UNIVERSITY OF TAMPERE

COMPUTERS IN PROMOTING CONSTRUCTIVIST PRACTICES IN THE CLASSROOM: THE PERCEPTION OF BASIC SCHOOL TEACHERS IN GHANA

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Master's thesis in education

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Few research has been conducted on exploiting technology in order to make changes and improve upon the school system on teachers' views resulting from the use of computer technology. In this regard, the government of Ghana introduced a program so that computer technology will be part of teaching and learning activities in the Ghanaian classroom. However, traditional method of teaching in Ghana dominates constructivist practices. Therefore, how the policy of integrating computer technology as part of teaching and learning to enhance constructivist practices in the learning environment was in doubt. It was against this background that the study examines the prospect of using computers to manage classroom when applying constructivist practices based on the perception of basic school teachers in Ghana. In an attempt to achieve this objective, survey instruments were administered on 125 basic school teachers from 20 basic schools to collect multivariate data of which 80% response rate was attained. The multivariate data collected was analysed using Partial Least Square Structural Equation Modeling (PLS-SEM).

The result was that, using computer technology serves as an effective tool to manage classrooms that apply constructivist practices. The results from the data that applies to computer technology accounted for 46.2% of the variance in constructivism in the classroom. Two of the predictors were significant to constructivist classroom practices while one was not. Using computer technology in the classroom was however not entirely significant to constructivism in the classroom and that for every 1% increase in favour of using computer in the classroom in Ghana, application of constructivist practices in the classroom reduces by 28.3%. It was therefore recommended that, the creation of competence through training of teachers to give classroom instruction digitally must be provided to ensure smooth implementation of constructivism without challenges by Ghana Education Services(GES). Until this is done, handlers of the subjects should be conversant in using computer in the classroom because teachers applying computer technology in teaching and learning situations deteriorate when adopting in the classroom for constructivist practices.

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Key words: Constructivist, Computer technology, Practices, Perception

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1 INTRODUCTION

Organizations and some schools in Ghana and beyond are finding ways and means of improving their teaching methods and learning activities by using an appropriate technology. This proposed work will examine Basic School teachers' ideas of using computer technology to promote constructivist practices in the learning environment. Using computers in the classroom as an instructional tool brings students and teachers together. This can promote the quality of work they perform on projects. In addition, the era of using computers enhance meta-cognitive thinking amongst students as they will discover information through the process of attempting to solve problems. Finally, computers can be used as tool for creating audio-visual materials for distribution to students to learn on their own pace.

Several studies have been made by some researchers about the importance on the introduction of computer technology in the school curriculum and its effects on students' performance. (Dawson, Cavanaugh & Ritzhaupt, 2008). Some of the aspects they focused on were such as using software in reading and mathematics curriculum whilst others also looked at integrating computer technology in the classroom. (Dawson, Cavanaugh & Ritzhaupt, 2008). Because we are in the computer age, everyone wants to use computer in teaching. The way we learn and teach has changed because of the bringing computer technology in the classroom settings.

The change has now become positive. Gone were the days when teachers will give the information to students without the students being engaged in the learning process. This time, students use the computers to find and browse for facts provided by someone, preparation, and presenting of assignments. (Dawson, Cavanaugh & Ritzhaupt, 2008). The positive change is being directed to students rather than the teachers. Teachers role here is an educator who ensures that, the pupils goals are achieved through the learning stages in improving their thinking when using computer and as such, students' goals are achieved. Students become independent learners. (Drayton, Falk, Hobbs, Hammerman, & Stroud, 2010).

In addition to this, integrating technology into the classroom encourages effective participation among teachers and students. This can clearly be seen through daily use of computer, sharing information about technology, and allowing students to play the role of a tutor. When teachers allow

students to get involve in the instruction process, it boosts their self-esteem. Thus, opportunities are given to the students to practice whatever they have learnt. The teacher role here is to direct the instruction. (Mouza, 2008).

This increases learners' ability to incorporate technology during collaborative participation. Accessibility to computer in the classroom increases students learning experience and responsibility. Using internet and email assist students in their learning and become responsible for their own actions. (Drayton, Falk, Hobbs, Hammerman, & Stroud, 2010). For this matter, students do not have to rely on the teachers to search for ideas and these tools (email and internet) assist students to become independent learners on their own.

After conducting the research into the problem and coming out with solutions, the findings would be used to improve existing research on the effect of computer to be supplied, thus one lap top to a student as well as a teacher. The perception of a Ghanaian teacher on computer technology has proven its effectiveness in schools. It will also surround discussions and answers relating to constructivism.

Few research has been conducted on exploiting technology in order to make changes and improve upon the school system on teachers' views resulting from the use of computer technology. This research will address and add to current knowledge, plan for a period of a term or semester, time table, different subjects handle in an institution that can give room to students to raise themselves academically or eitherwise, giving prizes to serve as motivation for them (McCombs, & Marzano, 1990) and adopting a different teaching and instructional style. (Menard 2010).

The theoretical basis for this study is the Teleological organizational change model which operates on the assumptions that, organizations have missions. Internal organizations feature more than external organizations motivates change. Before change can take place in any organisation, there must be planning, brainstorming of ideas, incentives to reward people, leaders for implement such initiatives. Educational leaders who institute change tries to set goals and expected to achieve them. This knowledge can help an educator to come out with appropriate designs and strategies to encourage change (Shapiro 2000). Computer Technology can change the method of teaching and the way students learn. (Doolittle & Hicks, 2003). Oberlander (2004) states that, todays learning approach is being directed towards constructivism. This change has come about at the time where technology has become common in our institutions. Technology based applications which are self-intuitive and can communicate more easily to students in classrooms. For instance, students have downloaded software applications on their mobile devices which assist them to have an experience of various sound effects created by characters in their environments in storybooks.

Consultation from the students, school administrators, parents, are very important when integrating technology into the school curriculum. (Alexiou-Ray, Wilson, et al.,2003). Beisser (2003) also suggests that, before one can learn, he or she has to come out with new ideas and not a situation in which the knowledge is put into their heads. In a study conducted by (Beisser, 2003), `` students were asked to explain meaningful experiences of what they have learnt in the past. Technology innovation when created requires researchers to use their theoretical perspectives, behavioural and cognitive approaches, in order to get the most out of technology for classroom delivery (Deubel, 2003). The responsibility of learning lies solely on students as they have access to computers anytime of the day. (Lunenburg, 1998). In integrating pedagogy and technology, the main objective is to divert responsibility to students to manage their own learning. Zimmerman (1990). In view of this, Student-regulated learning assist students to find the right learning approach as they learn at their own pace, and this gives educators an insight into monitoring and evaluating of learners' behaviour.

1.1 Statement of the research problem

Some literature review that, teacher's perception with regards to bringing computer into teaching and learning has not much being dwelled upon in Ghana. There are few research on computer technology when we try to make changes in educational policies on teachers views about development of constructivist approach in an attempt to use computer technology. There is no study pertaining to Ghana that address issues relating to curriculum, learning for students with different aims and aspiration and adopting a different teaching and instructional style such as constructivism.

In Ghana, the national teaching curriculum and policy documents talks about the significant of introducing computer in schools to promote teaching and learning. (Buabeng-Andoh, 2015). In this regard, the government of Ghana introduced a program dubbed "one child one laptop" to introduce into schools for pupils to be taught the rudiments of computer works. In Ghana, the traditional method of teaching dominates constructivist practices. Therefore, how the policy of bringing computer technology to ensure effective teaching and learning in learning environment/classroom adopting constructivist practices was in doubt.

Generally, adopting different aspects of computer technology to ensure effective teaching and learning entails some challenges. In a study conducted by some researchers, they classified the problems into two major groups. First order barriers are problems teachers see outside and examples are lack of financial standing, schools and colleges, subject areas and evaluations. Aside, the second-order barriers are those that are inherent to educators and examples may include point of view,

accepted norms, information and skills´´ (Ertmer et al. (1999). However, most schools don't have the requisite skills to operate computers that are now emerging in developing countries like Ghana. Also, broadband internet is not available to students and teachers. Moreover, in some countries, those professionals to teach educators for them to use digital instructions are not available to give them the skills they need. There are some teachers who are still not abreast with computer.

However, since high level technology needs the expertise of teachers to be able to impact knowledge in the various aspects of the basic type written documents, couching, there is the need to train well versed teachers in this field to handle the subject and allow pupils or students to have a lot of activities involve in practical activities of computer work. (Becker, 1994; Brush & Saye, 2009).

1.2 Broad objective

The main aim is to find out how computers can be used in promoting constructivist practices in the classroom based on perception of basic school teachers in Ghana.

1.3 Specific objectives

1. To find out the perception of Ghanaian teachers on using computers as a means for constructivist practices in the classroom.
2. To examine the level of computer usage in the classroom in Ghana.
3. To determine the relationship between computer usage and the constructivist practices in the classroom.
4. To identify some challenges that the application of computer-based constructivist practices in the classroom present
5. To evaluate the support that is available for integration of computer technology and constructivism in the classroom

1.4 Research questions

1. What is the perception of Ghanaian teachers in using computers as a means for constructivist practices in the classroom?
2. What is the level of computer usage in the classroom in Ghana?
3. What is the relationship between computer usage and the constructivist practices in the classroom?

4. What challenges do the application of computer-based constructivist practices in the classroom present?
5. What support is available for integration of computer technology and constructivism in the classroom?

1.5 Justification of the study

The justification will be that, the findings would be used to improve already existing ideas on computer technology on constructivist practices in the classroom. This study will as well enhance the views of teachers on computer technology in promoting constructivist practices in the classroom. Another justification will be that, teachers and administrators will gain an understanding if they want to integrate computer technology in a constructivist environment. Teachers, government and policy makers will also realize that, computer technology can support and improve student learning. Leaders in education will see the need to educate instructors in constructivism to promote the use of computer technology.

Above all, students and teachers can come together to implement and control their learning and teaching experience.

1.6 Scope of the study

It was such that, it covered Kumasi metropolis in Ghana, West Africa. The area of study was constructivist practices in the classroom narrowed down to basic schools and specifically centered on teachers in the Basic School. The study spanned across a period of thirty-two weeks. The intention was to assess how using computers in the classroom can promote constructivist practices based on what basic school teachers in Ghana perceived. It further examined the level of using computer in the classroom in Ghana; determine the relationship between computer usage and the constructivist practices in the classroom; identify some challenges that the integration of computer-based constructivist practices in the classroom present; and finally, evaluate the support that is available for the bringing computer technology and constructivism in the classroom.

1.7 Summary of the methodology

The population studied involved some basic school teachers in Kumasi Metropolis in Ghana. A sample size of 125 teachers from 20 basic schools in Kumasi metropolis in Ghana were used. The sampling technique adopted was stratified random sampling. This ensured a fair representation of

the population of the study. The data collection method made use of quantitative methods and analysis. In the case of the quantitative method, it administered questionnaire/survey instrument. PLS-SEM was used to analyse the data. Some descriptive data and some analysis of statistics were also used in addition. SmartPLS and SPSS were the statistical tools for the data analysis.

1.8 Limitations of the research

The research was done only in public schools in Ghana and it cannot be described as an objective study. This is because the study did not use the existing records of the schools' understudy. Therefore, perceptual bias is present to some extent. This means that, it is possible for a few of the responses to be inaccurate. Convincing inferences in terms of casual sequences and changes overtime cannot be made because the data of the study could not use all the measurement items relating to constructivist practices in the classroom. Nonetheless, the shortfalls listed above would not materially vary the quality of the results of the study.

1.9 Organization of the study

The entire work had been organised into five (5) chapters. Introductory part is the first which gives information about the background. It also includes problem statement, scope, summary of methodology, and then the limitations. Chapter two looked at what people have discussed about the topic. The third chapter was the methodology highlighting data collection method and procedures, population, data analysis, sample and sampling techniques. Chapter four presents the results and lastly, discussions and conclusions are highlighted in chapter five.

2 LITERATURE REVIEW

2.1 The concept of constructivism

Constructivism (Piaget (1936) is based on the notion that, learning is formulated through experiences. Example, when one encodes information, it does not necessary mean that, the person has `learnt´ something but rather, this new information is integrated into an old, existing experience the person has previously acquired. Meaning is therefore derived by connecting the old and the new information. For this reason, Lorsbach and Tobin (1997), argued that, knowledge and experience is acquired by learners and got through the teachers' guidance. Therefore, leaners must acquire understanding from what they are taught based on their own previous experience.

According to Carlile & Jordan (2005), practical method of teaching leads or ensures greater understanding in knowledge acquired. Currently though, some approaches that emerged from a constructive perspective and which include student centred learning, the focus is on the student, arguing that, independent learning by negotiated learning approaches and learning contracts can enhance knowledge construction, which may lead to overall understanding (Carlie & Jordan 2005). Teachers role is simply to support students by encouraging their own reasoning, meaning making skills and create the environment so that emerging ideas can grow.

In constructive approach, the teachers' role in teaching and learning is to guide students to come out with new ideas. This can also be made possible by developing exploratory method/approach of teaching. The students mainly exploit to get reasonable and practical experience or knowledge. (Martin, 2006).

Martin (2006), research stated that, teachers must assist students to come out with practical and reliable solutions to problems. Research showed that, effective teaching and learning are achieved when practical methodology is used. These involves guiding students to practise to find reliable solutions to task. The method, eventually emphasize on child centred way of teaching. The attention is on the learner and ensures independent learning. Some level of guidance from the teacher is however given to the learner /student.

Student-centred learning involves activities in the classroom such as arrangement of desk in small groups, activities that takes place outside the traditional classroom settings that include travel

experiences, communal labour, internship, apprenticeship. Giving students the chance of becoming researchers gives them the opportunity to handle issues themselves, make them think far. Very clear instructions are followed by the students as well as individual learning becomes an asset to them with the help of computer technology. (Ahmad, Ching, Yahaya, & Abdullah, 2015). In addition, recognizing the characteristics nature of the learner in the classroom by designing a pedagogical plan based on the way they are in a constructivist classroom should be a concern for all teachers. (McLeod, 2015).

2.2 Constructivism in the classroom

In practical terms and in the constructive learning environment, teachers adopt different approaches to learning. Students learn by exploring methods of finding solutions to real world problems through experiments, reflection and discussion. By developing concepts and principles, understanding becomes deeper. Compared to a traditional classroom where the teacher teaches the student, knowledge does not challenge the student strong enough to trigger higher levels of cognition. A constructive classroom allows the student to ask questions and manage their own learning process. This may occur in a fixed, physical settings such as in schools, classrooms, workshop, field and others. However, the environment in which we learn is not always the physical setting. Resources for learning include technology, approaches to teaching and learning, and making connections to what is happening in our society and the world, are all influential impact on teenagers and adolescents' development. (Laurel & Lindgren, 1975).

For these reasons, the handlers of opinions in accordance with tradition is being taken over by student oriented one. This emphasizes concepts for students to be knowledgeable by means of gaining skills, getting involved in lessons, working together to achieve aims to learn as a result of integrating technology. (Ahmad, Ching, Yahaya, & Abdullah, 2015). For example, Malaysia has been very successful in raising standard of education since it replaced the traditional approach with student centred approach.

