this, great importance should be given to these factors because of how they affect teachers' pedagogical content knowledge. Moreover, the study revealed that in-service training, personal development training courses, further training and expertise, workshops and seminars also helped in teachers' acquisition of pedagogical content knowledge. This means that teachers are already aware of the structures in place they need to fall on if they want to acquire or advance their skills in pedagogical content knowledge. Finally, the study revealed that teachers' pedagogical knowledge had an impact on students' learning outcomes as teachers presented content using appropriate approaches that meet the diverse needs of learners.

5.4 Recommendations

In view of the above research findings and the conclusions arrived at, the following recommendations are proposed:

1. The Effutu Municipality Educational Directorate in collaboration with the heads of schools should organize periodic in-service training and workshops so that all teachers will develop a better understanding and aptitude of the importance of pedagogical knowledge in teaching deaf students.
2. Teachers should be motivated with incentives to stay in the teaching of the deaf as research has shown a high degree of teacher' attrition in recent years.
3. Teachers should be encouraged to take part i in-service training, personal development training courses, further training and expertise, workshops and seminars as structures like these have been found to aid in the acquisition of pedagogical content knowledge to handle deaf students.
4. Educational workshops and seminars that would shape teachers' views on the impact of pedagogical content knowledge and deaf students' academic achievement should be held frequently.

5.5 Suggestions for Further Research

The following are recommended for future research:

1. It is suggested that a similar study be conducted in other districts in the Central Region and other regions in Ghana. This would provide a basis for more generalization of conclusions to be arrived at on teachers of Inclusive Schools Pedagogical content knowledge.
2. Future research should be carried out on Pedagogical Content Knowledge of teachers in Inclusive schools in subject-specific areas as literature showed a paucity of studies in this area.

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APPENDIX A

UNIVERSITY OF EDUCATION, WINNEBA
FACULTY OF EDUCATIONAL STUDIES
DEPARTMENT OF SPECIAL EDUCATION
TEACHERS' QUESTIONNAIRE

Dear respondent,

This is an anonymous questionnaire. Do not write your name or any comment that would identify you on the questionnaire. This questionnaire seeks your response about your pedagogical content knowledge in teaching deaf students in inclusive settings. There are no right or wrong answers to the question. Information from this questionnaire will be used to improve teaching and learning practices in the Effutu Municipality and in Ghana as a whole. The confidentiality and anonymity of your responses are assured. The information you provide will be used for academic purpose only. This questionnaire is divided into two main sections, section A and section B-E. The first section is for eliciting information about background characteristics. The other sections are about your pedagogical content knowledge in teaching deaf students in your school. INSTRUCTION: You are kindly requested to tick (√) and/or supply short response(s) where necessary in spaces provided.

SECTION A
BIO DATA

1. Gender: Male [ ] Female [ ]
2. Your Rank: Assistant superintendent [ ] Superintendent [ ] Senior Superintendent [ ] Principal Superintendent [ ] Assistant Director II [ ] Assistant Director I [ ] Others, Please specify ……
3. Please indicate your highest qualification in your area of discipline

   Diploma [ ] B.Ed. [ ] BSc [ ] M.Ed. [ ] M.Phil. [ ] PhD [ ]
4. What class (es) do you teach ……
5. How long have you been teaching? 1- 10 years [ ] 11- 20 years [ ] 21- 30 [ ]

SECTION B

Teachers' Pedagogical Content Knowledge

Indicate your level of agreement or disagreement with these statements by a tick in the spaces provided: SA=Strongly Agree, A= Agree, UD= Undecided, D=Disagree, and SD=Strongly Disagree

STATEMENT	SA	A	UD	D	SD
6. I use suitable approaches and strategies for teaching a concept					
7. I address students' way of thinking about a concept					
8. I address students' misconception about a concept					
9. I explain a topic, concept or procedure					
10. I identify aspects of tasks that affect its complexity					
11. I illustrate ways to model a concept					
12. I use resources available to support teaching					
13. I discuss how topic fits into the curriculum					
14. I discuss reasons why content is included in the curriculum and how it might be used					

SECTION C

Factors that influence your pedagogical content knowledge

Indicate your level of agreement or disagreement with these statements by a tick in the spaces provided: SA=Strongly Agree, A= Agree, UD= Undecided, D=Disagree, and SD=Strongly Disagree

Expected Factors	SA	A	UD	D	SD
15. Gender Factor					
16. Teaching Experience Factor					
17. Individual Specialization Factor					
18. Personal and Organization Factor					

SECTION D

Acquisition of Teachers' Pedagogical Content Knowledge

Indicate your agreement or disagreement with these statements by a tick (√) in the spaces provided: SA=Strongly Agree; A= Agree; UD=Undecided; D=Disagree; SD = Strongly Disagree

Statement	SA	A	UD	D	SD
19.In-service training					
20.Professional development training					
21. Further schooling					
22.Workshop and Seminars					

SECTION E

Impact of Teacher' Pedagogical Content Knowledge on Students' Academic Performance

Indicate your agreement or disagreement with these statements by a tick (√) in the spaces provided: SA=Strongly Agree; A= Agree; UD=Undecided; D=Disagree; SD = Strongly Disagree

STATEMENT	SA	A	UD	D	SD
23.I present content using appropriate approaches that meet the diverse needs of learners					
24.I know about pedagogies I have to use to enhance learning					
25.I know about pedagogies I have to use to enhance teaching					
26.I combine content and pedagogy effectively in the teaching and learning process					
27.I have techniques in assessing students' understanding and diagnosing the level of understanding of concepts during teaching					
28.I possess the essential characteristics required for the teaching of complex issues					

29. I am able to establish a purposely learning atmosphere					
30. I am able to foster critical thinking in students by relating content to students' lived experiences					

THANK YOU FOR COMPLETING THIS QUESTIONNAIRE

APPENDIX B

INTERVIEW GUIDE

Department of Special Education

This study is purely for academic purposes. You will be contributing to its success, if you provide responses to the items as frankly and honestly as possible. Your response will be kept confidential. Kindly read each of the items carefully and indicate the opinion that is the nearest expression of your view on each of the issue raised.

1. How do you understand pedagogical content knowledge?
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   ……
   ……
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   ……
2. What are some of the activities you do to illustrate pedagogical content knowledge?
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3. What are the factors that influence your pedagogical content knowledge?
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4. How do you acquire your pedagogical content knowledge?
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5. How do you engage students to ensure that your pedagogical content knowledge influences their academic performance?
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