

# Senior High School Mathematics Teachers' Continuous Professional Development: Evidence from Keta Municipality in Ghana

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## To cite this article:

Nicholas Mawufemor Kojo Goka, Charles Kojo Assuah, Christopher Owu-Annan. Senior High School Mathematics Teachers' Continuous Professional Development: Evidence from Keta Municipality in Ghana. *International Journal of Secondary Education*.

Vol. 11, No. 2, 2023, pp. 49-54. doi: 10.11648/j.ijsedu.20231102.12

**Received:** July 3, 2023; **Accepted:** August 10, 2023; **Published:** August 22, 2023

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**Abstract:** To improve students' learning and academic performance, educational reforms have been proposed and implemented. One of these reforms was the introduction of teacher participation in Continuous Professional Development (CPD). The purpose of this study was to investigate the type of CPD workshops organised by stakeholders and the kind of motivation senior high school mathematics teachers get in participating in such workshops in the Keta Municipality in Ghana. The study was conducted using a phenomenology design and a semi-structured interview guide as the research instrument to collect data from the respondents. A purposive sampling technique was used to select eighteen (18) public senior high school mathematics teachers. The findings of the study show that CPD workshops that were subject-based were less organised for mathematics teachers and non-subject-based CPD workshops do not have much impact on their mathematics teaching and learning abilities. Again, some mathematics teachers participated in CPD workshops because of allowances and certificates for promotion exercises, not necessarily being motivated to improve their mathematical knowledge and competencies. The study recommends that CPD trainers should organise more subject-based workshops for mathematics teachers in senior high schools to increase their knowledge and teaching skills. Again, National Teaching Council should educate teachers on how important continuous professional development is to their teaching profession and clear the misconception that they attend CPD workshops for allowances and promotion purposes.

**Keywords:** Continuous Professional Development (CPD), Mathematics, Teachers

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## 1. Introduction

Continuous Professional Development refers to those processes and activities designed to enhance the professional knowledge, skills, and attitudes of teachers so that they might, in turn, improve the learning of students [1]. Globally, continuous professional development (CPD) is an important educational policy intervention designed in the form of training courses to help teachers stay up to date with their professional knowledge. This is based on evidence that improving teacher quality through CPD correlates strongly with student learning and achievements and the quality of schools [1]. The change in mathematics teachers' classroom practices, attitudes, and beliefs that support students' learning

through their participation in CPD workshops could be influenced by motivation. Mathematics is crucial in our lives and it is an unavoidable subject because it is used in everyday life. For example, it helps us to understand the world around us. Mathematics plays a crucial and unique role in human cultures and growth [2]. The comprehension of the physical world and its natural patterns, and ability to compute, which is related to the power of technology demonstrates the significance of mathematics in the evolution of society. In light of this remark, mathematics teachers need to improve their knowledge and classroom practices in order to prepare their students for academic work and to meet the needs of the global labour market. Mathematics teachers need to equip themselves with modern technological knowledge and skills

in order to provide curriculum-aligned lessons for their students, and this can be achieved through continuous professional development [11].

In this regard, there is a need to examine the type of CPD workshops organized by stakeholders and the kind of motivation senior high school mathematics teachers get in participating in such workshops in Ghana.

The study was guided by the research questions below;

- 1) What types of continuous professional development workshops have been organised by stakeholders for senior high school mathematics teachers in the Keta Municipality in Ghana?
- 2) What motivates senior high school mathematics teachers' participation in continuous professional development workshops in the Keta Municipality in Ghana?

