

Teachers' technological literacy for ICT integration to implement competence-based curriculum in public secondary schools in Tanzania

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
Abstract. This study investigated teachers' understanding of ICT integration in implementing a competence-based curriculum (CBC) among public secondary schools. Interviews and focus group discussions were used to collect the data from 139 teachers, academic teachers and the head teachers. Simple random and purposive sampling was used to obtain participants. The thematic analysis covers the whole process of data analysis. The study findings revealed that most teachers are aware of the Education and Training Policy and ICT Policy. However, they could not link their teaching practices in the classroom to meet policy goals, 85% of teachers did not integrate ICT as a pedagogical tool in their teaching and learning process, most teachers did not use online assessment, and the most used ICT devices were smartphones, computers and laptops. The study found that most teachers understand the benefit of ICT in implementing a competence-based curriculum. The study recommends aligning our policies and practices, especially in real school environments.

Keywords: ICT, competence-based curriculum, CBC, technological literacy, IT in education, teachers

1. Introduction

Technological literacy effectively uses technology to access, evaluate, integrate, create and communicate information to enhance learning through problem-solving and critical thinking [21]. Currently, technological advancements have brought new changes in the education system worldwide, like the integration of Information and Communication Technology (ICT) in the teaching and learning process and the introduction of a Competence-Based Curriculum (CBC) [23]. Today's learners are more connected compared to past days; they are using the Internet for chatting, social networking and learning [16]. ICT has been considered a virtual element in the classroom teaching and learning. Therefore, teachers must also update their technological knowledge and skills to align with these changes.

The integration of ICT in the teaching and learning process has the potential to enhance the effective delivery of education [43]. ICT facilities such as computers, smartphones, laptops, projectors, televisions, speakers, Internet, printing and photocopying help to simplify the teaching and learning process and give learners real-world experiences [41].

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1.1. Implementation of CBC worldwide

Developed and developing countries are implementing CBC due to technological advancement and to prepare learners with 21st-century skills applicable in real-life situations [19]. In the United States of America, the idea of CBC was paved by the Soviet Union in 1957, which launched the first satellite. This event brought about a realisation to the USA educational system, hence the development of CBC, which supports technological development [20]. While in Europe Komba and Mwandaji [27] explained that CBC was introduced due to economic decline caused by widespread unemployment among youth. Many youths possessed unnecessary skills in the industrial era; hence, they shifted to competency education to equip learners with skills needed in the industrial era. The above discussion shows that ICT provides quality and relevant education, especially in this 21st century. However, literature findings indicate that teachers do not fully integrate ICT in their teachings [18, 24, 25, 40]. In Spain Casillas Martín, Cabezas González and García Peñalvo [12] found that teachers have a positive attitude toward using ICT, but they have scarce knowledge, skills and competence in using it for their professional future. In Germany König, Jäger-Biela and Glutsch [28] found that the effective use of ICT tools in education goes mainly with teachers' technological competence, such as pedagogical technological knowledge are essential in integrating ICT in teaching and learning process. In Turkey Altun [4] found that teachers spend more time using ICT for social media, playing games and shopping rather than teaching and learning. This is due to their low competencies in TPACK.

The adoption of CBC in African countries gives potential to the future generation to establish and attain competencies needed in the digitalised world. Different scholars acknowledged that the CBC approach is instrumental in helping students to increase mastery of skills and knowledge and develop self-confidence in solving problems [29]. The increased trend in many African countries to adopt CBC is because the curriculum emphasises the attainment of skills and competencies, which is fundamental to the the digitalised job market. However, evidence from the literature indicates that most teachers are not integrating ICT into their teaching due to different factors. In South Africa, Dlamini and Mbatha [14] found that despite the government's huge investment into ICT infrastructures, teachers are still not integrating ICT in their teaching because they have low competencies. In Zimbabwe Ngwenya and Pelsler [35] found that teachers are not fully integrating ICT in teaching and learning because they have only basic knowledge of using ICT but have low knowledge of using ICT as a pedagogical tool. In Rwanda Akinyemi [2] argues that ICT integration in secondary school has been showing a positive impact on teaching and learning; however, it has been noted that the majority of teachers have sufficient skills in integrating ICT in their teachings due to a lack of prior training on GIS (Geographic Information Systems). In Tanzania, the study by Mtebe [30] asserts that teachers in public secondary schools are not integrating ICT in their teaching, even in schools equipped with ICT facilities, due to insufficient ICT facilities and low levels of technological competence and skill.

