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# Teachers' Perception of Factors Affecting Integration of Information and Communication Technology for Instructional Purposes in Secondary Schools in Kenya

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## Abstract

*This research determined the perception of secondary school teachers on the effect of teacher-related factors on the integration of information and communication technology (ICT) for instructional purposes. The study was conducted in 40 secondary schools of the North Rift Valley region of Kenya that had computers. Likert-type scale for each technology acceptance variable (Computer self-efficacy, teacher efficacy, attitude towards computer, Social influence, and Constructivist beliefs) was developed/ adopted for the study. These scales were established to have adequate reliability through a pilot study. Usable data from 400 respondents was collected and used to test the hypotheses. T-test, ANOVA and Fisher's LSD post hoc analyses were conducted on the data collected using SPSS version 20.0. The results show that voluntariness and computer experience were the two main variables that determined teachers' perception of factors affecting the integration of Information and Communication Technology for instructional purposes. On the other hand, subject specialization, gender and teaching experience had marginal or no significant influence on teachers' perception of factors affecting the integration of Information and Communication Technology for instructional purposes. Therefore, it should be understood that a number of factors interact to produce a significant effect on ICT integration in pedagogy.*

**Keywords:**
*Teachers*
*Self-efficacy*
*Attitude towards computer*
*Social influence*
*Constructivist beliefs*
*Secondary school*
*ICT integration.*



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## 1. Introduction

Teachers' ICT capabilities and disposition are vital in the process of ICT integration as acknowledged by a variety of countries and organizations both international and local (Markauskaite, 2007). This implies that teachers (play) are an essential component in the integration of ICTs in all levels of education as agents and catalysts of curriculum change and the instructional process (see also (Afshari, Bakar, Luan, Samah, & Fooi, 2009; Gulbahar & Guven, 2008; Omoniyi & Quadri, 2013)).

Although most of these endeavors have not equally emphasized on the role of the teacher in the instructional process (e.g., for planning, delivery, evaluation and reporting) with the help of ICTs, other extant studies indicate a number of teacher-related factors being possible reasons for use of computers in pedagogy. Some of these teacher-related factors are gender, age, teacher experience with computers, teacher self-efficacy, attitudes towards computers, pedagogical beliefs and perceived social influence (Al-Ruz & Khasawneh, 2011; Chen & Reimer, 2009; Kurgat, 2011; Rastogi & Malhotra, 2013; Sang., Valcke, Van Braak, & Tondeur, 2010). However, these studies revealed inconsistent relationship between these teacher-related variables and

computer use. This inconsistency does not afford the generalizability of findings to different cultural (or country) settings other than those they were studied.

The observed inconsistency could be attributed to cultural differences (that is, computer use is dependent on geographical, technological or social development among countries). Teacher's subject specialization could be another contributing factor to the discrepancy in the use of ICT in secondary schools (Fakomogbon, Adebayo, Adegbija, Shittu, & Oyelekan, 2014). This study therefore sought to provide further insight into this inconsistency by investigating the effect of a selected number of teacher-related technology acceptance variables on computer use for instruction by teachers in secondary schools in Kenya.

## 2. Literature Review

The literature review presents a discussion on the five selected technology acceptance variables (teacher factors). Sources of literature are those that cover on the definition of these selected variables and their effect on technology use.

### *2.1 Self-Efficacy*

The study of self-efficacy stem from the work of Albert Bandura and has been defined as an individual's confidence in his or her ability to do things that he/she strives to do or in performing a specified behaviour (Ajzen, 2002; Buabeng-Andoh, 2012; Gilakjani, 2013). Similarly, self-efficacy is considered as ones judgment of his/her capabilities to organize and execute courses of action that are required to attain a desired type of performance (Edwards, Higley, Zeruth, & Murphy, 2007; Pauli, Gilson, & May, 2007). Notice though that self-efficacy does not focus on *skills* one possess but on the *judgments* of what one can do with those skills. In other words, self-efficacy is the perceived ease or difficulty of taking action or displaying target behaviour.

Self-efficacy develops as a result of emotional, cognitive, motivational processes, behavioural indicators or social environment in which people live and work. Four primary sources of self-efficacy are thus identified (Bandura, 2001; Goddard, Hoy, & Hoy, 2004; Goddard & Skrla, 2006; Usher, 2009): (a) Mastery experience from one's own previous performance, (b) Vicarious experience which involves observing the actions of others (such as role models), (c) Social persuasions that individuals receive from others (such as parents, and peers to provide evaluative feedback, judgments, and appraisals on their performance), and (d) Emotional or physiological states (such as arousal, anxiety, mood and fatigue) or one's affective states. This paper distinguished between teacher's general sense of efficacy (teacher efficacy) and teacher's computer self-efficacy.

#### *2.1.1. Teacher Efficacy*

Teacher's general sense of efficacy has been referred to as "teacher efficacy" (Goddard et al., 2004). According to Dunn and Rakes (2011) teacher efficacy is "the self-reflective judgment" (p. 42), a judgment made by a teacher about his/her capability concerning teaching-learning practices. Teacher efficacy is therefore a characteristic that provides the teacher with indispensable impetus to persist and persevere in the presence of adversity, failure being imminent if such confidence is diminished.

Sang. et al. (2010) contend that teacher efficacy is a crucial factor in accounting for individual differences among teacher's instructional effectiveness. Similarly, instructional decision-making is influenced by teacher efficacy (Dunn & Rakes, 2011). Moreover, Dunn and Rakes (2011) conjecture that teachers with more positive teacher efficacy are more apt to implement learner-centred practices and endure when faced with students' early resistance to learner-centred practices.

