

## A Fitted Logistic Regression Analysis of Factors Influencing Teachers' Learning And Professional Development. Evidence From Selected Schools in Ghana.

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**Abstract:** This article focuses on the factors that influence the professional development of teachers after they have completed their basic education. We defined teacher professional development as teacher learning: how they learn to learn and how to use their knowledge in practice to support student learning. We collected data from 274 teachers from 44 high schools and 10 universities in Ghana. We therefore adopted a fitted logistic regression model for our analysis. The results show that individual and organizational factors influence teacher learning. The collaboration of teachers is important for the way they are developed and some teachers can lead such learning activities. In addition, a positive school culture, a good atmosphere and a good understanding of teacher learning and collaboration with external specialists can influence the professional development of teachers. The article concludes that good management policies as well as learning at school is the best ground for the further development of teachers.

**Keywords:** teacher learning; professional development; teacher collaboration; external experts

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Date of Submission: 11-12-2017

Date of acceptance: 26-12-2017

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### I. INTRODUCTION

The initial training of teachers has become a necessity in all educational institutions especially in the high schools and universities due to the speed and dynamic nature of modern technology and its impact on education as a whole. This has become a common practice in countries like the United Kingdom, Norway, Sweden and the USA as well as many other African countries including Ghana in a bid to increase the performance levels of these teachers. For example, nowadays, most management of educational institutions in Ghana and the world in general ensure that their teachers complete professional training of at least between 100 and 150 hours annually which is well integrated in many of the institutions' comprehensive training programs and are often obligatory and sometimes associated with some kind of reward in the form of promotion and certificate to serve as motivation for the teachers. It must however be noted that, confidence in the value and impact of such professional educational training for teachers' performance has not been based on solid evidence. Some research reviews on university teachers concluded that there is little evidence of the impact of such training on the performance of teaching and even could not trace any solid evidence regarding the effects it has on student learning (Houston & Hood, 2017; Kaye & Brewer, 2013). The evidence so far as found in the extant literature usually includes a report on minimal changes in teachers' attitudes, either through questionnaires on the evaluation of special programs or through group discussions and interviews. Most studies on this topic usually do not base their findings on theoretical or psychometric data collection methods, in order to obtain empirical data from students, and also to show evidence of the effect such training has on student learning. This article however seeks to compile data from a number of schools (high schools, universities and other tertiary institutions in Ghana) on professional teacher training programs and its impact on teachers' performance. The use of training in this context, refers to the training of university teachers which often involves some level of complicated processes supported by theoretical models of professional development (Hofer, 2017) and evolves over time in the doctrinal concepts of teaching (Prosser & Trigwell, 2014).

A framework developed by Gibbs and Coffey and cited by Houston and Hood (2017) from in-depth interviews with trainers to analyze the main goals and the rationale of professional teachers training programs identified a number of training objectives. Their study looked at the extent to which training can achieve three basic goals. These were:

- Improve the skills of teachers
- The development of teaching and learning concepts
- The resultant changes in student learning.

They however noted that other common learning objectives have not been explored, such as teachers' ability to think and improve or to increase self-confidence or self-efficacy. Much of the training is explicitly aimed at developing teachers' pedagogical skills, particularly their teaching practice.

In Ghana most of the teachers' trainers focus primarily on improving student learning rather than improving teachers lessons and that their training focuses on the evolution of teachers so that they in turn focus on students learning instead of focusing on their teaching performance. Chen, Chen, and Chen (2014) citing from Trigwell et al. (1974) described the various methods used by teachers in teaching. They identified two main methods: Teacher Orientation (this is when the teacher mainly deals with organizing, presenting and revising the content and his / her own teaching behaviour in order for the students to obtain knowledge), and Student's Approach (in which the primary goal of the teacher is to develop and increase his performance to support student learning so that they can acquire or develop concepts). It has been shown that the pedagogical approach of teachers is related to the study of their students and that it is more likely that teachers who focus on the student usually have students who take a deep approach; i.e. trying to understand the content and not just trying to remember the content (Chen et al., 2014). Students who take an in-depth approach have shown superior learning outcomes in various studies, particularly in understanding and developing new and more sophisticated concepts of the subject. Therefore, if trainers are willing to change teachers' pedagogical approaches, they can reasonably expect that if they succeed, it will improve student learning and outcomes. In a detailed study of a training program that explicitly aims to change the pedagogical concepts of teaching, Angela Ho established that there is a chain of influence that goes through training objectives and training processes, teacher approaches and approaches to their students (Muijs et al., 2014). According to Avalos (2011) teacher professional development means learning from teachers how to learn to learn and how to use the knowledge acquired in practice to help students. Teachers can learn by participating in different courses, at school, reflecting on their own teaching, and working with colleagues to observe and reflect on the teaching of others. Learning can take place at scheduled brainstorming sessions between teachers, or teachers can learn from inadvertent conversations with other colleagues before or after teaching, or at encounters between parents and teachers. Therefore, learning can take place in different ways, both formal and informal.

