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# Integration of information and communication technology in teaching: Initial perspectives of senior high school teachers in Ghana

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## Abstract

The study examined the Integration of Information and Communication Technology in teaching in Senior High Schools. The study focused on the Kumasi Girls Senior High School in Ghana. The study had two objectives. The first objective examined the extent to which the attitude of teachers influences the integration of ICT in teaching. The second objective examined the gender differences in the integration of ICT in Senior High Schools. A descriptive survey design and quantitative approach were adopted for the study, descriptive statistics using means and inferential statistics using standard regression were used for analysing the data. Hypotheses were developed using the diffusion of innovation theory. Data was collected through self-administered questionnaires which were distributed to the study population. The testing of hypothesis was made possible through the use of structured equation modelling. Findings revealed that teachers' attitude had a significant positive relationship with ICT integration. The study further concluded that there was no significant difference in gender acceptance of ICT integration in teaching.

**Keywords** Integration · Gender · ICT · Teaching · Learning · Structural equation modelling

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## 1 Introduction

The impact of Information and Communication Technology (ICT) on modern societies cannot be over emphasized. The spread, adoption and use of information technology has transformed many societies in the world (Ahiatrogah and Barfi 2016; Shiboko 2015). Studies across the globe have revealed that the advent and emergence of computer technologies have not only changed the socio-cultural dynamism of traditional societies but have also improved the politico-economic performance of modern economies (Buabeng-Andoh 2012; Koc and Bakir 2010). In view of the vast impact of ICT, the extent to which it can improve education in general and teaching in particular cannot be underestimated. According to Koc and Bakir (2010), the educational sector continues to remain one of the most important beneficiaries of ICT. Over the years there has been a growing demand for ICT to be fully utilised by teachers to improve teaching and learning processes that will go a long way to enhance students' academic performance (Ahiatrogah and Barfi 2016; Shiboko 2015; Buabeng-Andoh 2012; Koc and Bakir 2010). To realise the full impact of ICT, existing structures in the educational system and classroom facilities are being reviewed, curricula are being revised and budget allocations are also being adjusted to make room for ICT integration. The benefits of the integration to the overall academic performance in schools cannot be overemphasized. For instance, Papaioannon and Charalambous (2011) observed that the integration of ICT in schools among other things motivates students, stimulates their interests, increases their self-esteem and confidence. ICT allows for greater interactivity among students and teachers, enhances critical thinking skills and increases student's ability to understand what they have been taught in class.

Due to the benefits of ICT integration in advanced societies, many countries are gradually embracing its use in their educational system (Bell 2011). In countries like Nigeria, Kenya and South Africa, previous studies have revealed positive associations between the integration of ICT in teaching and improvement in the general academic performance of students (Bhasin 2012; Farrell 2007; Shiboko 2015). This observed positive relationship which exists between the integration of ICT and academic performance becomes possible when effective policies are made towards ICT integration in education.

The situation is not different in Ghana. There is a rising pervasiveness of ICT in almost all spheres of the academic landscape (Agyei 2014; Ahiatrogah and Barfi 2016; Buabeng-Andoh 2012). Research into ICT integration in teaching has revealed that it can boost education delivery. Teaching and learning has been made much easier with the use of ICT in schools (Boakye and Banini 2008; Buabeng-Andoh 2012; Buabeng-Andoh and Yidana 2015). A study by Amedeker (2020), revealed that the use of ICT in teaching has nurtured students who are committed and are able to engage themselves actively in their own learning, students who develop new ideas by collaborating with other students all over the world. The going concern shows that there is a literature gap as far as integration of ICT is concerned in Ghana. Thus, this study examines assess the integration of ICT in teaching in Senior High Schools in Ghana.

## 2 Statement of the problem

Many Senior High Schools (SHSs) in Ghana have access to computers courtesy of the various governments' spear-headed initiatives, developing partners, Non-Governmental Organisations (NGO) and individual stakeholders of these schools (Shiboko 2015; Yusuf and Yusuf 2017). Additionally, the government of Ghana and its allies have been trying to provide teachers as well as students with free laptops aimed at improving teaching and learning. The situation is not different at the Kumasi Girls High School (Ahiatrogah and Barfi 2016; Buabeng-Andoh 2017). The expected pace of ICT integration in SHSs have not been fast enough. It has been argued that Senior High School (SHS) teachers particularly those in Kumasi Girls Senior High School are still rooted in the traditional style of teaching and this is perceived to affect ICT integration.

