RELATIONSHIP BETWEEN TEACHERS PROFESSIONAL KNOWLEDGE AND STUDENT MATHEMATICS ACHIEVEMENT AMONG SENIOR SECONDARY SCHOOL STUDENTS IN CHANCHAGA LOCAL GOVERNMENT

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(2017/3/69291BE)

DEPARTMENT OF SCIENCE EDUCATION

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ABSTRACT

The study was purposed to study was to find out relationship between teachers' professional knowledge and senior secondary school students' in mathematics Academic Achievement in Chanchga Local Government. The describe approaches based on the constructivism theory which stresses the importance of joint planning, analysis of learner's needs, and formulation of learning objectives based on the needs and interests of the students' (Richards and Rodgers, 2014) was adopted. The researcher reviewed teachers' general professional knowledge about teaching, their demonstration of their Professional knowledge and their understanding of the Professional knowledge. The researcher adopts descriptive quantitative Survey, and correlational research design. Three research questions and hypothesis were raised to guide this study, Data were analyzed using SPSS statistical tools, Pearson product-moment correlations, multiple regression, and other statistical techniques. The researcher evaluates the teachers' professional knowledge and skill using Likert scale structure questionnaire and it relationships with their students' academic achievement in mathematics using correlational regression. Participants in this study were senior secondary school mathematics science teachers and students in 12 senior secondary schools in Chanchaga Local Government (N = 49, 900). A statistical level of p < .05 was used for all tests conducted, the number of the study was indicated and the positive correlation relationship between teachers' professional knowledge and skills on students' academic achievement in mathematics was found, relationship between teachers teaching methodology and students' academic achievement and teachers' students' knowledge at (r= 0.265, 0.147, 0.147 respectively), the result The study therefore concludes that teachers' professional knowledge and skills, teachers' teaching methodology and student' knowledge influences students' academic achievement. Therefore, school management should organize seminars to enlighten teachers on the advantage of innovative and creative teaching, supporting activities that are geared towards innovation enhancement.

CHAPTER ONE

1.0 INTRODUCTION

1.1 BACKGROUND TO THE STUDY

The importance of mathematics in national development is so high that the Federal Republic of Nigeria enshrined mathematics in the National Policy on Education as a core (compulsory) subject for all primary and secondary school's students in Nigeria (FRN, 2014). Its inclusion as a pre-requisite for admission into science and technology based courses in the Nigerian tertiary institutions is basically because of the recognition of the indispensable role it plays in the advancement of science and technology of any nation (Iyekekpolor and Buleis, 2012).

In the contemporary Nigeria, subsequent to the nation's endorsement of international protocols for Education for All (EFA); the Millennium Development Goals (MDGs) and the adoption of a National Economic Empowerment and Development Strategies (NEEDS), a greater emphasis is now being placed on industrial and technological development Nigerian Education Research and Development Council (NERDC, 2007). Consequently, students are being encouraged to take up science and technology related disciplines. Globally today, scientific methods persuade literally field of human endeavour and play a fundamental role in economic development of any country. In our match toward scientific and technological advancement and following our aspiration to be among the first twenty economies in the world by the year 2020 (Obioma, 2009; NERDC, 2007) we need nothing short of good performance of our youths in mathematics at all levels of education.

Mathematics enables one to make the invisible to be visible, thereby solving problems that would be impossible otherwise. According to Lambdin (2013), mathematical demands on students increases as they progress through school; take up their adult lives at home and in the workplace. In order to function in a mathematically literate way in the future, students must

have a strong foundation in mathematics. A strong foundation involves much more than the rote application of procedural knowledge.

Teachers who have good qualifications in mathematics have their students performing better in mathematics, Tata (2013) made his study in Nigeria and came out with findings that, students' negative attitude toward mathematics, fear of mathematics, inadequate qualified teachers and inadequate teaching materials were some of the causes of poor performance in mathematics. Developing positive attitude, motivation and proper guidance toward mathematics and provision of relevant teaching materials could make students perform better in mathematics.

Educators are at the core of every educational system and therefore, the quality of the educators in every school system reflects and impacts the overall quality of the school system and the potential of the students within the system (Darling-Hammond, Wei, Andree, Richardson, and Orphanos, 2011; Darling-Hammond, Chung and Frelow, 2012; Goldhaber Brewer, 2000; Hickman, Bartholomew, Mathwig, and Heinrich, 2016). Educators, as lifelong learners, equip learners with the skills and resources needed to attain success academically and socially.

However, to accomplish this requires more consistent and effective programmes which adequately prepare educators and provide them with the knowledge, skills, and resources needed to successfully engage students and increase academic achievement (Intrator and Kunzman, 2016).

Effective teaching and learning cannot occur without congenial classroom environment. Teachers maintain positive and effective learning environment through well-prepared and varied lessons, which cater for the range of student abilities and interests. It also involves, setting of realistic and challenging academic standards of student performance. Teachers are required to demonstrate commitment to teacher professional development through interest and

attendance at appropriate in-service courses, commitment to a programme of professional study.

Biotenbeck (2011), defined teaching practices as what teachers do in the classroom, how teachers apply instructional methods and traditional ways of teaching. These were such as lecture style teaching, teacher centre methods and rote memorization in teaching mathematics. To optimize the available teaching the study by (Pantziara and Philipou, 2017) tells us that teaching practices such as problem solving and use of visual aid in the mathematics classroom could increase students' motivation and morale to their performance. This was also supported by (Mtitu, 2014, Kafyulilo, *et.al*) that teachers have to be encouraged to apply student centered methods that require teachers to actively involve students in the teaching and learning process.

1.2 Statement of the Research Problem

Effective and efficient teaching methods that could help improve student's performance in mathematics are most desired. According to Gurney (2012), teaching is effective and efficient when students are taught the right content, having enough learning materials and high ratio of teachers' time on the teaching activity. This requires a teacher to have passion in sharing knowledge with students while motivated with school management system. Mtitu (2014) also identified that, for effective and efficient teaching, learner centered methods that require teachers to actively involve students in the teaching and learning process must be applied.

However enough effort was put to improve students' performance in mathematics through programmes like Secondary Education Development Program. SEDP (Secondary Education Development Programs, SEDP I, 2004 & SEDP II, 2010), updating teaching syllabus with all the guides to teachers on the competence based teaching practice (Universal Remote Terminal 2010). The number of mathematics teachers was increased compared to before and were provided with frequent seminars and workshops that emphasized on the application of professional based teaching methods.

Despite all the efforts (Mkumbo, 2013) the rate of students' performance was low 16.09% in the year 2010, 14.55% in the year 2011, 12.14% in the year 2012 and 18% in the year 2013. Performance in the year 2013 was a bit exceptional due to the change in national examination grading systems for Certificate of Secondary Education Examination, but still performance was low, West Africa Examination body(WAEC) reports in,

Table 1.1: WAEC report on students' academic performance in mathematics 2000 - 2014

Years	**Percentage (Pass)**	**Percentage (Fail)**
2000	A1-C6 32.80%	D7-F9 67.20%,
2001	A1-C6 41.60	D7-F9 58.40%,
2002	A1-C6 15.00%	D7-F9 85.00%,
2003	A1-C6 45.80%	D7-F9 54.20%,
2004	A1-C6 53.80%	D7-F9 46.20%
2005	A1-C6 35.55%	D7-F9 64.45%,
2006	A1-C6 39.94%	D7-F9 60.06%,
2007	A1-C6 15.56%	D7-F9 84.44%,
2008	A1-C6 23.00%	D7-F9 77.00%,
2009	A1-C6 31.00%	D7-F9 69.00%,
2010	A1-C6 33.55%	D7-F9 66.45%,
2011	A1-C6 38.93%	D7-F9 61.07%,
2012	A1-C6 49.00%	D7-F9 51.00%,
2013	A1-C6 36.00%	D7-F9 64.00%,
2014	A1-C6 31.30%	D7-F9 68.70%,
2015	A1-C6 34.18%	D7-F9 65.82%,
2016	A1-C6 38.68%	D7-F9 61.32%

According to (Mkumbo, 2013) which implies that students are performing at the low expectation.

There is public outcry that the standard of educational system in the nation, Nigeria as indicated in the examination and performance of education output that are inadequate for employment in mathematics.

The problems now are, is it that there are no professional knowledge teachers in our public schools in Chanchaga Local Government secondary schools. Is it that professional knowledge teacher does not impact positively to the academic performance of the students? If that's the case what can be the possible solutions.