2.3 Computer as a catalyst for constructivism

Eventhough virtual learning technologies and computer-based teaching methods have resulted in the improvement in the quality and efficiency of teaching, concern have been raised by how much impact they have on the level of educational standards and in the construction of knowledge. For example, a study by (Bulman and Fairlie, 2015) to among other things, assess what influence

technology on educational outcome in the classroom. Those who did the researcher work did not find any notable impact on educational outcomes apart from some exceptions in developing countries. This calls for caution in the over reliance of technology in the classroom. They however suggested that, using technology for activities give better outcomes than the traditional teaching method. For example, one can have instant results when using computers to search for an information, reducing search time drastically compared to without a computer. Skills and learning can be enhanced using technologies. In this regard, better outcomes can be achieved in the longer term with technology than without.

These days, there have been attempts to bring computers into classrooms, example, since President declared technology in schools a priority, some schools in several districts in the United States have invested over billion dollars in classroom computers and infrastructure to improve educational outcomes. Similar initiatives have been taken by the European Union, aiming to supply each and every school with computer by the year 2020. Advocates of computer-based technology in the classroom have cited evidence in support of an idea that, technology used brings about positive changes in educational activities. (Means, 2010). Cuban, Kirkpatrick & Beck (2001), for example, were in support of the idea that, using computer technology by teachers in the classroom transmogrify their instructional activities, thereby promoting student centred learning that shift teaching from traditional method to constructivist approach.

Previous studies into home and school computers used have expressed both negative and positive effects, example, the fear of negative impact through the entertainment and gaming especially on young people have been expressed by many studies. (Weinhardt, F., Faber, B., & Sanchis-Guarner, R. 2015). However, using computers in schools have brought two sides of the coin. Concerning the positive effect, it has made buying and selling possible (Czernich et al,2011), and makes things to be done easily, and how it is also reacted socially in our lives (Bauernschuster, Falck, & Woessmann, 2014). Then again, it could be seen on the negative aspect that, it affects our vision when we continuously sit behind at it for a very long time. When this happens, it means we are straining the eyes. Therefore, success on reliance on technology will partly depend on the outcomes of the long-term exposure of the use for example, computers in the classroom and how this outcome will be put into effective use.

2.4 The perception of students in using computer technologies in Constructivist classroom

An improvement in technology has affected our educational systems in country. Among these technologies, computer is the most common ones we used in our educational settings. The use of computer enables students to know and understand what is happening in the classroom teaching. (Yenice, 2003). Nowadays, many countries are investing in their human resources so that they will be abreast with computers. This would enable them to think through and solve problems in the educational environments. (Aydede & Keserciolu, 2008).

The opinions of students about the use of computer is that, it enables them to create their own power point assignments, upload it in moodle for class presentation. Aside, online discussion is also made possible. This is because, students can do class assignments and discussion outside the school, thus distance education is encouraged. This assists in teaching and learning.

When students use computer technology, it encourages feedback between the teacher and the students. This is because, teachers are able to give academic instructions and reminders to students. Students receive copies of class task though email or in a moodle instead of writing the whole class assignments on the board.

2.5 Design and development of constructivist classroom for learners

Computer technology must be a concern for every country if they want to grow and develop. Using computer as an informative tool helps to access and transfer knowledge to the learners to learn at the right time. (Lavy, 2015). The aim of every learner is to direct his or her attention to knowledge construction. For this reason, learners must develop their analytical thinking through reasoning, effective communication, problem solving skills, create and develop something using their computer skills and collaborate well. Learners are expected to be part of the learning process which forms the basis for new learning. Without computer skills, it will be very difficult to practice these skills. (Office of Higher Education Commission, 2010).

In designing and implementing constructivist classroom for learners, teachers must design the curriculum in such a way to meet the goals, the objectives and aspiration of the learners. When teaching and you are given examples to students, use real world experiences. Teachers must also see every student as unique and value their point of views. (Christie 2005& Honebein 1996)

2.6 Computers as a means for applying constructivist teaching methods

Constructivists has helped us to understand that, learning is accomplished when students are part of the learning process and the teachers most at times lead students through discussions, questions, discovery and acquisition of experience. (Richards's et.al, 2001). Modern trend has been readily available for educators who want to upgrade their teaching and classroom work. In this regard, effort shall be used to give description and make analysis of basic school teachers understanding in making use of a skill in technology to work on classroom activities.

Modern institutions are finding ways and means to develop their imparting understanding skills to increase the output of computer work. (Azizinezhad, & Hashemi, 2011). Educators are now becoming aware that, technology in educational field assist them in their academic achievement. (Nanjappa & Grant, 2003; Phillips, 2000; Shapiro, 2003). Learning through experience behoves that, individuals construct, interpret and make connections with what they have already learnt and based on that, draw a valid conclusion. Constructivism is a proposal that has been put forward to explain that, individuals construct, interpret and make connections with what they have already learnt and based on that, draw a valid conclusion. (Ahmad, Ching, Yahaya, & Abdullah, 2015)

2.7 Integrating computer technology into constructivist classrooms

Several ways of designing curricula and going about different means of giving instructions to bring about very good constructive outcome is one of the factors that has being observed for some time now. (Isaacson, 2014). In constructivism, learners come out with concepts and ideas and educators should provide them with instructional tools for them to perform.

In advancement of technology, educators are able to use that technology or tools to design things to bring about improvements in designs in their standard of living. In this respect, it has had an effect of our way of life, helping us to communicate with one another, meeting people, doing business, contributed to the way students learn and method of teaching. (Lambert, 2003). Technology offers instructors, tools to tailor their leaning to each students' strengths, interest, needs, and also ensure that, they are being heard. As a requirement to learning, learning environment that is furnished with adequate technology has been one of the goals of school administrators and governments.

The question that we need to ask is, "can we bring technology into our classroom activities for pupils to understand better``? The readiness of the teacher is one of the requirements when we want to bring innovations into schools and our classrooms. It is important that, if you want to teach

effectively, the handlers of the subject should have knowledge about the subject matter and the teaching method to employ. If teachers want to integrate instructional technologies in the classroom, appropriate training must be a concern. (Weinhardt, 2015). Teachers need to have skills and competent in teaching, mentoring, software application so that, it can be converted from pedagogical knowledge to visual learning for easy instructional delivery. In the era of the introduction of technology, the quality of teacher is very important than just looking at their behaviour in which they were considered as just providing information. It is possible for teachers to use constructivist theory for online discussion and for critical thinking. This can serve as an effective learning experience especially if the students and the instructors show much concern.

What we derive from instructional technology is to allow learners to bring out their observations and their knowledge acquired to give them the opportunity to bring out what they have seen from outside to real classroom situations. And also, to allow them to be able to communicate through discussions and shared their ideas in debates, that would help them socially in very good constructive manner and give support to educators in their various professions both individually and in groups using their data, expertise and learning experiences to give their best to people involve in teaching and learning.(Gilakjani, 2013).

2.8 Challenges of integrating computer into constructivist classrooms

There are several challenges that are experienced if we want to use technology as part of teaching and learning. For many countries, there is lack the qualified teachers who have the capacity to deliver digital instruction to assist teachers who want to use technology in their educational activities. Aside, some teachers are not computer literate. (Amarin & Ghishan, 2013). Some also claimed to be technophobia and they are not abreast in using technology. Some teachers have also not come into contact with some computer terminologies and interpreting it in teaching and learning is difficult. They can only come into contact with computers when it deems necessary. Also, in countries too, getting low-cost broadband, computer, printer, internet facilities to utilize technology in teaching is lacking. (Ramorola 2013).

Without teachers who are conversant with computer operations or usage, in imparting knowledge and acquisition of it will be useless unless communication and low-level task like word processing, practical activities are done in classrooms. Today's world has become a global village and as such digitalization and having knowledge on online learning under ones' sleeve would be an advantage to peoples who have gone through the appropriate training. (Becker, 1994; Brush & Saye, 2009) and (Nkhwalume, 2013).

2.9 Implementing computer technology in teaching

In today's World, society is changing the way we obtain information. In the field of education, technology has caused a great change and educators have no option than to plan and prove for presence of these tool/equipment to be with pupils. Computer must be part and parcel of our everyday activities in order to bring the use of the tool into other lessons in classroom activities. Many schools are finding the overall benefit of technology when teaching and learning. (Canough 2013).

With the advent of computer technology, it has affected teaching process, the way students learn, and the physical learning environment and this has become a great benefit to learners (Somekh et al., 2006). It has proven that, using computers in classroom makes learning easier (Schrum et al., 2007). Using educational technology brings problems and needs expertise and experience to handle such things from teachers. (Lambert and Sanchez, 2007). To heighten and raising the standard of learning through applying computer technology, it should be a tool for both teachers and students to assist them in their intellectual pursuit in order to achieve their goals in the learning situations (Hakkarainen, 2009). The handlers of the subject should be able to have in-depth knowledge of the technological advancement needed in the curricula and educational theorist. Implementing virtual learning programmes helps to provide learning materials to students and this helps to prioritise learning conditions from constructivist point of view. (Kaya 2015). Pitler and Hubbell (2007), stated that, integrating technology into instruction makes the lesson enjoyable and teaching moves from teacher way of teaching to student approach and this makes the classroom environment more dynamics.

Recent studies show that, theory and practice do not match, and that, there is a difference between the right and what is worked on assumptions. (Mooij & Smeet, 2001). Haaparanta (2008), came out with his findings that, the handlers had not gotten the needed pedagogical training on technology. (Walls-Carpelan, 2005).

2.10 Perceptions of teachers on computer technology usage in the classroom

Of late, there have been a major interest in education to introduce computer technology as part of teaching and learning in schools. These rests highly on the handlers of the subjects and the students. (Selwyn, 1999; Woodrow, 1991; Teo, 2009). The teachers however, considered the use of computers technology to bring about effective interaction between teachers and students in schools. Research

had been conducted on the manner teachers would use computer technology to teach other subjects. Interestingly, Ismail et al. (2010), did a research work about computer technology to teach effectively United Arab Emirates(UAE) language. The work on the quantitatively and qualitatively data proved that, teachers embraced integrating of computer technology to teach other subjects. It was also realised that, integrating computer technology in teaching some subjects, insufficient knowledge of using computer technology to teach other subjects, motivation the teachers to apply computer technology and computer technology integrated programmes available for both the teachers and the students were all considered. Almekhlafi & Almeqdadi (2010), conducted a research on the views of teachers on computer integration in the United Arab Emirates (UAE) schools and it was very useful. Besides, the teachers adopted different technology approaches to enhance students learning. However, the method used by both female teachers and male teachers differ. Sipilä (2014), did a research work on teachers view on their competencies in using computer technology and the factors that might bring about the difficulties when we use computer technology in schools. The research further proved how skilful the tutors in the use of computer technology most often integrate it into other subjects for better results.

There was a research work by Göktas et al. (2009). The study tried to find out the perceptions and competencies on using computer technology by the teacher educators. There was one finding which showed positive perceptions of most teacher educators on integrating computer technology into other subjects in teacher educational programmes. Other findings also indicated that, the teacher educators have sufficient competencies in integrating computer technology in other subjects. There was another finding which proved that, the use of internet programmes was used as a tool to give support in the computer technology integration. There was a recommendation that, teacher educators should include in their course or study programme, computer technology.

There was a study by Chai et al. (2011), involving seven (7) Singaporean pre-service teachers(personnel) being trained as teachers. It considered their epistemological beliefs in relation to their perceptions of integrating computer technology into teaching and learning of other subjects. (Christensen & Knezek, 2008). Interestingly, the study showed a direct relationship between their epistemological beliefs in integrating teaching of other subjects using computer technology on one hand and their perceptions on integrating other subjects on the other hand. Aydin (2013), did a research on teachers' perception in using computer technology to teach English Language in non-English speaking countries. The result was that, the teachers had sufficient knowledge in accepting the use of computer technology to teach English Language as second language to foreigners. The research further checked on the teachers' competencies in the use of computer technology to teach other subjects as well as the teachers getting technical and training support from their schools. The

research came out that, the teachers had inadequate knowledge in using computer programmes in teaching English. Also, the school did not give any technical and instructional support to the teachers. There was suggestion by Aydin (2013), that, other factors that may affect educators' knowledge in the use of computer technology should be looked at. Likewise, Mai (2014), research into trained and student teachers' sensation and behaviour towards the application of computer technology programmes to other subjects. The data was collected from 152 teachers and the analysis showed that, the teachers had sufficient knowledge and positive views in using computer technology to teach other subjects.

Mai (2014), research gave suggestion that, in some years to come, it should find out teachers´ views and their stand on computer technology using longitudinal design. Besides, in Ghana, finding about teachers views on computer technology has not been extensive. Sarfo & Ansong-Gyimah, (2010), made a research into the views of student's handlers of the subjects as well as the supervisors in educational ladder on the role played by computers in teaching the five principles of instructions. According to the findings obtained, there were different views expressed about teachers on the role of computers used to implement the five principles (task centeredness, showing clearly how it is done, bringing into use, being useful, bringing into being) of instruction. Also, the outcome was that, there were different views expressed by participants as regards by their recommendations concerning the training for students to get the skills needed for computer work and how teachers should be able to come out with their own designs in handling their work. However, the approach adopted in the collection of data was of quality unless the teachers did not make use of better questionnaires.

Consequently, (Agyei & Voogt, 2011), made an examination into computer technology used in handling mathematics as a subject to student teachers in the country. The research found out that, teachers of mathematics did not make use of computer technology in their everyday classroom work. Furthermore, teachers who handle mathematics do support the idea of integrating computer technology into their work.

2.11 Perceptions of Ghanaian teachers on ICT usage in the classroom

Going through literatures available on the ideas of teachers on computer technology as related to teaching in the classrooms have been found to be woefully inadequate. This feasibility study on computer technology will dwell much into how teachers would get knowledge and understanding to become efficient in applying them into their teaching.

Access to computer, lack of training, and capabilities are some of the major problems to come by in a developing country where computer technology is a new thing in the syllabus. (Ertmer,1999).

A country's curriculum and documents on educational policies have been accepted to be used in teaching for the raising of standards in computer teaching to bring about the usefulness of technology to be part of subjects taught in schools. (Policy, 2003). The curriculum drawn for the country does not coerce teachers to use computer technology in their lessons. Very effective work will not be done in the classrooms since some of the teachers do not have the requisite skills to impart the needed knowledge.

The opinion of Makrakis (2005), says that, the introduction of computer technology requires new teaching skills and approach. For teachers to achieve their objective when using computer technology in the classroom, they must be ready to learn the new trend to be current to face the new challenges. Instructional technology would speed up the learning process. Most often, the men counterparts in the profession have confidence using computer technology more than their women. It can be iterated that, by providing female teachers with training as to how to use the computer would go a long way to change their views about computers in a way that, they can be integrated appropriately into teaching and learning (Odera 2005). Results that came from teachers' opinion on computer technology said that, everyone in the academic ladder, people at the helm of affairs and students should be part of the change to raise that standard of teaching and learning.