According to Lam and Muldner (2017) citing from Schwartz and Bransford (1998), there is also "a time to count" in a constructivist paradigm. Bakhtin (1981) as cited by Blackledge and Creese (2014) presented two concepts that could be useful tools for reflection in this situation. He referred to two key words' that is, "authoritarian" and "authoritative". He defined authoritarian as a word that indicates the transfer of new knowledge, while he described authoritative as a word that invites dialogue. That is, in a lecture, it is possible that many discourses can occur between listeners and speakers without exchange of words. The speaker can create internal dialogues in each listener (Bakhtin, 1981; Daniels, 2016). These dialogues can foster understanding of each individual, but this requires that the listener has decided to participate in a lecture that has been talked about, aroused their interest and has met their expectations. Therefore, lectures, based on the knowledge of interest and background and in the proximal area of the learner (Daniels, 2016) citing from (Vygotski, 1978), can contribute to learning. Thus, attending courses and lectures can be useful in the teacher professional learning process. In order to optimize the learning process, the dialogue must continue after such lecture sessions, which in the case of teachers it means they should continue the dialogue even in their schools.

### **Teachers Metacognitive Processes and Learning**

Metacognition is part of what is referred to as self-regulated learning. This in the context of teachers' professional development means that teachers learn to learn. Herman and Pinard (2015) citing from Dewey (1916) believed that people who constantly participate in developmental situations also learn to learn. Metacognition serves as the common denominator of metacognitive approaches and metacognitive knowledge (Smith, Black, & Hooper, 2017). Metacognitive approaches are at a higher level of reflection than that of cognitive methods (Greene, 2015). In using metacognitive approaches, the main issue is not to achieve certain objectives, but instead it is to find out how objectives would be achieved or have been achieved. Metacognitive approaches involve thinking about thoughts, knowledge or the cognition of a cognitive phenomena. The use of metacognitive strategies means that teachers can plan, guide, regulate and also control their own learning (Greene, 2015; Schunk & Zimmerman, 2013). In controlling the learning process through the use of metacognitive approaches, metacognitive knowledge thus become extremely important in order to understand which approaches can be used in different contexts by school management for teachers' learning and professional development. In the view of Zhang (2015) citing Flavell (1979) metacognitive knowledge has three components: knowledge of a person, tasks and strategies. Knowledge of a person is the understanding of oneself as a person who learns and thinks. Task knowledge refers to one's knowledge of different cognitive tasks and their different solutions. Knowledge of strategies involves the teacher's knowledge of various methods that can be used to solve a task. In a school environment, this refers to a situation where the teacher develops a metacognitive attitude in his own practice. In such situations, it is a question of seeing the pupils and fashioning out how the pedagogical actions in the session between the teacher and the pupils are adapted to each one of

them. Therefore, it is important to place a meta-perspective on classroom interaction processes to facilitate learning and coping with expected and unexpected contributions. It also means learning actions that take place in the classroom through active learning so that teaching can be constantly modified and improved. This includes knowing how to learn from these actions and how to use metacognitive approaches. Dearden (1976) as cited by Rescorla (2014) referred to this as first-order and second-order learning. First-order learning refers to the learning content while the second-order learning refers to being aware of how the content is learned. Metacognition originated from the cognitive paradigm (Smith et al., 2017). Teachers get to know their own practice when they develop a metacognitive attitude (Jackson & Allemand, 2014). Teachers interact and build knowledge and learn with their students during class. In such a situation, the development of metacognition and metacognitive attitude becomes important factors of learning in a constructivist setting.

### **Teachers' Learning and Professional Development in School**

Benson (2013) discusses a new wave of teacher learning and teachers' ability to learn and be metacognitive. In the view of Benson, this self-learning should take place in daily teaching in class. The lessons learned must be processed which must lead to the development of a new and deeper knowledge of the teacher and that in the subsequent class it should help in developing their own performance at work. Benson indicated that teachers should not be caught up in the experiences, but should be involved in the current situation and planning for future practice. Thus, teachers can be exploratory and therefore a meta-perspective on their own teaching practice to learn from their own experience (Postholm & Jacobsen, 2011).