This study sought to determine the relationship between teacher professional knowledge and mathematics Achievement among senior secondary school students in Chanchaga local government secondary schools.

1.3 Aim and Objective of the Study

The aim of the study is to evaluate the Teachers' professional knowledge and mathematics Achievement in Senior Secondary School students in Chanchaga Local, Niger State. The following were the objectives of the study:

1. To identify strength of Teachers' professional knowledge and students' academic achievement in mathematics among public senior secondary schools in Chanchaga Local Government secondary schools.
2. To find out strength of relationship between teacher's teaching methodology and students' academic achievement in mathematics among public senior secondary schools in Chanchaga Local Government secondary schools
3. To determine the strength teachers' students' knowledge and students' academic achievement in mathematics among public senior secondary schools in Chanchaga Local Government secondary schools.

1.4 Research Questions

To conduct this research effectively, there are essential questions that research must be established. These questions are not only helped focus the research but also led to great impact on the research. The following research questions were raised to guide the study.

1. What are the level of teachers' professional knowledge and skills on student academic achievement in public senior secondary schools in Chanchaga Local Government?
2. What are the level of teachers' teaching methodology on student academic achievement in public senior secondary schools in Chanchaga Local Government?
3. What are the level of teachers' students' knowledge on student academic achievement in public senior secondary schools in Chanchaga Local Government?

1.5 Research Hypotheses

The following were the hypotheses of the study:

Ho_1: There is no significant relationship in mean response of teachers' professional knowledge and skills on students' mathematics achievement at public senior secondary schools in Chanchaga Local Government.

Ho_2: There's no significant relationships in mean response of teachers' teaching methodology on student mathematics achievement in senior secondary schools at Chanchaga Local Government.

Ho_3: There's no significant relationships in mean response of teachers' students' knowledge on student mathematics achievement at senior secondary schools, Chanchaga Local Government.

1.6 Significance of the Study

The significant of this research is to contribute to the body of knowledge. This study is important to other researchers as a reference on studies concerning students' performance in mathematics. It is the sincere hope of the researcher that by going through this work, it will make mathematics teachers to help their students perform well in mathematics subject. Teachers will consider students, and the entire necessary factor before actual classroom teaching to know if the students have the basic concepts in particular unit of study in

mathematics. Then teachers can be in a position to improve students' performance in mathematics. The study will also help future researchers to come with findings on how teacher experiences and teacher's professional knowledge are connected to effects of academic achievement in mathematics. This will consequently guide the ministry in adopting a new policy of recruiting teachers i.e. to make sure they recruit qualified teachers who are highly effective i.e. those with knowledge of content, teaching professional knowledge, professional certificate and overall academic ability, and also the need for the teacher in-service training so as to make more effective, impactful teaching and learning as well as in increase in student academics performance.

1.7 Definition of Terms

Professional Knowledge

This can be defined as application of teaching required skills, experience, education, theories, practices and information and communication technology tools by the teachers in teaching and learning process.

Academic Achievement

Academic achievement is the extent to which a student has achieved the short term educational goals in measuring instrument. Academic Achievement can be measured through students' grade point average; achievement may be measured through graduation examinations.

CHAPTER TWO

2.0 LITERATURE REVIEW

2.1 Conceptual framework

2.1.1 Teacher professional knowledge

Teacher's Subject Matter Knowledge Subject matter is an essential component of teacher knowledge. According to Buchman (1984) indicates that it would be very odd to expect a teacher to plan a lesson on, for instance, writing report in science and to evaluate related assignment, if that teacher is ignorant about writing and about science. Teachers' professional knowledge may be affected by the attitudes and expectations that their students bring to the classroom. Teacher's understanding of subject content affects their capacity to simplify content to help students to understand. Helping students learn subject matter involves more than delivery of facts and information (Ball, 209). Jadama (2014) indicates that a teacher who is ignorant or uninformed about subject content can pass in accurate ideas to students, use texts uncritically and even change unsuitably. He further argues a teacher will find it extremely difficult to answer varied questions from students about a subject matter if the teacher has little knowledge about it. Understanding of subject matter of a discipline enables teachers to plan their lesson and also to evaluate their assignment. The researcher further explains that; benefits of knowledge of subject matter include enabling the teachers to teach well using different teaching methodologies, give varied and alternative questions and ability to clarify misconceptions on subject content. This helps the teacher a great deal especially in the evaluation of the learners. Kimosop (2015) agrees with other researchers in that if the content to be learnt is incomplete the acquisition of curriculum goals will not be achieved.

2.1 Student Academic achievement

According to Ferguson (2010) academic achievement is the quality and quantity of knowledge skills, grades, techniques, positive attitude, behavior and philosophy that learners achieve or

acquire and evaluated through marks and grades that the students attain in a test or examination which is done at the end of a topic, school term, year or education cycle. Adegoroye (2014) argues that improving academic achievement depends on improvement of quality of classroom practices of the subject teacher. The more organized the teacher is the better the performance. Baikie (2010) states that it is the teacher who should establish the right climate of conditions for learning, use of learning resources and appropriate teaching methods to attainment of mathematical skills and achievement. Mutua (2008) found that low academic achievement of students in mathematical was an aftermath of a negative attitude of both teachers and students towards teaching and learning process of mathematics.