2.12 Conceptual framework

Conceptually, the study attempts to experiment the prospect of computer technology in promoting the interaction between teachers and students at a place of study. With this, basic school teachers' perception in using computer in the classroom; available support for computer integration and computer usage in the classroom were used as predictors. The criterion construct was constructivism in the classroom. According to the study, constructivism in the classroom is expected to predict constructivist practices in the classroom in Ghana. The conceptual framework is made up of multiple variables, therefore, Partial Least Square Structural Equation Modelling (PLS-SEM) was used to assess the multiple relationships. The analysis tool for this PLS_SEM method is SmartPLS3. Please refer to figure 1 below for the study model.

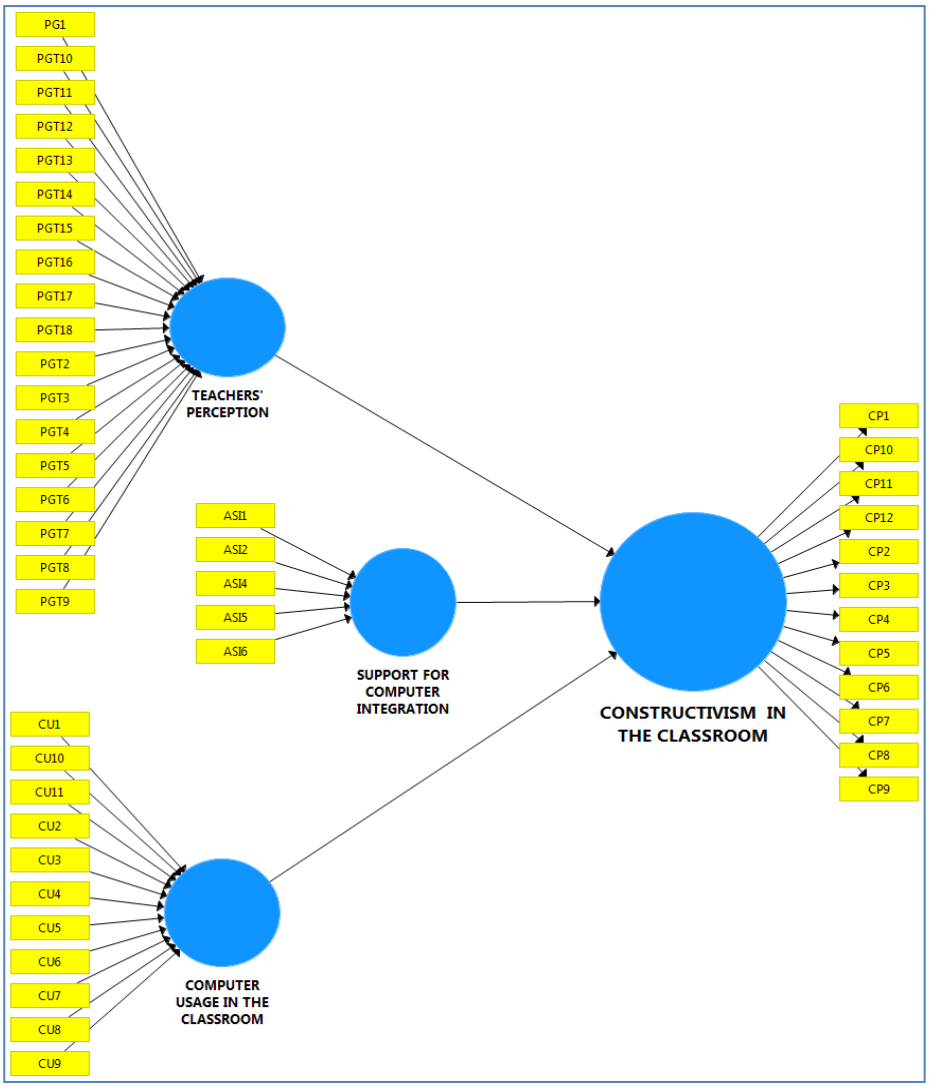

FIGURE 1. Conceptual Framework

3 METHODOLOGY

The chapter comprises research paradigm, data collection method and procedures, population, data analysis, sample and sampling techniques.

3.1 Research Paradigm

In the research studies conducted by social scientist, they classified qualitative research under interpretivist way of thinking and quantitative research under positivist way of thinking. Quantitative research deals with the measurement, collection and analysis of data (Bryman, 2004). Furthermore, quantitative research preoccupies itself with measurement of data, causality, generalisation and replication. Conversely, qualitative research is a broad category that encompasses several perspectives used in different research disciplines (Ritchie & Lewis, 2003). How a phenomenon or studies is interpreted and explained through social interaction is critical to qualitative research. Bryman (1998),

In this work, quantitative research was employed. Therefore, the study used quantitative method to gather information from basic school teachers in Ghana. The suitability of this method was judged by quantitative nature of the data and the quantitative data analysis selected. Purpose of the study

Research purposes are diverse as the authors who classified them Saunders et al (2007), categorised research purposes as exploratory, descriptive and explanatory. Earlier, Cooper and Schindler (2006), classified the purpose of the research into two namely, casual and descriptive. Prior to the above, Suvillan (2001), put them under four headings: predictive, descriptive, evaluative and explanatory.

Away from the classifications, Malhotra and Birks (2007), observed that, explanatory studies are usually preceded by descriptive by descriptive studies. Thus, exploratory studies are less structured. It therefore makes it possible for the study to gather more information ahead of the explanatory study (Saunders et al, 2007). They go ahead to add that; descriptive study is an extension of exploratory study. Examples of such studies are profiling of situations, events and persons. The aim of descriptive research is to give an account of what is happening during the study period and to inquire into the causes of an event.

According to Sullivan (2001), who had similar opinion observed that, descriptive study attempts to come out with the facts or describe the reality. They continue that, the purpose is to give account of a phenomenon in existence in terms of percentages, numbers and some other statistics. Contrary to Saunders et al, (2007), and Sullivan et al, (2001), Malhotra and Birks (2006), argue that, descriptive studies are different from exploratory study. Thus, unlike exploratory study, information needed in descriptive study is clearly defined through the formulation of research questions and hypothesis. The position of Neuman (2006), is not different from the popular opinion that, descriptive and exploratory studies are virtually the same. He added that, they share similar characteristics and they blur bat a point.

Explanatory study also called causal research seeks to bring to light the links among variables (Saunders et al 2007; Sullivan 2001; Cooper and Schindler 2006). The research attempts to establish the causes of phenomenon in addition to descriptive of the phenomenon (Sullivan 2001). This is done with perceived conceptualisation of the variables involved and how they relate in theory.

Neuman (2006) highlight the characterises of the aims of the study through:

3.2.1 Exploratory

This study is partly exploratory because the variables involve are yet to be explored and the study intends to explore these variables. Exploratory study makes you become fluent with elementary rules and challenges, generate psychological outlook of situations and come out with questions for advance study. It as well generates fresh ideas, principles and hypothesis whilst developing new ways of measuring and locating future data.

3.2.2 Descriptive

Part of this study will be descriptive. Unlike exploratory study, descriptive study comes out with a highly precise picture and current/fresh data that is different from the old. It further generates hypothesis on which additional research may be based.

3.2.3 Explanatory

Explanatory study differs from exploratory and descriptive study because, it tests principles of a theory elaborating and enriching explanation of a theory extending to new issues. The study supports or refute an explanation or prediction and relate to a general principle. Finally, explanatory study comes out with the best explanation. From the analysis so far, the purpose of this study is said to be

explanatory. This is because in bringing the research questions to light, the research work needs to emphasise or reject an explanation or prediction concerning computers seen in promoting constructivist practices in the classroom among basic school instructors. At the end of the study, assumptions could be accepted or rejected. The research questions aim in highlighting the link among these assumptions regarding computers in promoting constructivist practices in the classroom among basic school teachers in Ghana.

3.2 Types and sources of data

This study relied mainly on primary data. Some secondary data was used in addition. It was gathered directly from the source of information. The finding consists of comprehensive kinds of digital data written and kept in different file format. ((Bewstra, 2001). These consists of audio tapes, prove of documentation. The initial information gathered for analysis for research work is known as the primary data.

This type of data is gathered by people who go to the field, making it authentic. Primary data offers the finest basis of information. These findings are very reliable. The data obtained are directly from the populace being studied.

Secondary data is data gathered from already investigated source which has been published or not. (SAGE, 2008). Such information is referred to as secondary source of information for research. Using these information helps to save time, reduce cost of doing further investigation, and reducing inconveniences. The secondary data can sometimes not be reliable and not given fully information.

3.3 Data collection methods

The method used were to gather information from the primary source. The questionnaires were prepared to get information to be used for the analysis on computers to speed up effective work in the classroom among basic school teachers in Ghana.

Prior to administering of the questionnaires, it was piloted to be sure that, the wording is devoid of ambiguous statements and questions. The respondents involved were made to ask anything which was unclear to them. They were also given statements to give ratings against the behaviour within their respective basic schools as a whole. They were specifically asked to think about constructivist teaching aided by computer as they experience it now as opposed to how they would like it to be.

The construction of the questionnaire centred on cardinal issues of computer mediated constructivist teaching methods in the classroom.

3.4 Population of the study

The study comprised basic school teachers in Kumasi Metropolis in Ghana. There are about 361,454 teachers in Ghana. Out of this, 38,000 basic school teachers are in Kumasi metropolis. (https://www.moe.gov.gh). Their educational background ranges from Diploma, Bachelor and master's degree. They as well have teaching experience between 1 - 10 years and above.

3.5 Sample size

The sample frame of the study was 20 basic schools in Kumasi metropolis. A sample size of 125 teachers were selected from 20 basic schools in Kumasi metropolis in Ghana. Therefore, the survey instrument was administered on 125 basic school teachers from the selected basic schools. A minimum response rate of 70% was anticipated.

TABLE 1. Table showing distribution of sample size based on the 20 selected schools

Basic schools selected	Sample size selected
1.KNUST Basic School	5
2.Suame Salvation Army Basic School	6
3.Pataase MA Basic School	9
4.Asafo Abrotia MA Basic School	8
5.Amakom Adventist Preparatory School	5
6.Dompoase Government School	7
7.Atonsu Bethel Presbyterian Basic School	8
8.St Theresa R/C Basic School	7
9.Adum Presby Basic School	7
10.Dichembuoso MA Basic School	6
11.Abirem New Town Elementary School	5
12.Ayeduase D/A Basic School	7
13.Kotei D/A Basic School	8
14.Asafo Presby Basic School	7
15.Akosa Basic School	9
16.Bantama R/C Basic School	5
17.Atonsu D/A Basic School	6
18.Juaben D/A Basic School	5
19.Ejusu Methodist Basic School	6
20. Ayeduase R/C Basic School	5
	Total sample size 125

Source: Field work, May-June, 2018

3.6 Sampling technique

In choosing the sample size, the study employed stratified random sampling method. The sample frame was divided into strata, of which each of the 20 basic schools selected represented a stratum. I obtained the information from the basic school teachers using a sampling technique called Simple random sampling and this ensured a fair representation of the population by the sample size being selected. This technique used to minimize sample selection bias and ensured that, certain segment of the basic school teachers in Kumasi metropolis of Ghana were not overrepresented or underrepresented.

3.7 Data Analysis

The survey instrument was administered on 125 respondents made up of basic school teachers. The study was conducted within 11 months. The data collected were analysed quantitatively using SmartPLS and predictive analytic software (PASW). Specifically, Partial Least Square Structural Equation modelling, regression analysis, and descriptive statistics were also used. The results were discussed based upon that, recommendations were made, and conclusions drawn.

3.8 Measurement of reliability and validity

To ensure that, appropriate results were obtained, reliability and validity were undertaken. Reliability is an instrument that is used to determine consistency in results while validity instruments also measures the idea researchers want to investigate. According to Flynn et al (1994) reliability and validity, give credence to empirical results obtained and they reflect proposed variables used in the study. To determine the potential effectiveness of the questionnaires used, they were pilot tested to ensure that, statements and wording were devoid of ambiguity. Closed ended questionnaires were used and respondents were asked to respond it according to their own understanding.

3.9 Ethical Considerations

Ethical consideration was considered in the whole research process. Articles, books, journals that were used in the study were referenced. Questionnaires were given to teachers of the selected basic schools in Kumasi Metropolis to administer and some interview were also conducted. Prior to that, letters were given to the District director of education for permission to carry out research in the selected schools. Respondents of the questionnaires were assured that; their information will be kept secret. Also, teachers were explained about the purpose of the research before they start filling out the questionnaires.

4 RESULTS

This study intends to assess computers in promoting constructivist practices in the classroom based on perception of basic school teachers in Ghana. In an attempt to achieve this, the study develops a model and used PLS-SEM to analyse it and to bring the research questions to light. PLS-SEM was used because of the multivariate nature of the research work. The chapter is sectioned under the five objectives of the research including the relevant demographic characteristics.

4.1 Demographic characteristics of respondents

80% response rate was attained from the 125 questionnaires administered. What this means was that, 100 out of the 125 questionnaires were returned. The males who responded were 37 of representing 37%, the females were 63 representing 63%. The results showed that, 45 of the respondents were married, 52 were single, 1 was divorced and 2 were separated representing 45%, 52%, 1% and 2% respectively. For the ages of the respondents, 29% of them were between 20 and 25years, 35% were between the ages 26-30years, 16% were 31-35years, 8% were between the ages of 36-40, 6% were between ages of 41-50 and 6% were between ages of 51- 60years. Regarding the educational qualifications of the respondents that the study covered, Diploma represented 54%, 1st degree represented 40%, Masters represented 1%, Professional degree represented 2% and others were 3%. The respondents had varied years of teaching experiences. From the chart below, 25 respondents had less than 1year teaching experience representing 25%, 16 respondents had 1 – 3years of teaching experience representing 16%, 23 respondents had 4-6 years teaching experience representing 23%, 17 respondents had 7-10years teaching experience representing 17%, and finally, 19 respondents representing 19% had teaching experience 10 years and above. Please, refer to the charts below for the details of the analysis.

TABLE 2. Characteristics of the respondents

Age of respondents	**Frequency (N=100)**	**Valid Percentage (%)**
20-25	29	29
26-30	35	35
31-35	16	16
36-40	8	8
41-50	6	6
51-60	6	6
TOTAL	100	***100***
Gender of Respondents		
Male	37	37
Female	63	63
	100	***100***
Educational Level of Respondents		
Diploma	54	54
First degree	40	40
Masters	1	1
Professional degree	2	2
Others	3	3
TOTAL	***100***	***100***
Marital Status of respondents		
Single	52	52
Married	45	45
Separated	2	2
Divorce	1	1
TOTAL	***100***	***100***
Years of teaching experience of respondents		
Less than 1 year	25	25
1-3years	16	16
4-6years	23	23
7-10years	17	17
10years and above	19	19
TOTAL	***100***	***100***

Source: Field data, 2018

4.2 Statement on the fitness of the study model

The study used model fit indices to judge how well the hypothesized relationship between computer usage in the classroom, support for computer usage in the classroom, the perception of teachers in using computers in the classroom and constructivism in the classroom fits the empirical data collected from the basic school teachers. For theory testing purposes the study used SRMR (RMStheta) to test the model. The threshold values for model fit in PLS-SEM is any value of less than 0.08(0.12 in the case of confirming theory) to indicate good fit. From table 3 below, the model fit value for the study model was 0.077 and significant at p = 0.000 indicating a good fit.