Studies have established a positive correlation between teacher efficacy and ICT integration in the classroom (Deryakulu, Buyukozturk, Karadeniz, & Olkun, 2009; Sang. et al., 2010). In addition, Goddard et al. (2004) established that teacher's sense of efficacy is a significant predictor of productive teaching practices.

#### *2.1.2. Teacher Computer Self-Efficacy*

Teacher efficacy as stated above is context or domain specific (Ross, Hogaboam-Gray, & Hannay, 2001; Tsai, Chuang, Liang, & Tsai, 2011; Tschannen-Moran & Hoy, 2001). Computer self-efficacy is one form of self-efficacy that is context specific to the use of computers by teachers in their pedagogical practices. Computer self-efficacy refers "to a judgment of one's capability to use a computer" (Compeau & Higgins, 1995). Teacher's computer self-efficacy is considered in this paper as teacher's judgment on the extent to which he/she is confident about successfully implementing computer-based instructional tasks that lead to student learning through productive classroom management and instructional practices.

Research examining self-efficacy beliefs toward technology use have focused on the effect of technology on attitudes toward computers (Sang. et al., 2010) or intention towards use: Traditional use of technology and constructivist use of technology (T. Teo, 2009). Al-Ruz and Khasawneh (2011) found that technology self-efficacy was the most important factor with the highest direct effect on technology integration. Albion (2001) and similarly, Player-Koro (2012) argues that research studies suggest that teachers' beliefs about their self-efficacy in using technology for teaching are directly related to their actual experience and practice with technology.

Moreover, Compeau and Higgins (1995) found that an individual's use of technology was affected by their self-efficacy and that participants with higher self-efficacy used computers more often and experienced less computer-related anxiety. Experienced teachers are less ready to integrate ICT (Baek, Jung, & Kim, 2008). Bao, Xiong, Hu, and Kibelloh (2013) established significant gender difference on computer self-efficacy affecting computer use. There was strongly correlation between practical ICT experience at school level and self efficacy (Yamamoto & Yamaguchi, 2016).

### *2.2. Teacher Attitude towards Computer*

"Attitude towards computer", has been referred to as "computer attitude" (P. O Jegede, 2008; Timothy Teo, Lee, & Chai, 2008) and will be adopted in this paper under "teacher's computer attitude." The successful initiation and use of computers in school programmes (such as for instructional process, administration, and classroom management) depend fundamentally on teacher's computer attitude, their willingness and support of the technology (Buabeng-Andoh, 2012; Timothy Teo, Lee, et al., 2008).

A number of authors (Abukhzam & Lee, 2010; Venkatesh, Morris, Davis, & Davis, 2003) argue that user's attitude is the key determinant in the adoption of technology to ones practice. In educational contexts, teachers as users of these technologies and refers teacher's general feeling of favourableness or unfavourableness towards computers use.

Computer attitude have been perceived to comprise of dichotomous categories. In this tradition, Hogarty, Lang, and Kromrey (2003) classify computer attitude as either (a) technology aversion which refers to a tendency to avoid computers or (b) technology affinity which refers to the tendency to like computers. Hung and Hsu (2007) classified computer attitude as either (a) computer liking which refers to the affection for computers or (b) computer anxiety which is a tendency to fear computers drawing a parallel to Hogarty et al. (2003). In this context, computer liking results into increased computer usage while computer anxiety results into decreased usage.

It is important to note that defining computer attitude seems to converge to looking at teachers' computer attitude as teachers' reactions to either accept or reject computers in their practice. Teacher's decision or volition to accept or to reject the use of computer emanates from a personal judgment as a response to computers albeit that this judgment may be a function of both intrinsic and/or extrinsic factors. These factors moderate or mediate teachers' computer attitude on computer use. Consequently, teachers' computer attitude has a bearing on ICT integration efforts in schools as either enablers or barriers towards computer usage (Abukhzam & Lee, 2010; Timothy Teo, Lee, et al., 2008).

### *2.3. Teacher's Perceived Social Influence*

Social influence emanates from the work of Venkatesh et al. (2003) crafted from a number of related concepts. Subjective norm is one of the constructs in the Theory of Reasoned Action. Subjective norm, according to Fishbein and Ajzen (1975); Abaidoo and Arkorful (2014) is "the combination of perceived expectation from individuals or groups along with intentions to these expectations" (p.414). Subjective norm is therefore the extent to which an individual recognizes the expectations of others on that individual to accomplish a task or, as in the case of this study, to use the computer for instructional purposes.

In developing and validating the Unified Theory of Acceptance and Use of Technology (UTAUT), Venkatesh et al. (2003) synthesized a number of related constructs (subjective norm, social factors and image) and referred to them as "social influence". Social influence is defined as "the degree to which an individual perceives that important others believe he or she should use the new system [e.g., computer technology]" (Venkatesh et al., 2003). Similarly, Flache and Macy (2011) define social influence as a "process in which individuals move toward the weighted average of the opinions of others with who they interact" (p. 971). This would mean that social influence is a perception adopted after considering varied opinions from significant others. According to Smith, Louis, and Schultz (2011) social influence occurs when an individual's thoughts, feelings, and actions are affected by other people.

In this study, social influence is an attribute of the teacher's social/human environment; it is how ones perception of significant others' opinions determine the extent of one's behaviour (or computer use). When others' opinions are favourable and are perceived as such, then there is a tendency of strong positive social influence which leads to the performance of relevant behaviour and vice versa. Social influence was found to correlate with teacher's computer use (Marcinkiewicz, 1994). Likewise, Ma, Andersson, and Streith (2005) found that for student-teachers, social influence has significant effect on their intention to use computers.