Teachers' contribution to the integration of ICT in teaching is paramount, however, attitude and demographic variables of teachers are arguable antecedents of success of ICT integration (Yusuf 2012). However, no empirical study has been conducted to test the implication of attitude and other demographic variables on ICT integration in teaching. Such a gap is militating against the formulated ICT policies in the educational sector. Resources are being channeled into ICT integration but the real impact is still not felt in the various high schools. It has therefore become imperative to examine how the behavior; attitude and demographic variables of teacher's influence ICT integration.

## 3 Study objectives

The overall purpose of the study was to examine the integration of ICT in teaching. The study specifically sought to:

1. Determine the extent to which Senior High School teacher's attitude influence integration of ICT in teaching.
2. Determine the gender differences in the integration of ICT in teaching in senior high schools.

### 3.1 Hypothesis

- $H_1$: Attitude of teachers has a statistically significant influence on the integration of ICT in teaching in senior high schools.
- $H_2$ There is a statistically significant difference between male and female teachers' integration of ICT in teaching.

### 3.2 Literature review

This section of the paper provides the theoretical and empirical background to the subject matter under study. The theoretical framework presents the theoretical arguments to support the focus of this study. The empirical review presents the current development on the subject under investigation.

### 3.3 Theoretical review

#### 3.3.1 Diffusion of innovation theory

The study was underpinned by Rogers' theory of diffusion of innovation. This theory was originally designed as an explanatory structure of adopting technology in education and in educational environments (Medlin 2001; Sarfo et al. 2016). The theory of diffusion of innovation is basically the theory which seeks to give explanations to the context of how, why and at what rate new ideas and technology spread through various cultures. Rogers indicated that the diffusion process is seen when an innovation is communicated via certain channels over time among some participants across different geographical areas (Gyamfi and Gyaase 2017). Within the context of this study the channel is the school and the innovation is integrating ICT into teaching and learning. The diffusion of innovations theory is not static and hence works in multiple ways (Dintoe 2018). The theory thrives on four dimensions each of which have been applied to the study. The four dimensions are time, innovation, communication channel, and social system.

In the view of Rogers (2003), the innovation aspect refers to ideas, practices, or projects that are perceived as new by an individual. According to him, communication channels are means by which an innovation spreads within a social system. Rogers (2003) further defined a social system as a set of interrelated units that are engaged in joint problem solving to commonly accomplish goals (Mwila 2018). Hajara and Bukari (2017) posited that the attitude of teachers forms part of the social system in the diffusion of innovation paradigm. Therefore, if teachers develop a positive attitude towards an innovation (technology), policies formulated to enhance ICT integration would receive a wider acceptance and adoption. On the other hand, if teachers develop fear for computer use and become less confident with technology adoption, ICT integration into teaching cannot be materialized. This therefore gives a theoretical justification for the formulation of hypothesis that:

> *The Attitude of teachers has a statistically significant influence on the integration of ICT in teaching in senior high schools.*

Furthermore, the diffusion of innovation theory proposes a five stage-decision process. These processes are: knowledge which is mostly referred to as an individual's awareness of an innovation and having an idea of how such a technology works. The second is persuasion and this occurs when the individual has a positive or negative attitude toward the innovation or technology (Hajara and Bukari 2017). The third stage is the decision stage where an individual chooses to reject or adopt the innovation, that is, through delving into activities that lead to a choice to reject the innovation based on the social perspectives of the individual (Rogers 2003).

The fourth is what is referred to as the implementation stage. At this stage, the innovation is put into use. The implementers may need some level of technical assistance from agents of change and others to reduce the degree of uncertainty about the expected consequences of the innovation. After the innovation has been implemented, the final stage is the confirmation stage. This is basically where users evaluate the decisions made about the innovation (Sherry 2011). This compels users to continue

adopting the technology for use or reject the technology in teaching. The theoretical implication of these stages is that the willingness of users is important for the successful implementation of an innovation. The social perspectives in the third stage illustrates that demographic factors like gender and experience could determine the acceptance of an innovation. The diffusion of innovation theory suggests that ICT could be integrated into teaching; however, much would be expected from teachers. The Attitude, behaviour and other demographic factors from teachers could determine the success of the integration.

### 3.4 Empirical review

In a study by Edumadze and Owusu (2013) at the university of cape coast, it was found out that the university provides teaching and learning resources but the resources were inadequate. They also revealed that lecturer's prior skills and knowledge in ICT predicted the extent of ICT integration in their teaching and there was a significant positive relationship between ICT related courses and students' competencies in ICT. The findings further suggested that on the part of students, ICT related courses were helping them to improve their ICT knowledge and skills even though the relationship between these variables were found not to be statistically significant. The implication is that teacher's ICT knowledge is a significant precursor to ICT integration. Therefore, the study sought to investigate the differences in gender and attitude as precursors to ICT integration as the diffusion of innovation theory proposes.