In Tanzania, the shift from a content-based curriculum to CBC was influenced by the National Development Vision of 2025, which intends to produce skilled human labour and equip society with the knowledge needed in the 21st century [41]. The Education and Training Policy (ETP) 2014 promotes the use of ICT in teaching and learning through various policy statements [45]. Despite the policy statements still, there is limited ICT integration in teaching and learning

due to the existence of limited digital content, limited use of presentation packages, shortage of ICT facilities, poor Internet connectivity and curriculum does not point out the specific use of ICT to accomplish learning goals [21]. After recognising the role of teachers' technological literacy in ICT integration in teaching and learning, the government of Tanzania has introduced various initiatives towards preparing and improving teachers' ICT competencies for effective ICT integration in secondary school education.

1.2. Research question

What is the teachers' understanding of ICT integration in enhancing CBC in public secondary schools in Tanzania?

2. Methodology

The phenomenological design was used to understand teachers' understanding of using ICT in implementing CBC among public secondary schools [36]. The study population consisted of academic teachers and head teachers, totalling 139 participants. Both purposive sampling and simple random sampling techniques were used. A purposive sampling technique was used to select academic and head teachers who meet specific characteristics to participate in the study [22]. Simple random sampling was used to select teachers to avoid bias and create an equal chance for all teachers to be included in the study. The sample comprised both genders, male 47.5% and female 52.5%, aged between 26-34 years 47.5%, 35-44 years 35.5%, 45-54 years 13.6% and above 54 years 3.4%. Their education level was 13.7% master degree holders, 2.9% postgraduate diploma holders, 61.8% bachelor degree holders and 21.6% diploma holders. Most teachers had below five years of working experience at 45.3%, between 5-9 years were 20.1% and above ten years were 34.6%.

2.1. Data collection methods and procedures

The study used interviews and focus group discussions to collect data. A semi-structured interview with the help of an interview guide was used to collect data from head teachers and academic teachers. The use of semi-structured interviews helped the researcher get more detailed and extensive explanations about participants' opinions, feelings, and experiences regarding the integration of ICT in implementing CBC in secondary schools [13]. Again, the study employed focus group discussion to collect data from teachers. The researcher initiated the discussion, and one moderator was selected from the group of five members, and each member was assigned numbers 1, 2, 3, 4, and 5; each teacher was given 3-5 minutes to present his/her ideas. The researcher worked with the participants in the study area in different ways, ranging from conversation to understanding how teachers understand the use of ICT to implement CBC. Several conversations with the informants were facilitated by record keeping through audio clips. The researcher engaged in the data collection process as informants went on with their day-to-day activities in a natural school setting. This helped the researcher come up with rich data as intended. The researcher's participation helped to gain in-depth information through

many forms of participation, from conversation and interviews to sharing rituals and emotional experiences.

2.2. Data analysis procedures

This study employed thematic analysis following the six steps developed by Braun and Clarke [10]. The first step involved familiarisation with data (transcription of data, translating, reading and re-reading data). The researcher transcribed the audio clips recorded during the interview and focus group discussion sessions with informants. Since the data were transformed into text format, they were read occasionally to develop a general understanding of what the respondents had discussed on the study topic. This helped the researcher to generate codes from participant responses. The second step involved establishing initial codes. The researcher observed this step by assigning unique codes to schools such as A, B, C, D and E. The third step involved searching for meaning (it is expected to look at re-occurring key concepts or codes for establishing sub-themes). This step was met using the ICT CFT framework aspects as sub-themes and respondents' answers as codes for specific objectives. In specific objective number three, the researcher combined the re-occurring. The fourth stage involved reviewing the theme and sub-themes (it involved modification of themes by editing, splitting, combining or discarding). The fifth stage involved naming and defining themes. The step guided the researcher in completing each theme aspect, resulting in 6 sub-themes. The sixth step was the writing of the report.

2.3. Trustworthiness of the study

This study involved four criteria: credibility, dependability, transferability and confirmability, to ensure that the obtained results are credible, confirmable, dependable and transferable [5]. The study ensured credibility through member checking of tools before going to the field. Dependability was ensured by describing the research methods used to obtain similar results when repeated in another context. The study ensured transferability by providing a dense description of the population studied by describing the demographic and geographic boundaries of the study. The study ensured confirmability by following rather than leading the direction during the interview and focus group discussion sessions by asking for clarification when needed.