### *2.4. Teacher Pedagogical Beliefs*

Previous studies on beliefs indicate that there could be as many approaches to the definition of beliefs as there are authors. But, generally, Pajares (1992) asserts that beliefs are personal road-maps in helping individuals to define and understand themselves and the world around them. Timothy Teo, Chai, Hung, and Lee (2008) regard beliefs about teaching as the "preferred ways of teaching by teachers" (p.164) and this answers the question, "how do teachers teach?"

Voogt (2010) operationalized teacher beliefs as "the importance teachers attached to curriculum goals [traditionally important or lifelong] in connection with teachers' pedagogical practices" (p. 464). Subsequently, this view is a value-based definition that essentially presupposes a dichotomous classification of teacher pedagogical beliefs. Studies (e.g., (Baser & Mutlu, 2011; Ertmer, 2005; Hermans, Tondeur, Van Braak, & Valcke, 2008; Woolley, Benjamin, & Woolley, 2004)) have identified pedagogical beliefs consistent with two main philosophical positions, namely; (a) Traditional beliefs associated with empiricist philosophy and (b) Constructivist beliefs consistent with constructivist philosophy.

Traditional (also as didactic, behaviourist or transmissionist) pedagogy is based on the belief that all knowledge comes from experience (empiricist philosophy). The learner's mind passively receives the experiences imparted by a specialist (teacher) and it is only active in knowledge construction posteriori, processing what is already acquired to memory (that is, top-down process). Teachers with this belief see themselves as the ultimate sources of knowledge and learners as passive recipient of these knowledge and experiences, thus leaning to the transmission of knowledge and teacher-centred teaching strategies with direct explanation (Song, Hannafin, & Hill, 2007; Timothy Teo, Chai, et al., 2008).

On the other hand, constructivist pedagogy is based on the belief that the learner's mind is an active contributor to the construction of knowledge a priori (a bottom-up process), not simply organizing experiences presented (Lim & Chan, 2007; Smeets, Van Gennip, & Van Rens, 2009; Timothy Teo, Chai, et al., 2008; Tondeur, Valcke, & Van Braak, 2008). As a result, for constructivists "learning is perceived as an active construction and reconstruction of knowledge, and teaching as a process of guiding and facilitating learners in the process of knowledge construction" (Lim & Chan, 2007). In addition, Onasanya, Shehu, Oduwaiye, and Shehu (2010) emphasize the use of ICT as pedagogically powerful for the construction of knowledge and subsequently in respect to computer use fits well with this philosophy.

Research studies have pointed out a relationship between teacher's pedagogical beliefs and computer integration in pedagogy (Chen & Reimer, 2009). Skill-based ICT applications, for example, fit into traditional pedagogical practices while the use of open-ended applications fits into constructivist pedagogical practices (Sang, Valcke, van Braak, & Tondeur, 2009; Smeets et al., 2009). Timothy Teo, Chai, et al. (2008) conducted a study on student teachers' beliefs and found that constructivist teaching is positively correlated to use of ICT. In contrast, Khader (2012) established non-significant relationship between pedagogical beliefs and classroom practices. Lim and Chai (2008) investigated (observed and interviewed) six teachers from two primary schools, the teachers accounted for the inconsistency between their espoused beliefs (five constructivists) and the traditional teaching practice as due to contextual constraints such as pressure on syllabus coverage for examination preparation.

## 3. Materials and Methods

### *3.1. Study Purpose*

Research studies have suggested that the success of ICT integration for instructional purposes is dependent on a number of teacher and non-teacher related variables or factors. This study investigated the perception of secondary school teachers on the effect of teacher-related factors on the use of computers for instructional purposes. Therefore, the study addressed the following main research question:

*What are secondary school teachers' perceptions on the effect of computer self-efficacy, teacher efficacy, Attitude towards computer, social influence, and constructivist beliefs on ICT integration for instructional purposes with respect to subject specialization, voluntariness, gender, age, teaching experience, and computer experience?*

### *3.2. Hypotheses*

The following main hypothesis was derived for the purpose of this study: *There is no significant difference in the mean scores for computer self-efficacy, teacher efficacy, Attitude towards computer, social influence, and constructivist beliefs based on subject specialization, voluntariness, gender, age, teaching experience and computer experience.*

### *3.3. Study Area*

This study was conducted in 40 public secondary schools, drawn from eight sub-counties (former constituencies) in the North Rift Valley region of Kenya.

### *3.4. Research Design*

The research design that was chosen for this study is the cross-sectional survey design. Cross-sectional survey design is whereby the research instrument is administered to the sample only once (Gay, Mills, & Airasian, 2009; Trochim, 2006). It did not require a series of several data collection rounds.

### *3.5. Population, Sampling and Sample Size*

For this study, the target population referred to all the teachers teaching in public secondary schools in Kenya. The study specifically targeted teachers in those schools sponsored by the Ministry of Education (MoE) through the Economic Stimulus Program (ESP). To obtain the sample from the identified population, several sampling techniques were utilized. First, the accessible population was conveniently chosen as the

secondary school teachers in ESP schools in the North Rift valley region. An assumption was made that the North Rift region of Kenya would provide a typical representation of the whole Rift valley. Second, eight sub-counties were selected through simple random sampling. Third, all the five schools in the selected constituencies were incorporated. Fourth, all the teachers in the 40 selected schools (8 constituencies x 5 schools = 40 schools) were asked to participate based on the subject specialization as either mathematics or non-mathematics. The final usable sample was 400 with a return rate of 81.3%.

