EFFECTIVE TEACHER PROFESSIONAL DEVELOPMENT AND TECHNOLOGY INTEGRATION: SECONDARY SCHOOL TEACHERS' VIEWPOINTS

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Abstract:

Central to the entire discipline of education in the digital age are the concepts of Teacher Professional Development (TPD) and, Information and Communication Technologies (ICTs) integration in teaching and learning. In recent years, there has been a growing recognition of the vital links between ICT-TPD and improved education standards. However, minimum attention has been given to the integrated ICT-TPD programmes that incorporate training opportunities to assist teachers learn how to integrate ICT for teaching based on teachers' immediate professional needs, experiences, and skills considering current improvements in pedagogy. The purpose of this qualitative study was to investigate secondary schools' teachers' perspectives with regards to effective ICT-TPD programmes. Data were collected through interviews of a purposeful selection of sixteen participants who were selected based on their exemplary ICT usage behaviour. Data from the interviews were analysed using the thematic analysis technique to gain in-depth understanding of teachers' perspectives on the subject under investigation. The analysis revealed five salient components leading to effective ICT-TPD: Teachers as a Community of Professional Practice; Teacher Champions (Mentors/Coaches); Teachers' Research; Teacher Appraisals (Accreditation); and Cascading good Practice. The findings from this study suggest that teacher's accounts of appreciation and dissonances with the TPD programmes in the context of integration of technology in teaching mirrored similar issues in literature. However, the findings also revealed some nuanced shifts on teacher perceptions and attitudes to the quality of teacher professional development for ICT integration in classroom teaching.

Keywords: accreditation, cascading good practice, community of professional practice, information and communication technologies, mentoring, teacher professional development, teacher research

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1. Introduction

Teachers' professional development (TPD) intended for ICT adoption in teaching has experienced unprecedented growth over recent years (Gamage et al., 2017; Tondeur et al., 2015; Zinger et al., 2017). As such, teachers are beginning to seek opportunities to engage in ICT training to ensure that they support their student's use of ICT across different school subjects to actively produce knowledge products, carry out inquiries and investigations to connect with other cultures and people (Buckenmeyer, 2010; Daly et al., 2010). Besides, many teachers are beginning to see ICT as a critical implement for preparing learners to successfully engage in the knowledge economy (Male & Burden, 2014). Training in technology can therefore equip teachers with cost effective strategies to support coaching relationships as well as different learning communities (Buckenmeyer, 2010; Hechter & Vermette, 2014). Education for All (EFA) Global monitoring Report of 2013/2014 denotes that the success of an education system is determined by the quality of its teachers (UNESCO 2014a). In this way, engaging in professional development will ensure that teachers operate within a framework of sustained and continuous learning. As Oyunge (2021) found, technology adoption in schools gives the essential underpinnings to the benefits of integrating ICT in schools and called for the need to examine teachers' pedagogical philosophies and how they are implemented in classroom using technology. This study commences by exploring crucial concepts associated with teacher professional development using ICT and proposes a conceptual framework that can be used to inform in-service teacher professional development programmes and the integration of ICT.

1.1 ICT and Teachers' Professional Development (ICT-TPD)

Existing research recognises the critical role teachers' knowhow and aptitude play for demonstrating the utilisation of ICT in their instructional methods (Janssen, Knoef & Lazonder, 2019; Liao et al., 2017). Teacher training is a major area of interest within the field of effective ICT use for pedagogical purposes (Lim, 2016; Montrieux et al., 2015) and can create opportunities and leverage positive change in teaching methods (Lim, 2016; Mingaine, 2013). While effective teacher training strategies using ICT improves the quality of teaching (Gamage et al., 2017), schools' ICT programmes are seldom accompanied by salient continued TPD (Akyeampong, 2016; Liao et al., 2017) because ICT-CTPD has not been prioritised in many developing countries (Hennessy et al., 2010; Mingaine; 2013 Tondeur et al., 2015). Conversely, in the absence of dedicated and motivated teachers, the adoption of technology in teaching is bound to be unsuccessful (Buabeng-Andoh, 2015; Daly et al., 2010; UNESCO, 2016). Accordingly, to accomplish a fruitful incorporation of ICT in teaching, teachers ought to realise that besides ameliorating their technical aptitudes, TPD builds up a more profound understanding of paradigmatic change to start seeing technology as a pedagogical device as opposed to seeing it as a stand-alone subject (Daly et al., 2010; Koehler & Mishra, 2009).

Over the years, there has been an increased research on how to train teachers to use technology confidently (McKnight, et al., 2016; Twining & Henry, 2014; Valencic & Vogrinc, 2010; Van Rij & Warrington, 2010; Gordon, 2000). For instance, while Twining and Henry (2014) proposed more funding towards teacher technology training for effective ICT use in schools in England, McKnight, et al. (2016) investigated teaching methods employed by teachers to enhance and change learning using interviews and observing classrooms of seven exemplary schools across the USA and found that teachers trained on pedagogical technology made good use of it and gained confidence in using it. A broader perspective has been adopted by Valencic and Vogrinc (2010, p.8) who examined the European Union core policy of promoting talent and creativity from an early age and found that Continued Teacher Professional Development (CTPD) equip teachers with "*the knowledge and competence required to change*" such as the aptitudes required to advance learner-centred perspectives, collaborative teaching techniques and the utilisation of contemporary learning implements, especially those based on ICT. Notably, Lindenberg et al. (2016) used ethnographic methods to investigate variables that determine the implementation of an educational intervention using teacher training and mentorship in Nicaraguan rural schools and found that CTPD is relevant as a means of changing teacher practices and improving schools. Weighing in on this debate, Belland (2009) emphasised the importance of identifying individual teacher-centred needs when settling on the type of training to be offered to them.

The literature presents case studies with good models of teacher training and quality teaching (Power et al., 2014; Hennessey et al., 2010). The Digital Education Enhancement Project (DEEP) case study conducted in South Africa and Egypt showed how technology deployed for teacher training, and participatory research together with ongoing peer-support, can transform teacher education and improve learning (Leach et al., 2006). The DEEP project entailed the provision of technological gadgets like laptops, printers, handheld pocket-computers for each teacher, and other digital devices like camera and video camera that were shared between several local schools. While the DEEP project participants reported affordance issues and device limitations, they adopted new classroom practices (Power et al., 2014). Further, UNESCO (2011) proposed a more person-centred teacher training for technology use perspective by developing a Technology Competency Framework for Teachers (TCFT) to advance a continuum method for educator training in technology adoption. The proposed training was perceived to move through three steps: ICTs literacy, the deepening and creation of knowledge. Every step according to Adam et al. (2011) enhances teacher capacity and empowerment in integrating technology for quality learning. However, T-CFT is criticised because the standards proposed can become an extreme form of regulated and bullying practice that will end up affecting teachers' creativity, innovativeness, and their professional judgement (Butcher, Moore & Hoosen, 2014; Sachs, 2008).