2.4. Ethical consideration issues

Creswell and Creswell [13] explained that considering ethical issues ensures that participants are free from harm, discomfort or danger during the research process. Therefore, several ethical issues were considered in protecting participants' rights. The study was conducted after getting permission letters from the authorities. Confidentiality was maintained by hiding participants' names and identities during data collection, analysis, and dissemination of the study findings. The researcher treated all participants with respect. No judgment or discrediting comments based on participants' opinions, ideas, and status were given out during data collection.

3. Findings

This study explored whether secondary school teachers understand the use of ICT in teaching and learning to enhance Competence-Based Curriculum (CBC) goals as stipulated in the Education and Training Policy of 2014 [45]. Moreover, the aim was to explore how teachers understand the use of ICT in implementing competence-based curriculum in public secondary schools based on UNESCO's ICT CFT aspects [42]. After reading and analysing data, the study termed the ICT Competency Framework for Teachers six aspects of the framework as themes to guide discussion as shown in table 1 below.

Table 1
Aspects of ICT Competency Framework for Teachers.

Theme	Response count	Representative quote
Policy awareness	90%	"In implementing CBC, ICT is used in designing, preparing and presenting teaching and learning materials which simplifies the teaching and learning process."
Integration of ICT in teaching and learning	85%	"In our school, we have ICT facilities as you can see but teachers are not using it in their teaching. Sometimes they can use ICT tools like computer just to show some experiments to students."
Assessment	35%	"Yes, they are able. For example here in our school after finishing marking each teacher uploads scores of students to Academic forum for further preparation."
Benefits of using ICT in enhancing CBC	95%	"In our school, we don't have good ICT infrastructures, but the use of ICT simplifies teaching and makes teaching more realistic. For example, when teaching science subjects like biology, students understand more by using short videos of pictures."
Application of digital tools	20%	"Our school does not have ICT facilities special for teachers in the office; the available facilities are used for administrative activities and printing examinations. In preparing the lesson plan, we are using those books."
Professional learning	85%	"I sometimes use my smartphone to watch YouTube videos to add my subject knowledge. For example, geography teachers can watch videos on how the volcano is formulated and its features."

3.1. Policy awareness

In this aspect, the aim was to explore if teachers are aware of the Education and Training Policy and National ICT policy and if teachers' classroom practices match the policy goals and objectives. Data in table 1 indicate that most teachers were aware of the Education and Training Policy and ICT Policy, though they could not link their teaching practices in the classroom to meet policy goals. Evidence to justify this comes from the interviews with head teachers, academic teachers, and teachers engaged in focus group discussion (FGD) who were asked

to express their understanding of ICT in implementing CBC. The findings revealed that 85% of teachers understand ICT use in teaching and learning activities to implement CBC. They expressed that ICT could be employed in different ways, like preparing teaching materials, as a pedagogical tool, and as a tool for teaching and learning. In this regard, head teacher from school B was quoted saying that:

In implementing CBC, ICT is used to design, prepare, and present teaching and learning materials, simplifying the process. (Interview school B, 2022)

In the same regard, the academic teacher involved in the interview from school C was quoted saying:

I am unsure if all teachers can match or relate ICT policy and competence-based curriculum objectives with their teaching practices in the classroom, but I am aware of CBC and ICT policy. (Interview school C, 2022)

The quotes above indicate that teachers understand the use of ICT in enhancing competence-based curriculum, drawing from the previous knowledge of integrating ICT in teaching and learning. This study found that most teachers understand that the use of ICT in enhancing competence-based curriculum is done through ICT facilities like computers, smartphones, and laptops. They argue that these are used in designing, preparing and presenting teaching and learning materials.