In another study, Gyamfi (2017) used the Technology Acceptance Model (TAM) to empirically investigate various factors that influence Ghanaian pre-service teacher's attitude towards Information and Communication Technology (ICT) use. Based on multiple stepwise regression analysis, his findings revealed that leadership support significantly influenced perceived ease of use and job relevance also had a positive influence on perceived usefulness. The study further revealed that perceived usefulness of ICT had a significant influence on the attitude of users. Buabeng-Andoh (2017) conducted a study which showed that students' use technology for personal purposes as compared to instructional purposes. The study revealed that despite, students' high acceptance of technologies, the integration of technology into learning was found to be very low. Dzakpasu and Adom (2017) conducted a study which found out that ICT had a favourable impact on the lesson delivered by lecturers and students and learning outcomes were positive in many areas of study. These areas included research, ease of dissemination of information and assessment procedures. The study contended that in order to improve ICT integration in the lesson delivery of lecturers as well as academic performances of students, educational policies should be changed to pave way for modern technological advancement which would groom and provide students with requisite skills to fit into the job market. Additionally, training should be periodically organized for instructors to improve their skills to deliver effectively. However, for students to acquire the requisite skills, teachers have a greater responsibility, therefore, the need for an investigation into factors that influence teacher's adoption of ICT integration is important.

In Botswana, Dintoe (2018) discussed how faculty found it very difficult to apply their experiences in the use of ICT for purposes of teaching and learning. The study revealed that though technology was available and accessible, faculty expected to adopt

technology at the University of Botswana found it hard to use technology in teaching and learning. The findings from the study posited that majority of faculty members used teacher-centered approaches as compared to the much-desired student-centered approach. Mwila (2018) in a study found that both male and female teachers had positive attitudes towards ICT integration in their teaching.

In summary, the empirical review revealed that integration of ICT in teaching and learning is confronted with several factors. These include inadequacy of resources, limited experiences from the perspective of teachers and lack of technical abilities and skill. However, teachers' attitude and how gender differences affect the integration of ICT in teaching has not received much attention in literature. This explains why the study examined teachers' attitude and gender differences on the integration of ICT in Senior High Schools.

#### 3.4.1 Attitude of teachers towards teaching and integration of ICT

Many researchers have revealed that, the effective use of ICT is dependent on teachers' personal beliefs, intentions, and attitudes toward teaching with technology (Divaharan and Ping 2010; Ozden 2007). Teachers attitude towards technology greatly influences its acceptance as well as its integration in the teaching profession. The availability of ICT facilities in schools will not automatically guarantee their effective use in teaching and learning processes (Ahiatrogah and Barfi 2016). Regardless of the quality and the quantity of technology placed in these classrooms, the key to how such tools are used largely rest on the teacher (Kadel 2005). There is a common saying that attitude determines altitude, therefore, attitude is determined by the analysis of the information regarding the results of an action and by the positiveness or negativity of the results based on careful evaluation (Ajzen and Fishbein 2000).

Different studies have already established close links and relationship between teacher's attitude and their use of ICT for teaching. In most of these studies, it has been revealed that teacher's positive attitudes towards the use of ICT were equally associated with their level of computer experiences (Buabeng-Andoh and Yidana 2015). This means that teachers' confidence in ICT can be explained through their attitude and behaviour (Lee 2013). Teachers' behaviour is a critical influence on teachers' confidence and attitude towards ICT as they become important role models to their students (Ajzen and Fishbein 2000). Other studies have indicated that the attitude of teachers towards technology skills can be improved when technology is integrated into teacher education (Bhasin 2012; Buabeng-Andoh and Yidana 2015). Existing findings have revealed that there is a significant relationship between teachers' computer attitudes and their use in classroom teaching (Beauchamp 2012). This means that attitude is a major predictor of teachers' use of ICT for classroom teaching. Studies have revealed that teachers who have positive attitudes and are highly enthusiastic about interactive teaching aids or tools for teaching are motivated to use ICT for lesson delivery (Gyamfi 2017). However, teachers need to be skilled in the use of ICT and also to be able to evaluate the various and appropriate strategies for teaching with ICT in diverse curriculum areas (Ittigson and Zewe 2003).