### *3.6. Research Instrument*

This study used a self-administered questionnaire. The self-administration of questionnaire was chosen because it offered anonymity (therefore confidentiality) to the respondent. Self-administered questionnaires also allowed coverage of the wide geographic area, and gave respondents the opportunity to complete questionnaires in their own time.

The instrument was designed and developed to comprise several sections that operationalized each of the research variables. The instrument consists of two sections (I and II). Section I comprised of items that defined teacher demographic variables in the study (gender and age) and teaching experience and computer experience (that is, experience with computers). Section II consisted of five sub-scales for each research variable with a number of Likert-type items. The respondent was expected to check/tick (√) on the box corresponding to the extent of agreement or disagreement of each item.

#### *3.6.1. Reliability of the Research Instrument*

Table 1 shows the reliabilities (Cronbach alpha) obtained from the pilot study and the actual study. These reliabilities were deemed reliable enough ($\alpha \geq .70$, (George & Mallery, 2003; Santos, 1999)) for the scales to be used in data collection in the main study.

**Table-1.** Cronbach alpha (α) reliabilities of the research variables.

| Variable (Scale) | Study | |
|---|---|---|
| | Pilot | Main |
| Computer self-efficacy | .81 | .92 |
| Teacher Efficacy | .75 | .89 |
| Computer Attitude | .72 | .84 |
| Social Influence | .81 | .88 |
| Constructivist Belief | .79 | .80 |

### *3.7. Data Analysis*

In data analysis, the mean scores and standard deviations gave the descriptive statistics while t-test and one-way ANOVA were used to compare the differences in mean scores for two or more than two groups respectively. The Fisher's Least Significant Difference (LSD) post-hoc test was computed to determine where the significant differences in mean scores lie between any two groups as a result of significant ANOVA tests. These analyses were done using SPSS 20.0 package.

## 4. Results and Discussions

This section will present results and offer discussions based on the hypotheses of the study that were obtained from the main hypothesis into specific hypotheses, $H_0 1$ to $H_0 6$. The main hypothesis was: *There is no significant difference in the mean scores for computer self-efficacy, teacher efficacy, Attitude towards computer, social influence, and constructivist beliefs based on subject specialization, voluntariness, gender, age, teaching experience and computer experience.* Each of the six specific hypothesis tests the differences in the mean scores of the selected dependent variables (computer self-efficacy, teacher efficacy, Attitude towards computer, social influence, and constructivist beliefs) based on each of the independent variables (subject specialization, voluntariness, gender, age, teaching experience and computer experience) respectively.

*$H_0 1$: There is no significant difference in the mean scores for computer self-efficacy, teacher efficacy, Attitude towards computer, social influence, and constructivist beliefs based on subject specialization.*

To determine whether subject specialization (mathematics or non-mathematics) affects teacher's perception on the effect of the selected variables on computer use for instructional purposes, independent samples T-test was conducted for each variable Table 2. From these analyses, it was established that the mean scores Table 3 of each selected variable based on subject specialization were not statistically significantly different from each other. Therefore, it is concluded that the perception of both mathematics and non-mathematics teachers on the effect of computer self-efficacy, teacher efficacy, Attitude towards computer, social influence and constructivist beliefs on computer use for instructional purposes is not different from each other. This, however, does not support the findings of Paraskeva, Bouta, and Papagianni (2008) who found a positive correlation between teacher's subject area and computer self-efficacy being strong for teachers of science and technology subjects.

**Table-2.** Independent samples t-test for subject specialization on the selected variables.

| Dependent variable | Levene's test for equality of Variances (Equal variances assumed) | | t-test for equality of mean scores | | |
|---|---|---|---|---|---|
| | F | p | t | df | p (2-tailed) |
| Computer Self-efficacy | 0.001 | .971 | 0.660 | 398 | .510 |
| Teacher efficacy | 0.003 | .955 | -0.380 | 398 | .704 |
| Attitude towards Computer | 0.165 | .685 | -0.790 | 398 | .430 |
| Social Influence | 0.237 | .627 | -0.775 | 398 | .439 |
| Constructivist Beliefs | 2.731 | .099 | -0.502 | 398 | .616 |

**Table-3.** Mean and standard deviation of selected variables versus subject specialization.

| Dependent variable | Mathematics ($n$ = 128) | Non-Mathematics ($n$ = 272) |
|---|---|---|
| Computer Self-efficacy | 23.2(4.4) | 22.9(4.3) |
| Teacher efficacy | 14.4(2.3) | 14.5(2.3) |
| Attitude towards Computer | 16.8(3.0) | 17.1(2.8) |
| Social Influence | 15.9(3.1) | 16.1(3.1) |
| Constructivist Beliefs | 17.8(3.6) | 18.0(3.3) |

**Note:** Standard deviations in parentheses.

*$H_o2$: There is no significant difference in the mean scores for computer self-efficacy, teacher efficacy, Attitude towards computer, social influence, and constructivist beliefs based on voluntariness.*

To determine whether voluntariness (voluntary or mandatory) affects teacher's perception on the effect of the selected variables on computer use for instructional purposes, independent samples T-tests were conducted Table 4. From the t-test analyses, mean values of Computer Self-efficacy, Attitude towards computer, Social Influence, and Constructivist Beliefs see Table 5 for those who perceive computer use as voluntary versus mandatory were statistically significantly different while that for Teacher efficacy were not statistically significantly different.