The role of teaching practice in preparing teachers for ICT integration in teaching has received increased attention in recent years (InfoDev, 2015; Wetzel, et al., 2014). For instance, Admiral et al. (2017) investigated how trainee teachers are initiated in the

incorporation of ICTs in secondary school teaching using a technology infused approach and found that the technology-infused courses were important for teaching practice, which in return improved trainee teachers' pedagogical skills and knowledge. This is corroborated by InfoDev (2015) study, which found that effective teacher training in ICT ought to go beyond computer literacy to include effective teaching practices that encompasses the technological teaching tools, curriculum, and context to promote student learning (Zinger et al., 2017). As asserted by Hakverdi-can and Dana (2012), efficient teachers do not require expertise in all types of technology, but they are expert at making use of the available technology they have sufficient expertise in to apply student-centred learning. After teaching practice, teachers may benefit from approved training as well as manageable and continuing support from their colleagues who are more skilled (Hennessey et al., 2010; Kopcha, 2010).

Some studies have examined the rationale of technology Teaching Grid (Joy et al., 2013; Laurillard, 2008; Warger and Dobbin, 2009). For example, Joy et al. (2013) researched technology utilisation in flexible teaching and revealed how the Teaching Grid furnishes teachers with a flexible experimental space through technologies to support staff comprehensively and practice student-centred teaching. Warger and Dobbin (2009) who suggests that flexible spaces motivate teachers to shift pedagogy from teacher-centred strategies to student-centred ones corroborate this finding. In the same vein, some studies have indicated that ICTs can aid teachers to flexible opportunities with learners' involvement using a constructivist approach (Laurillard, 2008; Oyunge, 2021). The Teaching Grid approach creates room for a flexible space to instructors with a focus on evolving learner needs (Joy et al., 2013; Autry, 2011).

For effective uptake of ICT for pedagogical purposes, the challenges experienced by teachers should be noted and addressed (Georgina & Hosford, 2009; Janssen, Knoef & Lazonder, 2019) because these negative perceptions hinder effective integration (Reinking, 2011), hence, the need for consistent and ongoing support for teachers to realise meaningful adoption of ICTs in their professional practice. This is important because teachers who are supported, motivated, and trained to integrate ICT offer personalised and tailor-made teaching which in return helps the students to reach their full potential by being able to interact with their own communities and with those from different cultures (Scott, 2015; Joy et al., 2013). Such teachers positively influence the learners by encouraging them to reason innovatively and equip them with the capacity to discerning appropriate information from what is inappropriate (Daly et al., 2010; Luckin et al., 2016). However, it has been suggested that introducing new ICTs is a compounded matter that can disrupt community dynamics, hence, the need to approach it sensitively and responsibly (Arnold et al., 2010).

1.2 ICT-TPD in Developed and Developing Countries

Literature report on how most of the teachers in developing countries lack the necessary expertise to implement ICT in their teaching process (Buckenmeyer, 2010). For example, Hennessey et al., (2010) examined the factors that facilitate technology integration in Sub-

Saharan Africa and reported that CPD is crucial to effective ICTs adoption in teaching. However, the study found lack of trained teachers, their inadequate ICT knowledge, and skills to be notable barriers to ICTs uptake in schools. The study suggested the need for offering teachers CPD refresher courses in three stages: technology literacy, the deepening, and the creation of knowledge as corroborated by UNESCO (2008). ICT-TPD in developing countries is mainly for purposes of enhancing computer literacy as opposed to being tools to actively reinforce existing teaching practices and to change the way students and teachers interact with each other (Buckenmeyer, 2010; UNESCO, 2008). Many teachers in developing countries albeit appreciating the need for participation in professional learning communities linked by a shared need to enhance student outcomes (Hechter & Vermette, 2014), they have a higher likelihood of rejecting ICT skills they feel conflict with their current ideas as part of the training process (Hennessy et al, 2010; So & Kim, 2009).

Conversely, studies carried out in developed countries can be a critical departure point for the reflections on using technology for TPD in the developing nations (Badia et al., 2013; McAleavy, et al, 2018), where teachers often remain key in the learning process and enjoy ongoing relevant training (So & Kim, 2009) and, understand ICT training as an important aspect that enables them to adopt new teaching strategies aimed at benefitting their learners (Burns & Lawrie, 2015). The ICT-TPD programmes in developed nations enables teachers become facilitators in their classes, and use the ICT skills linked to planning, preparation, and follow-up of the curriculum (Baturay et al., 2017). Similarly, ICT-TPD in developed countries' context underscores the criticality of embracing ICT into the lesson planning process to enable their learners to remain focused for higher attainment (Badia et al., 2013) and centre on supporting teachers to apply the knowledge gained to form small discussion groups (Baturay et al., 2017) that enable them to adopt student-centred teaching approaches (Janssen et al., 2019; Regan et al., 2019). For example, teachers in countries such as Norway, the USA, and the UK, have adopted ICT in their instructional methods, and have moved on from traditional teaching methods to learner-centred approaches (McAleavy et al., 2018 Montrieux et al., 2015). More importantly, ICT training is seen as a tool that actively prepares the teacher to benefit from the application of ICT use as opposed to only learning the technical skills (Montrieux et al., 2015). While ICT-TPD in developing nations is often done as a one-off event, teachers in developed nations undergo extensive and constant exposure to technology training to enable them to examine and choose the adequate resources to fit into their students' needs (Daly et al., 2010). However, as in many developing countries, some developed countries also struggle with the idea that developing the necessary educational practices is more critical than gaining the necessary mastery over ICTs (Daly et al., 2010). And again, the presence of technology does not necessarily change teacher practices on its own given a teacher's pedagogical reasoning and practices impacts heavily on how they use ICT (Buckenmeyer, 2010).

Previous studies conducted in Kenya have suggested that ICT-TPD programmes help grow teachers' proficiencies in using technology to perform their professional practices (Bett, 2016; Mwanda et al., 2017; Tondeur et al., 2015). For example, Keengwe and Onchwari (2008) reported a continued emphasis on the need for TPD geared towards ICT adoption in teaching which helped the teachers to utilise software to improve instruction in their classrooms. On their part, Tondeur et al. (2015) advocated for the involvement of TPD programmes to support teachers' learning in ICT incorporation rather than facilitating it as a stand-alone event and taking into consideration the schools' setting and daily cultural practices when involving emerging technologies, and new teaching methods. Following this realisation, studies have cautioned that placing technological devices in schools without a trained workforce places pressure on the training arrangement of the nation undertaking the transformation (Kamau, 2014; Tondeur et al., 2015). For example, it is suggested that the TPD required in a country like Kenya is complicated and the skills required to achieve it are rare (Ogembo et al., 2012) due to limited funding and misuse of resources that hinders scheduling of ICT-TPD programmes from time to time (Chao, 2015; Hennessey et al., 2010; Kamau, 2014). The country's ICT-TPD perspectives takes form of periodic workshops, regularly conducted in a day, featuring distinct ICT abilities, with individual teachers left to imagine on how to put them to practice denying them the ideal opportunity for evaluating their thoughts back in the classroom (Hooker, 2017; Mereku et al., 2010). And again, teachers alone will not be able to actualise the adoption of ICT in teaching without a shared vision founded on the real needs of the schools and one that incorporates all stakeholders (Orwenjo & Erastus, 2018).