### **Factors That Influence Teacher Learning and Professional Development**

Desimone (2009) as cited by Kang, Cha, and Ha (2013) in conducting a theoretical study, identified five main principles of teachers' learning, that should be highlighted when school management want to strengthen the knowledge and skills of the teacher and improve their performance. These are: focus on content, active learning, consistency, duration and collective participation. Focusing on content means knowing the subject and also knowing how students can acquire that knowledge. Active learning may mean observing subject teachers or personal observation followed by interactive feedback and discussion. Consistency refers to the content of the teacher's learning and corresponds to his previous knowledge and beliefs. Duration means that development activities must last for a certain period. Desimone suggested that the development activity should last at least one semester and include 20 hours or more of contact time between participants. Cooperation as an important factor in development activities means that teachers from the same school who teach in the same year or in the same department can learn together. Thus, in this way, teachers can learn from each other. Desimone adds that directors and management of the school play an important role for teachers' learning and professional development.

### **Individual and Organizational Factors of Teachers Training, Learning and Development**

Different researchers have examined the relationship between teachers' beliefs, values and practices and their learning. For instance, James and McCormick (2009) indicated that teacher learning influences their teaching according to their values and their further practice. However, the results of their study of teachers in a survey of 40 elementary and secondary schools revealed that change is not a sequential process. Thus, changes that take place in practice and the values and beliefs are related. This means that teachers can practically find practice with different ideas about what is good lesson for students; however, these ideas can be influenced by the context in which the teachers find themselves, the level where they are in their career, their previous practice experiences and the students that they have. It was revealed that all of these factors influence what, how and why teachers learn at the school where they work (Opfer & Pedder, 2013). The research also found that orientation at the school level in terms of school as a community, including leaders and teachers are very important regarding teachers training and development in the schools where they work. They emphasize the importance of a school that provides a clear vision, supports professional development and understands the importance of expertise and support networks.

The research therefore suggests that both individual and organizational factors may affect teachers' training, learning and development though, Opfer and Pedder (2013) conclude that the most important factors for a good outcome at school capacity is supporting teachers professional learning and development and the ability to involve teachers in a cooperative manner. In a study of 1939 conducted on German high school teachers in 198 schools revealed that teachers took advantage of the opportunities available to them to learn differently during their work (Robinson, 2014). The study also suggests that teachers' collaboration decreases in the course of their teaching careers. The results of the study further revealed that teachers cooperate more at the beginning of their careers than in the middle and at the end. Teacher independence is very important for them to learn effectively (James & McCormick, 2009). Teachers independence can be supported when they are allowed to define their learning objectives, discuss and think about learning in independent and ongoing processes with their colleague teachers. They also discovered that teachers should have a clear idea of where development

should take place so that they can have a common vision. They argued that schools' management need a system that promotes teacher training and professional development and that teachers should be able to plan, implement and evaluate their practice based on initial considerations as found in their practice. They also said that it is important for teacher learning and that knowledgeable people in the school could be relied on as a resource in their schools and in external networks in developing other activities.

There are other studies conducted in the form of changes that teacher training and learning can bring about. For instance, Hoekstra, Brekelmans, Beijaard, and Korthagen (2009) focused on some teachers who participated in development activities to promote positive learning and self-regulation, developed their understanding but not necessarily their action in the classroom, while others can develop their teaching practice but not their knowledge. However, others can develop both. They maintained that the main conclusion of the study is that teachers learn in different ways and that their learning support system must be differentiated. Hoekstra and Korthagen (2011) presented in their results that the totality of the individual must be taken into account, and that aspects of perception, action, emotion and motivation should be considered as an essential factor for the professional development of the teacher. The study further stated that the starting point for further development must be what the individual knows and what is the purpose of that person. This will consequently provide the development process a positive start-up phase and at the same time will have the knowledge to develop the practice which will focus on learning activities and the self-learning process of the students.

### **Teacher Collaboration for Teachers' Training, Learning and Development**

Teacher collaboration is a topic for many researchers studying teacher learning. Sjoer and Meirink (2016) indicate that most studies show that participation in collaborative communities influences teaching methods and improves teachers' learning and development. In his study of seven secondary school teachers working in the same team shows that different approaches and varying activities with different structures can contribute to varying contents of the cooperation. Thus, a problem would be described by a teacher and other teachers would ask clarifying questions in a later discussion. The direction of what teachers would do or say was determined by the principal at the beginning of the meeting or by a common understanding of a particular routine or activity. Sjoer and Meirink (2016) conclude that various forms of cooperative activities should be planned to promote learning in different areas.