3.2. Integration of ICT in teaching and learning

Data in table 1 indicate that 85% of teachers did not integrate ICT as a pedagogical tool in their teaching and learning process. It was revealed that most teachers used ICT devices like computers, laptops, projectors, smartphones and tablets to prepare science experiments, teach computer subjects, do administrative activities, print examinations, watch videos from YouTube channels, socialise with others and search materials. This was confirmed by one academic teacher who was interviewed from school E:

I sometimes use my smartphone to watch YouTube videos to develop my subject knowledge. For example, Geography teachers can watch videos on how volcanos are formulated and their features. (Interview school E, 2022)

Similarly, another teacher engaged in the focus group discussion (FGD) from school A added:

I use a projector to teach practical sessions to my students. So, sometimes, instead of going to the laboratory with the whole class, I come with a projector and display short videos to explain how to perform a certain experiment, especially in science subjects. Students understand well when taught this way. This helps me simplify my teaching when it comes to real practicals in the laboratory. (FDG school A, 2022)

The quotes above indicate that teachers do not use ICT devices like smartphones, computers, and tablets in the teaching and learning process. Rather, they use ICT in different activities like socialisation, printing examinations, teaching practical subjects, etc. Moreover, it was found that not all teachers could use these ICT devices in their teaching activities due to insufficient ICT facilities in public secondary schools. Also, it was found that most teachers use their ICT devices for socialisation rather than academic activities.

This implies that secondary school teachers mostly use their smartphones for social issues rather than academic issues. Also, computers and laptops are used to search for materials and print examinations. Other teachers use projectors in their teaching, especially when they teach new topics or practical subjects like Biology, Physics and Chemistry. Moreover, it was found that some teachers use their smartphones to interact with students' parents. For example, when schools are closed, teachers form WhatsApp groups with parents to inform parents on different matters, like when to come and take their children's examination reports. They also used those groups to discuss issues concerning students' progress and give different information concerning school timetables.

3.3. Assessment

The study finding indicates that most (90%) teachers did not use online assessment methods to support the implementation of CBC, specifically in this digitalised world. Most teachers in public secondary schools still use conventional methods to prepare students' examination reports, exercises, quizzes, examinations and portfolios. Furthermore, the study revealed that some teachers used ICT devices to enter student scores and upload results to academic master. All respondents evidenced this; for instance, only 15% teachers used ICT to enter students' scores and submit the scores electronically to the academic master. In this regard, a head teacher from school B was quoted saying:

Our teachers can use ICT for assessment activities. For example, after finishing the marking task, each teacher submits students' scores to the Academic Office for further preparation. (Interview school B, 2022)

On the same issue, another teacher engaged in a focus group discussion from school E had these to say:

Our school doesn't have programs like online assessment or communication with parents. We still use report forms to record students' results, and, in case of homework or quizzes, we give them hard copies in the classroom. As you can see, our school environment is not well organised, and ICT infrastructures are inadequate to support such activities. (FGD school E, 2022)

The quotes above indicate that teachers do not practice online CBC assessment due to the lack of supportive programs and poor school ICT infrastructures. This study found that some teachers use ICT devices like computers to enter student scores and upload them to academic masters for further processes. In some schools, it was found that after finishing marking school examinations, each subject teacher is responsible for entering students' scores and submitting

them to the academic master for producing student progress reports. Also, it was noted that teachers did not practice any all online assessment practices; i.e., they could not assess homework activities, quizzes or exercises to students using ICT devices like smartphones. In addition, teachers use their smartphones to communicate with students' parents only and not for online assessments. For instance, it was possible for teachers, during holidays, to formulate social groups with parents and use the group to send some exercises, homeworks and quizzes to their students instead of just giving other school information.

3.4. Benefit of using ICT in implementing CBC

Data in table 1 indicates that a majority of teachers (95%) understand the benefit of using ICT in implementing a competence-based curriculum. Moreover, the study found that most teachers agreed that using ICT in teaching and learning simplifies teaching and makes teaching more exciting and realistic. Also, the study revealed that integrating ICT into teaching and learning processes increases the quality of education provided to students because it promotes students' critical thinking and problem-solving abilities. In this regard, the head teacher of school A said the following:

We don't have good ICT infrastructures in our school, but I know the use of ICT simplifies teaching and makes it more realistic. For example, when teaching science subjects like Biology using videos, students understand more than when taught without using ICT. (Interview school A, 2022)

Similarly, another academic teacher engaged in an interview from school C added:

In this digital age, where ICT dominates almost every aspect of life, it is impossible to avoid the benefits of technology. I frequently use my smartphone to learn new materials concerning my subject matter. For example, English language teachers can also use ICT to learn and even pronounce some vocabulary correctly. (Interview school C, 2022)

Similarly, in a group discussion with teachers of school E, teachers emphasised the significance of ICT in teaching and learning:

I think ICT plays a significant role, especially in this digital era when students and society have become more connected to the Internet than before. So, ICT is beneficial in the teaching and learning process, as is searching for teaching and learning materials. (FGD school E, 2022)

The quotes above indicate that teachers agreed that using ICT in teaching and learning is fundamental for implementing CBC. ICT motivates and engages learners and promotes creativity. Also, ICT is flexible and can be adjusted according to the environment. ICT allows teaching and learning activities to take place even outside classroom walls. Moreover, the use of ICT in implementing CBC contributes to the availability of plenty of teaching and learning materials that support students in developing problem-solving skills.