From another perspective, Davis and Tearle (2008) conducted a research to review frameworks for ICT integration in teacher education, from their study they noted that many countries around the world were using different approaches to ensure that their

educational systems are reviewed in order to permit equality of access and to ensure that key ICT skills were developed in educational institutions to be used by their teachers. The authors also noted that it was becoming clear that the training of teachers in ICT skills and the use of appropriate pedagogical approaches were essential for teachers to integrate ICT in their teaching.

### 3.4.2 Teachers' social and demographic factors and ICT integration

Many research studies have revealed that a considerable number of teachers hold negative attitudes towards ICT integration in teaching. This attitude ranges from anxiety to computer avoidance, lack of confidence, self-efficacy, enthusiasm, liking and usefulness of computer towards personal and well as social life (Makhanu 2010; Wernet et al. 2000). Other socio-demographic factors like age, gender, training, access to computers, years of computer use and ownership of computers are equally regarded as some of the variables used to evaluate teacher's attitudes towards ICT integration in schools.

Teacher's beliefs and attitudes toward ICT and associated technologies have been observed to be among the factors that influence successful integration of ICT into teaching (Hew and Brush 2007). The implication is that teachers' positive attitudes towards the use of educational technology can easily provide a useful insight on the adoption and integration of ICT into teaching and learning processes in secondary schools.

### 3.4.3 Teacher training and ICT integration in schools

Teachers' ICT skills and access to professional development is quite critical to the integration of ICT in teaching in the classroom. In the view of Hennessy (2010), when teachers' view ICT programs as satisfying their needs or their students' needs, it is likely that they will integrate it in their teaching. This means that needs assessments is important to assess the ICT skills and knowledge teachers need in their schools. Designers of university education programs for teachers should understand teachers' perceptions of ICT and their attitudes towards ICT integration and make the necessary provision towards its integration in the curriculum (Gebremedhin and Fenta 2015).

Osborne and Hennessy (2003) posited that, when teachers are insufficiently trained, they will not be adequately confident with the integration of ICT in their teaching. Thus, with proper training on how to implement ICT, teachers can use appropriate strategies to select and integrate computer tools to support teaching and learning as these computer tools are the backbone in helping students achieve their educational goals.

The successful integration of ICT into teaching and learning clearly depends on how teachers have been prepared to use computers in teaching (Wernet et al. 2000). Teachers are the backbone in curriculum implementation, this implies that teachers should be trained to integrate computer tools to support teaching and learning. However, the training of teachers on ICT adoption in most of the developing countries have not been adequate due to institutional challenges (Makhanu 2010). It has been observed that the curricula used for training in most cases are oriented towards teaching the technical aspect while ignoring the organizational and social aspects of ICT integration

(Schlebusch 2018). According to Schlebusch (2012), the training of teachers should therefore, focus on ICT pedagogical issues and not just on ICT skills. Therefore, university management should provide teachers with adequate opportunities to experiment with ICT tools before using them to teach students. According to Becta (2004), the lack of initial training in ICT use at the pre service level has been a barrier to teachers' integration of ICT in teaching. According to Sherry (2011), when there is no effective training on ICT, teachers will not be able to use ICT resources for integration purposes.

Similarly, Hajara and Bukari (2017) have advocated that teachers who do not consider themselves to be well skilled in using ICT feel anxious about using it in front of a class of students who perhaps know more than them. Effective integration will depend to a large extent on the level of training and support given to teachers. Some challenges in the schools have been lack of the provision of adequate resources to support teachers in the acquisition of appropriate technical skills important for integrating ICT in the classroom (Lee 2013).

### 3.5 Research design and approach

The study used a descriptive survey design and quantitative approach to examine the integration of Information and communication technology in teaching. The focus was on the Kumasi Girls Senior High school. Bryman and Bell (2015) define a survey design as a method used in collecting information through interviewing or administering questionnaires to a sample of individuals to collect data about people's opinions, attitudes, habits and social issues.

### 3.6 Population, instrument and data collection procedure

The population of the study consisted of all the teachers in the Kumasi Girls Senior High school. A census was employed to select 83 teachers in the school. The data was collected using a self-administered questionnaire which comprised of closed ended questions for the quantitative analysis and open-ended questions to capture the qualitative responses. The questionnaires were distributed through a drop and pick method where the researcher allowed the respondents to answer the questions at their own pace. The data collection instrument was based on an existing instrument which had been validated by experts with a high reliability score. The reliability of data was computed using the Cronbach Alpha value, which gave a figure of 0.78.