The perception of teachers who consider the use of computer as voluntary have significantly higher mean scores for Computer Self-efficacy ($t(398) = 4.283$, $p < .001$), Attitude towards computer ($t(398) = 2.424$, $p < .05$), Social Influence ($t(398) = 2.9$, $p < .01$), and Constructivist Beliefs ($t(398) = 2.757$, $p < .05$) than their counterparts who perceive computer use as mandatory. On the other hand, voluntariness does not determine teacher's perception on the effect of teacher efficacy ($t(398) = -0.264$, $p > .05$) on computer use for instructional purposes.

**Table-4.** Independent samples t-test for voluntariness on the selected variables.

| Dependent variable | Levene's test for equality of Variances (Equal variances assumed) | | t-test for equality of mean scores | | |
|---|---|---|---|---|---|
| | *F* | *p* | *t* | *df* | *p* (2-tailed) |
| Computer Self-efficacy | 3.301 | .070 | 4.283*** | 398 | .000 |
| Teacher efficacy | 1.205 | .273 | -0.264 | 398 | .792 |
| Attitude towards Computer | 0.041 | .839 | 2.424* | 398 | .016 |
| Social Influence | 3.850 | .050 | 2.900** | 398 | .004 |
| Constructivist Beliefs | 0.760 | .384 | 2.757** | 398 | .006 |

**Note:**
1. $p < .05$, **$p < .01$, ***$p < .001$
2. Equal variances assumed.

**Table-5.** Mean scores and standard deviations of selected variables for voluntariness.

| Dependent variable | Voluntary ($n$ = 122) | Non-Voluntary($n$ = 278) |
|---|---|---|
| Computer Self-efficacy | 24.4(4.6) | 22.4(4.1) |
| Teacher efficacy | 14.4(2.4) | 14.4(2.2) |
| Attitude towards Computer | 17.5(2.8) | 16.8(2.9) |
| Social Influence | 16.7(3.2) | 15.7(3.0) |
| Constructivist Beliefs | 18.7(3.5) | 17.6(3.3) |

*$H_o3$: There is no significant difference in the mean scores for computer self-efficacy, teacher efficacy, Attitude towards computer, social influence, and constructivist beliefs based on gender.*

To determine whether gender (male or female) affects teacher's perception on the effect of the selected variables, independent samples T-test was conducted Table 6. From this analysis, it was established that the mean scores of each variable for male and female teachers were not statistically different from each other:

computer self-efficacy ( Male: $M = 22.6$, $SD = 4.5$; Female: $M = 23.3$, $SD = 4.3$), teacher efficacy (Male: $M = 14.2$, $SD = 2.3$; Female: $M = 14.5$, $SD = 2.3$), Attitude towards computer (Male: $M = 16.9$, $SD = 2.8$; Female: $M = 17.1$, $SD = 2.9$), social influence (Male: $M = 15.9$, $SD = 3.0$; Female: $M = 16.1$, $SD = 3.1$) and constructivist beliefs (Male: $M = 17.6$, $SD = 3.5$, Female: M = 18.1, SD = 3.3) . Therefore, it is concluded that the perception of both male and female teachers on the effect of computer self-efficacy, teacher efficacy, Attitude towards computer, social influence and constructivist beliefs on computer use for instructional purposes is not different from each other.

On computer self-efficacy, these findings support the findings of Philip Olu Jegede (2007). However, these findings do not support the work of Bao et al. (2013) who established significant gender difference on computer self-efficacy affecting computer use. Specifically, Kong, Chai, Tan, Hasbee, and Ting (2014) and Sarfo, Amankwah, and Konin (2017) found that male teachers have a significantly higher computer self-efficacy than their female teachers.

On Attitude towards computer, these findings are congruent to that of Agbatogun (2010); Wozney, Venkatesh, and Albrini (2006); Kurgat (2011); Rajasekar and Vaiyapuri (2007) and Tezci (2010) who found no differences between male and female teachers in terms of their computer attitude. There are reported gender differences on computer attitude (P. O Jegede, 2008; Ocak, 2005) male teachers being more positive than female teachers (Kahveci, Sahin, & Genc, 2011; Papanastasiou & Angeli, 2008).

On pedagogical beliefs, no significant differences between male and female primary school teachers (Hermans et al., 2008; Sang et al., 2009) similar to the findings of this study. However, Baser and Mutlu (2011) found a significant relationship between gender and pedagogical beliefs, female teachers were more likely to be constructivist than their male colleagues.

**Table-6.** Independent samples t-test for gender on selected variables.

| Dependent variable | Levene's test for equality of variances (Equal variances assumed) | | t-test for equality of mean scores | | |
|---|---|---|---|---|---|
| | ***F*** | ***P*** | | ***df*** | ***p* (2-tailed)** |
| Computer Self-efficacy | 2.216 | .137 | -1.639 | 398 | .102 |
| Teacher efficacy | .036 | .849 | -1.208 | 398 | .228 |
| Attitude towards Computer | .076 | .783 | -0.550 | 398 | .583 |
| Social Influence | .068 | .794 | -0.602 | 398 | .548 |
| Constructivist Beliefs | 3.007 | .084 | -1.458 | 398 | .146 |

*$H_04$: There is no significant difference in the mean scores for computer self-efficacy, teacher efficacy, Attitude towards computer, social influence, and constructivist beliefs based on age.*

To determine whether age (presented as age-groups) affects teacher's perception on the effect of the selected variables on computer use, one-way ANOVA was computed Table 7. From these analyses, it was established that the mean scores Table 9 of at least two age-groups for Computer Self-efficacy were statistically significantly different from each other. This findings on computer self-efficacy support the conclusion made by Elbitar (2015) that age had significant effect on teacher's computer self-efficacy.