3.5. Application of digital tools

The study indicates that most teachers use ICT devices like smartphones, computers, laptops, television, and radio for different activities. Teachers use ICT devices mostly to search for materials through search engines like Google and individual works. Moreover, the study found that teachers moderately used ICT in preparing lesson notes and teaching aids. Likewise, the study found that teachers did not use ICT in preparing lesson plans. Most teachers in public secondary schools still use local books to prepare lesson plans. Most teachers still use local methods in preparing teaching materials that do not support the full integration of ICT in implementing CBC. In this regard, the academic teacher from school C was quoted saying:

Our school does not have special ICT facilities for teachers in the office. The available facilities are used for administrative activities and printing examinations. In the preparation of lesson plans, we use local books. (Interview from school C, July 2022)

Similarly, another teacher engaged in a focus group discussion from school C expressed that:

I used my laptop and smartphone to search for new materials and teaching aids for the subjects I teach. Also, my laptop acts as my store where I keep all teaching materials and other supplies. (FGD member 5 from school C, July 2022)

The quotes above indicate teachers do not use ICT devices like computers, laptops and smartphones to prepare lesson plans. In public secondary schools, most teachers still use traditional methods to prepare lesson plans, like filling out lesson plan books. Also, teachers use ICT devices to store personal information, such as notes and downloaded materials. Moreover, some teachers use ICT devices to design different activities in visualisation mode, such as short videos, animations, and pictures, as teaching aids to clarify their teaching and make it more meaningful. Again, teachers use ICT tools to search for materials through different search engines, such as Google, for their activities. While CBC emphasises that teachers should integrate ICT in almost every aspect of curriculum implementation, the findings revealed that teachers did not integrate ICT in different curriculum activities, such as lesson plans.

3.6. Professional learning

Under this aspect, the researcher explored how teachers used ICT devices for their professional learning, specifically in implementing CBC. Data in table 1 indicates that most public secondary school teachers did not use ICT to support professional development in implementing CBC. The study found that teachers mostly used ICT to search for materials like books, videos, and other subject-related materials. Furthermore, the study found that, in public secondary schools, there are no platforms/forums for teachers to improve their profession for up-to-date developments. Moreover, it was found that most teachers did not use ICT for their professional learning to implement CBC because they lacked the platform/forum to do so at the school level. This was confirmed by one academic teacher from school B who had this to say:

I am unsure if teachers use ICT for their professional learning to implement new curricula. This is because we do not have such a platform for teachers to use computers or laptops for professional development and to learn new approaches in our school. Maybe they use their smartphones to do so, but I am unsure if this is possible. (Interview from school B, July 2022)

On the same issue, another head teacher interviewed from school A explained that:

In our school, we don't have an Open Education Resources forum for teachers to do things like learning online courses to improve their professional skills, though I think this is too personal for them. Maybe if you ask individual teachers, they will tell you. (Interview from school A, July 2022)

In the same regard, another teacher engaged in a focus group discussion from school A stated that:

I used my phone to read different materials online and develop my knowledge of the subject matter. Also, sometimes, I use my phone to watch videos and learn new teaching methods. (FGD member 3 from school A, July 2022)

The quotes above indicate that teachers use ICT devices mainly to search for information concerning subject matters, not their teaching activities in implementing CBC. Teachers could not attend online courses using ICT devices like smartphones and laptops to learn new ideas specifically for 21st-century skills. Likewise, most teachers use ICT devices to store downloaded materials. Teachers use personal computers and laptops to store important information like books, notes, certificates, photos and other materials. Only minority teachers used ICT devices to learn new teaching methods from other teachers through social groups like WhatsApp and Facebook.