Independent variable

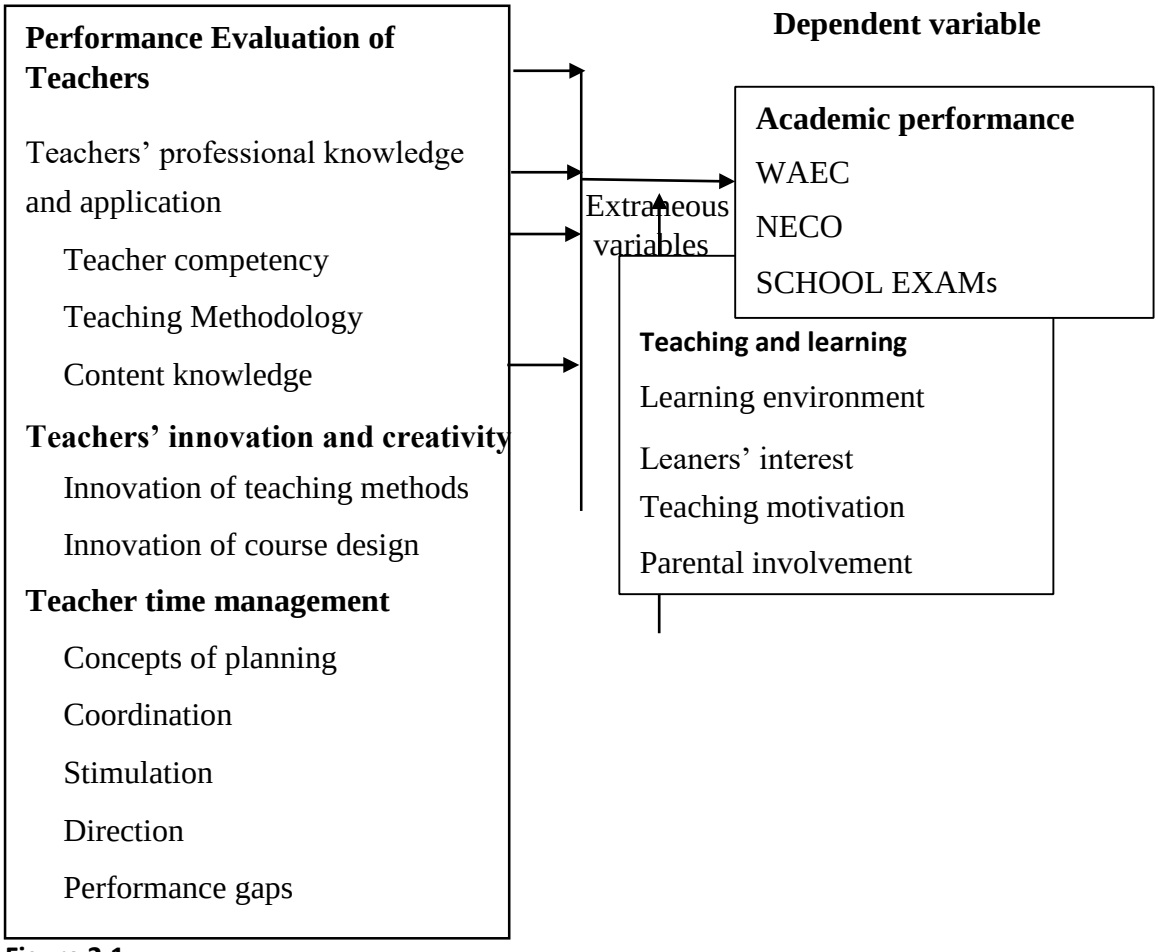

Figure 2.1

2.2 Theoretical Framework

This study was guided by Stufflebeam's Context-Input-Process-Product (CIPP) Model, Stufflebeam Daniel (2014). His approach is recognized as the Context, Input, Process and Product or CIPP model. This comprehensive model considers evaluation as a continuous process of providing useful information to managers for decision making and that the evaluation data is an essential component for good decision-making. The central concern of evaluation therefore is to meet the information needs of the managerial decision makers (Ouda and Ndung'u, 2016). It is a three-step process: delineating the information necessary for collection, obtaining the information and providing the information to interested parties. Context evaluation involves studying the environment of the program and the purpose is to define the relevant information, focus on unmet needs and missed opportunities, and diagnose the reasons for unmet needs. It is actually a way to provide information and determine how to utilize resources to meet program goals. It provides evaluators with information that enable them to decide whether to continue, terminate or modify the program. CIPP model gives a process of delineating, obtaining and providing useful information for judging decision alternatives. Context, Input, Process, and Product (CIPP) evaluation model is recommended as a framework to systematically guide the conception, design, implementation, and assessment of service-learning projects, and provide feedback and judgment of the project's effectiveness for continuous improvement.

In this section, the researcher describe approaches based on the constructivism theory which stresses the importance of joint planning, analysis of learner needs, and formulation of learning objectives based on the needs and interests of the participants (Richards and Rodgers, 2014).

In my study, I reviewed teacher's experiences about math, their participation with the math Professional knowledge and their understanding of the Professional knowledge.

Weimer (2013) applied constructivist theory in a comprehensive overview of learner-centered teaching by providing examples of educators providing instruction across content area in college and university settings. Weimer advocated learner-centered methods, and provided a detailed discussion of the way students' developmental comprehension concerns could influence the success of learner-centered teaching. She demonstrated how instruction and curriculum are connected to the process of comprehension for participants. For example,

Weimer observed several classrooms in which the teacher's primary mode of delivery of instruction was lecture even though that teacher had had previously attended Professional knowledge development that focused on learner-centered strategies. Weimer concluded that teachers prefer to demonstrate what they are acquainted with, as opposed to using different methods with which they are uncomfortable. According to Weimer, "learner-centered teachers opt for those instructional strategies that promote deep and lasting learning". It is more important for students to remember more and apply more than to cover the content. My study was based on a conceptual framework built from Weimer's learner-centered teaching using a constructivist approach through an adult learning lens.

Constructivist theory developed and refined by Piaget, Bruner, and Vygotsky (Adom and Anack, 2016) addresses how people acquire knowledge. Its principal foundation is that people construct their understanding and knowledge through experience and by reflecting on the lessons to become creators of their understanding (Dollarhide, and Moss, 2013). In this study, I also drew from the framework of constructivism. Constructivism encompasses sharing several perspectives with the thought that authenticity is constructed and yields various understandings (Lodico *et al.*, 2010). During the production of information from a diversity of perspectives, learners create meaning from their environment and experiences to develop their point of view.

Ulrich *et al.* (2014) examined how applying constructivist theory may lead to a specific methodological practice, and increase higher-order thinking skills for students, thus enabling mathematics educators to become highly effective teachers for their learners. They discussed how the constructivism approach can be used to clarify and stimulate teaching and learning in a more practical adaptation to the complexity of instructional strategies. Ulrich et al. showed how the process of higher-order thinking skills is created through constructivism, and, as it progresses, teachers become more effective in providing instruction to learners.

Both constructivism and andragogy are the frameworks that contributed to the formation of key aspects of my study and research questions:

(1) How do math teachers' perspectives on professional Knowledge strategies vary by type of professional Knowledge development provided?

(2) What are the math teachers' experiences with staff development training in mathematics?

And (3) how does students' depth of understanding (as measured by performance on classroom assignments) differ by the type of professional Knowledge provided?

In conducting this research, the review of literature search terms was obtained by reviewing teacher perceptions of professional Knowledge effectiveness and strategies taught at the high school level. The researcher reviewed sources based on the Teacher Performance Rubric utilized by the local school district as it relates to professional Knowledge and teacher collaboration. The researcher studied literature that related to professional Knowledge and its effectiveness to ensure that high school teachers can relate new knowledge to their specific content. The researcher retrieved various books by authors who had effectively implemented professional development in their school as administrators. The researcher read a variety of scholarly journals from Walden University Library and various sources. In conducting this research, the researcher used the following search terms: effective professional development, professional Knowledge and the researcher retrieved information from the subsequent

databases for this literature review via Walden's library: Education Research Complete, ProQuest, Education Research Starters, Sage, EBSC and ERIC were all retrieved. The following topics were discussed in my review of literature: Understanding Professional Development; Theoretical Underpinning of Professional Development; Social Learning Theory; The Relationship between Professional Development and Student Outcomes; and Effective Professional Development.

Understanding Professional knowledge and Effective Professional knowledge has been defined as a professional learning that is well structured and leads to changes in the practices of teachers and useful improvements in the outcomes of student learning. The definition of the features of an active Professional knowledge needs a review of studies carried out concerning methodologies in the past decades' research (Gregory, and Pianta, 2014). For professional Knowledge to be considered effective, different elements have to be taken into consideration. First, it has to be focused on content. In other words, there is much emphasis on the teaching strategies that are connected to the particular content of curriculum supporting teacher learning in the context of a classroom. This element is inclusive of the international focus on the development of curriculum that is centered on discipline and pedagogies in areas such as literacy, science or mathematics (Bayer, 2014). Secondly, an excellent professional Knowledge takes into consideration active learning that involves direct engagement of teachers in the designing and attempts at the application of strategies used in teaching. Additionally, it offers them an opportunity of engaging in a similar teaching style in learning that is many benefits to students (Stein and Silver, 2016). This type of professional Knowledge makes use of interactive activities, authentic artifacts and other relevant strategies for developing an understanding of the embedded and highly contextualized professional learning. Therefore, this type of approach does not employ the same aspects of traditional methods of learning and learning environments

that are based on lectures. These lecture-based learning environments are devoid of a direct connection between the students and the classroom environment of teachers.

Thirdly, an active program development for teachers provides collaboration. This means that high-quality development of a program results in the creation of room for teachers to efficiently and freely share ideas and work together in their learning activities. Through collaborative working activities, teachers can create communities that have a positive reaction to changes in the instruction and culture of students. This is about the departmental, grade, school and district level (Lang, 2017). The fourth necessary element is that a valid profession development program takes into consideration of the models of efficient practice. The curricular modeling and instruction models serve in the capacity of providing teachers with enhanced and clear vision of the most appropriate type of training to adopt. Through the element of models ineffective practice, teachers are given room to view the whole unit and lesson plans, a sample of the work of a student, video or written teaching cases and observing peer teachers. The fifth essential element rests in the provision of expert and coaching support. The expert and coaching support is critical to the sharing of knowledge on the evidence and content-based practices that lay much emphasis on the individual needs of teachers.

Additionally, an active program development has room for the provision of reflection and feedback. Often, professional learning of high quality offers inbuilt time for teachers to reflect on their teaching and make the necessary changes by soliciting for feedback. Accordingly, indicating and feedback is essential in providing teachers to carefully move towards the vision and overall goals of the teaching practice. Finally, a practical program development has sustainability in its direction given that it offers teachers ample learning, practicing, implementation and reflection time on the new adoptable strategies (DiPaola and Hoy, 2013).