**Table-7.** One -Way ANOVA of variable based on age of teachers.

| Dependent variable | | SS | df | MS | F | p |
|---|---|---|---|---|---|---|
| Computer Self-efficacy | Between Groups | 314.739 | 7 | 44.963 | 2.435* | .019 |
| | Within Groups | 7237.011 | 392 | 18.462 | | |
| | Total | 7553.750 | 399 | | | |
| Teacher efficacy | Between Groups | 30.274 | 7 | 4.325 | .832 | .561 |
| | Within Groups | 2037.324 | 392 | 5.197 | | |
| | Total | 2067.598 | 399 | | | |
| Attitude towards Computer | Between Groups | 54.589 | 7 | 7.798 | .964 | .457 |
| | Within Groups | 3172.389 | 392 | 8.093 | | |
| | Total | 3226.978 | 399 | | | |
| Social Influence | Between Groups | 59.027 | 7 | 8.432 | .897 | .508 |
| | Within Groups | 3683.551 | 392 | 9.397 | | |
| | Total | 3742.578 | 399 | | | |
| Constructivist Beliefs | Between Groups | 72.287 | 7 | 10.327 | .890 | .515 |
| | Within Groups | 4550.503 | 392 | 11.608 | | |
| | Total | 4622.790 | | | | |

**Note:** *$p < .05$.

On the other hand, the mean scores of age-groups for Teacher efficacy, Attitude towards computer, Social Influence, and Constructivist Beliefs were not statistically significantly different from each other. It is therefore concluded that teacher's age (age-groups) does not affect their perception on the effect of teacher efficacy, attitude towards computers, social influence and constructivist beliefs on computer use for

instructional purposes. The extent of teachers' agreement of their perception on the effect of these variables on computer use is similar across all the ages. The findings on Attitude towards computer support does not support conclusion made by Kurgat (2011) on non-significant effect of age on computer attitude. However, the findings of Hung and Hsu (2007) and Ocak (2005) that positive computer attitude decrease with age were not supported.

To determine where the differences lie in the effect of age on the perception of computer self-efficacy affecting computer use, a post-hoc analysis using Fisher's LSD was performed on a pair-wise comparison of mean scores Table 8. These results showed significant differences in the mean scores of teachers between ages (a) (21-25) years and (36-50) years and (b) (31-35) years and both (36-40) years and (46-50) years: younger teachers showing significantly higher mean scores than their older counterparts. These findings partially support the conclusion made by Sarfo et al. (2017) that younger teachers whose age was less than 30 years had higher computer self-efficacy than older one who were 31years and above.

**Table-8.** Post-Hoc comparisons using fisher's LSD.

| Dependent variable | (I) AGE (Years) | (J) AGE (Years) | Mean Difference (I-J) | *SE* | *p* |
|---|---|---|---|---|---|
| Computer Self-efficacy | 21-25 | 36-40 | 2.06344** | 0.73649 | .005 |
| | 21-25 | 41-45 | 1.62931* | 0.82427 | .049 |
| | 21-25 | 46-50 | 2.75725** | 1.00634 | .006 |
| | 31-35 | 36-40 | 1.53788* | 0.67790 | .024 |
| | 31-35 | 46-50 | 2.23168* | 0.96429 | .021 |

**Note:** *The mean difference is significant at the 0.05 level.
** The mean difference is significant at the 0.05 level.

**Table-9.** Mean scores and standard deviations for different age-groups.

| | Age Group (Years) | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | **21-25** | **26-30** | **31-35** | **36-40** | **41-45** | **46-50** | **51-55** | **56-60** |
| **Variables** | ($n$ = 61) | ($n$ = 95) | ($n$ = 84) | ($n$ = 77) | ($n$ = 49) | ($n$ = 26) | ($n$ = 6) | ($n$ = 2) |
| Computer Self-efficacy | 24.2(3.7) | 23.2(3.6) | 23.7(4.5) | 22.1(4.9) | 22.6(4.7) | 21.4(5.0) | 21.0(4.6) | 27.0(4.2) |
| Teacher efficacy | 14.2(2.3) | 14.1(2.2) | 14.7(2.2) | 14.6(2.4) | 14.7(2.3) | 14.6(2.4) | 14.2(3.0) | 14.5(0.7) |
| Attitude towards Computer | 17.2(2.4) | 17.1(2.6) | 17.3(2.5) | 17.0(3.5) | 16.7(2.8) | 16.1(3.3) | 15.5(3.4) | 17.5(2.1) |
| Social Influence | 15.7(3.1) | 15.7(3.0) | 16.2(2.9) | 16.2(3.3) | 16.1(3.3) | 16.2(2.7) | 18.5(2.3) | 17.0(1.4) |
| Constructivist Beliefs | 17.7(3.3) | 17.8(3.5) | 18.0(3.7) | 18.2(3.1) | 17.5(3.5) | 19.2(3.0) | 16.3(4.3) | 18.5(0.7) |

*$H_0$5: There is no significant difference in the mean scores for computer self-efficacy, teacher efficacy, Attitude towards computer, social influence, and constructivist beliefs based on teaching experience.*

To determine whether teaching experience shapes teacher's perception on the effect of the selected variables on computer use, one-way ANOVA was computed Table 10. From these analyses, it was established that the mean scores Table 11 of teaching experience levels for all the selected variables were statistically not significantly different from each other. These findings suggest that teaching experience does not contribute to any significant differences in determining the perception of the effect of computer self-efficacy, Attitude towards computer, teacher efficacy, social influence and constructivist beliefs on computer use for instructional purposes.