1.3 Characteristics of Effective ICT-TPD

A growing body of literature has identified explicit characteristics of essential TPD approaches using ICT: personalised to individual teachers' needs; situated in context; situated in authentic experience; hands-on; pedagogically focused; and evaluation applicable in ICT-TPD context (Cordingley et al., 2015; Darling-Hammond et al., 2017; Karlin & Ottenbreit-Leftwich, 2018; Mouza, 2016). Studies have also denoted teachers' positive views of ICT-CPD (Butler et al., 2013; GESCI, 2017; Longhurst, et al., 2016). For instance, a recent report in North America suggests that teachers who took part in a two-year ICT-TPD expanded their technological knowhow and aptitudes, transformed their technology adoption application, and improved their students' accomplishments as opposed to their counterparts who took part in just one year or those who did not take part at all (Longhurst, et al., 2016). This shows how CPD positively influences ICT use in teaching and learning unlike the short time one-off approach (Daly et al., 2010). Teachers also see ICT-TPD as pivotal when individual needs are addressed within it (GESCI, 2017; Janssen et al., 2019; Meyers, et al., 2016). However, when teachers think that TPD is not helpful and steady to address their professional adapting needs, they become reluctant to implement its usage (Badia et al., 2013; Hooker, 2017; Saunders, 2014).

While classroom-based expert coaching provides salient opportunities for learning that can lead to desired change (Badia et al., 2013), external expertise equally helps teachers overcome existing practices and pave way for new knowledge and aptitudes to ameliorate learners' outcomes resulting in meaningful change (Cordingley et al, 2015, McAleavy et al., 2018). Notwithstanding, off-site workshops are largely considered as weak strategy for changing the teacher's behaviour (McAleavy, et al., 2018). This implies ICT-TPD considers the unique circumstances like school assets accessible and study room condition within which the digital innovation will be utilised (GESCI, 2017; Jakubowski, 2014; Longhurst, et al., 2016; OECD, 2017). This perspective presents a challenge to ICT-TPD programmes in Kenya as the greater part of the training exercises occur away from the establishments where they are supposed to be utilised (Bailey & Kaufman, 2015; GESCI, 2017; Hennessy et al., 2010).

Authenticity is an important characteristic of effective ICT-TPD that refers to learning that is hands-on and pedagogically oriented initiatives (Bailey & Kaufman, 2015; McAleavy et al., 2018; Liao, et al., 2017). For instance, teachers ought to be allowed the chance to utilise and work with technology tools (Meyers et al., 2016) and possess ICT pedagogical knowledge for ICT-TPD to be successful (Mouza, 2011). This is important because teachers are bound to employ ICT in many innovative ways when they associate it with pedagogical values (Daly et al., 2010; Karlin and Ottenbreit-Leftwich, 2018). Notably, meaningful changes take time to embed, suggesting the need for time to be set aside for ICT-TPD learning and to put measures in place, if external expert support is withdrawn (Cordingley et al., 2015, McAleavy et al., 2018). Hence, ICT-TPD approaches ought to be based on thorough adult learning principles to avoid a situation where teachers reject new ideas conflicting with the ones they already hold (Cordingley et al., 2015, Daly et al., 2010). These conflicts need to be addressed as part of the professional development learning to gain the trust of the teachers being trained (McAleavy et al., 2018). Equally important is the need of subject specific training while taking care to avoid ICT-TPD focused on generic pedagogic strategies (Cordingley et al, 2015; Daly et al., 2010).

Recent developments in ICT-TPD have heightened the need for evaluation and review of the programme at the end of the session (Luckin et al., 2016; McAleavy et al., 2018) with Karlin and Ottenbreit (2018) pointing out the importance of assessing TPD by means of multiple assessment measures to weigh its success and viability. However, research has shown that some evaluations seldom move past self-reported survey (McAleavy et al., 2018). Notwithstanding the limitation, these accepted practices of on-going ICT-TPD with authentic experiences require personalised and community support (Liao, et al., 2017), together with follow-ups soon after training sessions (Karlin, & Ottenbreit-Leftwich, 2018) for effective ICT integration for pedagogical purposes.

2. Theoretical Framework

A Community of Professional Practice (CPP) integrates five elements indicated in Figure 1: training, cascading of good practice, mentoring/coaching, teacher research and accreditation that fits in the expectations of the ICT-TPD (Sentence et al., 2014).

Figure 1: An integrated TPD framework (Kennedy 2005; 2014).

Providing every Aspects of the TPD framework will improve teachers in numerous ways at different phases of improvement. Each aspect of this framework is further explored below:

2.1 Community of Professional Practice (CPP)

Literature has explored the importance of CPP in providing support and improved working environment for instructors (Akersonn, et al., 2009; Ryoo et al., 2015) and defined it as group of people with a joint mutual endeavour and a shared repertoire of public interest (Wenger, 2000). Realistically, when teachers working together to meet a shared objective such as adopting a new methodology, share their encounters, talk a similar language, and are happy to gain from each other, they become a Teachers Community of Professional Practice (TCPP) (Sentence et al., 2014). The improvement of TCPP in the utilisation of ICT in the entire school would be of advantage (Kennedy, 2014) and ought to cross disciplinary limits, be effectively bolstered by education leaders, to form web-based learning networks (Howell, 2010).

CPP has been gaining consideration from the past two decades because it is pivotal for teachers to take part in a professional learning community aimed at improving learners' outcomes (Cordingley et al., 2015; Kopcha, 2010). CPP refers to a grid-group of people with similar fundamental beliefs and moral principles (Kopcha, 2012; McAleavy et al., 2018). Within the CPP arrangement, the trainer should have ready prepared ICT-TPD activities, to help direct teachers appropriately for successful implementation of ICT (Kopcha, 2012) and deepen successful utilisation of ICT through exploration, interpretation, and negotiation (Blitz, 2013). Hence, some studies have reported on how

ICTs have increased opportunities for groups of teachers to throw back and join forces with one another and with virtual specialists (Chuang, 2010; West et al., 2009). However, CPP face huddles such as limited resources, getting the time, room, leadership goodwill support that communities of practice require to grow (McLaughlin & Talbert, 2006). Furthermore, Cox (2005) alerts that where school leadership arranges CPP, this might look suspicious to the teachers, who might view it as a way of control with the expectation seen as a type of controlling as opposed to improved TPD.

2.2 Cascading Good Practice

Cascading good practice is when an instructor (Champion Teacher) who has gained skills from a TPD programme can then impart the same skills to other colleagues in the department (Ang'ondi, 2013; Kennedy, 2005) and are trained ideally in a nation that has effectively integrated ICT in teaching (Hardman et al., 2011). When adequate individuals have partaken in such workshops, some of them would be able to become mentors, in this way empowering the procedure by cascading aptitudes and expertise downwards through the system of education (Chan, 2002; Kennedy, 2014). The cascading good practice strategy has been popular especially for the initial phase on technology integration (Gathumbi et al., 2013; Hardman et al., 2011; Pryor, 2013) where there is limited expertise in schools (Mingaine, 2013). However, the existing body of research on the cascading strategy suggests that it focusses on aptitudes and knowledge aspects of the TPD while relegating the values and attitudes that have been recognised as key components of the process (Bett, 2016; Kennedy, 2005). This strategy has been criticised for its trickle-down effect that waters down the content when being passed on to trainees (Gathumbi et al., 2013; Hayes, 2000) and its failure to meet the training needs of teachers (Nyarigoti, 2013). Based on these limitations, a literature review conducted by Bett (2016) recommended change of the teachers' continued professional development (TCPD) approach in Kenya from the cascading good practice approach to a more integrated approach.