2.2.1 Teachers' Professional development

The theories relating to professional Knowledge included social and cognitive aspects of learning, with an emphasis on perspectives. Cognitive perspectives focus on the idea of changes in the knowledge or belief of teachers, while the social perspectives focus on human interactions (Syafii and Yasin, 2014). Different theories, including social learning theory, have provided theoretical strategies for the integration of social and cognitive effects of learning. Self-efficacy is a vital sub-construct of social learning theory has been utilized in the placing of teacher education in a theoretical framework. Just like the constructivism theory, the social learning theory has been used in the exploration of the application of the learning theory in the program of Professional knowledge for supporting teachers in the use of Student-Centered Problem-Solving approaches (SCPS). The SCPS approach involves teaching characterized by the collaboration of students and discussion for purposes of arriving at solutions to open-ended activities and tasks (Syafii and Yasin, 2014), and it is entirely different from the traditional centered teaching approach focused on teaching of mathematical routines and methods. The essence of SCPS rests in the fostering of a detailed understanding of mathematics and the improvement of the engagement and motivation. The different criteria used in the assessment of a theory or model used in the provision of guidance towards the evaluation of how viable the already mentioned theories are in the Professional knowledge context. The power of explanation refers to the extent to which a method offers different descriptions on the manner in which something works.

2.2.2 Social learning theory

Often, when teachers start their careers, they observe and model the other teachers' practices, efficiently adapt them and finally reproduce them in the classroom setting (Watson, 2013). There are different responses, feedback, and self-assessments that can be used in the development of teaching behaviors. These practices may grow into routines over time (Watson,

2013). This teacher-to-teacher direct contact approach is often based on conservative and traditional approaches to teaching.

There is a need for a constant reminder of the contextual and social effects which challenge innovation efforts, often mediated through self-efficacy (Watson, 2013). When one's behaviors are challenged, s/he can begin having doubts about the chances of final success, and for teachers, this applies to pedagogy. Alternatively, one can influence a positive change teaching via improved teacher self-efficacy and positive cognitive effects. As mentioned, it has been recognized that the effects of the environmental (job demands, working conditions, and the learning institution where Professional knowledge occurs) can impact the teaching offered (Jones, and Pollitt, 2015).

Social learning theory (Bhatia, 2014), constructivism (Adom and Anack, 2016), and other relevant theories have been used in conceiving knowledge as the potential behaviors that are modeled in a mental perspective. If the theories offer reasonable explanatory and descriptive capability, then there are chances of observatory learning (Laurillard, 2002) The self-efficacy beliefs of a teacher have a direct reflection on his/her motivation, confidence and innovative willingness in the process of teaching. Conversely, there are negative effects connected with self-efficacy directly related to the expectations of a parent, a student or a colleague that might have an effect of preventing the transmission of knowledge in a classroom environment (Tseng and Kuo, 2014).

The Relationship between Professional knowledge and Student Outcomes Studies other than those mentioned in the introduction (Mayotte and Doyle, 2013) also have supported the conclusion that math teachers' perceptions of Professional knowledge strategies used in the classroom may affect student outcomes (Jones, and Pollitt, 2015). These researchers have encouraged educators to apply the lessons they have learned through practice and theory for purposes of increasing the intensity of evaluation of professional development. This could be

achieved through the incorporation of reliable and valid Professional knowledge methods and practices and knowledge of teachers. Mayotte and Doyle's research demonstrated positive outcomes across five dimensions of elementary education in the professional development. These include the reaction of participants, organizational change and support, learning and the application of skills and new knowledge to influence the outcomes of students.

The National Mathematics and Science Initiative Standards (2015) were created to increase the performance of students in Science, Technology, Engineering, and Math (STEM) fields by teaching and transforming education (Watkins and Mazur, 2013). To do this, researchers drew upon the most effective programs to create quantifiable results. The underlying rationale is that once an idea works, it can be utilized on a national scale closely monitored for effectiveness.

NMSI's 'Laying the Foundation Program' is meant to strengthen the existing teaching corps through professional training resources aligned with Common Core State Standards (Graham and Harris, 2013). A group of six articles reviewed by Milner (2014) supported effective STEM educator Professional knowledge and preparation, discussing targeted efforts to prepare and retain new teachers to know the pedagogical content produced by the STEM to allow them to have adequate learning.

Anhalt and Cortez (2015) focused on a variety of approaches to support teachers including the application of a math curriculum based on standards. Additionally, Anhalt and Cortez focused presented a detailed PD program for administrators and teachers (Anhalt and Cortez, 2015). They agreed that math content area is a concern and efforts aimed at increasing achievement in math for students of low-income is a top priority for narrowing the achievement gap (Anhalt and Cortez, 2015).

2.2.3 Effective Professional development

Birk (2013) investigated the contributions of the gaps in incomes towards the scores in mathematics, and she identified an even distribution in her studies. All students were needed

to pass a state test to achieve a diploma in her school district (2013). In 2008, only 23% of lowincome learners passed the state test. The findings from Birk's research indicated a need for increased attention to the various challenges of high school math teaching, such as: student motivation, the organization of the school, and the implementation of mathematics instructional practices effective for student achievement. She also specified a need to increase consideration on meeting the academic needs of high-achievers, as well as low-achieving learners, to reduce the achievement gap that exists between them. According to Nugent et al. (2016), mathematics teachers need to include more cooperative and active experiences in the classroom environment. The outcomes of a study carried out by Nugent et al. comparing teachers who received Professional knowledge through a summer institute combined with coaching with teachers who received no intervention. Teachers who received coaching had significant gains compared to the control teachers. Results indicated that interacting with math instructional coaches was a positive experience for teachers because the coaches offered lessons for development to teachers. Additionally, the coaches provided support for teacher ideas, observed and gave feedback, and helped teachers with understanding the concepts presented in the PD. This approach of PD required teachers to formulate lessons and teach mathematical concepts through guided inquiry as a method of instruction (Aschermann and Klenzan, 2015).

2.3 Empirical studies

The issue of teacher as a factor that affects students‟ academic performance has received a lot of attention in the literature and findings have been mixed and inconclusive. A strand of the literature revealed that a number of teacher variables which include years of teaching experience, level of educational attainment or academic qualifications, teacher development programmes, availability of qualified teachers, teacher-student ratio, teacher attitude, degree of job satisfaction, motivation and salary affect students‟ learning outcomes (Daso, 2013; Akpo,

2012; et al), (Odiri, 2011;Ewetan, 2010; Akinsolu, 2010; Adesoji and Olatunbosun, 2008; Bressoux 2008; Adeyemi, 2008; Abu and Fabunmi, 2005). Another strand of the literature found that a number of teacher variables which include teacher years of experience, teacher academic attainment or qualifications, teacher-student ratio, and teacher development programmes had no significant influence on students‟ academic performance (Yara and Surumo, 2012; Ayodele and Ige, 2012; Zaku, 1983).

Akpo (2012) examined the impact of teacher-related variables on students‟ junior secondary certificate mathematics results in Namibia using questionnaire, multi-correlation and regression analysis and found that teacher educational qualifications, teaching experience, subject specialization, standards-based professional development, standard-based classroom activities, and classroom management beliefs are related to students‟ academic achievement in JSC Mathematics. Similar study by Daso (2013), on teacher variables and senior secondary students‟ achievement in Mathematics in Rivers State, Nigeria, reported that there is a significant relationship between teachers‟ method of teaching, teachers‟ attitude, teacher quality and students‟ achievement in Mathematics. Akinsolu (2010) investigated teachers and students‟ academic performance in Nigerian secondary schools and its implications for planning using questionnaire, Anova and Spearman Rank Correlation coefficient and found that teachers‟ qualifications, years of experience, and teacher-student ratio were significantly related to students‟ academic performance. In their study on “Student, Teacher and School Environment Factors as Determinant of Achievement in Senior Secondary School Chemistry in Oyo State, Nigeria, Adesoji and Olatunbosun (2008), adopted an ex-post facto research type and used four sets of instruments. They found that 7.2% of the total effect on achievement in chemistry was accounted for by all the seven predictor variables when taken together. It was also revealed that only four variables, school location, laboratory adequacy, teachers‟ attitude to chemistry teaching, and teachers‟ attendance at chemistry workshop had direct causal

influence and significantly contributed to the prediction of achievement in chemistry. In a similar study of the relationship among teacher variables and adult learners‟ academic performance in the part-time sub-degree programme of the University of Ibadan in Nigeria, Abu and Fabunmi (2005) discovered that there is a significant and positive relationship between teacher's qualification, age, years of experience, teacher-learner's ratio, and adult learners‟ academic performance.