### 3.7 Data analysis

The collected data was cleaned and edited to ensure completeness and consistency. The data was tabulated and analysed using statistical package for social sciences (SPSS version 22) in conjunction with IBM Amos for Structured Equation Modelling (SEM) for data analysis. SEM is one of the comprehensive statistical approaches to testing relationships among observed and latent variables (Hoyle 1995) and it is also one of the popular statistical methodologies available to quantitative management researchers for data analysis. To test the two hypothesis, different approaches were used. Multivariate regression analysis was used for the first hypothesis and the independent T test was

used for the second hypothesis. Attitude was measured from three perspectives, Interest (IN), Affective (AT), and Effort (ET). The interest was defined within the context of how eager teachers were to accept the integration of ICT tools. The affective was defined as the context of love and enthusiasm towards ICT integration in teaching and effort defined as the ability, willingness and desire to learn new skills in order to complement the integration of ICT in teaching.

$$Y = \beta 0 + \beta_1 IN_1 + \beta_2 AT_2 + \beta_3 ET_3 + \varepsilon \quad (1)$$

Where:

Y = ICT integration (dependent variable).
β0 = Constant Term.
$\beta_1$, $\beta_2$, $\beta_3$ = Beta coefficients IN = interest; AT = affective and ET= effort.
ε = Error.

## 4 Results and discussion

Out of the 83 questionnaires administered 70 were received. This represented a response rate of about 85%. According to Kothari and Gang (2014) a response rate above 70% is very good. Sixty-five percent of the teachers had been teaching for more than 10 years and this showed that they have an experience in the teaching profession.

### 4.1 Determine the extent to which senior high school teachers' attitudes influence ICT integration in teaching

The first objective was to determine the extent to which senior high teachers' attitudes influence ICT integration in teaching. To achieve this research objective, three variables with a total of 17 indicators were used to measure the variable on a five-point likert scale. Score ′5′ indicated the strongest agreement while score ′1′ showed the least agreement. Given this measurement scale, the overall highest score expected was 75.00 (i.e. 5 indicator X 17 point on the scale) and the lowest was five (i.e. 1 indicator X 5 on the scale). The perceived negative attitude towards ICT integration had a range of 1–2.9, whilst the perceived positive attitude towards ICT integration was 3–5. The implication was that on the likert scale of 1–5, the cut-off point was 2.9.

Table 1 shows that each of the constructs used for the measurement of teachers' attitude towards the integration of ICT in teaching demonstrated a low range. Using a cutoff mean point of 2.9, none of the constructs had a mean value higher than the cutoff point. Specifically, interest had a mean value of 2.78 whilst affective and effort had mean values of 2.66 and 2.64 respectively. The overall mean aggregate was found to be 2.69 which was below the cutoff point. The data therefore showed that teachers had a negative attitude towards the integration of ICT in teaching in the Kumasi Girls High school.

From Table 2, it could be observed that the integration of ICT in teaching is relatively low in the Kumasi Girls senior high school. It could be observed that its use in the preparation and delivering of lessons, communication with other teachers, making presentation and storage of vital data or information had a high mean score

**Table 1** Descriptive analysis of teachers' attitude towards integration

| Attitudinal constructs | N | Mean | Std. Dev |
|---|---|---|---|
| Interest | 70 | 2.78 | .543 |
| Affective | 70 | 2.66 | .541 |
| Effort | 70 | 2.64 | .535 |
| Grand mean | | **2.69** | **.539** |

*Scale (Mean): Low = 1.00–2.90; Cut-off Point = 2.99; High = 3.00–5.00*

*Source: Field Survey (2020)*

which was within the higher margin of 3 to 5. Nine (9) indicators on the use of ICT resources were employed in the data collection. Out of a total of 75 mean point, it was observed that the total mean score was 23.03 and the grand mean was 2.55, which was low. Having determined the level of ICT integration, the study proceeded to employ SEM to determine the extent to which senior high teachers' attitudes influence the integration of ICT in teaching. The hypothesis was that:

> *The Attitude of teachers has a statistically significant influence on the integration of ICT in teaching in senior high schools*

Prior to running the multivariate analysis, certain assumptions or conditionality's, i.e., normality and linearity test of data should be met.

#### 4.1.1 Normality and linearity diagnostics test

The normality test is on the relationship between attitude of teachers on the integration of ICT. Normality and linearity assumptions are fundamental to standard regression.