TABLE 3. SRMR (RMS_{theta})

	Sample Mean (M)	Standard Deviation (STDEV)	T Statistics (|O/STDEV|)	P Values
Saturated Model	0.077	0.007	14.886	0.000
Estimated Model	0.077	0.007	15.205	0.000

The model fit here is not a transfer of the notion of goodness of fit (GoF) as in CB-SEM. This is because model fit in PLS-SEM follows a different aim when estimating parameters, which is to maximize the explained variance instead of minimizing the divergence between covariance matrices. Unlike CB-SEM, the PLS-SEM used in this study applied the SRMR (RMStheta) to assess the predictive capabilities of the study model. Thus, the model fit was primarily assessed on the basis of how well the study model predicts the endogenous construct/variable (constructivism) in the model. It is instructive to add that the PLS-SEM classifies models into formative model, reflective model and structural model. The study model has therefore been classified into same components.

4.3 The perception of Ghanaian teachers in using computer as a medium for constructivist practices in the classroom.

This section responds to research question number one. The section examines the relevant part of the formative model of the study by assessing the outer weights of the indicators that the study used to measure the views of basic school teachers on computer usage in Ghana. The section further examines the significance of the perception of the teachers to the application of constructivism in the classroom. In addition, the contribution of the perception of the teachers to constructivism in the classroom is examined.

4.3.1 Contribution of each indicator to the perception of teachers in using computers in a constructivist classroom ranked in order of their outer weights

The study ranks the contribution of each indicator to the construct "perception of teachers" in order of their outer weights. The indicator with highest contribution to "perception of teachers" has the highest outer weight and the indicator with the lowest contribution has the lowest outer weight. From figure 2 below, it was seen that, using computer in constructivist classroom is a powerful tool for students of all abilities justified by the highest outer weight of 0.439. This was followed by the assertion that, using computer in the constructivist classroom enhances professional development. This indicator had an outer weight of 0.411. In addition, using computer in the constructivist classroom makes it easier to teach. This also contributed an outer weight of 0.337 to the composite "perception of teachers".

On the other hand, the indicator that registered the lowest contribution to "perception of teachers" was the assertion that, using computer in the constructivist classroom does not require enough time to be spent on technical difficulties with an outer weight of --0.617. The fact that it registered lower contribution means that, using computer in the constructivist classroom waste a lot of time. Similarly, using computer in the constructivist classroom allows teachers to be facilitator to the learning rather than providing information and it contributed as low as -0.283 to the perception of teachers. Thus, all the indicators that registered low contributions to the perception of teachers simply mean that those indicators do not enhance the using computer as a tool for constructivist classroom. Surprisingly, those indicators that registered the highest contributions and recorded the highest outer weights were not necessarily significant to the composite construct "perception of teachers". Comparable assertions that ranked low on the perception of teachers were that, using computer in the constructivist classroom is very expensive in relation to its resources, effort and that computer in the classroom is not an important material for learning presumably given the way of imparting knowledge, settings as well as the content of the curriculum.

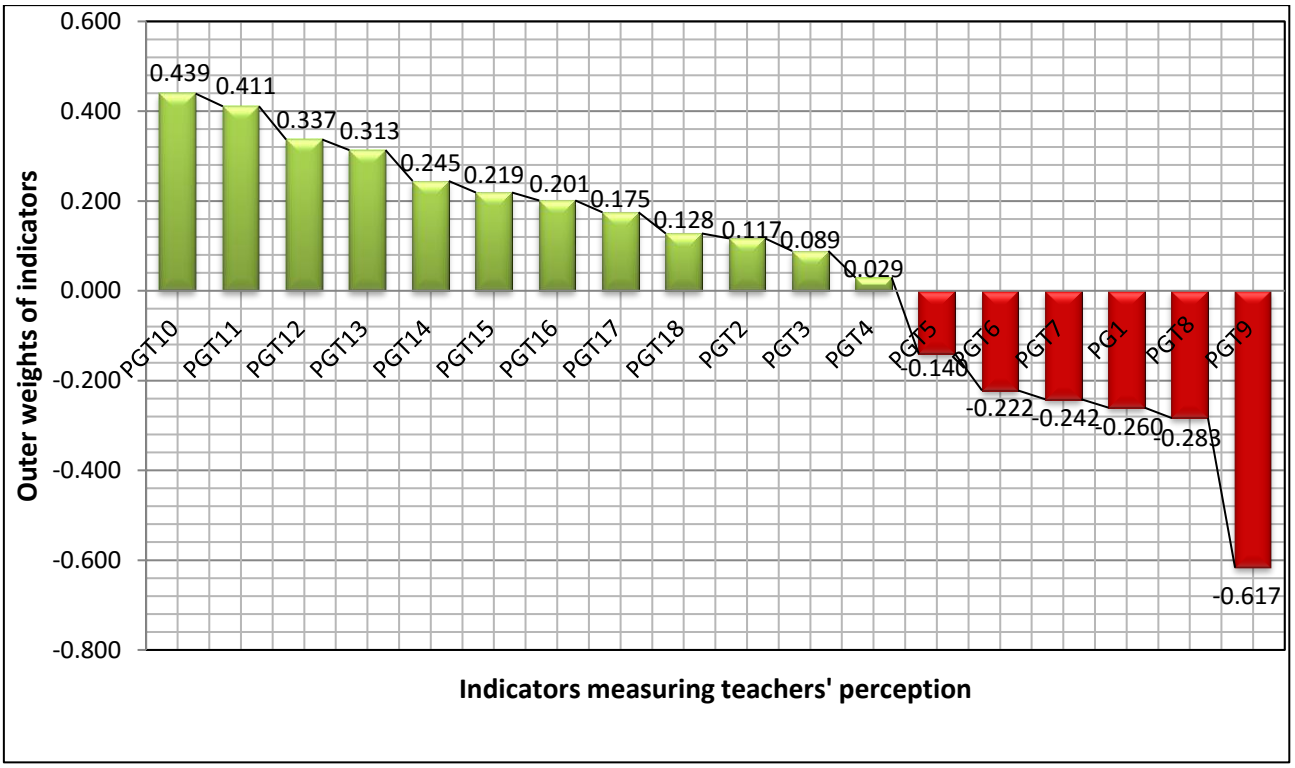

FIGURE 2. Contribution of each indicator to the perception of teachers in using computers in a constructivist classroom ranked in order of their outer weights

TABLE 4. Contribution of each indicator to the perception of teachers in using computers in a constructivist classroom ranked in order of their outer weights

Names of indicators	Indicators measuring the perception of teachers	Outer weights of the indicators
PGT10	Using computer in the constructivist classroom is a powerful tool for students of all abilities	0.439
PGT11	Using computer in the constructivist classroom enhances my professional development	0.411
PGT12	Using computer in the constructivist classroom makes it easier for me to teach	0.337
PGT13	Using computer in the constructivist classroom helps students' learning styles	0.313
PGT14	Using computer in the constructivist classroom motivates students	0.245
PGT15	Using computer in the constructivist classroom does not require software training skills that consumes much time	0.219
PGT16	Using computer in the constructivist classroom supports the development of students' interpersonal skills	0.201
PGT17	Using computer in the constructivist classroom will not increase the amount of stress	0.175
PGT18	Using computer in the constructivist classroom improves student learning	0.128
PGT2	Using computer in the constructivist classroom promotes student collaboration	0.117
PGT3	Using computer in the constructivist classroom makes classroom management easier	0.089
PGT4	Using of computer in the constructivist classroom promotes the development of communication skills	0.029
PGT5	Computer in the classroom is an important instructional tool for learning	-0.140
PGT6	Using computer in the constructivist classroom is not expensive in relation to its resources and effort	-0.222
PGT7	Using computer in the constructivist classroom makes teachers feel more competent as educators	-0.242
PG1	Using computer in the constructivist classroom increases academic achievement	-0.260
PGT8	Using computer in the constructivist classroom allows teachers to be a facilitator to the learning rather than providing information	-0.283
PGT9	Using computer in the constructivist classroom does not require enough time to be spent on technical difficulties	-0.617

4.3.2 The significance of the contributions to the views of basic school teachers in the application of constructivism in the classroom

The key question that gave rise to this subsection was whether the formative indicators truly contributed to forming the views of basic school teachers in Ghana. To bring the question to light, the study tested if the outer weights of the indicators in the formative measurement models were importantly different from zero by means of bootstrapping method. Based on the bootstrapping procedure that was run, the study determined the relative importance/contribution and absolute importance of the formative indicators to the perception of the basic school teachers including their corresponding statistical significance. These were the criterion used to tell whether the indicators truly contributed to the perception of the teachers. An indicator is relatively important when the indicator's outer weight is statistically significant to the perception of the basic school teachers at $p < 0.05$ obtained by regressing all the indicators against the construct labelled as "perception of basic school teachers" considering all other indicators. On the contrary, an indicator has absolute importance to the perception of the basic school teachers when its outer loading is ≥ 0.50 obtained by regressing only that indicator against the construct "perception of basic school teachers" without considering any other indicators. The rule of thumb is that, when dealing with non-significant indicator weights, we must not interpret it as an indicative of poor measurement model quality. Instead, researchers must first know a formative indicator's relative importance. The second to consider is the indicator's absolute contribution. Thirdly, formative indicator should not be done away based on statistical outcomes. When doing away with an indicator from the measurement model, researchers must know its importance from a content validity point of view, by examining to see if the conceptualization is strong to support an indicator's inclusion and or there is an evidence to support the indicator's importance in providing content to the formative index. If there is, such indicator must not be taken away from the formative measurement model.

According to table 5, not all the formative indicators provided significant relative contribution and significant absolute contribution towards the formation of the views of basic school teachers in Ghana. Table 5 below summarizes the results for the formatively measured constructs for "views of basic school teachers" in Ghana. The table shows the formative constructs, the formative indicators, the original outer weights estimates, the original outer loadings estimates, t values, p values for the weights, p values for the loadings, and the bias corrected (BCa) confidence intervals derived from the bootstrapping of one thousand (1,000) random samples. The last column of the table deals with contribution of the formative indicators towards the formation of the content of the "perception of basic school teachers". Seven out of the eighteen formative indicators provided significant relative

contribution and significant absolute contribution towards the formation of the "perception of basic school teachers" and they have been labelled "YES" in table 5. Where the relative and absolute contribution of the indicators to the "perception of basic school teachers" were not significant, and the corresponding reflective outer loading was less than 0.50, the indicator has been labelled "No" and have been maintained in the analysis on the basis that they were theoretically and conceptually found to be of importance to the content of the "perception of basic school teachers". Figure 3 below shows the decision-making process of maintaining or doing away with formative indicator. It is noteworthy to state that, all the indicator outer weights whose p-values were less than 0.05 were cited as having relative contribution to their formative constructs. On the other hand, all the indicator outer loadings whose p-values were less than 0.05 were cited as having absolute contribution to their formative constructs. The t-values in the table suggest that some of the indicators were significant at an amount of error less than 5%, whereas some were less than 01% and others at an error less than 1%. Nonetheless, this study entertained an error margin of less than 5% (Thus, $p < 0.05$).

TABLE 5. Relative and absolute importance of indicators to their Corresponding Formative Constructs.

Formative Constructs	Formative Indicators	Outer weights	Outer Loadings	t-Values	Relative contribution P-Values for weights	Absolute contribution P-Values for loading	97.5% BCa Confidence Interval 0.025	97.5% BCa Confidence Interval 0.975	Significant contribution to construct?
Perception of Ghanaian teachers in using computers as a medium for constructivist practices in the classroom.	PG1	-0.260	0.040	0.197	0.204	0.844	-0.708	0.055	NO
	PGT10	0.337	0.427	2.139	0.117	0.033	-0.011	0.734	YES
	PGT11	-0.617	0.005	0.019	0.033	0.985	-1.110	-0.292	YES
	PGT12	0.245	0.414	1.576	0.401	0.115	-0.297	0.798	NO
	PGT13	0.219	0.402	1.740	0.287	0.082	-0.148	0.640	NO
	PGT14	0.175	0.477	2.520	0.456	0.012	-0.234	0.681	YES
	PGT15	-0.283	-0.116	0.496	0.241	0.620	-0.713	0.148	NO
	PGT16	0.313	0.319	1.575	0.234	0.116	-0.110	0.865	NO
	PGT17	-0.242	0.037	0.221	0.342	0.825	-1.249	0.088	NO
	PGT18	0.439	0.478	2.235	0.123	0.026	0.022	1.046	YES
	PGT2	-0.222	0.259	1.017	0.414	0.310	-0.878	0.166	NO
	PGT3	0.029	0.293	1.343	0.898	0.180	-0.482	0.456	NO
	PGT4	0.411	0.426	2.214	0.087	0.027	0.162	0.842	YES
	PGT5	0.117	0.232	1.257	0.496	0.209	-0.185	0.464	NO
	PGT6	0.201	0.347	2.006	0.308	0.045	-0.122	0.638	YES
	PGT7	0.128	0.388	1.752	0.644	0.080	-0.478	0.592	NO
	PGT8	-0.140	0.094	0.605	0.484	0.545	-0.547	0.217	NO
	PGT9	0.089	0.050	0.332	0.616	0.740	-0.228	0.455	YES

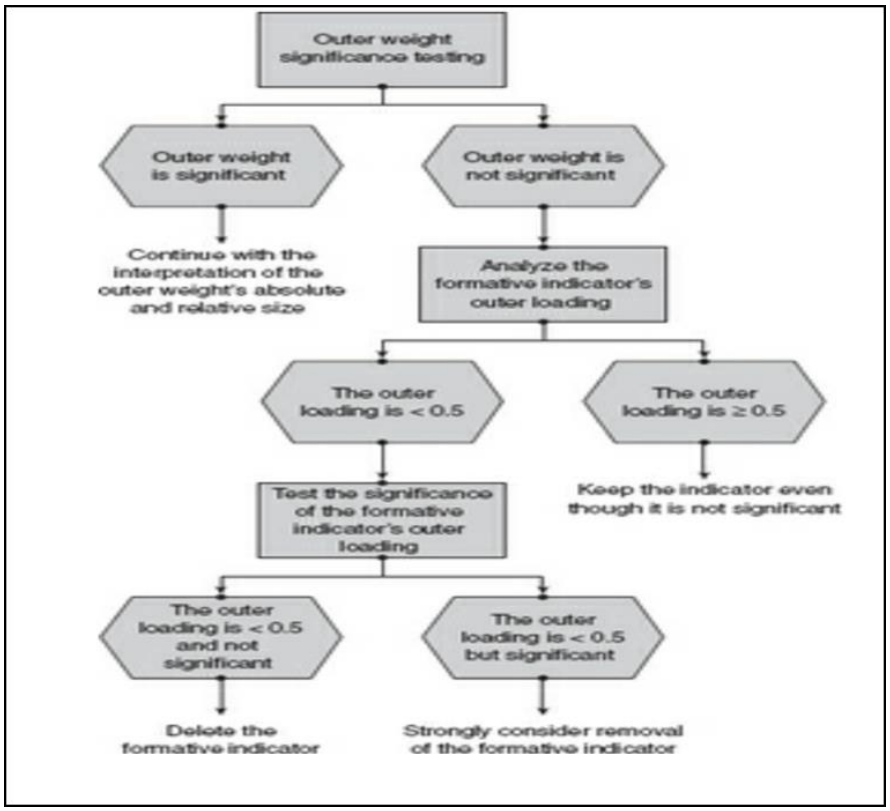

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FIGURE 3. Decision making process for keeping or deleting formative indicators

4.3.3 Effect of the perception of basic school teachers in using computers on constructivism in the classroom

In this section, the study essentially assesses how perception of basic school teachers in using computers impacts constructivism in the classroom based on the study model presented below. From the study model in figure 4 and 5, the effect of the path coefficient of perception of basic school teachers about the use of computer was statistically significant to constructivism in the classroom. Thus, the effect of the path coefficient of perception of basic school teachers about the use of computers was statistically significant to constructivism in the classroom with path coefficient of 0.354 at $P = 0.001$ (where $p < 0.05$). It follows that every 1% increase in perception of basic school teachers in Ghana in support of using computers enhances the application of constructivism in the classroom by 35.4%. Conversely, 1% decrease in the perception of basic school teachers in Ghana against using computers in the classroom reduces the application of constructivism in the classroom by 35.4%.