4. Discussion

The findings on integrating ICT in teaching and learning activities for implementing CBC are rooted in the Education and Training Policy 2014. The policy guides teachers to integrate ICT at all levels to prepare a knowledgeable society to support the National Vision of 2025 [45]. National ICT Policy statements clearly explain that ICT should be taught as a subject and integrated as a pedagogical tool in all subjects [43].

Also, Ghavifekr et al. [15] revealed that most teachers are normal ICT users in teaching activities. However, most teachers use ICT in their teachers' rooms or offices for their work rather than in classroom teaching and learning. Again, Perienen [37] studied the framework for integrating ICT in teaching Mathematics in Mauritius. It was found that few teachers (48%) used technology in their teaching practices. Most of the teachers did not use ICT in their teaching activities.

Again, these study findings align with those obtained by Ndibalema [33], who revealed that teachers had a positive attitude towards using ICT as a pedagogical tool but did not integrate it

effectively in their teaching. Also, there is low familiarity with ICT as a pedagogical tool among teachers in Tanzania; most teachers use ICT for basic knowledge and skills [33].

Again, these study findings align with those of Mwila [32] and Ngeze [34], who found that, in Tanzania, most of the teachers in secondary schools possess ICT facilities such as laptops and smartphones. However, they do not integrate it into their teaching activities. Moreover, due to low technological competence, teachers severely control and use ICT tools in other activities but do not integrate them into their teaching. Moreover, Kissaka et al. [26] researched secondary school teachers' integration of ICT in Tanzania and revealed that despite teachers having access to computers, they still had moderate knowledge to integrate ICT in teaching and learning activities.

In contrast to this study, Boonmoh, Jumpakate and Karpklon [9] revealed that, in Thailand, most teachers knew technological devices and their integrated ICT in classroom teaching activities. However, this reference is taken from developed countries and does not suffice to be compared to Tanzania, a developing country.

The findings on e-assessment align with Astalini et al. [6], who revealed that using mobile phones as an e-assessment tool improves communication between teachers, students and parents. Using e-assessment in education improves the quality of tests and increases the reliability of student scoring. Also, these study findings are similar to those of the study by Redecker and Johannessen [39], who studied the change of assessment practices into a new assessment paradigm using ICT. The study revealed that ICT enhanced assessment tools that allowed the appreciation of 21st-century skills among students. Moreover, ICT-enabled assessment practices focus on further developing ICT-based assessment programmes. Again, Cachia and Ferrari [11] revealed that most assessment procedures in formal education systems have traditional indicators which focus on examining students' knowledge and facts through testing. Therefore, there is a need for authorities to revise and make some improvements in assessment approaches to cope with the 21st-century skills.

Therefore, the ability to conduct e-assessment is among the competencies advocated in the ICT CFT framework. Under this aspect, teachers are supposed to use ICT in different assessment activities in and outside the school environment. Also, the CBC emphasises using ICT across the curriculum for teaching and learning as well as formative and summative assessment. Again, in this digitalised world, where technology dominates every aspect of life, teachers need to change their assessment techniques from traditional to digital methods, such as giving quizzes, homework, tests, and progress reports. Teachers should practice online assessment practices such as sending quizzes and tests to students through different applications like WhatsApp, Facebook, SMS and emails.

The findings about the benefit of ICT integration in implementing CBC align with the national ICT Policy of 2016 and ETP of 2014. The policy emphasises that integrating ICT in the teaching and learning process can enhance the effective delivery of education [43]. Also, the Education and Training Policy (ETP) of 2014 states that using ICT in teaching and learning improves the quality of education. Moreover, using ICT facilities such as computers, smartphones, laptops, projectors, televisions, speakers, Internet, printing and photocopying helps simplify the teaching and learning process. It gives learners real-world experiences [41].

Similarly, Ratheeswari [38] found that integrating ICT in teaching and learning is a catalyst to prepare learners to achieve 21st-century skills and simplify teaching and learning pedagogy.

Then, these study findings correlate with those of Ghory and Ghafory [17], who conducted a study on the impact of modern technology in the teaching and learning process in Afghanistan. The study revealed that introducing computers into the education system has made it simpler for teachers to transform knowledge for students. Also, it made it easy for students to retrieve materials. The ICT made teaching and learning more enjoyable than traditional teaching. Likewise, the study findings align with those of Akram et al. [3], who revealed that technology integrated into teaching activities assists teachers in implementing instructional practices effectively. ICT in curriculum implementation makes the learning process exciting and interactive and keeps learners more motivated compared to when ICT is not integrated.