**Table 2** Integration of ICT in teaching

| Checklist | N | Mean | Std. Deviation |
|---|---|---|---|
| Practical demonstration | 70 | 1.94 | .593 |
| Teaching learning materials | 70 | 2.01 | .645 |
| Drill and Practice with students | 70 | 2.02 | 1.467 |
| Finding information during lessons | 70 | 2.04 | .537 |
| Keeping records of students' scores | 70 | 2.41 | 1.464 |
| Preparing and delivering lessons | 70 | 3.13 | .285 |
| Communicating with other teachers | 70 | 3.14 | .600 |
| Making presentation | 70 | 3.16 | .632 |
| Storage of vital data or information | 70 | 3.18 | .693 |
| Total mean | | **23.03** | **6.916** |
| Grand mean | | **2.55** | **.768** |

*Scale (Mean): Low = 1.00–2.90; Cut-off Point = 2.99; High = 3.00–5.00*

**Source: Field Survey (2020)**

According to Pallant (2007), standard normal probability plots also called 'Normal P-P Plot' provides standard basis for testing assumptions. The Normal P-P plot or graph is generated concurrently when a regression output is produced. According to Pallant (2007), an observation of reasonable straight normal probability plot is an indication of normality and linearity. Where these assumptions are not met, the standard multiple regression will not give reliable results. The result of The Normal P-P plot is reported in Fig. 1.

It can be observed from Fig. 1 that the line passes through a number of points suggesting a straight line. This demonstrates that normality and linearity in the study variables as assumed by regression have been met. The normality is observed by the nature of the points and how the line passes through majority of them while the linearity is seen from the diagonal line from the bottom left corner to the top right corner of the graph. Furthermore, reasonable constancy in the variance of the residuals shows homoscedasticity. However, there is no level of deviations suggesting there is no certainty in the normality. Since the deviations are not wide, they may not have significant effect on the results. According to Pallant (2007), there is no nonparametric method for regression, one may still use regression to run predictive analysis when the violations of the assumptions are not severe. The normality of data was tested and found to be relatively normal and the study proceeded to estimate 'relationship'.

From Table 3, it could be observed that the coefficient of IN (Unst. Beta(β)) −0.235 was negative. However, the coefficients of AT and ET are 0.153 and 0.385 respectively were positive. The corresponding sig values or *p*-values are IN (0.000), AT (0.003) and

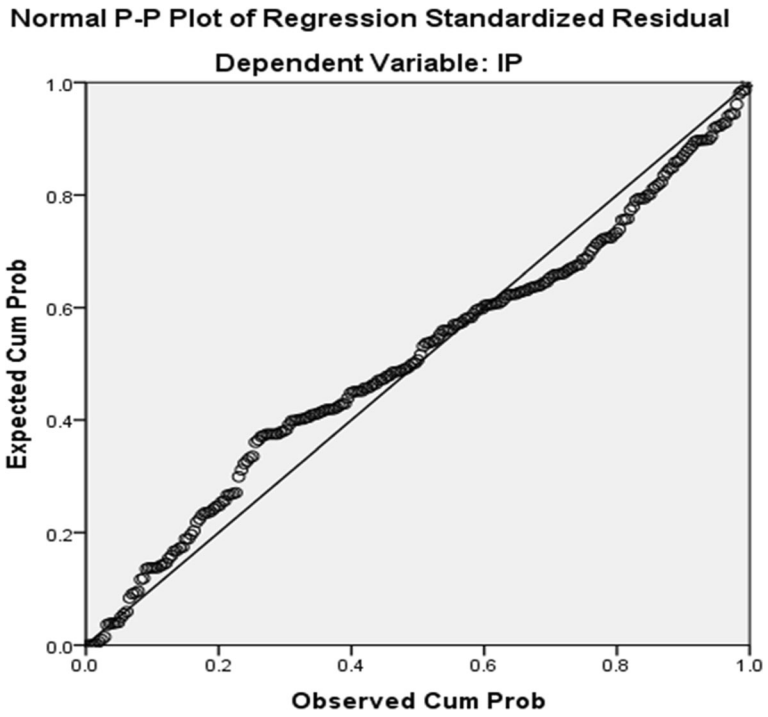


**Fig. 1** Diagnostic test of normality and linearity. **Source: Field Survey (2020)**

**Table 3** Estimation of the relationship between teachers' attitude and ICT integration in Teaching

| Model | | Unstandardized coefficients | | Standardized coefficients | T | Sig. |
|---|---|---|---|---|---|---|
| | | B | Std. Error | Beta | | |
| 1 | (Constant) | 2.838 | .190 | | 14.940 | .000 |
| | IN | −.235 | .060 | −.337 | −3.923 | .000 |
| | AT | .193 | .088 | .275 | 4.744 | .003 |
| | ET | .385 | .076 | .444 | 5.085 | .000 |

**Source: Field Survey (2020)**

ET (0.000). The implication of the p-values is that IN and ET are very significant at 1% and AT is significant at 5%. The significant level of IN implies that, a percentage increase in interest will lead to 0.235 points decrease on the level of ICT integration. However, IN, AT and ET values indicates that a 5% increase and a percentage of (1%) increase will lead to 0.193 and 0.385 increase in ICT integration in teaching. The conclusion is that since two of the constructs of teachers' attitude have positive coefficient and a significant relationship, there is a positive significant relationship between teachers' attitude and ICT integration in teaching in the Kumasi Girls school. Based on these results, the study confirms the hypothesis that attitude of teachers has a statistically significant influence on the integration of ICT in teaching in senior high schools.