TABLE 6. Path coefficients of predictors

Predictors	Path coefficients	P values
Computer usage in the classroom to promote -> constructivist practices in the classroom	-0.283	0.161
Support for computer integration to promote -> constructivist practices in the classroom	0.336	0.002
Teachers perception of computer to promote -> constructivist practices in the classroom	0.354	0.001

Source: Field data (2018)

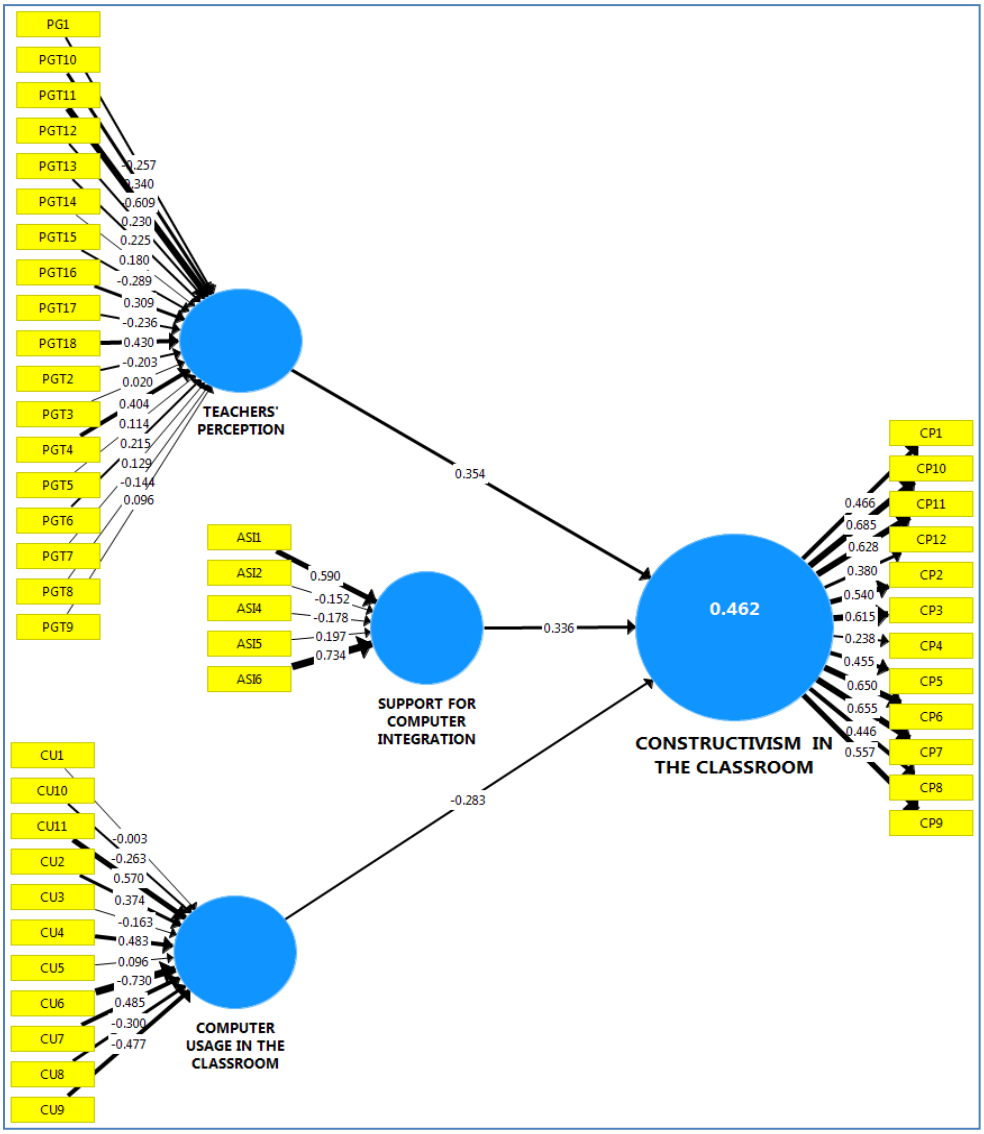

FIGURE 4. Partial Least Squares SEM (PLS-SEM) results showing path coefficient estimates of the predictors, the R square (R2) value of the criterion construct, the outer weights and the outer loadings in the modelling window

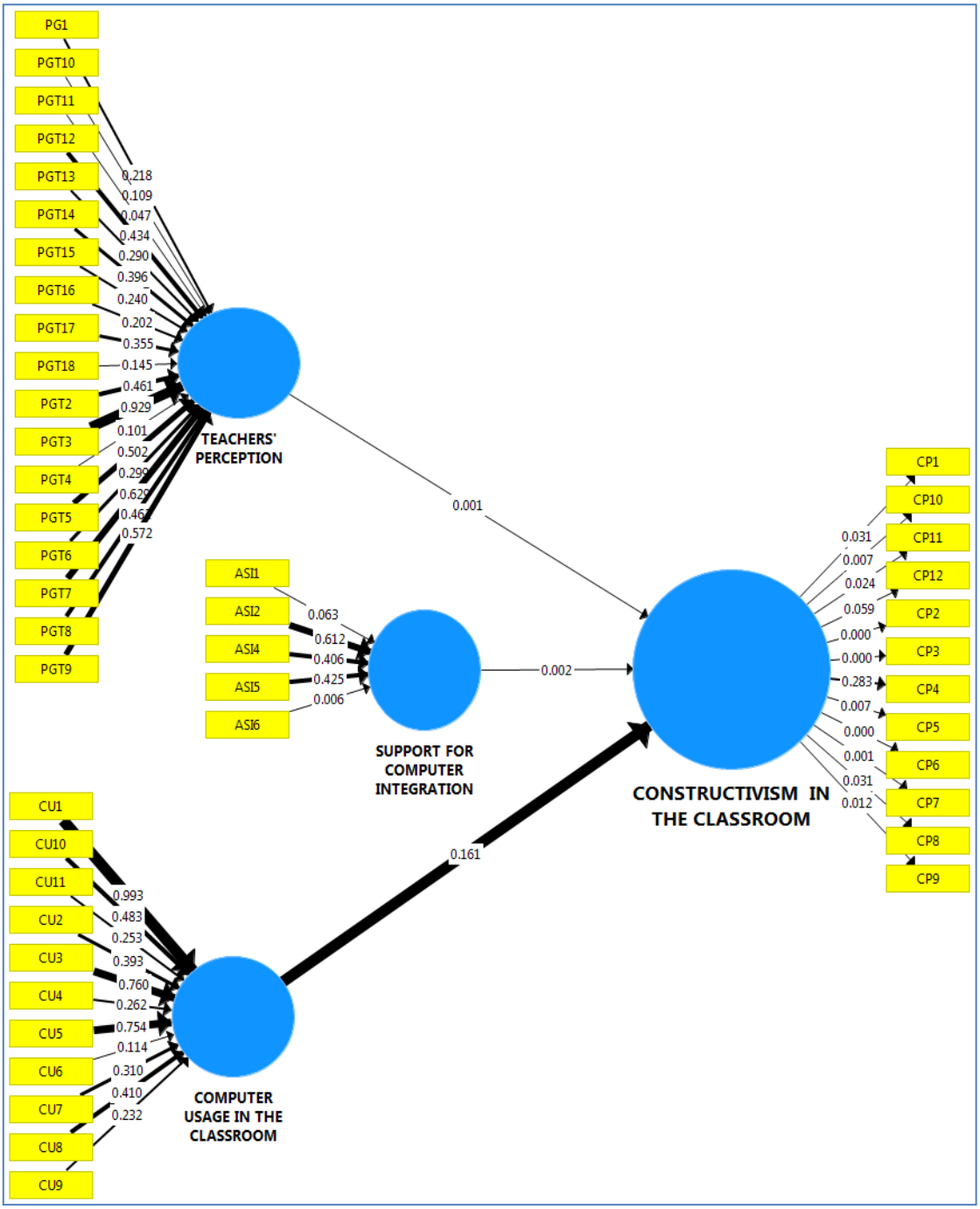

FIGURE 5. Bootstrapping results showing statistical significance (p-values) of various PLS-SEM results in the modelling window

4.4 Computer usage in constructivist classroom

This section provides answer to research question two and three. The section as well assesses the relevant part of the formative model of the study by assessing the outer weights of the indicators that the study used to measure the level of computer usage in the classroom in Ghana. The section further examines the significance of the level of computer usage in the classroom to the application of constructivism in the classroom. In addition, the contribution/importance of the computer usage in the classroom to constructivism in the classroom is examined, not leaving out the impact that computer usage in the classroom have on constructivist practices.

4.4.1 Contribution of computer usage in a constructivist classroom

The study ranks the contribution of each indicator to the construct computer usage in the classroom in order of their outer weights. The indicator with highest contribution to computer usage in the classroom has the highest outer weight and the indicator with the lowest contribution has the lowest outer weight. From figure 6, it was observed that students have access to computer confirmed by the highest outer weight of 0.570. Besides, teachers ask their students to complete assignments with computer. This indicator had an outer weight of 0.485. In addition, the teachers use computer as a recreational tool in the classroom. It also contributed an outer weight of 0.483 to the composite "computer usage in the classroom".

Conversely, the indicator that registered the lowest contribution towards "computer usage in the classroom" was the assertion that, the teachers use the internet to teach in class. The outer weight for this indicator was -0.477. The fact that the indicator registered lower contribution towards computer usage in the classroom means that the teachers virtually do not use the internet to teach in class. Similarly, teachers do not use computer to process and analyse student data and records, they do them manually. That is why the indicator contributed as low as -0.30 to computer usage in the classroom. Furthermore, most of the students were not familiar with the computer evidenced by an outer weight of -0.263.

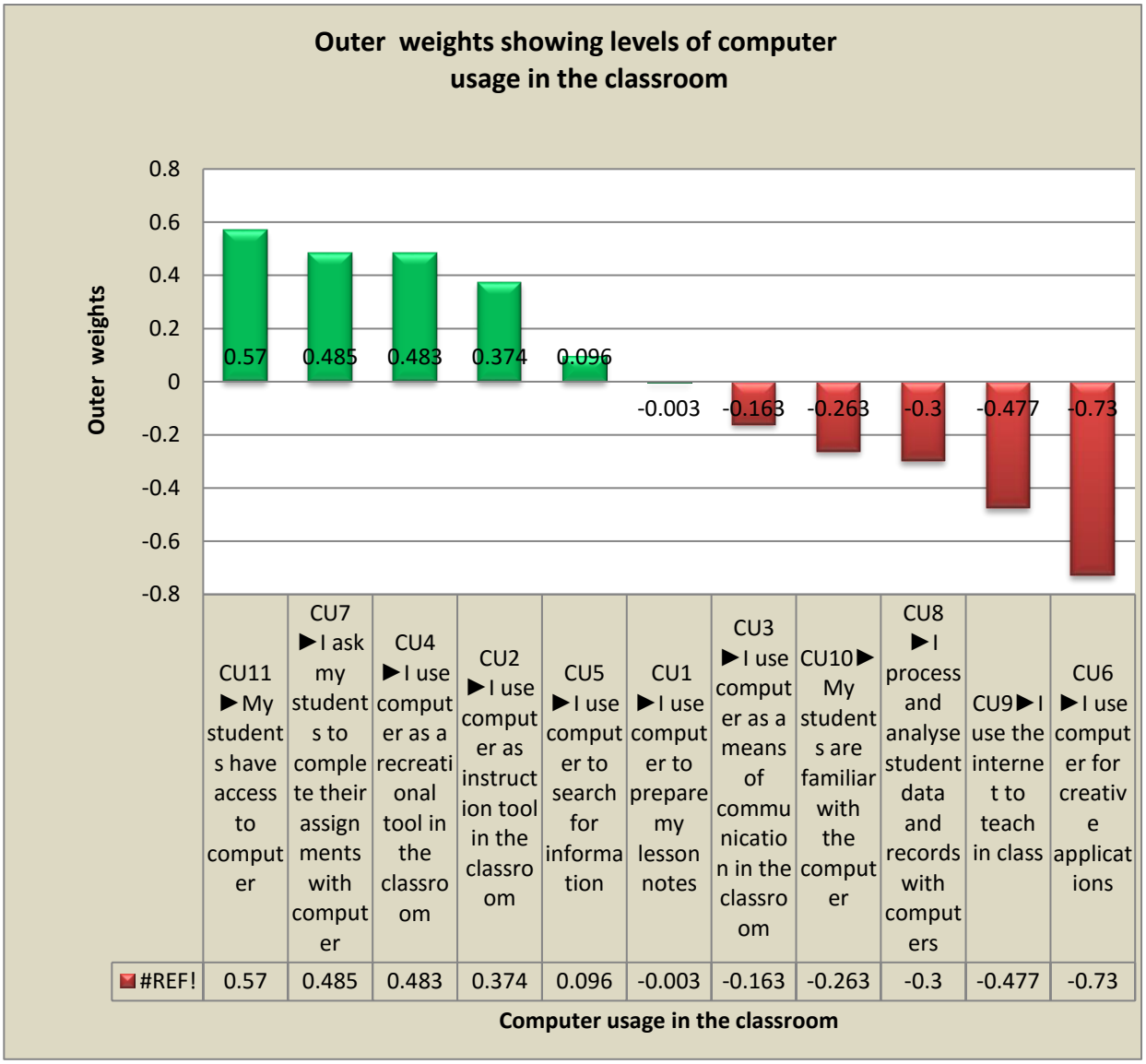

FIGURE 6. Outer weights showing levels of computer usage in the classroom

4.5 The significance of computer usage in constructivist classroom

Was using computer in the classroom really significant? The study answered the question by testing if the outer weights of the indicators in the formative measurement models were statistically significant by means of bootstrapping. Based on the bootstrapping, the study ascertained the relative importance/contribution and absolute importance/contribution of the formative indicators to computer usage in the classroom including their corresponding statistical significance. These were the criterion used to tell whether the indicators truly contributed to computer usage in the classroom.