Lawrence and Chong (2010) teachers plan a class together, then one of them teaches the class during the assigned time while others observe and learn. After teaching, they reflect on how the class has worked against the specified goals, then modify the classroom plan as needed, and then another class member teaches the class while the others observe. In this exercise, the teachers were joined by an expert and the findings of the study showed that the opinion of the expert teacher was useful. Thus, this system allowed the teachers to acquire new knowledge on the subject and the pedagogical practice resulting in a better understanding of the students' needs and lesson management. The study also showed that this work reinforced the sense of unity among colleagues and the self-efficacy of teachers in the context of the classroom. Study participants also highlighted the challenges of observing and also having time to reflect. (Ono & Ferreira, 2010) noted in their study that teachers cannot change their teaching methods and practices overnight and that it will take a little more time to have any meaningful effect. Research has shown that documenting students' learning processes and teaching teachers who have a particular orientation and serve as a basis for dialogue and reflection lead to changing practices. This helps to improved teachers' ability to observe, take notes, analyze, represent and respond to the teaching and learning that took place in their classrooms, which in turn changes the culture of their learning community. The ability to think with colleagues and experts leads to greater reflection, and that such reflection can also be an important contribution to teacher learning (Postholm, 2012). This shows that cooperation between teachers can be beneficial for their learning development.

It has been established that the greatest number of changes in classroom practice is achieved when teachers observe each other and comment on the observed practice. When teachers know they are being monitored, they feel some pressure to experiment and develop new teaching strategies for the observer. Teachers learn more when they have the opportunity to talk about their experiences in an atmosphere of trust, confidence and constructiveness. Studies have shown that teachers who have an internal motivation to learn participate in continuing education programs, even though school management may not support them with time and programs. It must be noted that it is not enough for structural and cultural circumstances to facilitate learning, but it also requires a willingness to learn if learning will take place. A lot of studies show that participation in a professional development program for one year for teachers may be too short to allow for systematic changes in measurement (Kolb, 2014). One of the factors that can prevent the optimal use of pairwise cooperation is fear (Sokolov, Kreutzer, Lo, & Riezler, 2016). Changes can cause anxiety and be threatening. If the teachers in such a paired collaboration are too different it could hinder the learning that should occur. Teachers learn at their workplace by testing different teaching methods after observing how a colleague teaches or after reflecting on a paired class with their colleagues (Louws, van Veen, Meirink, & van Driel, 2017).



### **School Culture and Teachers Learning**

Research has shown that school culture can also contribute to teacher co-operation and professional learning and development in informal settings, that is, unplanned collaboration (Kyndt, Gijbels, Grosemans, & Donche, 2016). Other studies have also shown that in addition to the administrative and structural factors that facilitate informal collaboration, there is also the need for a culture among teachers that promotes and values learning among them (Kyndt et al., 2016). It is believed that when a school culture has an ordered character and therefore has the top-down strategy for promoting teacher performance, teachers would then have a negative attitude toward informal collaborative learning. It is therefore important that the management of a school focuses on the expectations of the teacher at the beginning of a development program to maximize the teachers' learning in collaborative problem-solving teams. Thus, teachers with high expectations of professional improvement also developed more and that this places greater emphasis on teacher professional development. It can therefore be argued that the quality of teacher development is influenced by the environment in which the learning experiences take place. In this context, a school management that focuses on the needs and interests of teachers, and to a school culture that is understood as the spirit of the school means that teachers share and act on that basis. There are several elements that can contribute to the professional development of teachers. These include peer-to-peer experts who can contribute to their know-how, having a common goal on the development of teaching, the exchange of experiences, the implementation of process and a meta-reflection of teacher development process itself (Kyndt et al., 2016).