2.3 Teacher Inquiry about ICT and Pedagogy

Teacher research enables teachers to examine changes in teaching and learning and weigh the effect of those changes on their students instead of being directed about the same changes during an inset day formal meeting (Pine, 2009), further enabling them to be confident in view of their learners and schools' needs (Burkbank, 2003). Successful TPD entails adopting new ideas in teaching and testing their adequacy (Pine, 2009). Teachers can be effective classroom researchers when they think critically, have self-sufficiency, have access to elevated level of support, strong procedures for self-monitoring and straightforward procedure for dissemination. Normally, a mentor or educator expert may have a duty in supporting teacher research (Krell, 2012) and supporting teachers to be increasingly intelligent (Herbert & Rainsford, 2014).

2.4 Teacher Champions (Mentoring/Coaching)

Mentoring and coaching have different meanings, but both enables a teacher to grow professionally (DfES, 2005). While coaching allows teachers of equivalent status work together either through coaching sessions or colleague observations without the idea of classing any one as an "expert" (Joyce & Showers, 1996), a mentor is assumed to have a more elevated level of skill than the mentee (DfES, 2005). Both mentoring and coaching strategies have room in an integrative and comprehensive approach to TPD (Kennedy, 2014; Sentance et al., 2014) as they have been reported to be especially, powerful in offering personalised help to the teachers (Davis & West, 2014; Dorner & Kumar, 2016). Normally, a mentor/coach is commonly an expert in technology adoption matters and normally offer one to one guidance, trouble shooting, planning, modelling and extra help to the teachers (Chuang, 2010; Davis & West, 2014; Karlin & Ottenbreit, 2018). Technology, e.g., blogs, WhatsApp and other types of network communication can be used to improve TPD skills to model ICT integration (Chuang, 2010).

2.5 Appraisals and Accreditation

The motivation behind on-going accreditation for teachers is to appreciate their dedication to growing as professionals (Kennedy, 2014; Sentance, Humphrey & Dorling, 2014). For instance, The Web-Based Education Commission (WEC) (2000) recommended TPD and policy reform in the USA to equip in-service teachers with in-depth knowledge and skills needed for ICT integration. The Commission also recommended more time for teachers to develop, master and reflect on technology-based learning approaches and be accorded time, incentives, and to be involved in lifelong TPD. This is corroborated by (Abuhmaid, 2011) who found that teachers can be motivated through rewards and in return attract other teachers to attend ICT-TPD programmes. To achieve this, teachers can be appraised for promotions gaining the required aptitudes.

3. Summary

The overarching theme of ICT-TPD and its influence on the integration of ICT in teaching were the main motivation for the current research. Concisely, key themes that are important for this study have emerged from the literature. The literature recommends that the salient ICT-CTPD programmes should incorporate planning dependent on teachers' needs analysis, executing them through sustained nonstop techniques, substance, and conveyance (Hennessey et al., 2010), be hands-on, located in the school (McAleavy et al., 2018), and assessing it by means of multiple assessment scales to determine its viability (Hooker, 2017). The literature further recommended that successful ICT-CTPD programmes should be intense and on-going (Cordingley et al., 2015; Hooker, 2017). A notable exception is in Kenya where ICT-CTPD will largely be a single time event concentrated on a particular technology (Hennessey et al., 2010; OECD, 2017). Although the literature indicates that successful ICT-TPD should be offered in an on-going way (Cordingley et al., 2015, McAleavy et al., 2018), insufficient recognition has

been accorded any importance as ICT-TPD initiatives in most developing countries where they tend to be held as a one-time activity (GESCI, 2017; Hennessey et al., 2010). For instance, Ogembo et al., (2012) suggested that the TPD required in a country like Kenya is complicated and the skills required to achieve it are rare. Translating these variations into the context of ICT-TPD in Kenya reveals a gap in the knowledge, and it is precisely within this lacuna that this research is located using the integrated TPD framework (Sentence et al., 2014) in the examination of the teachers therein and supplement new knowledge.

4. Methodology

Data for this research were drawn from a study investigating secondary school teachers' perceptions towards ICT integration in teaching and learning in Kenya. The qualitative data significantly gave the participants a voice about their experiences, and their perceptions of ICTs adoption in teaching methods. Sixteen teachers who exhibited keen interest with ICT use in teaching were purposively selected to participate in the interview. I scheduled a day and time to meet teachers at their school. Of the sixteen teachers I interviewed, eleven of them were graduate teachers, three of them head of department and two Principals. They had varying teaching experiences and assigned responsibilities. Every respondent was classified by gender, age, and responsibility held in school as denoted in Table 1. The teacher ages ranged between 25 and 55years. For purposes of confidentiality, each participant was identified with a number designation of 1, 2, 3 etc. They were all self-identified as ICT-using in secondary schools. The interviews took place in schools (departmental office) at a convenient and comfortable location, at a convenient time to the interviewees, devoid of any pressure (Hannan, 2007; Kvale & Brinkmann, 2009). Respondent validation was conducted to guarantee the validity and accuracy of the information gathered.

Table 1: Interviewed teachers' codes and demographic details

Interviewee Code	Gender	Position in school	Age (years)
T1	Female	Teacher	28
T2	Female	HOD	31
T3	Male	Teacher	36
T4	Female	Principal	42
T5	Male	Principal	53
T6	Male	HOD	39
T7	Female	Teacher	25
T8	Male	HOD	45
T9	Male	Teacher	55
T10	Male	Teacher	29
T11	Female	Teacher	34
T12	Male	Teacher	32
T13	Male	HOD	48
T14	Female	Teacher	46

| T15 | Female | Teacher | 37 |
| T16 | Female | Teacher | 27 |

I employed the semi-structured interview approach, which helped illuminate more information regarding ICT-TPD approaches. The interview technique is arguably widely approved in qualitative studies due to its flexibility to give rich detailed responses and answers (Bryman, 2012; Kvale & Brinkmann, 2009). I prepared a primary checklist to ascertain all appropriate sections were covered, and that participants were free to examine, explore and ask important questions about the research. Semi-structured interviews are important as they enable in-depth probing and permit the interviewer to keep the interview within the context of the study subject (Bryman, 2016). I set a timetable for interviewing face-to-face, the 16 teachers who were purposively selected two from each of the eight participating schools. Once a recording device was tested in readiness for the interview, I started the interview with an introductory statement concerning the nature and aim of the research. Confidentiality matters were raised beforehand, and every interviewee was assigned a code to guarantee anonymity, but which made it possible for the interviewee to be identified through data collection, analysis, and discussion stages. Permission was granted before the interviews were conducted and all participating teachers were assured of and guaranteed confidentiality. When each interview ended, each interviewee was appreciated for their time and commitment to contribute to the research and were each prompted of the rights to alter or pull back the data already shared. The interviews took approximately 30 to 35 minutes. All interviews in the current research were digitally voice recorded and transcribed verbatim for accuracy.