## 2. Literature Review

There are criticisms about the quality of teachers, common problems in curricula of various institutions preparing teachers to teach, the competences and knowledge that graduates acquire, and so on have been expressed in relation to the routes into the teaching profession [3]. This is due to the frequency of out-of-field-subject teachers who teach subjects they have not received formal training on or have no experience gathered [4]. Although this practice is common in other developing countries it is especially prevalent in rural schools in Ghana where there is a shortage of teachers [5, 6]. The design of the educational system has drawn criticism not just in Ghana but in other nations as well. An international review of literature on teachers' professional development has criticised teacher education systems in developed and developing countries, citing poor curricula, low qualifications of candidates entering the teacher profession, overreliance on theoretical teaching methods, and unsatisfactory teacher quality [7, 8]. These issues have an effect on the teacher education system in Ghana and have contributed to the rising level of dissatisfaction with the initial teacher preparation. Concerns have been raised about the disconnection between the training provided by teacher education institutions and the reality of teachers' work in today's classrooms, schools, and communities. There is also the issue of the type of professional knowledge that teachers acquire and whether the teacher training programmes are providing adequate subject-matter understanding to teachers in their respective fields [9]. Despite the growing body of literature suggesting CPD activities as a panacea for teacher quality deficiency, most CPD programmes fail to address teachers' subject matter knowledge and their teaching practices [10].

## 3. Methodology

### 3.1. Research Design

This study was conducted using a descriptive phenomenology design to find out what type of continuous

professional development workshops have been organized by stakeholders for senior high school mathematics teachers and what motivates their participation in continuous professional development workshops in the Keta Municipality in Ghana. This design was appropriate for this study because it focuses on the phenomena that we know about but do not fully understand. Again, various types of phenomena occur in the world in which we live and we may encounter such phenomena in different ways in our daily lives but we do not fully understand them because of our familiarity [12]. Studies that aim to explore the phenomenon that we are familiar with, but do not understand well constitute appropriate bases for phenomenology. This study which was conducted using the descriptive phenomenology design has the concept of "CPD workshop" as its phenomenon. The descriptive phenomenology design is suitable for the study because mathematics teachers have lived experiences and are still living through CPD activities so they have a better feel of the phenomenon and can tell a better story than anybody else.

### 3.2. Participants and Sampling Technique

The participants were eighteen (18) public senior high school mathematics teachers in the Keta municipality in Ghana. The study participants were drawn from seven (7) public senior high schools within Keta municipality. The sampling technique employed for the study was purposive sampling. The sample included seventeen (17) male mathematics teachers and one (1) female mathematics teacher. Only one (1) female mathematics teacher was included in the study because female mathematics teachers were not in the schools except one (1) senior high technical school within the Keta municipality. The average age of the participants was forty-three (43) years. In addition, most participants hold bachelor's degrees in mathematics education, and their years in teaching mathematics range from ten (10) to twenty-five (25) years.

### 3.3. Instrumentation, Validity, and Reliability

The instrument employed for this study was a semi-structured interview guide. The semi-structured interview guide was pre-tested with two (2) colleague teachers at Bright Star School (not real name) in the Anloga District in Ghana. This was done to test the interview questions and to gain some practice in interviewing as well as to identify flaws or limitations within the interview design that need modifications to the major study. As a result, we assessed whether the language, wording, phrases, sequence, and concepts used in the questions were good to measure what it was intended to measure. The pre-tested interview guide revealed that some of the interview questions required reframing pertaining to its language, wording, and relevance. So, we employed two peer debriefers with in-depth knowledge of qualitative study who helped in the modification of the questions with wrong wordings and phrases. Again, leading and rhetorical questions were also removed. This was necessary because if the questions are too

much or the conversation is too long, the participant may get tired and may become unwilling to answer the rest of the questions. The debriefers made sure that the interview guide was good to measure what it was intended to measure. Again, trustworthiness in the form of credibility, confirmability, dependability, and transferability was ensured [13, 14].

### 3.4. Data Collection Procedure and Analysis

Prior to the distribution of the questionnaire, permission was sought from the authorities of the senior high and senior high technical schools where the study was conducted. The senior high and senior high technical school administration's approval was required before contacting the mathematics teachers who were selected to take part in the study. Before the interview has begun, the participants were told the conversation would be recorded but they were given assurance that both the recordings and their names would be kept confidential so that they can freely share their feelings and thoughts. Again, the study's purpose was explained to them briefly. The interview was done in the participants' schools during pre-arranged hours. Thus, the interviews were conducted in the teachers' free time to avoid any time restrictions. An in-depth face-to-face interview was then conducted with the participants individually to safeguard their anonymity. In addition, the researchers took personal observation notes to interpret some non-verbal communication signs during the interview. In all, four open-ended questions (in 2 categories) were asked during the interview. Probing questions were directed to the participants to comment on or provide their opinions. The interview was entirely conducted in English. All participants were asked the same questions and every interview lasted half an hour (thus, 30 minutes). All participants who voluntarily agreed to be interviewed were engaged in the study.