### **Collaboration Between External Specialists and Teachers for Teachers' Development and Learning**

Resource persons who participate in a school's teacher professional development projects enhances teachers learning. Teachers are considered by most people as change agents, but the importance of cooperation between university teacher educators and school teachers must be seen as the new way of training teachers in their practice. Bayar (2014) pointed out that expert external ideas should be part of reforms of the professional development of teachers. The study shows that teachers see the value of working with other teachers who teach the same subject and suggests that the content of the work be adapted to the needs of the school and teachers. The quality of the external expert support that teachers receive in their work is important to ensure successful professional development. Teachers who receive professional development training from external resource persons usually have good pedagogical skills, a high level of experience in teaching their subject, strong communication skills and the ability to build constructive relationships. In addition to these qualities, they also gain significant thinking skills, the ability to challenge thought and action, combined with good data skills knowledge of the needs of the school and ability to model the practice of teaching (Bayar, 2014). Baumfield (2015) indicated that the focus on student learning also contributes to teacher professional development through student feedback. The stated that in class, students receive visual aids that allow them to talk about their own experiences in the learning process in a "creative mind bubble" that allow students to express what they think. This help takes effect because it leads to dialogues at different levels. The teachers received feedback from the students which results in a dialogue between the teachers. This helps teachers in collaboration with researchers at the university, by developing a researcher's attitude towards student feedback and a researcher's point of view of cooperation. Cooperation between teachers and the external expert, assist in the development of teachers professional training. Teachers believe they developed their professionalism through other external programs that are organized by experts in the field. They learn to find information about their needs and then plan their lessons based on their talents and abilities. It is thus useful for teachers in a community of practice to observe and reflect on the practices of others so that they learn and improve student learning outcomes.

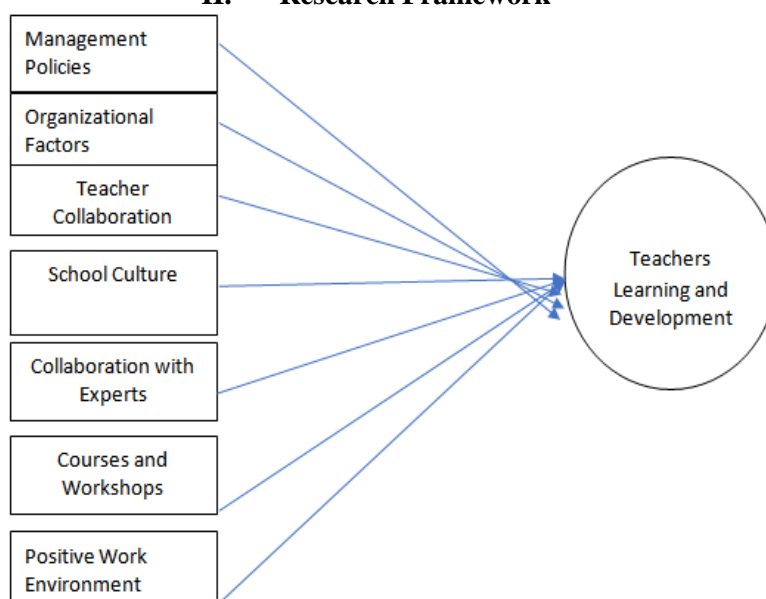
### **Positive Environment and Understanding of Teacher Learning**

A study by Muijs et al. (2014) found that good relations between the management of school and the staff especially teachers were a prerequisite for teachers' professional development processes. It is important for school management to create a positive atmosphere and constructive relationships among colleagues, and that one of the objectives of teacher training should be that future teachers learn to share their opinions. He also discovered that the distribution of subjects and lessons can hinder cooperation between teachers and that professional development of teachers as starting points should be topics relevant to the personal and professional needs of teachers. It has been suggested that educational policy that does not show a sense of co-operative and continuous professional development for teachers will not offer a good leaning environment to motivate teachers as teachers are judged individually according to professional standards. It is therefore prudent for managers of schools to focus on building a professional community of teachers and their learning and development in this community. A study conducted by (Clausen, Aquino and Wideman 2009), shows that even if the directors of a school take the initiative to promote professional development and the activities involved, over time, teachers can identify with the project and make it their own. Teachers, who have participated in such activities over time develop a learning community with open communication that supports and impact positively on their professional development.

Various authors argue that research should focus on all the factors that contribute to learning, and their justification comes from Vygotsky's ideas on the holistic perspective of professional learning and development (Daniels, 2016). This means that the content, the students and the learning context should be included in a Continuing Professional Learning (CPL) process (Daniels, 2016). He sums up the study by stating that professionals learn from experience and that learning takes place continuously through active participation in practice and also suggested that critical thinking can influence learning effectively. One of the goals for teachers and leaders in collective community learning processes is to develop teaching methods based on the presentation and reflection of success stories from their own classes and also learn to learn and to become aware of how they were reflected in practice. According to Vygotski, (2000) as cited by Daniels (2016) there are seven elements in a professional learning context. These are:

- Provide adequate time for advanced opportunities to learn effectively and use time
- Engaging external resource persons
- Focus on teacher involvement in the learning process
- Challenge problematic discourses
- Provide the opportunity to interact in a community of professionals
- Ensure content is consistent with broader policy trends
- Engaging Leaders in School Initiatives to Promote Professional Learning Opportunities