In contrast, Player-Koro (2012) argues that research studies suggest that teachers' beliefs about their self-efficacy in using technology for teaching are directly related to their actual experience and practice with technology. Hernández-Ramos (2005) proposed that teacher's overall *work experiences* will have a positive impact in building a positive attitude towards ICT was not supported. Other studies established that the more experienced users generally hold less positive computer attitude (Christensen, 2002; Hung & Hsu, 2007; Kutluca, 2011; Yusuf & Balogun, 2011). Specifically, Tezci (2010) found significant differences in teaching experience and computer attitude for teachers with 5 and less years and those with 6 and above year. Bingimlas and Hanrahan (2010) concluded that teacher beliefs and their practices may be related to prior experience both in and outside schools, though this was not supported.

**Table-10.** One -way ANOVA of variable based on teaching experience.

| Dependent variable | | *SS* | *df* | *MS* | *F* | *p* |
|---|---|---|---|---|---|---|
| Computer Self-efficacy | Between Groups | 168.806 | 6 | 28.134 | 1.498 | .178 |
| | Within Groups | 7382.944 | 393 | 18.786 | | |
| | Total | 7551.750 | 399 | | | |
| Teacher efficacy | Between Groups | 34.345 | 6 | 5.724 | 1.106 | .358 |
| | Within Groups | 2033.253 | 393 | 5.174 | | |
| | Total | 2067.598 | 399 | | | |
| Attitude towards Computer | Between Groups | 12.882 | 6 | 2.147 | .263 | .954 |
| | Within Groups | 3214.095 | 393 | 8.178 | | |
| | Total | 3226.978 | 399 | | | |
| Social Influence | Between Groups | 90.056 | 6 | 15.009 | 1.615 | .142 |
| | Within Groups | 3652.521 | 393 | 9.294 | | |
| | Total | 3742.577 | 399 | | | |
| Constructivist Beliefs | Between Groups | 52.884 | 6 | 8.814 | .758 | .603 |
| | Within Groups | 4569.906 | 393 | 11.628 | | |
| | Total | 4622.790 | 399 | | | |

**Table-11.** Mean scores and standard deviations for teaching experience (in Years).

| Dependent variable | 0 - 5 (*n* = 168) | 6 - 10 (*n* = 89) | 11 - 15 (*n* = 68) | 16 - 20 (*n* = 44) | 21 - 25 (*n* = 20) | 26 - 30 (*n* = 8) | 31 - 35 (*n* = 3) |
|---|---|---|---|---|---|---|---|
| Computer Self-efficacy | 23.5(4.0) | 23.1(4.0) | 23.1(4.9) | 22.0(4.3) | 20.9(5.6) | 23.8(4.9) | 23.3(7.0) |
| Teacher efficacy | 14.2(2.2) | 14.3(2.2) | 14.8(2.2) | 15.0(2.3) | 14.2(3.0) | 14.0(2.0) | 15.3(1.5) |
| Attitude towards Computer | 17.1(2.6) | 17.1(2.5) | 17.0(3.6) | 16.8(3.0) | 16.4(3.0) | 17.0(3.2) | 17.0(1.7) |
| Social Influence | 15.6(3.1) | 16.2(3.0) | 16.5(3.2) | 16.5(3.3) | 16.1(2.4) | 17.9(2.6) | 16.3(1.5) |
| Constructivist Beliefs | 18.0(3.4) | 17.5(3.2) | 18.0(3.42) | 17.9(3.6) | 18.5(3.8) | 19.7(2.9) | 18.3(0.6) |

*$H_0$6: There is no significant difference in the mean scores for computer self-efficacy, teacher efficacy, Attitude towards computer, social influence, and constructivist beliefs based on computer experience.*

To determine whether computer experience affects teacher's perception on the effect of the selected variables on computer use, one-way ANOVA was computed Table 12. From these analyses, it was established that the mean scores Table 13 of at least two computer experience levels for computer self-efficacy ($F(3, 396) = 4.555$, $p = .004$)), Attitude towards computer ($F(3, 396) = 5.637$, $p = .001$), and social influence ($F(3, 396) = 4.432$, $p = .004$)) were statistically significantly different from each other while that of constructivist beliefs are marginally significant ($F(3, 396) = 2.587$, $p = .053$). The mean scores of computer experience levels for teacher efficacy ($F(3, 396) = 0.219$, $p = .883$)) are not statistically significantly different from each other.

These findings support the conclusions made by Elbitar (2015) who found statistically significant relationship between teachers' computer experience and their perceived computer self-efficacy. Paraskeva et al. (2008) found positive prior experience in computer use as the greatest factor forming a positive attitude towards computer.

**Table-12.** One -Way ANOVA of variable based on computer experience.

| Dependent variable | | *SS* | *df* | *MS* | *F* | *p* |
|---|---|---|---|---|---|---|
| Computer Self-efficacy | Between Groups | 251.916 | 3 | 83.972 | 4.555** | .004 |
| | Within Groups | 7299.834 | 396 | 18.434 | | |
| | Total | 7551.750 | 399 | | | |
| Teacher efficacy | Between Groups | 3.431 | 3 | 1.144 | 0.219 | .883 |
| | Within Groups | 2064.166 | 396 | 5.213 | | |
| | Total | 2067.598 | 399 | | | |
| Attitude towards Computer | Between Groups | 132.160 | 3 | 44.053 | 5.637** | .001 |
| | Within Groups | 3094.817 | 396 | 7.815 | | |
| | Total | 3226.977 | 399 | | | |
| Social Influence | Between Groups | 121.568 | 3 | 40.523 | 4.432** | .004 |
| | Within Groups | 3621.010 | 396 | 9.144 | | |
| | Total | 3742.577 | 399 | | | |
| Constructivist Beliefs | Between Groups | 88.859 | 3 | 29.620 | 2.587 | .053 |
| | Within Groups | 4533.931 | 396 | 11.449 | | |
| | Total | 4622.790 | 399 | | | |