## 5 Discussions

The finding from the study was supported by the diffusion of innovation theory. The theory assumes that social interaction influences the level of acceptance of ICT integration Rogers (2003). The findings have confirmed that given the opportunity of ICT integration, the attitude and behaviour of teachers would decide whether integration would be successful (Mwila 2018). This is because, the findings have revealed that attitude of teachers has a positive significant relationship. This means that positive attitudes of teachers leads to a high level of ICT integration and vice versa. Empirically, Hajara and Bukari (2017) noted that the attitude of teachers forms part of the social system in the diffusion innovation paradigm. If teachers develop positive attitudes towards innovation (technology), policies formulated to enhance ICT integration would receive a wider acceptance and adoption. On the other hand, if teachers develop fear for computer use and become less confident with technology adoption, ICT integration into teaching cannot be materialized. The findings are further consistent with other studies which found that the success of ICT integration largely depends on the attitude of teachers (Divaharan and Ping 2010; Ozden 2007; Mwila 2018). The study is consistent with a number of studies that reveal that a considerable number of teachers hold negative attitudes towards ICT integration in schools. These attitudes range from computer avoidance, anxiety, self-efficacy, enthusiasm, confidence, liking and usefulness of computer towards personal and social life (Makhanu 2010; Schlebusch 2018; Wernet et al. 2000).

### 5.1 Determine the gender differences in the integration of ICT in teaching in senior high schools

The second objective of the study focused on the gender differences in the integration of ICT in teaching in senior high schools. The assumption is that the adoption or acceptance of ICT integration in teaching is different on gender basis. The hypothesis is that there is a statistically significant difference between the integration of ICT in teaching by male and female teachers.

This research objective was analysed using independent sample t-test. The t-test relied on t-statistics to determine the significance difference. The results from the independent t-test often reports two t-statistics, to determine the appropriate t-statistics, the Levene test was used.

### 5.2 Levene's test for equality of variance

Prior to reporting the independent sample tests, the study analysed equality of variances using the Levene test to assess whether the variance (variation) of scores for the two or more groups is the same. The outcome of this test would determine which of the t-values from the independent t-test would be more appropriate to use. The test decision was that if the sig. value or *p* value is greater than 0.05, then it is more appropriate to report the t-value of 'equal variances assumed'. However, if the sig. value of the Levene's test is equal to or less than 0.05, then, it implies that the variances for the groups are not the same. Therefore, it would be more appropriate to use the t-value of the 'equal variances not assumed. The results are reported in Table 4.

It could be observed from Table 4 that interest had an F – stat of 0.397 and corresponding p – value of 0.529. The affective attitude had an F – stat of 1.359 and corresponding p – value of 0.245. Lastly the effort had F – stat of 3.303 and corresponding p – value of 0.070. The sig values for attitudinal and economic satisfaction, social satisfaction and psychological satisfaction were more than 0.05.

### 5.3 Independent T- test of significant differences in gender integration of ICT in teaching

After determining the appropriate t-value to use in analysing the statistical gender differences, the study proceeded to report the test results of the independent-test. To

**Table 4** Levene's test for equality of variances

| Teachers' attitude | Variance assumption | F | Sig. |
|---|---|---|---|
| IN | Equal variances assumed | 0.397 | .529 |
| | Equal variances not assumed | | |
| AT | Equal variances assumed | 1.359 | .245 |
| | Equal variances not assumed | | |
| ET | Equal variances assumed | 3.303 | .070 |
| | Equal variances not assumed | | |

**Source: Field Survey (2020)**

assess whether there was a significant gender difference in the integration of ICT in teaching, the study used the t-values and the sig. values reported under the column labelled Sig. (2-tailed). The results are reported in Table 5. Where the sig. value of the t-value is equal or less than 0.01, 0.05 or 0.1, then there is a very strong, strong and weak significant gender difference in the mean scores. On the other hand, if the t-value has sig. value greater than 0.1, then, there is no significant gender difference in the integration of ICT in teaching.