## II. Research Framework



## III. MATERIALS AND METHODS

### Data Source

We collected data from 44 high schools and 10 universities respectively in Ghana. These schools were selected due to the high number of teachers, their policies towards teachers' education and development and also for convenience. In total they have teaching population of about 600. A total of 305 respondents were initially recruited to participate in the research that took place over a three-month period. The author adopted but modified items to establish the construct of organizational factor, teacher collaboration, school culture, collaboration with external experts and positive environment factors and their resulting effect on teachers' learning and development from the extant literature. This was constituted into a closed-ended questionnaire that was robustly tested and fine-tuned before it was administered to the selected respondents. After several iterations of item editing and refinement, a final constituted closed-ended questionnaire was administered to the sampled population. consequently, 274 respondents fully completed the questionnaire and their responses were accepted for the final analysis in the research.

### Analytical Procedure

The analytical procedure included two staged statistical analysis to obtain the results. First, we performed factor analysis to investigate and validate the threshold values of teacher learning and development. We thoroughly verified the basic assumptions i.e. the constant variance and normality and these did not affect the results. The appropriateness of the data for factor analysis was determined by employing Kaiser–Meyer–Olkin

measure of sampling adequacy (KMO-MSA) and Bartlett's Test of Sphericity. A KMO value of more than 0.60 was recorded and a significant value for the Bartlett's Test of Sphericity. We performed Varimax rotation and principle components analysis for factor analysis. Factor loadings lower than 0.50 were all eliminated all after which we conducted the Cronbach's alpha reliability analysis. We confirmed that all measure of sampling adequacy was above the Cronbach's alpha reliability value threshold level of 0.60 and large and significant Bartlett's Test of Sphericity. The exploratory factor analysis and reliability statistics measures of the accepted variables were composed into five composite values of organizational factor, teacher collaboration, school culture, collaboration with external experts and positive environment. In the first model, we designated the five factors as independent variables to test their effect on a dichotomous teacher learning and development. Again, we disaggregate organizational factor, teacher collaboration, school culture, collaboration with external experts and positive environment and establish their individual relationship with teacher learning and development. In all, we modeled a fitted logistic regression model by considering the situation where the independent variable is nominal scale and dichotomous (i.e. measured at two levels). This case provides the conceptual foundation for all the other situations. The assumption was that, the independent variable,  $x$ , is coded as either zero or one. The

difference in the logit for a subject with  $x = 1$  and  $x = 0$  is  $g(1) - g(0) = \beta_0 + \beta_1 - \beta_0 = \beta_1$ .

In interpreting this result, we needed to introduce and discuss measure of association termed the odds ratio. The possible values of the logistic probabilities may be conveniently displayed in a  $2 \times 2$  as shown in Table 1.

**Table 1** Values of the Logistic Regression Model

Outcome Variable (Y)	Independent Variable (X)	
	x=1	x=0
y = 1	$\pi(1) = \frac{e^{\beta_0 + \beta_1}}{1 + e^{\beta_0 + \beta_1}}$	$\pi(0) = \frac{e^{\beta_0}}{1 + e^{\beta_0}}$
y = 0	$1 - \pi(1) = \frac{1}{1 + e^{\beta_0 + \beta_1}}$	$1 - \pi(0) = \frac{1}{1 + e^{\beta_0}}$
Total	1.0	1.0

The odds of the outcome being present among individuals with  $x= 1$  is defined as  $\pi(1)/[1 - \pi(1)]$ . Similarly, the odds of the outcome being present among individuals with  $x = 0$  is defined as  $\pi(0)/[1 - \pi(0)]$ .

Nevertheless, if the coding scheme is different from the (0,1) then the odds ratio formula needs to be modified, but for the purpose of this study all the dichotomous variables were coded using the (0, 1) coding scheme. The interpretation given for the odds ratio is based on the fact that in many instances it approximates a quantity called the relative risk. This parameter is equal to the ratio  $\frac{\pi(1)}{\pi(0)}$ . It follows that the odds ratio approximates the

relative risk if  $[1 - \pi(0)]/[1 - \pi(1)] \approx 1$ . This holds when  $\pi(x)$  is small for both  $x=1$  and 0. A  $100(1 - \alpha)\%$  confidence interval (CI) estimate for the odds ratio is attained by first calculating the endpoint of a confidence interval for coefficient,  $\beta_1$ , and then exponentiating these values.