Chhinh and Tabata (2003) in their study on the effects of selected teacher factors on the Mathematics achievement of urban primary school pupils in the state of Cambodia, used questionnaires and achievement test to construct an index of academic performance. The results of the stepwise regression analysis revealed that teachers‟ economic status, their years of teaching experience and job satisfaction have statistically significant relationships with the achievement of the pupils whose economic status had been held constant. However, these three teachers‟ variables explain only about 20 percent of the variance in the pupil learning achievement. In a similar study on the impact of different teacher and class characteristics on third graders‟ outcomes in Germany, Bressoux et al (2008) found that teachers‟ training substantially improves students‟ test scores in Mathematics, and small class is more beneficial to low-achieving students within classes, and to all students in low achieving classes.

In a study of the relationship between teachers‟ effectiveness and students‟ academic performance in public secondary schools in Delta State, Nigeria, Akiri and Ugborugbo (2009) using correlation, simple regression, t-test, and single factor analysis of variance found that effective teachers produced better performing students. However, the observed differences in students‟ performance were statistically not significant. Adu and Olatundun (2007) in a study on teacher's perception of teaching as correlate of students‟ academic performance in Oyo State, Nigeria, found that, the relationship between teachers‟ perception and students‟

academic performance is positive and significant, and that qualification has no significant effect on students‟ performance.

Abuseyi (2001) examined student and teacher related variables as determinants of secondary school student academic achievement in Chemistry in Epe and Ibeju-Lekki Local Government Areas of Lagos State, Nigeria, using questionnaire, and adopted an ex-post facto design. He found that teacher age, teacher gender, qualifications, and experience had direct causal effect on students‟ achievement in Chemistry. Ayodele and Ige (2012) examined the relationship between utilization of teachers and students‟ academic performance in senior secondary schools in Ondo State, Nigeria, using questionnaire, descriptive survey, and ex-post factor design. The results of the multiple regression analysis and t-test statistic revealed that the effective utilization of teachers rather than its mere availability impacts students‟ academic performance. Adeyemi (2008) examined teachers‟ teaching experience and students learning outcomes in the secondary schools in Ondo State, Nigeria, using questionnaire. The result of the chi-square test, correlation analysis, and t-test statistic revealed that teachers‟ teaching experience was significantly related to students‟ learning outcomes.

The literature reviewed above show clearly that teachers play a significant role in ensuring excellent academic standards measured by students‟ learning outcomes in both developed and developing countries. This study is another attempt to shed more light on the connection between teacher Professional knowledge and students‟ academic performance within the context of education in a developing country.

2.4 Summary of Literature Review

This paper presented some theoretical concepts which may prove to be useful in studying teachers' professional knowledge. It also showed some evidence suggesting that a different view of the teacher's knowledge and professional activity may be fruitful in studying mathematics teaching.

Recent research has most emphasized teachers' conceptions and beliefs. We may also study teachers' images (a clearly less evaluative concept), practical principles and rules of practice (more directly related to teachers' actions), and how these relate to teachers' agendas and scripts in specific lessons. We should be looking for the internal integration of the different levels of the structure of teachers' professional knowledge as well as for their ability to guide actual practice in a variety of contexts.

The difficulty in integrating problem solving into the mathematics curriculum is a feature common to all these teachers. Júlia presents her students with situations with a problem solving flavour, but does not value specific problem solving activities or students' learning of problem solving strategies. Isaura proposes many problem solving tasks, but does not explore them to their full potential. She is aware that sometimes things do not go very well but has trouble in understanding the specific nature of the difficulties. Carolina agrees that problem solving activities would be desirable but simply does not feel comfortable in doing them and chooses to work in other directions.

Practice, an inherently complex and unpredictable realm, has its own specific characteristics that need to be valued on its own right. Teachers work within many constraints (of which we need a better understanding) but still create quite sensible solutions for their practical situations. Innovative curriculum orientations, such as problem solving, need to be studied more closely from the point of view of practitioners.

There is a need to keep discussing general models and concepts of teachers' professional knowledge as well as carrying specific studies on the external influences and on the internal development processes. Such research may provide important guidance for the development of new professional development programs and promote a better account of the role of the teacher in curriculum development initiatives. To be successful, research in this field needs to include a strong participation of teachers where they are granted the role of active partners speaking on

their own voice (Jaworski, 2012). This collaborative process may turn out to be a most valuable key for a better understanding and improvement of mathematics education.

CHAPTER THREE

3.0 RESEARCH METHODOLOGY

3.1 Research Design

In carrying out the study. A descriptive survey and correlational research design was adopted. According to Uzoagulu (2011) define survey research as the gathering of information about a large number of people or objects by studying a represent active. Sample of the entire group through the use of questionnaire and correlational research design according to McCombes (2019) correlational research design measures a relationship between two variables without the researcher controlling either of them, it aims to find out whether there is either positive, negative or zero correlation. Therefore, a descriptive correlational design was adopted to describe the relationship among variables. Quantitative data will be obtained from a descriptive correlational research design which involves the uses of questionnaire to seek information from staffs and students of public senior secondary schools in Chanchaga Local Government, Minna, Niger State.

This research design is suitable for this research since it will enable the researcher to gather broader data and provide more comprehensive explanation of professional knowledge development in mathematics.

3.2 Population of the Study

The study population comprises of fifty-two (52) public Senior Secondary School Mathematics teacher's in Chanchaga Local Government secondary schools, which contain of 12 senior secondary schools and total numbers of 1280 students (according to Niger State ministry of Education, Department of planning, Research and statistics report 2021). They were selected by researcher because they are directly involved in the teaching and learning process. Consequently, they will provide reliable information for the conduct of this study.

3.3 Sample and Sampling Techniques

In selecting the various Teacher's in Chanchaga Local Government secondary schools, the simple random sampling method was used. The sampling method gave each school the opportunity to be selected. The Population sampling is conducted using Krejcie-Morgan formulae so, forty-nine (49) teachers and nine hundred (900) was sampled for the investigation in Chanchaga local government secondary schools,

The lottery type of simple random sampling method was used to sample both teachers. This process was repeated till the teachers in the sample were sampled.

3.4 Research Instrument

The Research Instrument the researcher adopts to collect data was Likert - scale structure questionnaire title Teachers Appraisal of the Teaching professional knowledge and general pedagogical knowledge, and documentation review, checking of student broadsheet to gather students' academic achievement. The questionnaire consists of five sections, section A was designed for collection of teachers' bio-data which included: gender, age, Section B has 6-items, measures factors that contribute to the teacher professional knowledge, Section C measures has 20-items professional skills and knowledge, section D has 6-items measures, Teaching and professional knowledge and section E has 5-items measures Teachers' knowledge about learners. The questionnaire is a very concise, replanted set of questions designed to yield specific information to meet a particular need for research information about a pertinent topic. The instrument was designed on five points Likert types scale such that a respondent selects an opinion against a particular statement. The response categories were as follows: 1 Not at all, 2 Not very, 3 Neutral, 4 Somewhat, 5 Essential. Questionnaire will be used because it can be completed at the respondents' convenience, has wider geographical coverage and offer greater assurance of anonymity so can elicit more candid and more objective replies.

3.5 Validation of the Instrument

The instrument was validated by two experts (lecturers) of Federal university of Technology Minna, Niger State. The experts are professional from Science Education, General Studies Departments of Federal University of Technology science education lecturer in verifying face and content validity of the questionnaires. The professional science education lecturer assess the relevance of the content used in the research instruments and necessary modifications were made based on their feedback. Content validity of research instruments is judge by the researcher and experts in the field.

3.6 Reliability of the instrument

A trial test was conducted on Teachers and students in Bosso Local Government to determine the reliability coefficient of the instrument using split-half reliability method on a randomly sample size of 30 students and 30 teachers. The statistical package for social sciences (SPSS) was used to compute the internal consistency of the research question. Therefore, the internal consistency calculated for each research questions is as follows. A = 0.77, B = 0.70, D = 0.75 E = 0.79. the overall reliability coefficient of the instrument was 0.71 indicating that the instrument has a high reliability. The items in the questionnaire were internally consistent in measure what is intended to be measured for the study.

3.7 Method for Data Collection

The researcher went to Niger State ministry of Education, Minna department of planning, research and statistics, to collect data on public senior secondary school students' and teacher enrolments. The researcher went to each schools and copies of the questionnaire were administered personally to the teachers in their schools. Before administering the questionnaires to the teachers, the purpose and significance of the study will be make known to them. After the administration of copies of questionnaire, to the teachers, they were allowed to respond to the items in the questionnaire. After that the questionnaires were collected on that

same day for further data collation and analysis. The rate of return will be hundred percent and collected for data analysis. Relative importance of the study as determined by the respondents and the quality and design of the questionnaire are the factors that affect percentage rate of return of copies of the questionnaire (Key, 2018).