The semi-structured interview of the study was tape-recorded verbatim and later transcribed. The researchers read and re-read the transcript to check the consistency between the audio recording and the transcribed data. The transcripts were given to a peer debriefer to comment on the appropriateness of the text regarding whether the information obtained represented exactly what the interviewees said during the interview. It was specifically intended for the debriefer, who had experience in qualitative research, to offer an extra, occasionally opposing perspective of the coding process and to urge the researcher to notice sensitising thoughts as they may influence the work [15]. The researchers were concerned about addressing specific research questions with this in mind; the researchers coded each segment of data that was relevant to the research questions. The researchers generated initial codes by analysing the data paragraph by paragraph but did not code every piece of text because the researchers used open coding, which means the researchers did not have pre-set codes but developed and modified the codes as they work through the coding process. The researchers worked through each transcript coding every segment of the text that seemed to be relevant to the research questions. The researchers did this by

hand initially, working through hardcopies of the transcript with pens and highlighters. The thematic analysis technique is identified as an avenue to understanding issues more widely [16]. Similarly, thematic analysis is in the form of identification, analysing, and reporting of patterns in the data collected during interviews [17]. The emerging themes from the qualitative data were re-categorized into two frames based on the study's research questions: (i) Organised CPD types for mathematics teachers (ii) Motivating factors for Math teachers' CPD workshop participation.

## 4. Findings and Discussion

This section deals with the discussion of data from the field to address the research questions that were formulated to guide the study.

Research Question One (1): *What types of continuous professional development workshops have been organized by stakeholders for senior high school mathematics teachers in the Keta Municipality in Ghana?*

This research question sought to find out from the participants the type of continuous professional development workshops that have been organized by the stakeholders for senior high school mathematics teachers in their municipality. Based on that, thematic analysis was conducted from the respondents' interview responses, and two themes emerged that is (1) subject-based workshop, and (2) non-subject-based workshop.

### (1) Subject-Based Workshop

Some of the CPD workshops stakeholders organised for teachers in the Keta Municipality in Ghana were based on a specific subject that aimed to improve the capacity of teachers with relevant content and pedagogical knowledge in their classroom competencies and support student learning. According to the data, almost half (thus, 7 mathematics teachers) of the participants indicated that they participated in a subject-based workshop that stakeholders have organised for them, while teachers acknowledged their infrequent participation in them. They nonetheless described its usefulness to their professional development as follows:

For instance, one teacher said:

*I participated in a workshop that was organised by GES three years ago. It was a classroom-based workshop for only form three mathematics teachers. We were taken through some important topics in mathematics such as Geometry, Trigonometry, and Globe as a solid figure. I learnt new methods in teaching those topics which I wasn't taught – (Teacher 18).*

Another teacher described his experience as:

*Yes, I participated in three (3) CPD workshops. One was organised by the Mathematics Association of Ghana (MAG), another on Exam ethics, and the most recent one was organised by National Teaching Council (NTC). In the first two workshops, we were educated on the number of weeks we are to spend on teaching a topic in the syllabus. I mean mathematics syllabus; and how to make lessons practical to students- (Teacher 15).*

These comments show that some of the CPD workshops which were organised for senior high school mathematics teachers were tailored towards mathematics teaching and learning. In my personal observation, descriptions from teacher “18” and teacher “15” were in place except that these CPD workshops are not frequently organised. The above findings are in line with the research [18] they asserted that teachers are the architects of a country’s future. They encourage the general public to pursue societal progress; therefore, it is essential to fulfilling their training needs. Also, the findings are in agreement with the research [19] sharing the same view that teachers are the key entities in charge of fostering students’ development.

## (2) Non-Subject-Based workshop

The thematic analysis of teachers’ interview data revealed that some of the organised CPD workshops were far from mathematics teaching and learning. In the data, 14 participants mention “teacher licensure” as an example of such a workshop although it focuses on their job security. Participants in this study said that although the organised CPD workshop did not meet their needs as mathematics teachers; they still participated in order to obtain the required points and certifications to renew their teaching licenses.