Under the assumption that the logit is linear in the continuous covariate,  $x$ , the equation for the logit is  $g(x) = \beta_0 + \beta_1 x$ . It follows that the slope coefficient,  $\beta_1$  gives the change in the log odds for an increase of "1" unit in  $x$ , that is  $\beta_1 = g(x + 1) - g(x)$  for any value of  $x$ . Most often the value of "1" is not statistically interesting. Hence to provide a useful interpretation for a continuous scale covariate we need to develop a method for point and interval estimation for an arbitrary change of "c" units in the covariate. The log odds ratio for a change of  $c$  units in  $x$  is obtained from the logit difference  $g(x + c) - g(x) = c\beta_1$  and the associated odds ratio is obtained by exponentiating this logit difference

$OR_{(c)} = OR(x + c, x) = \exp(c\beta_1)$  An estimate may be obtained by replacing  $\beta_1$  with its maximum likelihood estimate ( $\hat{\beta}_1$ ). An estimate may be obtained of the standard error needed for confidence interval

estimation is obtained by multiplying the estimated standard error of  $(\hat{\beta}_1)$  by c. Hence the endpoints of the  $100(1-\alpha)\%$  confidence interval (CI) estimate of  $OR_{(c)}$  are

$$\exp \left[ c\hat{\beta}_1 \pm Z_{1-\frac{\alpha}{2}} \times cSE(\hat{\beta}_1) \right]$$

Since both the point estimate and endpoints of the confidence interval depends on the choice of c, the particular value of c should be clearly specified in all tables and calculations. Table 1 presents the computations of the crude odd ratio for effect of network ties or network linkages  $X$  on resource transfer  $Exp(B)$ . As explained by Tennant and Pallant (2006) the crude odds ratio of factor explains the degree of influence of each of the variables on the dichotomous value of resource transfer which is the dependent variable of study. Firstly, the Wald's and log likelihood ratio tests were also performed to ascertain the significance of effect of each of the explanatory variables on resource transfer in this model. According to (Brown, 2015), a probability value below or equal to 0.05 is considered to be statistically significant. Hence the inclusion of that explanatory variable as important in determining resource transfer  $Y= 0$  or  $1$ . The parameters of the model were estimated using maximum likelihood approach. The estimates for each explanatory variable are interpreted relative to the referenced category.

**Table 2:** Odd Ratio Output of Logistic Regression Predicting

Variable	Estimates	S.E.	Wald	Df	P-Values	$e^{\beta}$
Management policies	0.617	0.260	5.630	1	0.018*	1.853
Organizational factor	0.591	0.140	17.688	1	0.000*	0.748
Teacher collaboration	-0.290	0.069	17.787	1	0.000*	1.805
School culture	0.404	0.193	4.376	1	0.036*	1.498
Collaboration with external experts	0.168	0.131	1.650	1	0.199	1.183
Positive work environment	0.744	0.389	3.660	1	0.056*	1.104
Courses and workshops	0.364	0.243	2.242	1	0.136	1.439
Constant	3.036	0.330	84.459	1	0.000*	20.828

\*Significant at 99% Confidence interval, \*\* Significant at 95% Confidence interval, \*\*\*Significant at 90% Confidence interval

In table 2, it is estimated that organizational factor is 0.748 more likely to impact on teachers learning and development than the other factors at 95% confidence interval (p-value=0.000) is statistically significant. With an odds ratio of 1.498 and a confidence interval of 95%, it can be predicted that school culture is more likely to contribute to teachers learning and development than all the other factors with the exception of organizational factor giving a similar statistically significant result. The analysis also shows that collaboration with external experts is 1.183 more likely to contribute to teacher learning and development than the other factors at 95% confidence interval (p-value=0.036) which is statistically significant. Similarly, the results indicate that positive work environment is 1.104 more likely to impact on teachers learning and development with a confidence interval of 95% (p-value=0.056). It is estimated that courses and workshops are 0.748 more likely to impact on teachers learning and development than the other factors at 95% confidence interval (p-value=0.136). Finally, the analysis also indicates that at the odd ratio of 1.853 management policies are more likely to contribute to teacher learning and development than the other factors at 95% confidence interval (p-value=0.018) which is statistically significant.