Thematic analysis strategy was used to examine the qualitative interview information in the current study. Thematic analysis identifies patterns in a dataset (Maguire & Delahunt, 2017; Floersch et al., 2010), involves a rigorous process that entails the recognition of themes by reading the data repeatedly (Fereday, 2006), and is flexible because it is not attached to a particular theoretical perspective (Clarke & Braun, 2013). The current study has adopted the six-step interview analysis framework of Braun and Clark (2006): Familiarisation with the data; Generate initial codes; Search for themes; Review themes; Define themes; and Write-up. Writing of interview data analysis commenced at the data collection time. In this analysis, I moved from one-step to the next linearly.

At step one, I familiarised myself with my data by reading, re-reading, listening to, summarising, and noting down themes emerging from the raw data, and summarised the transcripts by noting down the key answers from the participants that were pertinent to the study questions. The reason for reading the transcripts repeatedly was to familiarise myself with the whole data (data corpus) for identification of themes (Nowel et al., 2017). I made notes as I read, and this helped me to jot down early impressions. At step two, I organised the data systematically and developed codes by reducing many data into small chunks of meaning. This led to the coding of each part of data that

contained something of interest regarding the topic under examination. Open coding was employed to develop and modify the codes through the coding process and generating new codes and at times modifying existing ones. Coding was done manually and from the responses, initial codes were generated. A single or few comments were considered crucial as those that were repeated severally. At step three, I embarked on examining data while condensing some of them into themes. I sorted the various codes and identified potential themes. Further to this, Grabtree and Miller (1999) indicate that themes and patterns in the data are discovered by combining codes. Similarities and variant groups of data emerged at this stage, showing areas of agreement in response to research questions and areas of conflicts. For instance, I had ten codes that associated to salient ICT-TPD characteristics. I collated the ten codes into a theme called, "Teachers' Professional Practice.

At step 4, I reviewed the codes, modified them, and developed the preliminary themes. I tried to examine if they made sense by gathering the entire data that is connected to each emerging theme. I did this process manually by 'cut and paste' (Bree & Gallagher, 2016; Nowel et al., 2017). I also tried to examine whether the themes fitted within the setting of the whole data set, both within a particular interview and across all the 16 interviews and considered whether themes were coherent and distinct from each other. I did this through cross-examination to find out if the themes made sense up to this level, if the data supported the themes, and if there were themes within themes. At the end of step four, my themes were: Communities of Professional Practices; ICT Continuing Teacher Professional Development (ICT- CTPD); Teachers' Pedagogical beliefs; Teacher Research; school leadership and technical support; ICT integration issues; Teacher mentors/Coaches; Cascading good Practice; and The Digital Education Enhancement Project (DEEP). At step five, I needed to refine the themes to justify the significance of each one (Nowel et al., 2017; Braun & Clarke, 2006), find out what each theme addressed and how sub-themes interacted with the main theme. In this analysis, "ICT-TPD' is an overarching theme that is rooted in most other themes. After I reviewed my themes, I captured what each theme was all about, created an overall narrative with my data corpus that enabled the emergence of five crucial themes. The five crucial themes indicated in Figure 2 emerged as critical segments for successful selection and incorporation in ICT-TPD strategies in Kenya: Teacher Communities of Professional Practice; Teacher Champions (Mentor and Coach); Teachers' Inquiry in ICT and Pedagogy; Teacher Appraisal and Accreditation; and Cascading good Practice.

Figure 2: Proposed Consolidated ICT-TPD Framework
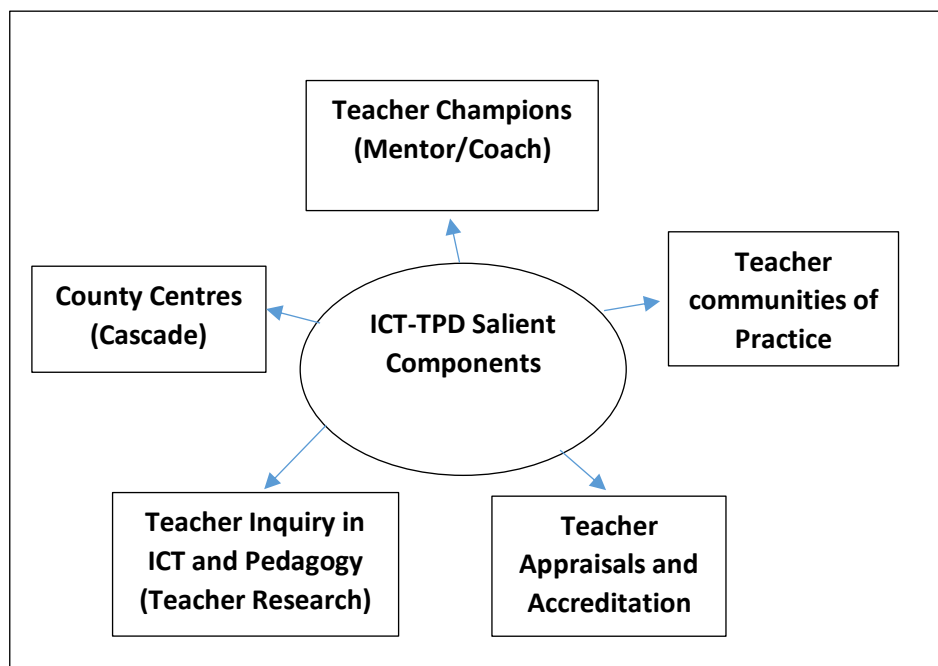
ICT-TPD = Information and Communication Technology – Teacher Professional Development

4.1 Research Quality and Trustworthiness

To maintain the quality of the study, I tried to remain neutral and respected the interpretations of the participants (Nowel et al., 2017; Devellis, 2012). In cases where data anomalies were detected, they were deleted and noted. This was possible because I conducted the interviews personally. Whenever something came up during the interview, I had a chance to seek clarification post the interview. I took time to reflect on the data and the interviewees' responses. This enabled me to carry out a critical analysis necessary in qualitative research. To further boost the credibility of the current research, I asked the participants to read and verify the recorded content from their interviews. This was consistent with Lincoln and Guba (1985) findings, which emphasised on how data checking improves the credibility of the research. Ensuring credibility in this study has been implemented throughout the analysis steps that emphasise clarity and rigour (Braun & Clarke, 2006). I picked participants who taught in different schools in Kenya to limit the ramifications on the research of local factors peculiar to a single school. Credibility is also gained through precisely recognising and designating participants in a research. For example, the sixteen interviewees in the current study were assigned codes in place of their names (T1, T2, T3, etc.). To meet the dependability criteria in the current study, I kept details about how data were collected, tape recordings, interview schedules, and notes with procedures, which can guide other researchers to validate the process (Nowel et al., 2017). The current study observed a clear and detailed account of the methodology used, data collection, methods, participants, and settings. I produced verbatim transcripts from the participants' interviews to offer a clear view of the actual data for transferability purposes (Hammersely, 2007).

4.2 Data Analysis and Findings

Through a procedure of review and clarification, five crucial themes emerged as critical segments for effective ICT-TPD: Teacher communities of Professional Practice; Teacher Champions (Mentors/Coach); Teacher Inquiry on ICT and Pedagogy; Teacher Appraisals and Accreditation; and Cascading good Practice.