Mathematics teachers who attended non-subject-based workshops responded to the interview questions as follows;

One of the teachers said:

*I would like to make it clear that the programme has not affected my capacity to effectively teach mathematics in the classroom. Honestly, the programme had nothing to do with mathematics; I saw it as a waste of time. Everything was teacher licensure. In fact, it was a boring programme meanwhile we paid for it (Teacher 1).*

When asked whether the programme he attended had affected his ability to teach in the classroom, teacher 3, expressed similar sentiments as follows: “..... not at all. It did not affect my knowledge regarding mathematics teaching and learning because it was primarily focused on teacher licensure”. (Teacher 3).

Another teacher responded to the same question:

*The workshop was about the accumulation of points on the teacher portal; how to checkpoints in order to meet the policy’s requirements for license renewal. So, to put the record straight, I will say no. I was not impacted as a mathematics teacher-(Teacher 9).*

The statements showed that the CPD workshop organized for teachers by the NTC was not directed to enhance mathematics teaching and learning. It focuses on gaining points for license renewal. Teachers “1”, “3” and “9” all mentioned that while they needed to keep their jobs, their needs were not met, contrary to what they had anticipated going into the workshop.

Here, is another teacher whose comment was not different from others. He said:

*In fact, the programme had no mathematical impact on me. It was all about how to open a portfolio account on the teacher portal, how to check the accumulated points earned, and the corresponding courses to attend on the*

*portal for a teacher to be eligible to renew his or her license - (Teacher 13).*

One could draw the conclusion that, if not because the teachers want to safeguard their job through the license policy, they might not want to participate in subsequent CPD workshops. This is due to the fact that they have lost motivation and confidence as a result of unrelated topics or programmes of this sort that they encountered on a particular training day. Teachers would like to learn more about subjects relevant to their field of study. This statement is in line with that [18]. They found that teachers generally have a preference for a training workshop that meets their needs, facilitates their teaching processes, and enhances their subject content knowledge.

Research Question Two (2): What motivates senior high school mathematics teachers’ participation in continuous professional development workshops in the Keta Municipality in Ghana?

This research question sought to find out from the participants what motivates them to participate in continuous professional development workshops. Based on that, thematic analysis was conducted from the respondents’ interview responses. The participant’s reasons for taking part in CPD programmes were grouped into two themes: (1) internal factors and (2) external factors.

## (1) Internal factors

The internal motivating factors are the teachers’ free will to participate with no expectation of material rewards. With regard to internal motivation, the participants indicated that they participated in some CPD workshops because they want to boost their capacity in classroom teaching and learning.

When mathematics teachers were asked what motivates them from within towards continuous professional development, they responded as follows;

*Learning is a continuous process, so I attend those programmes of my own free will in order to update my knowledge. Most of us heavily rely on textbooks as our only source of information, so I connect with others to learn about innovative teaching techniques that I am unaware of. (Teacher 15).*

*A different participant responded to the same question:*

*No one can be an expert in everything, so I try to always network with my colleagues from other schools in order to learn new teaching and learning strategies from them. When you are lagging, you may occasionally need someone to wake you up. (Teacher 11).*

The result shows that in-service teachers are willing to update their knowledge through CPD programmes. The above findings corroborate with [20], they argue that participants attend the CPD workshop of their free will (internal motivation) because they were eager to gain more knowledge.

## (2) External factors

The external factors on the other hand referred to material rewards. The results from the interview revealed that job security (e.g., license), promotion, allowances, and other incentives motivated some mathematics teachers in the Keta

Municipality to participate in CPD workshops.

During the researchers' interactions with the mathematics teachers in the study about the factors that influenced their decision to participate in the CPD workshop, some recognised "promotion" which was linked with salary increment, license renewal (job security), certificate and participation allowance as the main reasons that inspire them to take part in CPD workshop. For instance, this teacher said:

*I participated in such programmes in order to receive a workshop certificate that I could use for my GES promotion exercise. Every teacher working for GES is required to provide at least one CPD certificate when applying for promotion. Therefore, I do attend workshops for the sake of job promotion. You see, teachers already make low salaries, so I would not be earning much if I did not receive a promotion in my job* (Teacher 14).