Correspondingly, Muslem, Yusuf and Juliana [31] revealed that using technology in teaching and learning activities helps to develop teaching methods from traditional to the most flexible. Hence, the implementation of CBC emphasised using ICT in all teaching and learning activities. Wanjiru et al. [46] revealed that using ICT in teaching and learning activities enhances knowledge acquisition among students. ICT increases students' creativity and ability to develop skills for problem-solving.

Therefore, the use of ICT in implementing CBC cannot be denied, especially in the 21st century digitalised world. ICT offers numerous benefits to teachers and students in the education system. ICT is a powerful tool for collaborative and creative learning, which is among the CBC's goals and objectives for secondary education. Also, ICT helps teachers and learners access, create, and share digital content in digital ways in a limited time and different environments. Also, technology allows teaching and learning to occur further than the walls of classroom settings because it is flexible.

Findings about the application of digital tools in implementing CBC are similar to those of Zamani, Esfijani and Abdellahi Damaneh [47], who revealed that, in Iran, teachers have adequate access to hardware applications both at home and in the school environment. Also, Perienen [37] in Mauritius found that most teachers are regular users of computers, though a minority of teachers used technology in their teaching practices. Teachers must be adequately trained in pedagogical skills to use ICT in teaching and learning effectively.

These study findings differ from those of Bhalla [8], who revealed that teachers often used computers to update their subject knowledge and teaching skills to develop lesson plans, prepare instructional materials, prepare questions and sometimes use computers to create simulations in the classroom. Moreover, it was revealed that teachers rarely used computers to present entire lessons, assign homework to students, and give online tests and assignments to students and for classroom presentations due to low technological competencies.

Therefore, the application of digital tools in implementing CBC plays a significant role in using ICT devices like computers, laptops, projectors, and smartphones. Other teachers could create and design visual teaching activities which promote critical thinking among students. Also, applying digital tools in teaching and learning makes the lessons more enjoyable and realistic. For instance, when teachers use computers to prepare lesson plans, it is easier to keep information for a long time than when using books. Moreover, teachers should use ICT devices in preparing for teaching, when teaching and after teaching in the classroom. This would support the effective implementation of CBC.

The findings about professional learning are similar to those of Belay, Khatete and Mugo [7], who revealed that most teachers did not receive formal training on how to use ICT devices in

different practices. Therefore, teachers have inadequate training in computer literacy; thus, they have low skills in improving the profession for integrating ICT into the teaching and learning process. Again, Tomczyk et al. [44] revealed that most teachers use technology in their lives because it has positively changed their lives. However, they do not use technology to improve their teaching profession, such as learning up-to-date teaching methodologies that reflect the 21st-century skills. Therefore, the more new technology and valuable tools are developed in the education system, the more teachers must use them to update their teaching skills and activities.

Also, these study findings concur with Agyei [1], who revealed that effective professional development in integrating ICT into schools and curriculum implementation impacts teaching and learning practices. This implies that teachers who use ICT devices for professional learning improve their teaching skills.

Therefore, in this digital age, teachers must improve their professionalism by sharing and interacting with other teachers using ICT to update their knowledge and teaching practices to implement CBC effectively. They help teachers attend online courses, Zoom meetings and other platforms that allow interaction and sharing of teaching professionals, specifically for implementing CBC. Moreover, teachers who own smartphones, laptops, and computers are likelier to use their devices for professional learning than those who do not have ICT facilities at their schools and home environments. Furthermore, it is essential to support teachers using ICT devices to implement CBC effectively. School-based platforms should exist for teachers to use ICT for teaching and learning.

5. Conclusion and recommendation

It was concluded that teachers understood the use of ICT in implementing CBC in all studied schools. The majority of teachers agreed on the role of integrating ICT in implementing CBC in public secondary schools. It was also established that teachers are aware of the Education and Training Policy and the ICT policy. The study revealed that the most popular aspects not frequently used by teachers were assessments like online assessments and professional learning to update their teaching skills, while the aspect used frequently was the application of digital tools, mostly in searching materials. The study recommends that the government, through the Ministry of Science and Technology, ensure that ICT education and training provided to teachers should focus on building technological competencies, specifically in curriculum implementations. The education and training should have specific and relevant features that foster the implementation of CBC in public secondary schools to prepare 21st-century learners with multiple skills.

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