TPD is defined as a continuous process that involves training to embrace change of teaching profession through taught courses, in-school training, coaching, mentoring and teacher action research (Coldwell, 2017). The interviews sought to find out whether training opportunities existed for teachers to grow their ICT aptitudes and expertise suitable for its assimilation process (Appendix 1). Emphasising the importance for congruous and meaningful ICT-TPD, one participating school Principal commented:

> *"Regardless of the futuristic devices in the classrooms, if teachers are not trained on how to utilise them, they cannot make good use of them. All teachers need to be trained on how to use ICT in their pedagogies."* (T5, Principal)

This implies that ICT-TPD is at the core of successful ICT adoption in teaching process and ought to be embraced. Teacher ICT knowledge identifies with their capabilities to utilise and become proficient in several ICTs and to make ancient artefacts to achieve their professional duties (Ouyang, 2015). The following teacher excerpts are representative of this view:

> *"Sometime last year, I attended an ICT training in my school. The school management brought in an expert who took us through the training. Furthermore, my school Principal arranged for me and two other teachers to attend training and workshops sponsored by the school."*

> *"My school has arranged for teachers from different departments to attend ICT-TPD every Friday of the end-month at the County Headquarters. The ICT department equally organises ICT-TPD seminars for teachers within the school."* (T16)

The dissonance lies in the type of training offered. Continued Teacher professional development (CTPD) in Kenya has mainly adopted the cascading model (Bett, 2016) with training offered from trainers at the headquarters to trainees at the local level. A few teachers, however, were critical about the appropriateness, sustainability, and the standard of the training they were undergoing. Outlining the unpleasant circumstances in the training centres, one teacher said:

> *"The computers are insufficient; the room is constantly packed; you find around six teachers grouped on one table and the most exceedingly terrible of all if you do not turn up ahead of time you will not secure a decent spot to sit. We additionally needed to do over 60 miles to the training centre."* (T3)

Concurring with the above citation, the majority of the participants were of the view that in spite of having had access to technology both in class and in the laboratory, they lacked support related to proficient use of ICT in classroom instruction as the following teacher excerpts suggest:

"Although there is a well-equipped computer laboratory, I have not been well prepared to utilise them. I just attended a one-day ICT-TPD workshop at our County Headquarters and from that point forward, I needed to be all on my own." (T14)

"Because I have not gotten any meaningful training, I do not feel confident enough to integrate technology in my teaching. I even have my own tablet, which I cannot competently use due to lack of relevant training." (T15)

The perspectives expressed above bolstered the impression that the incorporation of ICT into classroom instruction may not be realised by simply enabling access to ICT. In other words, access to ICT devoid of suitable training for their use is certainly not an adequate condition for the adoption of technology. Similarly, one humanities teacher confided that:

"Often, we receive instructions on how to utilise a programme without any accompanying information on the best way to incorporate it to the curriculum. The information picked up in training rapidly disappears since it is not used in the practical teaching in class." (T16)

Participating teachers with minimal technology experiences reported that there was insufficient ICT-TPD accessible to match their individual prerequisites, while their counterparts who were more proficient and good technology users remained disappointed with the low-level training offered. This contradiction was illuminated when one participant remarked:

"The training offered does not put into consideration the trainees' individual differences. Those of us who went to school and trained to be teachers before the advent of computers hardly know beyond the turning on and off the computers, however, we are all grouped and trained together with the youthful colleagues who happen to have more exposure to technology." (T9)

The excerpt above implied that the ICT-TPD attained by the participating teachers was not intended to meet their specific training requirements. This revelation conflicts with the strategies to successful ICT-TPD illustrated in the literature from the developed nations.

Conversely, some teacher narratives centred on ICT-TCPD benefits for teachers and learners through knowledge deepening. For instance, the following Head of Department comments would appear to objectify the kind of training teachers received

through Kenya Secondary School Teachers Advanced Technology Training offered by the African Digital Schools Initiative (ADSI). Explaining the trajectory of the initiative and the skills he was already gaining from the programme, the HOD teacher remarked:

> *"The training begins with Technology Literacy and after two weeks goes to a level higher through the knowledge Deepening Cycle. By week six, we were introduced to Knowledge Creation, which entails Information Literacy, Research and other identified difficult to teach concepts from learners' feedback. By the end of the six weeks, I would competently use technology in class.* (T8, HOD)

When probed further about where he preferred in-house training and workshops to take place, Teacher 14, (male aged 48), preferred non-formal training and suggested this to take place at his school so *"I can attend during my free time."* Nearly half of the interviewed teachers shared this view with many of them adding that they needed to have their learners to pass in examinations and this to them would only happen if they covered the syllabus without further interruptions.

While the majority of the teachers were in agreement regarding the importance of ICT-CTPD, some appeared dissatisfied by the ICT resources in their schools; hence, they viewed the training as a waste of time. The participants described the computers in their schools as not fully functional. For instance, one of the participating teachers said,

> *"It is not necessary to be involved in in-service computer training without having effective regular access to a functional computer laboratory equipped with appropriate hardware and software."* (T15)

With respect to the quality of the training, nearly all teachers pointed out the need to acquire pedagogical training rather than technical skills. When asked if they had mastered the necessary technology skills such as Word Processing, Spreadsheets, Blackboard Teaching and Electronic Presentation, more than half of the participating teachers said '*no.*' The majority, however, acknowledged having taken some computer courses during their university teaching studies, though the courses aimed at meeting the programme requirements as opposed to improving technology skills for pedagogy. More than half of the teachers further revealed that they had attended ICT-CTPD course, but they felt it was not beneficial. Anecdotal evidence is in the narrative below:

> *"We were crowded in the training room, twelve of us per a computer and only one of the trainees had to touch the computer as others just observed. It is not worth the time taken to attend."* (T2).

These participants felt that the training was inadequate and of low quality.

More than half of the interviewed teachers recommended mandatory technology training for teachers accompanied by rewards. They suggested the use of incentives like

accreditation and promotions to higher job groups. This way, teachers feel encouraged to train and motivated at the same time. These types of incentives according to the majority of the interviewed teachers are very important. They appealed for technology-infused professional training aimed at technology adoption in their classroom instructional methods.