3.8 Method of Data Analysis

The data collected for the study was analyzed using mean, Standard deviation and correlational regression. The mean and standard deviation was used to answer the research question while the correlation regression was used to test the null hypotheses.

CHAPTER FOUR

4.0 RESULTS AND DISCUSSION

4.1 Distribution of the Sample

Table 4.1.1 Distribution of the Sample

GENDER	FREQUENCY	PERCENTAGE (%)
MALE	21	42.5%
FAMALE	28	57.5%
TOTAL	49	100%

Source: Researcher 2021

The table 4.1 above provides the frequency distribution for the mathematics teachers been sampled, the table show that numbers of respondent were 49, where male are 21 and 28 female teachers. The 42% of the respondents are male while 57% of the respondents are female.

4.2.1 Research Question 1:

What are the level of teachers' professional knowledge and skills on students' academic achievement in public senior secondary schools in Chanchaga Local Government?

Table 4.2.1 Analysis on levels of professional knowledge and skills effect on student academic mathematics achievement

S/N		NA	NV	N	S	E	MEAN	SD
1.	Pedagogical psychology	14%	20%	18%	24%	22%	3.08	2.71
2.	Interpersonal relationships in schools	20%	16%	4%	28%	30%	3.33	3.14
3.	Student problems	30%	10%	8%	30%	20%	3.00	2.82
4.	Lesson planning	22%	18%	14%	20%	24%	3.06	2.78
5.	Teaching methods	8%	16%	24%	12%	38%	3.57	3.09
6.	Teaching goals and aims	18%	20%	10%	12%	19%	3.33	3.10
7.	Teaching evaluation	24%	12%	16%	16%	20%	3.10	2.83

8.	Teacher's role	24%	4%	16%	14%	30%	3.16	2.89
9.	Forms of teaching	30%	22%	10%	16%	20%	2.72	2.55
10.	Student Performance Evaluation	8%	18%	26%	24%	22%	3.35	2.79
	GRAND MEAN						3.17	2.87

From table 4.2 above, the grand mean of the 10 items used to answer Research question one, is 3.17 which is greater than median of Likert scale, hence it's agreed that Teachers Professional Knowledge and skills affects student's academic achievement.

4.2.2 Research question 2

What are the level of teachers' teaching methodology on students' mathematic achievement in public senior secondary schools in Chanchaga Local Government?

Table 4.2.2 Analysis on level of teachers' teaching methodology effect on student academic mathematics achievement

S/N		NA	NV	N	S	E	MEAN	SD
1.	Allow students to speak	20%	10%	34%	16%	18%	3.02	2.42
2.	Adopt innovative teaching methods	26%	30%	8%	4%	30%	2.82	2.69
3.	Opt for group teaching	18%	20%	14%	30%	16%	3.06	2.71
4.	Give descriptive assessments	6%	24%	24%	28%	16%	3.24	2.68
5.	Use new technology	18%	34%	24%	12%	10%	2.61	2.05
6.	Use the project method	32%	24%	16%	20%	6%	2.43	2.04
	GRAND MEAN						2.86	2.87

From table 4.3 above, the grand mean of the 6 items used to answer Research question two, is 2.86 which is greater than median of Likert scale, hence it's agreed that teaching methodology affects student's academic achievement.

4.2.3 Research question 3

What are the level of teachers' students' knowledge on students' mathematics achievement in public senior secondary schools in Chanchaga Local Government?

Table 4.2.3 Analysis on level of teachers' students' knowledge effect on student academic achievement

S/N		NA	NV	N	S	E	MEAN	SD
1.	Allow students to speak	4%	22%	36%	20%	16%	3.22	2.48
2.	Discuss classroom problems with students	16%	18%	4%	20%	40%	3.51	3.31
3.	Discuss student performance with students	20%	38%	2%	18%	20%	2.80	2.66
4.	Discuss the personal problems of Students with students	18%	28%	12%	16%	24%	3.00	2.73
	GRAND MEAN						3.13	2.80

From table 4.4 above, the grand mean of the 4 items used to answer Research question two, is 3.13 which is greater than median of Likert scale, hence it's agreed that teachers' students' knowledge affects students' academic achievement.

4.3 Testing of Hypotheses

The purpose this research hypothesis was to choose between two competing hypotheses about the value of a population parameter. This was analyzed through running a regression analysis and using p value static at 5% level of significant of relationship.

$H0_1$: There is no significant relationship between teachers' professional knowledge and skills on students' mathematics academic achievement at public senior secondary schools in Chanchaga Local Government.

Table 4.3.1 Teachers' professional Knowledge and skills on Students' Academic Performance Model summary.

Model	R	R square	Adjusted R square	STD Error of the estimate
1	.265	.070	.023	1.269

a. predictors: (Constant). Teachers' Professional knowledge.

The coefficient of correlation (R) between teachers' professional knowledge and skills on students' academic mathematics achievement was 0.265 indicated a positive relationship between teachers' professional knowledge and skills on students' academic performance. The coefficient of determination of 0.070 indicated that 7% of students' academic performance could be explained by teachers' professional knowledge and skills. Therefore, the effect of teacher's professional knowledge and skills accounts for a variation of 7% on the students' academic performance. The standard error of estimate (1.269) showed the average deviation of the independent variables from the lie of best fit.

Table 4.3.2 Teachers' professional Knowledge and skills and Students' Academic Performance Model ANOVA

	df	Sum of Square	Mean Square	F	Significance F
Regression	1.000	1.215	1.215	0.754	0.406[b]
Residual	10.000	16.111	1.611		
Total	11.000	17.326			

a. Dependent Variable: Students' Academic Performance
b. Predictors: (Constant). Teachers' Professional Knowledge

The findings revealed (F=0.754, p value = 0.406[b]). The results indicate that the significance of F is 0.754 which is greater than 0.05, therefore, implies that the regression model statistically significantly in predicts the outcome variable, therefore, it fit for the data. This is an indication that there exists a significant relationship between teachers' professional knowledge and skills on students' academic achievement. The study hypothesized that there's no significant relationships between teachers' professional knowledge and skills on students' academic performance. The results are presented in Table 4.3.3

Table 4.3.3 Teachers' professional Knowledge and skills and Students' Academic Performance Model Coefficients

Model		Unstandardized Coefficients		Standardized coefficient	t	Sig.
		B	STD Error	Beta		
1	Constant	0.745	2.223		0.335	0.101
	Variable X	0.049	0.056	0.265	0.868	0.406

The study findings indicated that there was a positive significant relationship between teachers' professional knowledge and students' academic performance (β= 0.265, t= 0.868 and p value 0.406). This therefore, means that an increase of in teachers' professional knowledge will increase students' academic performance significantly. Since the p-value is .406 the result is not significant at p<.05 hence, the null hypothesis that there's no significant relationships between teachers' professional knowledge and skill on students' academic performance is accepted.

$H0_2$: There's no significant relationships between teachers' teaching methodology on student academic achievement senior secondary schools at Chanchaga Local Government

Table 4.3.4: Teachers' teaching methodology and Students' Academic Performance Model summary.

Model	R	R square	Adjusted R square	STD Error of the estimate
1	.147	.022	.076	1.566

a. predictors: (Constant). Teachers' teaching methodology.

The coefficient of correlation (R) between Teachers' teaching methodology and academic mathematics achievement was 0.147 indicated a positive relationship between Teachers' teaching methodology on students' academic performance. The coefficient of determination of 0.022 indicated that 2% of students' academic performance could be explained by Teachers'

teaching methodology. Therefore, the effect Teachers' teaching methodology account for a variation of 2% on the students' academic performance. The standard error of estimate (1.566) showed the average deviation of the independent variables from the lie of best fit.