An indicator is relatively important when the indicator's outer weight is statistically significant to computer usage in the classroom at $p < 0.05$ obtained by regressing all the indicators against the construct labelled as computer usage in the classroom considering all other indicators. On the contrary, an indicator has absolute importance to computer usage in the classroom when its outer loading is ≥ 0.50 obtained by regressing only that indicator against the construct computer usage in the classroom without considering any other indicators. The rule of thumb is that, when dealing with non-significant indicator weights, we must not interpret it as an indicative of poor measurement model quality. Rather, researchers must first think carefully about formative indicator's relative importance. The second to consider is the indicator's absolute contribution. Thirdly, formative indicator should not be done away based on statistical outcomes. When doing away with an indicator from the measurement model, researchers must know its importance from a content validity point of view, by examining to see if the conceptualization is strong to support an indicator's inclusion and or an evidence to hold up for the indicator's importance in providing content to the formative index. If there is, then the indicator must not be removed from the formative measurement model.

TABLE 7. Relative and absolute importance of indicators to their Corresponding Formative Constructs

Formative Constructs	Formative Indicators	Outer Weights	Outer Loadings	t-Values	Relative contribution P-Values for weights	Absolute contribution P-Values for loading	97.5% BCa Confidence Interval 0.025	97.5% BCa Confidence Interval 0.975	Significant contribution to Computer usage in classroom?
Computer usage in constructivist classroom	CU1	-0.014	0.326	1.581	0.969	0.114	-0.839	0.574	NO
	CU10	-0.270	0.008	0.040	0.471	0.968	-1.044	0.385	NO
	CU11	0.580	0.261	1.164	0.251	0.245	-0.375	1.281	NO
	CU2	0.374	0.355	1.655	0.404	0.098	-0.345	1.188	NO
	CU3	-0.202	0.301	1.486	0.715	0.138	-1.221	0.808	NO
	CU4	0.503	0.503	1.744	0.256	0.082	-0.365	1.234	YES
	CU5	0.077	0.033	0.156	0.803	0.876	-0.485	0.679	NO
	CU6	-0.714	-0.399	1.244	0.129	0.214	-1.236	-0.398	NO
	CU7	0.513	0.398	1.740	0.291	0.082	-0.202	1.541	NO
	CU8	-0.293	0.010	0.049	0.405	0.961	-0.858	0.381	NO
	CU9	-0.471	-0.089	0.388	0.231	0.698	-1.223	-0.016	NO

According to table 7, not all the formative indicators provided significant relative contribution and significant absolute contribution towards the formation of computer usage in the classroom. Table 7 above summarizes the results for the formatively measured constructs for "computer usage in the classroom". The table shows the formative constructs, the formative indicators, the original outer weights estimates, the original outer loadings estimates, t values, p values for the weights, p values for the loadings, and the bias corrected (BCa) confidence intervals derived from the bootstrapping of one thousand (1,000) random samples. The last column of the table deals with contribution of the formative indicators towards the formation of the content of "computer usage in the classroom". One out of the eleven formative indicators provided significant relative contribution and significant absolute contribution towards the formation of the "computer usage in the classroom" and it has been labelled "YES" in table 7. Where the relative and absolute contribution of the indicators to "computer usage in the classroom" were not significant, and the corresponding reflective outer loading was less than 0.50, the indicator has been labelled "No" and have been maintained in the analysis on the basis that they were theoretically and conceptually found to be of importance to the content of "computer usage in the classroom". Figure 3 above shows the general decision-making process for maintaining or doing away formative indicator. It is noteworthy to state that all the indicator outer weights whose p-values were less than 0.05 were cited as having relative contribution to their formative constructs. On the other hand, all the indicator outer loadings whose p-values were less than 0.05 were cited as having absolute contribution to their formative constructs. The t-values in the table suggest that some of the indicators were significant at an amount of error less than 5%, whereas some were less than 10% and others at an error less than 1%. Nonetheless, this study entertained an error margin of less than 5% (Thus, $p < 0.05$)

4.5.1 Effect of computer usage on constructivism in the classroom

In this section, the study essentially assesses how computer usage in the classroom impacts constructivism in the classroom based on the study model presented above. From the study model in table 6, the effect of the path coefficient of computer usage in the classroom was not statistically significant to constructivism in the classroom. Thus, the effect of the path coefficient of computer usage in the classroom was not statistically significant to constructivism in the classroom with path coefficient of -0.283 at $P = 0.161$ (where $p < 0.05$). It follows that every 1% increase in computer usage in the classroom in Ghana reduces the application of constructivist practices in the classroom

by 28.3%. Conversely, 1% decrease in the computer usage in the classroom in Ghana increases the application of constructivist practices in the classroom by 28.3%.

4.6 Available support for integration of computer into constructivist classroom

Section 4.6 addresses research question five. The section examines the available support for integration of computer into constructivism in the classroom (available support). The study did the examination by assessing the outer weights of the formative indicators that the study used to measure the available support for integration of computer into constructivism in the classroom. The section went ahead to examine the significance of the available support for integration of computer to the application of constructivism in the classroom. In addition, the relative and absolute importance of the available support for integration to constructivism in the classroom was examined.

4.6.1 The magnitude of individual support for integration of computer into constructivist practices in the classroom

The individual support available simply refers the indicators used to measure the construct labelled "support for integration" in the study model. It also refers to the individual support towards the composite support available for computer integration. The study ranks these individual available supports for integration of computer in order of their outer weights. The highest supports for integration of computer has the highest outer weight and the lowest supports for integration of computer has the lowest outer weight. From figure 7 below, it was discovered that instructional strategies based on constructivism has been integrated into the basic school curricula of Ghana Education Service. This was justified by the highest outer weight of 0.494. This was followed by the claim that basic school teachers feel free and skilled in using computers. This indicator/support had an outer weight of 0.466. Thirdly, the respondents argue that, their personal philosophy supported a student approach, based on observation and study that include projects as defined by the student interest. This assertion from the basic school teachers was ranked third with an outer weight of 0.343 to the composite support of computer integration.

On the other hand, the analysis revealed that there was not enough computer equipment's, and this didn't allow computer work to go on smoothly along with other learning activities. This indicator registered the lowest magnitude of the outer weight of 0.086. The fact that it registered the lowest contribution means that, using computer in the constructivist classroom was non-existent. Similarly, the schools' daily class timetable virtually did not allow students in using computers as part of class

activities and that was the second lowest among needed support for integration of computers with an outer weight of -0.134. All the, indicators/supports that registered low magnitude of outer weights simply mean that those support were not available to ensure the integration of computers in constructivist classroom to enhance teaching and learning. Earlier, the respondents argued that, using computers in the constructivist classroom is very costly in relation to its resources, effort and computer in the classroom is not a valuable instructional tool presumably given their method of teaching. Ironically, instructional strategies based on constructivism was said to have been integrated into the basic school curricula of Ghana Education Service but largely not applicable at the classroom level.

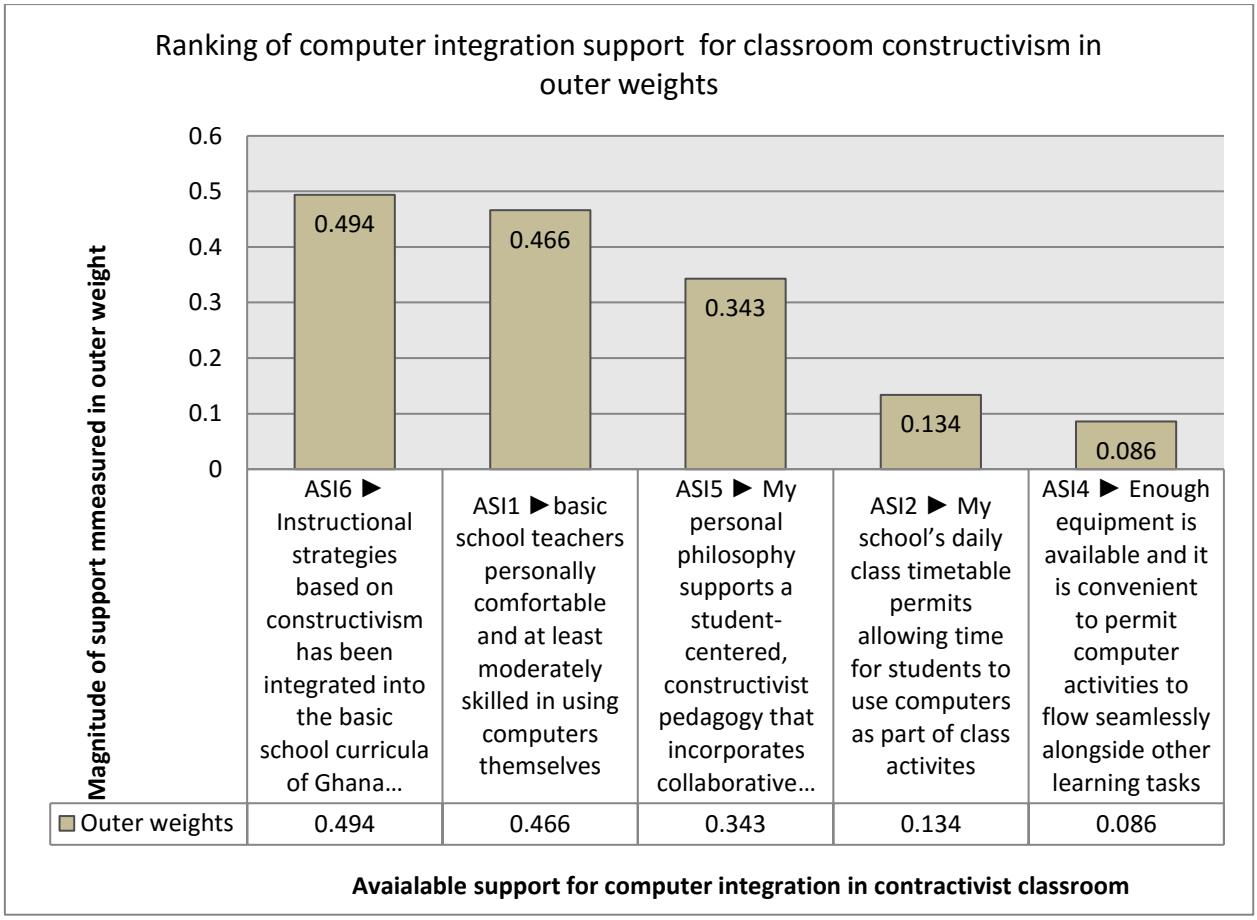

FIGURE 7. Ranking of computer integration support for classroom constructivism in outer weights

4.6.2 The significance of the available support for computer integration in the application of constructivism in the classroom

The preceding section 4.6.1 focused on the individual support/indicators that make up the composite support available for computer integration. The main concern of this subsection is whether the support/indicators were truly important to forming the composite support for computer integration. To bring the question to the light, the research work tested whether the magnitude of the outer weights of the support/indicators in the formative measurement model were statistically significant by running a bootstrapping procedure. Based on the bootstrapping procedure that was run, the study determined the relative importance/contribution and absolute importance/contribution of the support/indicators to the composite support for computer integration including their corresponding statistical significance. These were criterion used to advise whether the supports/indicators were truly important to the composite support for computer integration. It is instructive to state that, an indicator is relatively important when the individual support's/indicator's outer weight is statistically significant to the composite support for computer integration at $p < 0.05$ obtained by regressing all the supports/indicators against the construct labelled as "composite support for computer integration" considering all other supports/indicators. On the opposite side, an indicator/support has absolute importance to the "composite support for computer integration" when its outer loading is $\geq$ 0.50 obtained by regressing only that indicator against the construct "composite support for computer integration" without considering any other indicators. The rule of thumb is that, when dealing with non-significant indicator weights, we must not interpret it as an indicative of poor measurement model quality. Rather, researchers must first think carefully about a formative indicator's relative importance/contribution. The second to consider is the indicator's absolute contribution. Thirdly, formative indicator must never be done away based on statistical outcomes. When doing away with an indicator from the measurement model, researchers need to know its importance from a content validity point of view, by examining to see if the conceptualisation is strong to support an indicator's inclusion and or there is an evidence to hold on to the indicator's importance in giving content to the formative index. If there is, then the indicator must not be removed from the formative measurement model.

TABLE 8. Relative and absolute importance of indicators to their Corresponding Formative Constructs.

Formative Constructs	Formative Indicators	Outer Weights	Outer Loadings	t-Values	Relative contribution P-Values for weights	Absolute contribution P-Values for loading	97.5% BCa Confidence Interval 0.025	97.5% BCa Confidence Interval 0.975	Significant contribution to construct?
Available support for integration of computer technology in constructivist classrooms in Ghana	ASI1	0.466	0.723	2.474	0.022	0.014	0.247	0.819	YES
	ASI2	0.134	0.481	1.423	0.610	0.155	-0.625	0.446	NO
	ASI4	0.086	0.412	1.749	0.590	0.081	-0.239	0.376	NO
	ASI5	0.343	0.703	2.839	0.017	0.005	0.001	0.610	YES
	ASI6	0.494	0.651	2.733	0.017	0.006	0.143	0.909	YES

According to table 8, not all the formative indicators provided significant relative contribution and significant absolute contribution towards the formation of the "composite support for computer integration" in Ghana. Table 8 summarizes the results for the formatively measured constructs for "composite support for computer integration" in Ghana. The table shows the formative constructs, the formative indicators, the original outer weights estimates, the original outer loadings estimates, t values, p values for the weights, p values for the loadings, and the bias corrected (BCa) confidence intervals derived from the bootstrapping of one thousand (1,000) random samples. The last column of the table deals with importance of the formative indicators towards the formation of the content of the "composite support for computer integration". Three out of the five formative indicators provided significant relative importance and significant absolute importance towards the formation of the "composite support for computer integration" and they have been labelled "YES" in table 8. Where the relative and absolute contribution of the indicators to the "composite support for computer integration" were not significant, and the corresponding reflective outer loading was less than 0.50, the indicator has been labelled "No" and have been maintained in the analysis on the basis that they were theoretically and conceptually found to be of importance to the content of the "composite support for computer integration". Figure 3 above shows the decision-making process for maintaining or doing away with formative indicator. It is noteworthy to state that all the indicator outer weights whose p-values were less than 0.05 were cited as having relative contribution to their formative constructs. On the other hand, all the indicator outer loadings whose p-values were less than 0.05 were cited as having absolute contribution to their formative constructs. The t-values in the table suggest that some of the indicators were significant at an amount of error less than 5%,

whereas some were less than 01% and others at an error less than 1%. Nonetheless, this study entertained an error margin of less than 5% (Thus, $p < 0.05$).