Following the result from the Levene's test, the t – values used for this independent t – test analysis was 1.618, 2.591 and .361 for interest, affective and effort respectively. The corresponding p – values for these t – values were 0.107, 0. 010 and 0. 718. It could be observed that none of the p – values demonstrated a significant relationship. The implication was that there was no significant gender difference in teachers' acceptance of ICT integration in teaching. All the constructs i.e., satisfaction; interest, affective and effort showed insignificant differences from the perspective of job experience. Therefore, the hypothesis that there is a statistically significant difference between the integration of ICT in teaching based on male and female teachers was rejected.

The findings have provided empirical evidence that teachers' adoption or integration of ICT in teaching is not influenced by gender. The theoretical justification from the diffusion theory posited that a social system including demographic variables like gender has a significant relationship with ICT integration (Mwila 2018; Hajara and Bukari 2017; Gyamfi and Gyaase 2017). However, the findings from the current study contrast other empirical studies (Hew and Brush 2007).

The interrelationship between attitude and gender of teachers and the integration of ICT in teaching is presented structurally in Fig. 2.

From Fig. 2, it could be observed that interest, affective and effort have a positive significant relationship with ICT integration. On the other hand, gender differences have no significant relationship with ICT integration.

## 6 Limitations

Quantitative analysis was used for the study. Therefore, the use of interviews which could have revealed in-depth information from the participants was not used as a

**Table 5** Independent T – test results

| | | T | Sig. (2-tailed) | Mean Diff | Std. Error Diff. |
|---|---|---|---|---|---|
| IN | EVA | 1.618 | .107 | .28947 | .17891 |
| | EVNA | 1.738 | . 088 | .28947 | .16657 |
| AT | EVA | 2.591 | . 010 | .38971 | .15039 |
| | EVNA | 2.875 | . 006 | .38971 | .13557 |
| ET | EVA | .361 | . 718 | .05119 | .14176 |
| | EVNA | .436 | . 664 | .05119 | .11730 |

**Source: Field Survey (2020)**

*Note: EVA denotes Equal Variances Assumed and EVNA denotes Equal Variances Not Assumed*

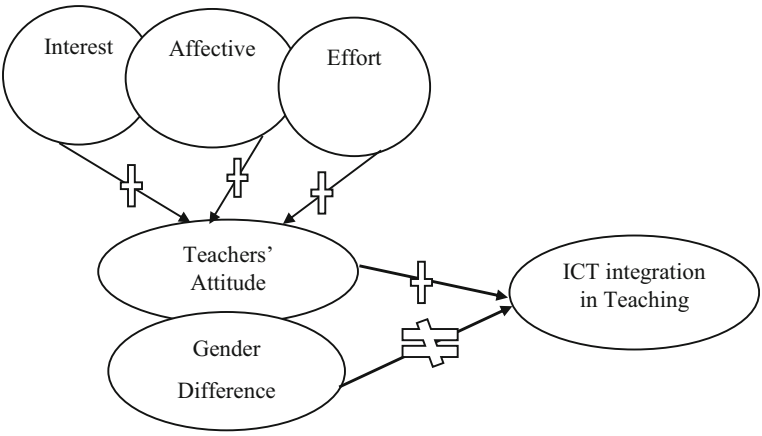


**Fig. 2** Path structural relationship between study variables

research instrument. However, the use of quantitative analysis through questionnaires provided empirical basis to enrich the literature on ICT integration in teaching. Additionally, the study was a form of survey, the population sample was not wide, however the researchers ensured that the selected participants gave accurate and reliable information to make inference about the study.

## 7 Conclusion and recommendations

The study examined the integration of Information Communication Technology in teaching in senior high schools. The study focused on the Kumasi Girls Senior High School in Ghana. Survey design coupled with quantitative analytical procedures were adopted. The study concluded that teachers' attitude had a positive relationship with ICT integration. The implication is that the success of ICT integration in senior high schools depended largely on the attitude of teachers. The study further concluded that positive attitudes lead to a high level of ICT integration whilst negative attitudes lead to a low level of ICT integration in teaching.

The study concluded there are no significant difference in gender integration of ICT in teaching. For ICT integration to be successful, teachers' gender does not have any influence. Policies that are aimed at ensuring success in the implementation of ICT integration should not give primary attention to the gender of teachers. The implication of the findings is that teachers should be encouraged to build interest in ICT integration for teaching. Additionally, teachers should be trained in order to enhance their effort and affection towards the use of ICT in teaching.

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