### Summary and Conclusions

The research looks into the professional development of teachers. This section presents the results and the conclusion. It has been shown from the findings of this research that courses and workshops can be very useful in teachers' professional development and learning processes. It is seen that all forms of activities that facilitate teacher learning and professional development may not necessarily be relevant to all teachers. According to Darling-Hammond (2015) there may be differences in learning development between teachers in the same school and different schools. Darling-Hammond argued that these practices have different cultural, structural and management aspects that influence each other. Cultures create structures and structures are shaped by cultures. School management can help transform structures and cultures, and raise leaders who may lack formal leadership skills but who can support change and development culturally and structurally. Teachers learn



and therefore are able to change the ongoing practice. It is also important that what happens in school is based on policy decisions. Conley, Smith, Collinson, and Palazuelos (2016) argued that today's society needs teachers to learn and develop their professional skills continuously and that education policies that are not financially supported by school management have a long history of failures. Conley et al. (2016) suggested that local authorities and teachers should be given the opportunity to participate in political decisions in order to be part in the decision-making process before the management of the school implement such decisions. It is believed that innovations in schools have failed too often because teacher training and professional development has not been taken seriously (Vermunt, 2014).

The findings of this research point out that formal training with hands-on exploration including classroom testing is particularly successful for the development of teaching practices and student learning (Spillane, Shirrell, & Hopkins, 2016; van den Bergh, Ros, & Beijgaard, 2015). Teachers' reflections on their own practice in their subsequent education can thus be pursued during and after the training in practice, especially when several teachers from the same school participate together in higher education. Various researches suggest that learning at school, in collaboration with other teachers and a school management that supports social learning and teachers' professional development, is the best way for teachers to develop their own lessons which benefits students learning. Teachers want to work together and reflect on the practice with their colleagues to change and develop their teaching. The findings of the research also suggest that experienced teachers or other resource persons, or what the theory referred to as competent experts (Daniels, 2016) citing Vygotsky, should be invited to the learning and professional development processes to add new knowledge and promote teachers' learning. The results of the survey show that the essential requirements are the competence of these people and therefore the quality of support provided (Bayar, 2014). Research indicates that developmental activities related to teacher learning and development should continue for some time, but there is no clear formula for the scope and duration of these activities.

The studies presented are consistent with Desimone (2009) five characteristics of teacher learning and development, but in general they also represent other important characteristics for teacher learning. The study conveys the idea that it is important for teachers to learn, self-learn and self-regulate in their own learning process. This means that they learn to gather information to develop their own practice and become researchers in their practice. To reflect on their own practice, they can assess whether the learning objectives have been met, and then plan to achieve new goals based on the knowledge of themselves and their students, to teach the tasks to be implemented and the teaching strategies they decide to apply. In such reflections on their own practice, they use metacognitive strategies and metacognitive knowledge (Moshman, 2017). In addition, the findings of the study indicate the importance of individual and interdependent factors for development activities that describe the characteristics of Desimone. For example, teachers must be willing to learn and there must be more time and resources. It is important that teachers experience the expectation of improvement and that the individual person is considered. This means that cognitive, action-related, emotional and motivational aspects are important factors for teachers' professional development (Hoekstra, Kuntz, & Newton, 2017) The study also suggests the importance of having a shared vision among colleagues, and that good relationships between employees are a prerequisite for development. The research further shows that peer attachment and teacher self-efficacy are reinforced by cooperation between teachers which is in consistent with (Gutentag, Horenczyk, & Tatar, 2017). Student learning does not focus on all studies, but on the basis of socio-cultural theory and it is known that external conditions for student learning can improve if the focus is on teacher learning and professional development.

There is no real conflict that exist between field-based teacher learning and participation in traditional higher education courses, but various researches suggest that courses involving teacher professional development processes need to be connected to what they do in their schools (Spillane, 2013). Thus, knowing that they are taking the course that can benefit the whole school in general. Ideally, all teachers in the same school, or at least some of them, should receive the same training at a stage in their practice and development. Teacher educators have a lot of knowledge; however, this knowledge needs to be present in practice and shared with teachers. The study suggests that the best way to do this is to have teacher educators contribute their knowledge to teacher interaction processes as has been espoused by (Henrick, Cobb, & Jackson, 2015; Postholm, 2016). In this spirit, it can be said with certainty that schools where teachers work are the best place to learn which has been argued that this could be the new way to train teachers. In such training, teachers can learn through professional development and that members of the teaching profession can learn to learn in order to use their knowledge in their classes.

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Blessing Dwumah Manu. "A Fitted Logistic Regression Analysis of Factors Influencing Teachers' Learning And Professional Development. Evidence From Selected Schools in Ghana." *International Journal of Business and Management Invention (IJBMI)* , vol. 06, no. 12, 2017, pp. 10-20.