4.6.3 Effect of the available support for computer integration into constructivist classroom

In this subsection, the study fundamentally assesses the impact of the available support for computer integration on constructivism in the classroom based on the study model presented above. From the study model figure 4 and 5 above, the effect of the path coefficient of available support for computer integration was statistically significant to constructivism in the classroom. Thus, the effect of the path coefficient of available support for computer integration was statistically significant to constructivism in the classroom with path coefficient of 0.336 at $P = 0.001$ (where $p < 0.05$). It follows that every 1% increase in available support for computer integration in Ghana enhances the application of constructivism in the classroom by 36.6%. Conversely, 1% decrease in the available support for computer integration in Ghana against using computers in the classroom reduces the application of constructivism in the classroom by 36.6%.

4.7 Computers for promoting constructivist practices in the classroom

The overall model of the research explains 46.2% of constructivism in the classroom. This means that the perception of basic school teachers, support for computer integration in the classroom and the actual usage of the computer in the classroom predicted an R^2 of 0.462. Thus, the study is 95% confident that computer is used to promote constructivist practices in the classroom based on the perception of basic school teachers in Ghana. Two of the predictors were significant to constructivist classroom practices while one was not. Available support for computer integration was significant and that promote constructivist practices in the classroom. Perception of basic school teachers was also significant to constructivist practices in the classroom. Of those predictors that were significant, the "perception of the basic school teachers" proved to be better in promoting constructivist practices in the classroom.

TABLE 9. R Square of the overall model

						Confidence Intervals Bias Corrected		
	Original Sample (O)	**Sample Mean (M)**	**Standard Deviation (STDEV)**	**T Statistics (|O/STDEV|)**	**P Values**	**Bias**	**2.5%**	**97.5%**
CONSTRUCTIVIST PRACTICES IN THE CLASSROOM	0.462	0.614	0.061	7.379	0.000	0.163	0.442	0.442

4.7.1 Constructivist practices in the classroom in Ghana

This section further gives detailed account of constructivist practices in the classroom in Ghana by assessing the outer loadings of the reflective model of the study. From the results in table 10 below, all the outer loadings of constructivist practices in Ghana were statistically significant except two of them. Prominent among them was that, the teachers' direct students to get clear understanding of task by building from their previous knowledge/performance. The teachers also design instructional that are understood by the students taking into consideration their knowledge, their experiences and their environment. The teachers monitor the student work and assess their performance. They usually compare their work with accepted standards. There is an understanding between the teachers and students which does not involve much discussions when compared with typical constructivist practices. In the classroom, teachers mainly transfer knowledge to students but do not them to construct their own meaning of the topic being studied. However, the teachers do modelling teaching, probing into solutions provided by students, clarifying of statements, adoptation of questionnaire, adoption of motivational practice, reorganisation of questions, etc. This also deviates from constructivist practices. It can be concluded that, constructivist practices take place in the classroom to some extent without computers but the point of departure from constructivist practices in the classroom is pronounced.

TABLE 10. Outer loadings of constructivist practices in the classroom

	Outer Loadings	P Values
CP10 <- I help students in achieving task which is difficult to understand based on previous knowledge	0.685	0.007
CP7 <- I plan the learning activities for students to understand based on their social norms and understanding.	0.655	0.001
CP6 <- I begin classroom activities with what students already know from home, community, and school.	0.650	0.000
CP11 <- I give immediate feedback on how students perform and compare it with some challenges they experience.	0.628	0.024
CP3 <- I have a clear academic goal that guides conversation with my students.	0.615	0.000
CP9 <- I plan instructional activities that improves student understanding that are difficult to understand.	0.557	0.012
CP2 <- I ensure that, the classroom welcomes interaction from the two sides, instructors and learners every day.	0.540	0.000
CP1 <- I and my students produce results together by designing instructional activities that are more students-directed than teacher-directed to accomplish a joint result in the classroom.	0.466	0.031
CP5 <- I direct discussion that include the views of students, their reasoning using textual evidence and other learning support.	0.455	0.007
CP8 <- I help students to connect whatever they have learnt in schools and apply them in their homes and community.	0.446	0.031
CP12 <- In the classroom, I do not transfer knowledge to students, but I ensure that, they come out with their own meaning based on the topic being studied while I do modelling, bringing out, investigating, stating questions differently for easy understanding and learning.	0.380	0.059
CP4 <- I ensure that students do much of the talking during teaching than the teacher.	0.238	0.283

Source: Field data (2018)

4.7.2 Distribution of the challenges that implementation of computer-based constructivist practices in the classroom present

The study was curious to know what the challenges that implementation of computer-based constructivist practices in the classroom present in Ghana. The result was that the magnitude of the challenges was about the same. Preeminent among them was that, the creation of competence through training of teachers to give classroom instructions digitally was lacking representing 19% of the implementation challenges. The second but not less of the first was that, getting broadband internet at a reduced price for students and teachers were also lacking, representing 19% of the overall challenges associated with the implementation of the computer-based constructivist practices

in the classroom. Please, refer to figure 8, 9 and 10 below for a pictorial view of the situation in Ghana.

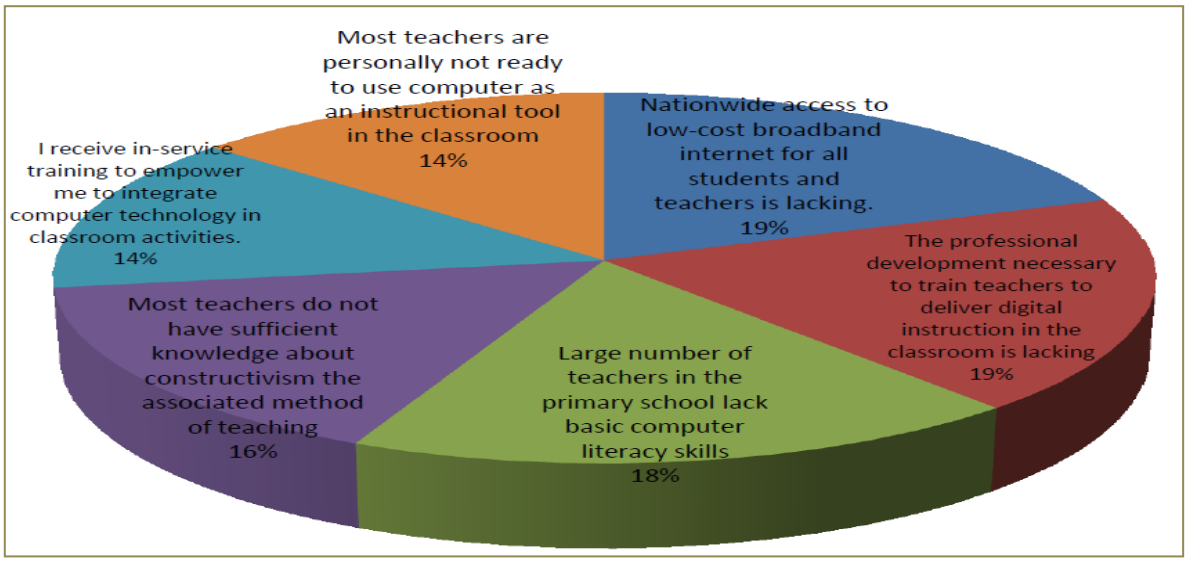

FIGURE 8. Distribution of the challenges that implementation of computer-based constructivist practices in the classroom present in Ghana.

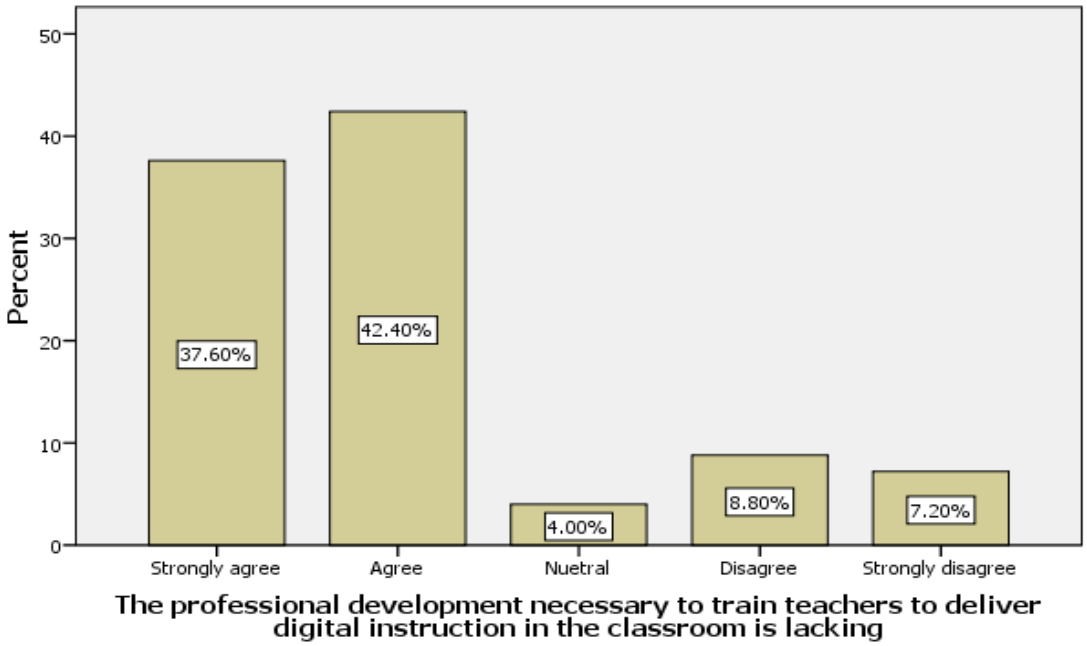

FIGURE 9. Professional Development

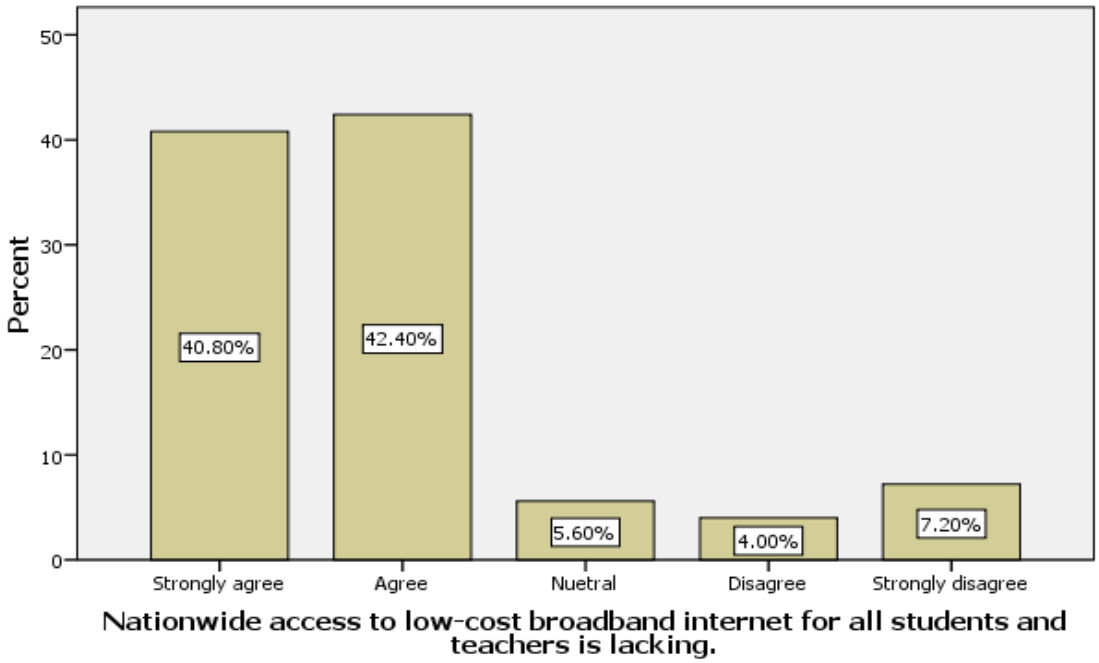

FIGURE 10. Nationwide access

5 DISCUSSIONS AND CONCLUSION

The chapter presents the summary of findings from the analysis in chapter four. Recommendations based on these findings have been made available to enhance constructivist practices in the classroom.

5.1 Findings

It has been sectioned under the five objectives of the study and discussed.

5.1.1 The perception of Ghanaian teachers in using computer as a medium for constructivist practices in the classroom.

It was observed that, the use of computer in constructivist classroom helps effectively students with different abilities justified by the highest outer weight of 0.439. This was followed by the assertion using computer in the constructivist classroom enhances professional development. This indicator had an outer weight of 0.411. In addition, using computer in the constructivist classroom makes it easier to teach. This also contributed an outer weight of 0.337 to the composite "perception of teachers".

On the other hand, the indicator that registered the lowest contribution to "perception of teachers" was the assertion that, using computer technology in the constructivist teaching and learning environment most often does not involve longer period to find solutions to problems. This has an outer weight of 0.617. The fact that it registered lower contribution means that, using computer in the constructivist learning environment allows most often longer period for the work.

In addition, not all the formative indicators provided significant relative contribution and significant absolute contribution towards the formation of the basic school teachers in Ghana perception of using computer technology in constructivist learning environment. Surprisingly, indicators that registered the highest contributions and recorded the highest outer weights were not necessarily significant to the composite construct "perception of teachers". Comparable assertions that ranked low on the perception of teachers were that, using computer in the constructivist classroom is very expensive in relation to its resources, effort and that, computer in the classroom is

not a valuable instructional tool presumably given their method of teaching, setting and the content of the curriculum.

Regarding the main predictors, the thrust of the study, perception of basic school teachers about the use of computer was statistically significant to constructivism in the classroom and that every 1% increase in perception of basic school teachers in Ghana in support of favour of using computers enhances the application of constructivism in the classroom by 35.4%.

5.1.2 Computer usage in constructivist classroom

It was unravelled that, students have access to computer confirmed by the highest outer weight of 0.570. Conversely, the teachers virtually do not use the internet to teach in class. Similarly, teachers do not use computer to process and analyse student data and records, they do them manually. Furthermore, most of the students were not conversant in using computer as evidenced by an outer weight of -0.263. Not all the formative indicators provided significant relative contribution and significant absolute contribution towards the formation of computer usage in the classroom.

Touching on the trust of the research, using computer in the classroom was not statistically significant to constructivism in the classroom to the extent that even 1% increase in favour of using computer in the classroom in Ghana reduces the application of constructivist practices in the classroom by 28.3%. The reason behind this was that, the creation of competence through training of teachers to give classroom instruction digitally was lacking representing 19% of the implementation challenges.

5.1.3 Available support for integration of computer into constructivist classroom

It was found that, instructional strategies based on constructivism has been integrated into the basic school curricula of Ghana Education Service. This was justified by the highest outer weight of 0.494. The teachers further argued that their personal philosophy supported a student approach, based on observation and study that include projects as defined by student interest. On the other hand, using computer in the constructivist classroom was non-existent. Similarly, the schools' daily class timetable virtually did not give students to have ample time to use computers as part of class activities. Earlier, the teachers argued that, using computer technology in the constructivist learning environment is expensive in relation to its resources, effort and that, computer in the classroom is not an effective tool to support instruction, presumably given their method of teaching. Ironically, instructional strategies based on constructivism was said to have been integrated into the basic school

curricula of Ghana Education Service but largely not applicable at the classroom level. Some of the formative indicators provided significant relative contribution and significant absolute contribution towards the formation of the "composite support for computer integration" in Ghana. Three out of the five formative indicators provided significant relative importance and significant absolute importance towards the formation of the "composite support for computer integration".