Table 4.3.5: Teachers' teaching methodology and Students' Academic Performance ANOVA

	df	Sum of Square	Mean Square	F	Significance F
Regression	1.000	0.542	0.542	0.221	0.648[b]
Residual	10.000	24.055	2.541		
Total	11.000	25.055			

a. Dependent Variable: Students' Academic Performance
b. Predictors: (Constant). Teachers' Professional Knowledge

The findings revealed (F=0.221, p value = 0.648[b]). The results indicate that the significance of F is 0.648, therefore, implies that the regression model statistically significantly in predicts the outcome variable. This is an indication that there's exists a significant relationship between Teachers' teaching methodology on students' academic achievement. The study hypothesized that there's no significant relationships between Teachers' teaching methodology on students' academic performance. The results are presented in Table 4.3.6

Table 4.3.6: Teachers' teaching methodology and Students' Academic Performance Model coefficients

Model		Unstandardized Coefficients		Standardized coefficient		
		B	STD Error	Beta	t	Sig.
1	Constant	0.160	2.742		0.058	0.005
	Variable X	0.033	0.070	0.147	0.470	0.648

The study findings indicated that there was a positive significant relationship between Teachers' teaching methodology and students' academic performance (β= 0.147, t= 0.470 and p value 0.648). This therefore, means that an increase of in teachers' professional knowledge

will increase students' academic performance significantly. Since the p-value is .648 the result is not significant at p<.05 hence, the null hypothesis that there's no significant relationships between Teachers' teaching methodology on students' academic performance was accepted.

H03: There's no significant relationships between teachers' students' knowledge on student academic achievement at senior secondary schools, Chanchaga Local Government.

Table 4.3.7: Teachers' students' knowledge on Academic Performance Model summary.

Model	R	R square	Adjusted R square	STD Error of the estimate
1	.147	.022	.076	7.043

a. predictors: (Constant). Teachers' students' knowledge.

The coefficient of correlation (R) between Teachers' students' knowledge and academic mathematics achievement was 0.147 indicated a positive relationship between Teachers' students' knowledge on students' academic performance. The coefficient of determination of 0.022 indicated that 2% of students' academic performance could be explained by Teachers' students' knowledge. Therefore, the effect Teachers' students' knowledge account for a variation of 2% on the students' academic performance. The standard error of estimate (1.566) showed the average deviation of the independent variables from the lie of best fit.

Table 4.3.8: Teachers' students' knowledge and Students' Academic Performance ANOVA

	df	Sum of Square	Mean Square	F	Significance F
Regression	1.000	11.023	11.542	0.222	0.647[b]
Residual	10.000	496.048	49.605		
Total	11.000	507.071			

a. Dependent Variable: Students' Academic Performance
b. Predictors: (Constant). Teachers' Professional Knowledge

The findings revealed (F= 0.222, p value = 0.647[b]). The results indicate that F is 0.647 this, therefore, implies that the regression model statistically significantly in predicts the outcome.

This is an indication that there exists no significant relationship between Teachers' students' knowledge on students' academic achievement. The study hypothesized that there's no significant relationships between Teachers' students' knowledge on students' academic performance. The results are presented in Table 4.3.9

Table 4.3.9: Teachers' Students' knowledge and Students' Academic Performance Model coefficients

Model		Unstandardized Coefficients		Standardized coefficient		
		B	STD Error	Beta	t	Sig.
1	Constant	39.578	2.486		15.992	0.000
	Variable 1	-0.646	1.370	0.147	-0.471	0.647

The study findings indicated that there was a positive significant relationship between Teachers' students' knowledge and students' academic performance (β= 0.147, t= 15.992 and p value 0.647). This therefore, means that an increase in teachers' students' knowledge will increase students' academic performance significantly. Since the p-value is .647, the result is not significant at p<.05 hence, the null hypothesis that there's no significant relationships between Teachers' students' knowledge on students' academic performance was accepted.

4.4 Discussion of findings

This section summarizes the results of the study, and includes a discussion of the results. It is organized around each of the three research questions and hypotheses that were the focus of the study.

According to this finding the researcher raised three research questions. A statistically positive relationship was found between teacher's professional knowledge and student's academic achievement at the level of (r = 0.265, 0.147, 0.147) respectively, which indicates the positive relationship. The theory applied was describe approaches based on the constructivism theory

which stresses the importance of joint planning, analysis of learner needs, and formulation of learning objectives based on the needs and interests of the participants (Richards and Rodgers, 2014). Akinsolu (2010) investigated teachers and students' academic performance in Nigerian secondary schools and its implications for planning using questionnaire, Anova and Spearman Rank Correlation coefficient and found that teachers' qualifications, years of experience, and teacher-student ratio were significantly related to students' academic performance. Also Adesoji and Olatunbosun (2008), adopted an ex-post facto research type and used four sets of instruments. They found that 7.2% of the total effect on achievement in chemistry was accounted for by all the seven predictor variables when taken together. It was also revealed that only four variables, school location, laboratory adequacy, teachers' attitude to chemistry teaching, and teachers‟ attendance at chemistry workshop had direct causal influence and significantly contributed to the prediction of achievement in chemistry.

The researcher raised three hypotheses which guide the study, from the hypotheses raised, the researcher found out that the results students' academic performance of correlation with Teachers' professional knowledge was not significant at $p<.05$, the researcher found results strand of the literature found that a number of teacher variables which include teacher years of experience, teacher academic attainment or qualifications, teacher-student ratio, and teacher development programmes had no significant influence on students' academic performance (Yara and Surumo, 2012; Ayodele and Ige, 2012; Zaku, 2013)

4.5 Summary of findings

Study involved 12 senior secondary schools and 49 Senior secondary school mathematics teachers in Chanchaga local government, Minna metropolis. The study used descriptive quantitative survey instruments: Theory of teacher's professional development was revealed. Descriptive statistics were calculated and reported for teacher's participating in this study were public senior secondary school mathematics teachers in Chanchaga local government, Minna

metropolis. The majority of the teacher participants were experienced in the field; professional Teachers were reasonably distributed across the senior secondary grade levels.

Regression statistics were used to test the three research hypotheses. The hypotheses were tested with the Pearson Product Moment Correlation.

Results indicate there is no statistically significant relationship between teachers' professional knowledge and skills on student's academic achievement in mathematics. However, the F significant value is positive which implies that, increase in teachers' professional knowledge can affect students' academic achievements in mathematics.

CHAPTER FIVE

5.0 SUMMARY, CONCLUSION AND RECOMMENDATIONS

5.1 Summary

The study investigates the relationship between professional knowledge and mathematics academic achievement in Senior School in Chanchaga Local Government, Niger state. The purpose of this study was to determine the strength of relationship between teacher professional knowledge and skills and mathematics achievement in examination. Three research questions and three null hypotheses was structured in the study and they were answered in accordance to the studies aim and objectives. The study covered the whole twelve senior secondary schools in Chanchaga LGA. The related literature was reviewed in this study. Also, research design adopted in this study is a descriptive survey design. The instruments adopted for the data collection in this study was structured Likert scale questionnaire. Data was analyzed using SPSS 16. The statistical tools use to analyze the data were Pearson correlation, mean and standard deviation. The result showed that there is a positive relationship between teacher professional knowledge and mathematics achievement which increase in teacher professional knowledge will led to students' academic Achievement increases.

5.2 Conclusion

From the results of the study, the researcher concludes that teachers' professional Knowledge and skills influence students' academic achievement. Teachers' teaching methodology influence students' academic achievements, and also teachers' students' knowledge influence students' academic achievements. The researcher concludes that statistically there's no significant relationship between teacher's professional knowledge, teaching methodology, and teachers' students' in academic achievements in mathematics

5.3 Recommendation

The teachers should therefore be provided with the study leaves or designed other Appropriate times that can allow a reasonable number of them enhancing their professional Knowledge and skills and applications of mathematical theory aspect rather than abstract.

Appropriate ways of funding should be made available by Nigeria Government and Teachers' Registration Council of Nigeria (TRCN) to teachers in the field of mathematics so as to influence their professional knowledge and skills application.

The mathematics should practical in teaching rather than the abstract at senior secondary levels so as to motivate and improve learners' performance the examinations.

The secondary school's principals should be encouraged to reinforce the uses of innovative teaching methodologies ways of teaching by the mathematic school teachers. This can be done by the school management organized seminars for teachers to enlighten them on the advantage of adopting technology innovative way and creativity teaching mathematics, supporting activities that are geared toward improving their teaching method.

The schools and teachers should form a good interactions and relationships with student parents and students so as to increase the academic achievement of the students, so as to solve the problems of teaching and learning encounters by the students.