Participant 3 expressed her perception on the use of technology for pedagogical reasons and recommended the integration of technology in teaching as it makes work easier. She proposed for the integration of a compulsory technology-training unit in the teacher-training programme to enable all qualifying teachers to come out of the training fully skilled in the implementation of technology in instructional methods. This view was echoed by *Teacher 8* who advocated for refresher courses to keep up with emerging technologies used in teaching. Other teachers expressed their desire for further training in technology, especially on how to draw diagrams using computers, which tend to be a challenge. Representative of this view are the following comments from one participant:

> *"I need on-going refresher courses on how to use ICT devises in my school. As a teacher there are some computer programmes that I feel I need more training to be comfortable."* (T9)

The majority of the teachers suggested to their school administrations to introduce ICT-CTPD programmes within the schools using the coaching programmes. This is evidenced by the teachers' narratives, which illuminated teachers' needs for technology training programmes. For instance, interviewees did not incorporate technology in their lessons because *"I am not comfortable with using technology in teaching due to inadequate training in the same"* (T8) and wondered why their schools were not ready to initiate peer-coaching and in-house training programmes. One head teacher remarked:

> *"When teachers do not feel confident enough about ICT use in teaching, they are encouraged to take the initiative of approaching their colleague with the knowhow about their need for peer coaching."* (T5 – Head Teacher)

A common view amongst the majority of informants was an appeal to their schools' administrations and management bodies to develop ICT-TPD programmes within their schools run by members of staff from their schools. This is clear evidence that teachers lacked adequate ICT support which hindered its use. However, there appears to be a contradiction in the suggested in-house coaching programmes of needs analysis. Such a programme will work well with a top-down way of identifying training needs rather than a bottom-up method suggested by teachers. More than half of the teachers indicated through their responses that their training needs targets related to skills development in software and hardware use instead of targeting the pedagogic application of ICTs. The teacher excerpts below represent this narrative:

"In as much as I would like to undergo technology training within the school, I, however, know nothing about databases and spreadsheet. I only know a bit of presentational applications such as PowerPoint, which I learnt in university." (T12)

"We are yet to be trained on how to use spreadsheets and how to deal with error messages that keep popping up from time to time and make teaching using technology very cumbersome." (T10).

Probed further to identify the type of training they thought matched their needs, the majority of the interviewees pointed to a more integrated ICT TPD framework that can establish a more emphatic professional component for collective and inclusive in nature. They suggested an integrated model that incorporates communities of professional practice, training, cascading of good practice, mentoring/coaching, teacher research, accreditation, and the Digital Education Enhancement programmes. The following two teachers' excerpts are representative of this view:

"I prefer a community of professional practice that entails cascade knowledge ICT training, mentoring/coaching, teacher research and accreditation. Providing every aspect of this framework will improve our teaching in various manners at different phases of improvement." (T1)

"The training programmes provided are not appropriate. For instance, only one teacher is picked to represent every department at the training. The same teachers are then expected to pass the skills learnt to their colleagues back in their schools. Some of the representative teachers fail to grasp the full information." (T12)

Generally, all participating teachers perceived the significance of providing appropriate ICT-TPD as valuable to change their instructional strategies. Conversely, the ICT-TPD in majority of the schools appeared to be propelled by that which Prestridge (2007) portray as 'retooling' goals[ii]. The ICT-TPD approach appeared to supplement the existing curriculum by just equipping teachers with the basic aptitudes and proficiencies centred on types of technological applications. Despite being a vital aspect of the ICT adoption procedure, the teachers needed more than information about ICT aptitudes; they also needed information on specific subjects or themes (Mishra & Koehler 2006; Prestridge, 2007).

[ii] Re-tooling strategies aid in augmenting the school curriculum through provision of aptitudes and proficiencies based on particular types of technology applications. Re-tooling strategies in ICT-TPD centre on ICT skills training in specific curriculum software applications. ICT-TPD skills focussed training is regarded as a pivotal aspect because through it, teachers' view their proficiency greatly improving their utilisation of ICT in teaching.

5. Discussion

This study set out to assess the importance of ICT-TPD programmes in the context of ICT integration in teaching and learning. The placement of ICT devices in schools, together with its comparative ease of use and pervasiveness meant that the interviewees considered ICT-TPD programmes as key in the effective integration of ICT in their pedagogies. Perhaps the most significant finding is that teachers needed an integrated approach to ICT-TPD programmes that incorporates communities of professional practice, cascading of good practice, Champion teachers (mentoring/coaching), teacher inquiry on ICT and pedagogy, and teacher appraisal and accreditation as opposed to the training they received in seminars and workshops that were concentrated on basic ICT use aptitudes. This finding is consistent with those of (Cordingley et al., 2015; Humphrey & Doring, 2014; Kennedy, 2014; Kopcha, 2010; MacDonald, 2008) who championed the need for an integrated approach to teacher ICT-TPD. This is a key finding because teachers' ICT training should be planned and developed to meet their genuine needs of becoming proficient in their professional duties. Hence, it could conceivably be suggested from the findings that ICT-TPD should be firmly associated and identified with teachers' actual teaching practices that will support their push to meaningfully integrate technology in teaching. Most importantly, teachers are progressively keen on learning about issues that are firmly associated with their teaching and their real practice in the classrooms.

The findings painted a picture of inadequacy in existing TCPD programmes to enable them use ICT in classroom teaching. For example, nearly all teachers pointed out the need to acquire pedagogical training rather than just learning basic ICT skills with teacher narratives suggesting that the training they received lacked connection to classroom pedagogies. These findings are consistent with those of (Admiral, et al., 2017; Gamage, 2017; Power et al., 2014; Voogt et al., 2014). The majority of the interviewees opined that ICT training should be carried out in their schools based on their individual needs. The interviews further revealed that ICT-TPD programmes that were contextualized, legitimate and applicable to their work intrigued teachers further surfacing their willingness for more quality and integrated professional development opportunities. Nevertheless, teachers' perspectives were restricted to traditional approaches to TPD and within the spectrum of their lived encounters. Apart from one teacher who suggested the communal of professional practice, the majority of the teachers appear to be oblivious of other options of quality TPD programmes. They also gave off an impression of being reluctant to relinquish their spare time for ICT-TPD, preferring training offered in the course of school-working hours.

The results of the current study indicate that the cascading good practice strategy has been popular especially for the initial phase on technology integration in Kenya where there is limited expertise in schools. These results mirror those of the previous studies that have explored ICT- TPD initiatives (Hardman et al., 2011; Gathumbi et al., 2013; Mingaine, 2013; Pryor, 2013). However, the cascading strategy on its own has

accentuated aptitudes and knowledge aspects of the TPD and by so doing relegated the values and attitudes that have been recognised as key components of the process (Bett, 2016; Kennedy, 2005). This strategy has been criticised for its "trickle-down effect" that waters down the content when being passed on to trainees (Gathumbi et al., 2013; Hayes, 2000) and its failure to meet the needs of teachers (Nyarigoti, 2013). These results are in agreement with Bett's (2016) findings which found the cascading good practice strategy to be limited in several ways and recommended a more integrated approach in the TPD programmes offered in Kenya.

6. Conclusions

This study set out to better understand effective ICT-TPD programmes in Kenya. Implications that mirror social change can be attained when instructors integrate ICTs in teaching plans that entails best practices found in studies, scholarly reports, and policy. This is crucial because it enables teachers to gain relevant experience and expertise in technology use. Training teachers on the best ways to incorporate ICTs for pedagogical purposes using the proposed integrated ICT-TPD model may result in positive social change. This study may give rise to positive social change in TPD programmes within the context of ICT integration in pedagogies, and by considering genuine understanding of teachers' concerns and needs.

The current study may inspire teachers to embrace ICTs for pedagogical purposes for the benefit and academic prosperity of their students. The overall study findings may promote and encourage teachers to perceive ICT integration in their pedagogies in a positive way. Teachers are likely to embrace technology in their teaching and become role models for their students, arouse their interest and engagement in ICT. This study would provide intuition and plan of action to aid teachers who face challenges in integrating technology in classroom teaching. Teachers may have an opportunity to learn from the intuitional perspectives of the successful participants who have integrated technology in their classroom instruction. These findings draw out attention to the importance of considering school leadership responsibility to give teachers free time from classroom teaching to participate in the required ICT-TPD programmes. Recognising that time is elusive and costly, policy processes that come with huge financial implications must consider the cost to schools in terms of staff relief, training, and infrastructure.