Concerning the predictors of the study, available support for computer integration was statistically significant to constructivism in the classroom and for that matter every 1% increase in available support for computer integration in Ghana enhances the application of constructivism in the classroom by 36.6%.

5.1.4 Constructivist practices in the classroom

The overall model accounted 46.2% of the variance in constructivism in the classroom. This means that the perception of basic school teachers, support for computer integration in the classroom and the actual usage of the computer in the classroom predicted an R^2 of 0.462. Thus, the study is 95% confident that, computer promote constructivist practices in the classroom and that, the application of computers in the classroom account for 46.2% of the variance in constructivism in the classroom. Two of the predictors were significant to constructivist classroom practices while one was not. Available support for computer integration was significant and that promote constructivist practices in the classroom. Perception of basic school teachers was also significant to constructivist practices in the classroom. Of those predictors that were significant, "perception of the basic school teachers" proved to promote constructivist practices in the classroom.

5.1.5 Constructivist practices in Ghana

All the outer loadings of constructivist practices in Ghana were statistically significant except two of them. Prominent among them was that, the teachers' direct students to get clear understanding of task by building from their previous knowledge/performance. The teachers also design instructional that are understood by the students taking into consideration their knowledge, their experiences and their environment. The teachers monitor the student work and assess their performance. They usually compare their work with accepted standards. There is an understanding between the teachers and students which does not involve much discussions when compared with typical constructivist practices. In the classroom, teachers mainly transfer knowledge to students but do not allow them to construct their own meaning of the topic being studied. However, the teachers do modelling

teaching, probing into solutions provided by students, clarifying of statements, adoptation of questionnaire, adoption of motivational practice, reorganisation of questions, etc. This also deviates from constructivist practices. It can be concluded that, constructivist practices take place in the classroom to some extent without involving computer technology. The difference between the two practices are clear/pronounce.

5.2 Challenges that implementation of computer-based constructivist practices in the classroom present in Ghana

The level challenges of the two practices were almost the same. Preeminent among them was that, training giving to the educators to be professionally competent to handle computer technology in classrooms was inadequate and representing 19% of implantation challenges. The second practice which involves the difficulty in getting broadband internet throughout the country and the high cost involve for both (teachers and students) also repented 19%. Theses overall challenges associated with the implementation of the computer-based constructivist practices.

5.3 Recommendations

- According to the findings, using computer technology in the constructivist classroom wastes a lot of time. This perception by teachers must be eradicated through the introduction of continuous professional development.
- Not all the formative indicators provided significant relative contribution and significant absolute contribution towards the formation of the perception of basic school teachers in Ghana. This was because, most of the teachers have never experienced the benefit of teaching with computer and for that matter limited their perception of the using computer in the classroom. Teacher must therefore be exposed to, in using computer for teaching and learning.
- Surprisingly, those indicators that registered the highest contributions and recorded the highest outer weights were not necessarily significant to the predictors. Therefore, it is recommended that the opinion of teachers must be relied upon after they have been tested statistically.
- Using computer in the constructivist classroom is very expensive in relation to resources, and effort and computer in the classroom is not a valuable instructional tool presumably given their method of teaching, setting and the content of the curriculum. Given the valuable constructivist practices in the classroom, the government must not be distracted by the above challenges.

- Perception of basic school teachers about the use of computer was statistically significant to constructivism in the classroom. However, it must not end there but rather the perception of teachers must further be improved with regards to using computer in the classroom especially how it can improve constructivist practices in the classroom.
- From the findings, the teachers virtually do not use the internet to teach in class. Similarly, teachers do not use computer to process and analyse student data and records, they do them manually. Furthermore, some students were not conversant with the use of computer. It is suggested that, the government through the Ghana Education Service (GES) should ensure that, internet is accessible in the classroom. Again, it is advised that teachers lesson notes be prepared with the computer, students data be analysed with computer and students be made familiar with the computer.
- Using computer in the classroom was not statistically significant to constructivism in the classroom to the extent that even 1% increase in favour of using computer in the classroom in Ghana reduces application of constructivist practices in the classroom by 28.3%. Against this background, it is recommended that the creation of competence through training of teachers to give classroom instruction digitally must be put in place by GES. Until that is done, tutors should not be allowed to use computer in the classroom because they are currently using it wrongly by that deteriorating constructivism in the classroom.
- Ironically, instructional strategies based on constructivism was said to have been integrated into the basic school curricula of Ghana Education Service but largely not applicable at the classroom level. It is recommended that constructivism as said to have been integrated into the basic school curricula of Ghana Education Service must be made functional by providing the necessary resources and compelling teachers to apply constructivist practices in the classroom in accordance with the GES curriculum.
- There is an understanding between the teachers and students which does not involve much discussions when compared with typical constructivist practices. In the classroom, teachers mainly transfer knowledge to students but do not allow them to construct their own meaning of the topic being studied. It is recommended that this method must be reversed to reflect constructivist practices in order impart creativity among students in Ghana.
- Constructivist practices take place in the classroom to some extent without computers but the point of departure from constructivist practices in the classroom is pronounced. Therefore, as a recommendation, the creation of competence through training of teachers to give classroom instruction digitally must be provided to ensure smooth implementation of constructivism without

challenges. The second recommendation that is not less of the first was that, broadband internet must be readily available for all students and teachers at a reduced cost to deal with the challenges associated with the implementation of the computer-based constructivist practices in the classroom.

5.4 Conclusion

The aim of the study was to assess the prospect of applying computer technology to facilitate studies by adopting constructivist practices in the classroom. In an attempt to achieve this objective, survey instruments were administered on one hundred and twenty-five basic school teachers to collect multivariate data of which 80% response rate was attained. Stratified random sampling was used to select the sample. Multivariate data collected was analysed by using Partial Least Square Structural Equation Modelling (PLS-SEM).

The overall model of the study accounted 46.2% of the variance in constructivism in the classroom. Thus, the perception of basic school teachers, support for computer integration in the classroom and the actual usage of the computer in the classroom predicted an R^2 of 0.462. Thus, the study is 95% confident that computer promotes constructivist practices in the classroom and the application of computers in the classroom account for 46.2% of the variance in constructivism in the classroom. Two of the predictors were significant to constructivist classroom practices while one was not. Available support for computer integration was significant and that promotes constructivist practices in the classroom.

``Perception of basic school teachers´´ were also significant to constructivist practices in the classroom and promote constructivism in the classroom. Of those predictors that were significant, the "perception of the basic school teachers" proved to facilitate extensively learning when constructivist practices in the classroom. Apart from the fact that computer usage in the classroom was not statistically significant to constructivism in the classroom, it was also found that for every 1% increase in support of using computer in the classroom in Ghana reduces application of constructivist practices in the classroom by 28.3%. In line with the above findings, it was recommended that, the creation of competence through training of teachers to give classroom instruction digitally must be provided by Ghana Education Service. Until that is done teachers must not be allowed to apply computer technology to teach because they are currently computer wrongly and this undermines constructivism.

Other findings from the research were that, ironically, instructional strategies based on constructivism was said to have been integrated into the basic school curricula of Ghana Education

Service but largely not applicable at the classroom level. It is recommended that constructivism as said to have been integrated into the basic school curricula of Ghana Education Service must be made functional by providing the necessary resources and compelling teachers to apply constructivist practices in the classroom in accordance with the GES curriculum.

Furthermore, there were understanding and cooperation among teachers and learners which does not involve much discussions when compared with typical constructivist practices. In the classroom, teachers mainly transfer knowledge to students but do not allow students to get understanding on their own on the topic being studied. It is recommended that, this method must be reversed to reflect constructivist practices in order impart creativity among students in Ghana.

Finally, the study brought to light that constructivist practices take place in the classroom in Ghana to some extent without computers but the point of departure from constructivist practices in the classroom is pronounced. Therefore, as a recommendation, the creation of competence through training of teachers to give classroom instruction digitally must be provided to ensure smooth implementation of constructivism without challenges. The second recommendation that is not less of the first was that, broadband internet must be readily available for all students and teachers at a reduced cost to deal with the challenges associated with implementing computer technology and constructivist practices in the classroom.

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Appendix 1(1)

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QUESTIONNAIRE

The aim of this research is to collect data on Computer in promoting constructivist practices in the classroom. This study which contains confidential data would be handled with strict care.

Topic: **Computer in promoting constructivist practices in the classroom: The perception of basic school teachers in Ghana**

SECTION 1: BACKGROUND OF RESPONDENTS

1. Age

(a) 20 – 25 [ ] **(d)** 36 – 40 [ ]

(b) 26 – 30 [ ] **(e)** 41 - 50 [ ]

(c) 31 – 35 [ ] **(f)** 51 – 60 [ ]

2. Gender

(a) Male [ ]

(b) Female [ ]

3. Marital status

(a) Single [ ] **(b)** Married [ ]

(c) Separated [ ] **(d)** Divorced [ ]

4. Educational Level

(a) Diploma [ ] **(b)** 1st degree [ ]

(c) 2nd degree [ ] **(d)** Professional [ ]

(e) Others [ ]

5. Years of teaching experience

(a) less than 1year [ ] **(b)** 1 – 3 years [ ]

(c) 4 – 6 years [ ] **(d)** 7 – 10 years [ ]

(e) 10yrs & above [ ]

SECTION 2: PERCEPTION OF GHANAIAN TEACHERS IN USING COMPUTERS AS A MEDIUM FOR CONSTRUCTIVIST PRACTICES IN THE CLASSROOM. **What is your opinion on the following statement based on your experience?**		**Strongly agree** **5**	**Agree** **4**	**Not sure** **3**	**Disagree** **2**	**Strongly disagree** **1**
PG1	Using computer in the constructivist classroom Increases academic achievement					
PGT2	Using computer in the constructivist classroom Helps students participation					
PGT3	Using computer in the constructivist classroom Makes the management of classroom easier					
PGT4	Using computer in the constructivist classroom Supports social development					
PGT5	Computer in the classroom Is an important instructional tool					
PGT6	Using computer in the constructivist classroom Is not expensive in relation to its resources and effort					
PGT7	Using computer in the constructivist classroom Makes teachers feel more competent as an educator					
PGT8	Using computer in the constructivist classroom Allows teachers to be a facilitator to the learning rather than providing information					
PGT9	Using computer in the constructivist classroom Does not require enough time to be spent on technical difficulties					
PGT10	Using computer in the constructivist classroom Is a powerful tool for students of all abilities					
PGT11	Using computer in the constructivist classroom Enhances my professional development					
PGT12	Using computer in the constructivist classroom Makes it easier for me to teach					
PGT13	Using computer in the constructivist classroom Helps accommodate students' personal learning styles					
PGT14	Using computer in the constructivist classroom Motivates students					
PGT15	Using computer in the constructivist classroom Does not demand software training skills that wastes time.					
PGT16	Using computer in the constructivist classroom Improves the way students interact with one another.					
PGT17	Using computer in the constructivist classroom Will not increase the amount of stress					
PGT18	Using computer in the constructivist classroom Improves student learning					

SECTION 3: CONSTRUCTIVIST PRACTICES IN THE CLASSROOM **To what extent do you agree or disagree with the following statements**		**Strongly agree** **5**	**Agree** **4**	**Not sure** **3**	**Disagree** **2**	**Strongly disagree** **1**
CP1	I and my students produce results together by designing instructional activities that are more students-directed than teacher-directed to accomplish a joint result in the classroom.					
CP2	I ensure that, the classroom welcomes interaction from the two sides, instructors and learners every day.					
CP3	I have a clear academic goal that guides conversation with my students.					
CP4	I ensure that students do much of the talking during teaching than the teacher.					
CP5	I direct discussion that include the views of students, their reasoning using textual evidence and other learning support.					
CP6	I begin classroom work with what students are aware of in their homes, communities and schools.					
CP7	I plan the learning activities for students based on their social norms and understanding					
CP8	I help students to connect whatever they have learnt in schools and apply them in their homes and community.					
CP9	I outline instructional activities that improves student understanding that are difficult to understand					
CP10	I help students in achieving task which is difficult to understand based on previous knowledge.					
CP11	I give immediate feedback on how students perform and compare it with some challenges they experience.					
CP12	In the classroom I do not transfer knowledge to students I ensure that, they come out with their own meaning based on the topic being studied whiles I do modelling, bringing out, investigating, stating questions differently for easy understanding and learning.					

SECTION 4: AVAILABLE SUPPORT FOR INTEGRATION OF COMPUTER TECHNOLOGY AND CONSTRUCTIVISM IN THE CLASSROOM **To what extent do you agree or disagree with the following statements**		**Strongly agree** **5**	**Agree** **4**	**Not sure** **3**	**Disagree** **2**	**Strongly disagree** **1**
ASI1	I am personally comfortable and skilled in the use of computers					
ASI2	My school's daily class timetable virtually did not give students to have ample time in using computers to form part of class activities.					
ASI3						
ASI4	Computer resources are available, and this allows computer work to go on smoothly along with other learning activities.					
ASI5	My personal philosophy supported a student approach, based on observation and study that include projects as defined by the student interest.					

ASI6	Instructional strategies based on constructivism has been integrated into the primary school curricula of Ghana Education Service					

SECTION 5: COMPUTER USAGE IN CONSTRUCTIVIST CLASSROOM **To what extent do you agree or disagree with the following statements**		**Strongly agree** **5**	**Agree** **4**	**Not sure** **3**	**Disagree** **2**	**Strongly disagree** **1**
CU1	I use computer to prepare my lesson notes					
CU2	I use computer as an instruction tool in the classroom					
CU3	I use computer as a medium to communicate in the classroom					
CU4	I use computer for recreational purposes in the classroom					
CU5	I use computer to search for information					
CU6	I use computer for creative applications					
CU7	I ask my students to complete their assignments with computer					
CU8	I process and analyse student data and records with computers					
CU9	I use the internet to teach in class					
CU10	My students are familiar with the computer					
CU11	My students have access to computer					

SECTION 6: CHALLENGES THAT IMPLEMENTATION OF COMPUTER BASED CONSTRUCTIVIST PRACTICES IN THE CLASSROOM PRESENT **To what extent do you agree or disagree with the following statements**		**Strongly agree** **5**	**Agree** **4**	**Not sure** **3**	**Disagree** **2**	**Strongly disagree** **1**
CH1	The creation of competence through training of teachers to give classroom instruction digitally is lacking.					
CH2	Broadband internet is available for all students and teachers at a reduced cost is lacking.					
CH3	Large number of teachers in the primary school lack basic computer literacy skills.					
CH4	Most teachers are personally not ready in using computer as an instructional resource in the classroom.					
CH5	Most teachers do not have much knowledge about constructivism associated method of teaching.					
CH6	I receive in-service training to empower me to integrate computer technology in classroom activities.					

THANK YOU