**Note:** ** $p < .01$, * $p < .05$.

To determine where the differences lie in the effect of computer experience on the perception of computer self-efficacy influencing computer use, a post-hoc analysis using Fisher's LSD was performed on the pair-wise comparisons of mean scores presented in Table 13. These results show there are significant differences in the mean scores see Table 14 of:

i) Computer self-efficacy for teachers with computer experience of between (0-5) years, ($M$=22.4, $SD$=4.4) and both (6-10) years ($M$=23.9, $SD$=4.2) and (11-15) years ($M$=24.3, $SD$=4.0). These findings indicate that perception on the effect of computer self-efficacy on computer use for instructional purposes significantly increased with increase in computer experience of up to 15 years. These findings are in support of Paraskeva et al. (2008) and Sarfo et al. (2017) found a strong correlation of prior experience in computer use and computer self-efficacy, such that increasing computer leads to increase in computer self-efficacy.

ii) Attitude towards computer for teachers with computer experience of between (0-5) years ($M$=16.6, $SD$=3.0) and (6-10) years ($M$=17.8, $SD$=2.4). These findings indicate that perception on the effect of Attitude towards computer on computer use for instructional purposes significantly increased with increase in computer experience of up to 10 years. These findings are in agreement with that of Kahveci et al. (2011) who found a significant relationship between computer experience and computer attitude such that those with high experience score higher in computer attitude.

iii) Social influence for teachers with computer experience of between (a) (0-5) years ($M$=15.8, $SD$=3.2) and (11-15) years ($M$=17.7, $SD$=2.6) and (b) (6-10) years ($M$=16.1, $SD$=2.8) and (11-15) years ($M$=17.7, $SD$=2.6). These findings indicate that perception on the effect of social influence on computer use for instructional purposes significantly increased with increase in computer experience of up to 15 years.

iv) Constructivist beliefs for teachers with computer experience of between (a) (0-5) years ($M$=17.9, $SD$=3.4) and (16-20) years ($M$=20.6, $SD$=1.9) and (b) (6-10) years ($M$=17.6, $SD$=3.4) and (16-20) years ($M$=20.6, $SD$=1.9). These findings indicate that perception on the effect of Constructivist beliefs on computer use for instructional purposes significantly increased with increase in computer experience of up to 20 years.

**Table-13.** Post-Hoc comparisons using fisher's LSD.

| Dependent Variable | (I) Computer Experience (Years) | (J) Computer Experience (Years) | Mean Difference (I-J) | *SE* | *p* |
|---|---|---|---|---|---|
| Computer Self-efficacy | 0 - 5 | 6 - 10 | -1.42087** | 0.49618 | .004 |
| | | 11 - 15 | -1.89669* | 0.80520 | .019 |
| Attitude towards Computer | 0 - 5 | 6 - 10 | -1.22542*** | 0.32307 | .000 |
| Social Influence | 0 - 5 | 11 - 15 | -1.90331** | 0.56710 | .001 |
| | 6 - 10 | 11 - 15 | -1.5430* | 0.60993 | .012 |
| Constructivist Beliefs | 0 - 5 | 16 - 20 | -2.65770* | 1.29635 | .041 |
| | 6 - 10 | 16 - 20 | -2.99596* | 1.32047 | .024 |

**Note:**
*The mean difference is significant at the 0.05 level.
** The mean difference is significant at the 0.01 level.
*** The mean difference is significant at the 0.001 level.

**Table-14.** Mean scores and standard deviations for computer experience (in years).

| Dependent variable | Computer Experience (in Years) | | | |
|---|---|---|---|---|
| | 0-5 ($n$ = 255) | 6-10 ($n$ = 106) | 11-15 ($n$ = 32) | 16-20 ($n$ = 7) |
| Computer Self-efficacy | 22.4(4.4) | 23.9(4.2) | 24.3(4.0) | 25.3(3.9) |
| Teacher efficacy | 14.4(2.3) | 14.4(2.3) | 14.3(2.4) | 15.0(1.6) |
| Attitude towards Computer | 16.6(3.0) | 17.8(2.4) | 17.6(2.5) | 18.0(1.8) |
| Social Influence | 15.8(3.2) | 16.1(2.8) | 17.7(2.6) | 17.6(2.3) |
| Constructivist Beliefs | 17.9(3.4) | 17.6(3.4) | 18.8(3.5) | 20.6(1.9) |

## 5. Conclusions

The purpose of this study was to investigate teachers' perception on the factors that affect ICT integration for instructional purposes. From the findings, a number of conclusions are presented.

a). Subject specialization did not determine teachers' perception on the effect of computer self-efficacy, teacher efficacy, attitude towards computer, social influence and constructivist beliefs on computer use for classroom instruction.

b). Voluntariness and computer experience determined teachers' perception on the effect of all the variables except teacher efficacy. These findings indicate the use of computer (a) on voluntary basis as resulting to positive effects and use than when it is mandatory and (b) is higher for teachers with high computer experience.

c). Gender and teaching experience were not significant determinants of teachers' perception on the effect of all the variables.

d). Age determined of teachers' perception on the effect of computer self-efficacy on computer use for instruction that decreased with age, and no influence on other variables.

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