The strength of this study included the in-depth thematic analysis of the interview data from the 16 teachers. However, limitations need to be noted and as pointed out by Strauss and Corbin (2008), a researcher needs to appreciate certain restrictions despite how precisely an academic study is designed. The present study is limited by the relatively small sample of sixteen participants from eight schools out of over 3000 secondary schools in Kenya. Using larger samples and several randomly selected schools could boost the findings' validity and reliability. Even though, the objective of the current research was not to generalise the findings but to obtain deeper comprehension of

Kenyan secondary school teachers' perceptions of ICT-TPD programmes' quality and effectiveness.

The study embraced a purposive sampling strategy to choose secondary school teachers from only eight out of over 3000 secondary schools in Kenya. Even more explicitly, this study speaks to the voices of secondary school teachers who hail from schools which have embraced technology in teaching in Kenya. Involving teachers from only schools that have adopted technology in education, the outcomes may not precisely reflect the experiences of those schools struggling to acquire the basic ICT infrastructure. Some studies have advised that the views of teachers in schools with sufficient ICT facilities may contrast from those without (Hennessy et al., 2010; Palinkas et al., 2013; Teo, 2014) primarily because of access inequalities. Such a situation may restrict the capacity to extrapolate the discoveries of the current study to a more extensive Kenyan teachers' populace.

This research was a snapshot of 16 teachers' effects to integrate technology in teaching and learning from among over 300, 000 secondary school teachers in Kenya. Although informative, the 16 teachers' experiences and viewpoints were only a snapshot that took place at that time and at the interview place and may be influenced by a few hours of experience using technology. A more broadly research is required to study teachers over a four-year span as recommended and done by Liu and Szabo (2009). The rationale for such a longitudinal investigation is to enable teachers to gain insight into the always changing and dynamic nature of technology used in teaching. There is abundant room for further progress in indulging in research that is longitudinal and contextual to help teachers to develop a technology integration protocol that is within their context.

A further study with more focus on ICT-teacher training programmes for pre-service teachers, who are the prospective teachers in secondary schools, is suggested. More specifically, further research should aim to investigate pre-service teachers' ICT training in teacher education programmes at the public and private universities. As posited in literature, when ICT-teacher training and technical support are done appropriately, teachers are influenced to adopt ICTs in their instructional methods (Inan & Lowther, 2010). A continued study with the same participating teachers in the current study is proposed. This is to find out how their understanding of ICTs Adoption change or remain the same over time. It is recommended that interviews consisting of other stakeholders like parents, school's board members, administrators and students be conducted to determine their perceptions of ICTs adoption in teaching and learning. Findings from such a study would provide in-depth insights and lead to the validity and generalisability of the research.

These findings suggest several courses of action with regards to ICT-TPD programmes. The findings point to the need of an integrated ICT-TPD approach because teachers are not homogenous, but individuals with varying training needs. The current study, therefore, proposes collaboration and sustained training among others as key components required for a successful ICT-TPD. This is based on the realisation that One-off training events cannot bring the desired change in the classroom (Admiral, et al., 2017;

CUREE, 2013; Kennedy, 2014). Training and mentoring done by champion teachers with aptitudes and knowledge that identify with the growth of students should take place in school (Angondi, 2013), and using classroom-based research to implement minor interventions and assess their success. School managements are, hence urged to support classroom-based research that will propel the Champion Teachers to progressively discover what works well in the classroom environment. TPD programmes should be sustained over time and allow peer-to-peer connections as a core element to its effectiveness (Voogt et al., 2015). In this setting, the research has demonstrated that teachers prefer ICT-CTPD programmes that focuses on empirical applications and on issues that are firmly associated with their practical classroom teaching. The findings suggest that this ICT-TPD training should not only concentrate on the cascading good practice programme that is the primary focal point of the training programme mainly offered in Kenya (Bett, 2016) but should incorporate training opportunities that can assist teachers learn how to integrate ICT for teaching. In this specific setting, they should be based on teachers' immediate professional needs, experiences, and skills (Akersonn, et al., 2009; Kennedy, 2014; Ryoo, Goode & Margolis, 2015; Sentance, Humphrey & Dorling, 2014), considering current improvements in pedagogy and in ICT.

The Research findings demonstrate that instructors are keen on accepting ICT training, in getting familiar with ICT, and in improving their aptitudes for their benefits, their learners' benefits, and for their general professional development. Teachers' positive perceptions toward ICT training and eagerness for further quality opportunities for ICT training should give the setting to the advancement of a well-planned ICT training. The plan should be founded on an explicit vision of anticipated achievements resulting from the significant and pedagogical thoughtful adoption of ICT in teaching procedures accompanied by realistic goals. It should incorporate an array learning opportunity to instructors, which will guarantee progressing and TCPD, considering instructors' diverse settings, their skill levels and experience. For these to be accomplished, the ITC-TPD programmes should be adaptable, while its content, goals, and outcomes should be ceaselessly evaluated and updated.

The findings of this investigation highlight the teachers' enthusiasm for ICT training; however, they suggest restricted access to it, inadequate training, and time constraints for attending it. Notwithstanding, this study strengthens the idea that teachers' ICT-TPD opportunities should be tailored, not exclusively to address and consider the issues that the educational system requires, yet also the various teacher' training needs (Bett, 2016; Bingimlas, 2009; Boschman et al., 2016; Kennedy, 2014 Mouza, 2009; Ottenbreit et al., 2014; Sentance, Humphrey & Doring, 2014). Thus, cautious consideration should be exercised to guarantee that the offered ICT-TCPD opportunities are planned and developed after a comprehensive assessment of teachers' ICT training needs that considers their preferred training content, training structures and models. This implies teachers should be engaged in decision-making with respect to their ICT-TPD programmes.

Conflict of Interest Statement

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Appendix 1: Semi-structured Interview Guide Questions

1. What uses of technology do you find relevant and meaningful?
 a. What uses of technology have you been impressed with or come away thinking "I would like to try that in my classroom?

2. What uses of technology were least relevant and meaningful in your classroom?
 a. What uses of technology have you been introduced to that you will never use in your classroom? Why do you think so?

3. How do your mentor teachers prepare you to integrate technology in classrooms?
 a. How have you integrated technology in your teaching?
 b. How do you see technology fitting into the teacher education programmes?
 c. Where can teachers go if they have a question about educational ICT resources?

4. What support do you receive in terms of technology?
 a. How has your school supported you in terms of technology integration?
 b. What difficulties have you encountered with technology while teaching?
 c. Are teachers using technology practices once they get into the classroom? Why or why not?

5. What are some of the most creative approaches you have seen in terms of preparing you to use technology in your classrooms?

6. What teacher professional development programmes do you think are important? Why?

7. How often does your school management give you time off to attend in-service training programmes?

 Do you have any questions?

  Thank you for your time.