5.4 Limitations of the Study

There are several problems with defining teacher professional knowledge solely in this way:

1. **Teachers are not exclusively responsible for students' learning**. An individual teacher can make a huge impact; however, student learning cannot reasonably be attributed to the activities of just one teacher—it is influenced by a host of different factors. Other teachers,

peers, family, home environment, school resources, community support, leadership, and school climate all play a role in how students learn.

2. **Consensus should drive research, not measurement innovations**. Trends in measurement can be influenced by the development of new instruments and technologies. This is referred to as "the rule of the tool": if a person only has a hammer, suddenly every problem looks like a nail (Mintzberg, 2011). It is possible that the increase in data linking student achievement to individual teachers and new statistical techniques to analyze these data are contributing to an emphasis on measuring teacher effectiveness using student achievement gains (Drury &Doran, 2013; Hershberg, Simon, and Lea-Kruger, 2014; The Teaching Commission, 2014). This, in turn, may result in a narrowed definition of teacher effectiveness. Instead, important aspects and outcomes of teaching should be defined first; then, methods should be used or created to measure what has been identified. In other words, define the problem; then choose the tools.

3. **Test scores are limited in the information they can provide**. Information is not available for some non-tested subjects and certain student populations. Furthermore, basing teacher effectiveness on student achievement fails to account for other important student outcomes. Student achievement gains do not indicate how successful a teacher is at keeping at-risk students in school or providing a caring environment where diversity is valued. This method does not provide any additional information on student learning growth beyond the data gleaned through standardized testing. Standardized testing cannot provide information about those who teach early elementary school, special education, or untested subjects (e.g., art and music). It cannot evaluate the effectiveness of teachers who co-teach and does not capture teachers' out-of-classroom contributions to making the school or district more effective as a whole.

4. Learning is more than average achievement gains. Prominent researchers have promoted the idea that definitions of teacher effectiveness should encompass student social development in addition to formal academic goals (Brophy and Good, 2016; Campbell, Kyriakides, e*t.al* 2015). Improving student attitudes, motivation, and confidence also contributes to learning. If the concept of effective teaching is limited to student achievement gains, differentiating between these factors becomes impossible. Was a teacher deemed effective because she focused class time narrowly on test-taking skills and test preparation activities? Or did the student achievement growth in her class result from inspired, competent teaching of a broad, rich curriculum that engaged students, motivated their learning, and prepared them for continued success? Teacher evaluations should be able to distinguish the former approach from the latter.

Therefore, the following are the limitations of the study:

i. The study covered only in public senior secondary schools in Chanchaga Local Government., hence making it very difficult to generalize the whole schools in Nigeria.

ii. Only public senior secondary schools were selected for the study; private schools did not have the opportunity of being included. This might affect the generalization made on the findings as it affects the population of the study.

5.5 Contributions to knowledge

The researcher was able to bring to light that teacher professional knowledge should increase through different programs at all levels, and there should be motivation for both teachers especially student for them to have great interest and passion for both teaching and learning of mathematics.

Also, Mathematics should be done practically at all secondary school level, so as to motivate and grasp the attention of student rather than been mathematics taught as abstracts.

5.6. Suggestions for further Research

The following suggestions are made for further research based on the research work.

1. Similar study could be carried out in another in the whole Niger State
2. Other factors that contributes to students' low academics performance especially in mathematics can be investigated.
3. Similar research can be done on the same topic in a different State, also in the whole nation, Nigeria.

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FEDERAL UNIVERSITY OF TECHNOLGY, MINNA.

DEPARTMENT OF SCIENCE EDUCATION (MATHEMATICS)

MATHEMATICS ACHIEVEMENT TEST (MAT) (For The Purpose of Research Only)

Time Allowed: 1hour 30mins

Section A

Class: _____

Section B

Instruction: Please, choose the correct answers from the options lettered (a – d)

1. A cuboid is of $12cm$ long, $10cm$ wide and $8cm$ height. Find the surface area of the of the cuboid using these formular $2(lb + lh + bh)cm^2$

   (a) $592cm^2$ (b) $539cm^2$ (c) $329cm^2$ (d) $523cm^2$

2. Solve the pair of the equations simultaneously by elimination

   $3x + 4y = 1$……(i)

   $x + 7y = 15$……(ii)

   (a) $x = 1, y = -2$ (b) $x = -1, y = 2$ (c)$x = 204, y = -27$ (d) $x = -1, y = -2$

3. Solve the pair of equation by substitution method

   $2x + 3y = 8$……(i)

   $2x + y = 4$……(ii)

   (a) $x = -1, y = 2$ (b)$x = 1, y = 2$ (c) $x = -1, y = -2$ (d) $x = 2, y = 1$

4. Solve the equation by substitution

   $2x + y = 16$……(i)

   $x + 4y = 1$……(ii)

   (a) $x = 5, y = 2$ (b) $x = -9, y = -2$ (c) $x = 2, y = 9$ (d)$x = 49, y = 12$

5. Solve the quadratic equation using formular method

   $x^2 + 2x - 15 = 0$

   (a) $x = -3$ or $x = -5$ (b) $x = 2$ or $x = -5$ (c)$x = 3$ or $x = -5$ (d) $x = 5$ or $x = -3$

6. Solve the equation using formular method

   $x^2 + 7x + 10 = 0$

(a) $x = -2$ or $x = -5$ (b) $x = 2$ or $x = -5$ (c) $x = -2$ or $x = -3$ (d) $x = -1$or $x = -3$

7. Solve the equation by factorization method

   $2x^2 - 50 = 0$

   (a) $x = \pm 2$ (b) $x = \pm 6$ (c) $x = \pm 5$ (d) $x = \pm 4$

8. Calculate the volume and surface area of a cube whose side is $60cm$ using the formular $V = L^3, S.A\ 6L^2$

   (a) Volume $= 216cm^3$, Surface area $= 216cm^2$

   (b) Volume $= 216cm^2$, Surface area $= 216cm^4$

   (c) Volume $= 214cm^3$, Surface area $= 216cm^2$

   (d) Volume $= 216cm^3$, Surface area $= 213cm^2$

9. Calculate the volume of the cuboid whose length is $10cm$, breath is $6cm$ and height is $4cm$ using the formular $V = l \times b \times h$

   (a) $V = 244cm^3$ (b) $V = 220cm^3$ (c) $V = 240cm^2$ (d)$V = 240cm^3$

10. Calculate the volume of a sphere whose radius is $4cm$ using the formular $\frac{4}{3}\pi r^2$

    (a) $201.7cm^2$ (b) $201.1cm^2$ (c) $204.1cm^2$ (d) $203.1cm^2$

11. Given $y = ax^2 - bx - 12$, find the value of x when $a = 1$, $b = 7$and $y = 6$.
    (a) x = 9 or x = -2 (b) x = 4 or x = -3 (c) x = 6 or x = 9 (d) x = -2 or x = 3

12. Solve simultaneously for x and y in a given equation.
    $2x + y = 4$ ……. (1)
    $x - y = -1$ …….. (2)
    (a) $x = 3$, y = 1 (b) $x = 2$, $y = 1$ (c) $x = 1$, $y = 3$ (d) $x = 1$, $y = 2$

13. Find the value of x and y if $2x - y = 6$ and $x + y = 3$
    (a) x = 2, y = 1 (b) x = 3, y = 0 (c) x = 0, y = 3 (d) x = 1, y = 2

14. A cuboid is of $10cm$ long, $5cm$ wide and $2cm$ height. Find the surface area of the of the cuboid using these formular $2(lb + lh + bh)cm^2$

(a) $160cm^2$ (b) $110cm^2$ (c) $260cm^2$ (d) $140cm^2$

15. Calculate the volume of the cuboid whose length is $30cm$, breath is $4cm$ and height is $3cm$ using the formular $V = l \times b \times h$

(a) $V = 300cm^3$ (b) $V = 220cm^3$ (c) $V = 360cm^2$ (d) $V = 340cm^3$

FEDERAL UNIVERSITY OF TECHNOLGY, MINNA.

DEPARTMENT OF SCIENCE EDUCATION (MATHEMATICS)

MATHEMATICS ACHIEVEMENT TEST (MAT) (For The Purpose of Research Only)

MARKING SCHEME

Note: Each question carries 1 mark.

1. A
2. C
3. B
4. D
5. D
6. A
7. C
8. A
9. D
10. B
11. A
12. D
13. B
14. A
15. C