This response shows some mathematics teachers attend CPD workshops just to receive participation certificates to present during their promotion processes. For example, Teacher 14's quest for promotion and its associated financial benefits influenced his decision to attend organised CPD workshop. His motive does not pertain to professional knowledge improvement but financial gains. This motive has been described by the author [20], as participation due to contingent outcomes (such as money, promotion, and job security). This also shows that, had it not been a promotion that would push "Teacher 14" to a higher salary, position, or rank, he would not have attended the CPD workshop. The findings revealed that another factor that pulled teachers' participation in the CPD workshop was certification, which they demanded as a form of guarantee and evidence to validate participation. Once, again the results show teachers had varied reasons for participating in continuous professional development workshops. This participant made the following comments when he was asked why he participated in the CPD workshop, he said:

*When I was teaching in the basic school, they do give us transportation and inconvenience allowance wherever we attend the workshop. I was disappointed in this one because they gave me no money. The organisers of the workshop rather snatched money from me.* (Teacher 4).

Participant 4's answer to the question shows he went to the workshop with the hope of receiving a monetary reward. However, he was disappointed because the organisers did not give such a benefit. It is obvious if he had known that inconvenience and transport allowances would not be given, he would have not attended the workshop. The researchers believe that external motives should not be considered by teachers before participating in a continuous professional development workshop if they truly wanted to update their professional knowledge. In line with the above findings, mathematics teachers needed to participate in CPD workshops to upgrade their professional knowledge because their initial university degree alone cannot adequately prepare them for a lifetime of teaching [21, 22]. Teachers' professional knowledge (content knowledge and pedagogical content knowledge) is a strong predictor of competency and

forms the foundation of classroom teaching practices [23]. Therefore, in-service teachers must disregard contingent factors and rather consider intrinsic reasons and participate in CPD programmes to help them update their professional knowledge.

## 5. Limitations

The generalizability of the findings is constrained by the use of data from a sample of senior high school and senior high technical school mathematics teachers in Keta municipality. Although, the senior high school mathematics teachers were the most practical for the study, involving the school headmasters and mistresses, assistant headmasters or mistresses in charge of academics, and district curriculum training officers, rather than focusing on mathematics teachers only would have improved the extension of the findings and the conclusions. Again, there is no evidence to suggest that the study, which involved only seven (7) public senior high schools in the Keta Municipality in Ghana, from which eighteen (18) mathematics teachers were selected and interviewed, is representative of the situation in the entire nation or of a different setting.

## 6. Conclusion

From the results of the current study, the following conclusions are made concerning the type of CPD workshops, the researchers concluded that CPD workshops that were subject-based were less organised for senior high school mathematics teachers and non-subject-based CPD workshops do not have much impact on their mathematics teaching and learning abilities were rather given prominence. This unfortunate situation has also become a disincentive for teachers to have an interest in CPD workshops. In addition, some mathematics teachers participated in CPD workshops because of allowances, development of the social network, and certificate of attendance for promotion exercises, which is linked with salary increments and not necessarily being motivated to improve their mathematical knowledge and competencies. It is therefore imperative for stakeholders in the education value chain to endeavor to disabuse the minds of teachers in order to get them to see such CPD workshops as avenues to broaden their horizons and grow professionally in an attempt to remain relevant in today's evolving world of knowledge acquisition and sharing.

## 7. Recommendation

Based on the findings, the researchers recommend that CPD trainers should organise more subject-based workshops for mathematics teachers in senior high schools to increase their knowledge and teaching skills. This, when done, will go a long way to deepen the appreciation of the various mathematical concept that they are required to teach their learners. It is the considered view of the researchers that the more exposed and equipped the teachers, the better they

stand to impact the lives of their learners meaningfully.

Again, National Teaching Council should educate teachers on how important continuous professional development is to their teaching profession and clear the misconception CPD workshops are for promotion purposes. When this is done successfully, the reasons for which they are organized will resonate with the teachers and encourage them not to only take these workshops seriously but also, to avail themselves anytime they are organized so they can derive the maximum benefits therein.

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