# The Challenges and Benefits in The Implementation of E-learning Teaching in Grade 8 Computer Studies: A Case Study of Six Selected Schools in Khomas Region, Namibia

Dr. Collins Kazondovi[1] & Martha Eliaser[1]

[1] University of Namibia, Namibia

Correspondence: Collins Kazondovi, University of Namibia, Namibia. E-mail: collinskazondovi@gmail.com

## Abstract

In order to equip students with technology and 21st-century abilities like problem-solving, creativity, and collaboration, a new model of education that involves altered curriculum, infrastructure, professional development for teachers, textbooks, and examinations have emerged. The use of information technology can help spread knowledge more widely. This is known as e-learning. The teachers and students can benefit from having current information and knowledge. The goal of this study was to investigate the variables that influence the adoption of e-learning at the selected secondary schools in the Khomas region, Namibia where computer studies is taught in grade 8.

A mixed method approach was used for the study. Random sampling was used to select the quantitative phase and purposive sampling was used for the qualitative phase. A self-administered questionnaire was used to collect quantitative data from the learners, and semi-structured interviews were conducted to gather qualitative data from the teachers. The population of the study consisted of all the computer studies teachers and grade 8 learners at the six selected schools, with a sample of 12 teachers and 90 learners. The data was analysed using SPSS and thematic analysis was used for the qualitative data.

According to both students and teachers, the key benefits of elearning were convenience of time and place, greater degree of trust in adopting e-learning as a teaching and learning instrument, and ease of contact between teachers and students. However, in the same vein, students and educators complained about challenges such as limited computer and internet access, a lack of technical support, and a lack of enthusiasm to use the e-learning platform.

The results indicated that lack of training, poor awareness of programs and poor infrastructure, were the contributing factors to the failure of the e-learning implementation in schools. The study recommends that the Ministry of Education should introduce mandatory e-learning courses into the curriculum for all learners, in order to better prepare the learners for e-learning and increase accessibility to it. When e-learning is introduced in schools, stakeholders' opinions and suggestions in the field of education must be taken into account, such as teachers and education officers in the Ministry of Education

**Keywords:** computers, e-learning, learners performance

## 1. Introduction

This article is organized in the following manner: first, the challenges in implementing E-learning, from the teachers' perspective is discussed, followed by the challenges in implementing E-learning from the students' perspective. Next is the discussion about the benefits of implementing E-learning from the teachers' perspective, followed by the discussion about the benefits of implementing E-learning from students' perspective.

The phrase "e-learning" has come to refer to a new approach to education that involves redesigning teaching programs, infrastructure, teacher professional development, textbooks, and examinations in order to give learners access to technology and 21st-century abilities such as creative problem solving (Adeniyi et al., 2024; Arumugam, Saleem & Tyagi, 2024; Tunmibi et al., 2015). Information and Communication Technology (ICT) can be used to promote opportunities of knowledge dissemination. Moreover, it can also help in the teachers and students with up-to-date information and knowledge. This can be achieved when teachers bring together knowledge of the subject matter with technology infusion.

Namibia is one of the countries with a small population in Southern Africa. Education in Namibia is free from primary school to secondary school (grades 1-12). A lot of schools in Namibia provide computer studies, which is taught as an elective (Ministry of Education, 2015). The teaching of computer studies supports the ICT policy that the Ministry of Education has adopted in 2006. The lack of e-learning infrastructure and its impact on implementation can be inferred from looking at the schools' ICT development levels. The implementation of e-learning in schools has been hampered by a number of factors, including technological ones (lack of internet connectivity and electronic devices) and pedagogical ones (lack of digital skills among teachers and students in implementing online pedagogy) (Arumugam et al., 2024; Valverde-Berrocoso et al., 2020; Ferri, Grifoni & Guzzo, 2020).

Furthermore, taking into consideration that computer studies teachers should have the relevant knowledge to learn and set up any Learning Management System (LMS) and be able to work within the environment. These reasons give insight that more factors are at play. With this, the researcher set out to investigate the factors that affect the implementation of e-learning at selected secondary schools in the Khomas region, which has schools offering computer studies in grade 8.

### 1.1 The Main Research Question for This Study

What are the factors affecting the implementation of e-learning in Computer Studies in Grade 8 at the selected schools?

The specific research sub-questions for the study:

1. What challenges were identified by teachers and learners in the implementation of e-learning in Computer Studies in Grade 8 in the teaching and learning process?
2. What benefits were identified by teachers and learners in the implementation of e-learning in Computer Studies for Grade 8 in the teaching and learning process?

## 2. Literature Review

The literature review focused on global and African ICT implementation and ICT activities in secondary education. Furthermore, the study aimed to explore challenges and the benefits of implementing e-learning.

### 2.1 ICT in Education

Over the past decade, countries have been investing in the use of Information Communication Technology (ICT) in education. For the purpose of this study, ICT integration means the use of computers, the internet and related tools in the teaching and learning of subject content.

Namibia, is a large country with a small population in Southern Africa. It has a well-developed ICT policy that has been implemented since 1999 (Ministry of Education, 2015). The Ministry of Education has five development levels with specific goals to measure progress in ICT implementation. Schools offering secondary education are expected to be at least Level 2 of the five levels The criteria for Level 2 include access to computers, internet access, and technology integration. Organizations like SchoolNet Namibia, Microsoft, and the Embassy of Finland have supported ICT development in education (Ministry of Education, 2015).

### 2.2 ICT in E-learning

Computer literacy positively impacts students' motivation to use e-learning, with basic skills boosting engagement (Al-Sartawi & Hannoon, 2024; Harrandi, 2015). E-learning is an online education where students use their laptops and home computers to access information (Alam, 2020). The University of Namibia has implemented three ICT integration courses to prepare educators for e-learning environments. However, ICT literacy training alone does not guarantee teachers can effectively integrate technology (Boer et al., 2021; Kacelo, 2019). The Namibian government's education ICT policy aims to prepare learners, teachers, and the community for the modern economy (Gunga & Ricketts, 2007; Kaisara & Bwalya, 2021). Challenges like limited internet access, limited technical support, and teachers' competency remain unaddressed for successful e-learning implementation in high schools.

### 2.3 Challenges of Implementation of E-learning

Challenges in e-learning implementation include lack of awareness, technological hurdles, limited time management, and lack of ICT skills (Alam, 2020). According to Agrawal (2015), students and parents are unaware of e-learning platforms, and there is a lack of awareness of their effectiveness. Limited financial resources, staff technical capabilities, and e-learning technology expenses also hinder e-learning adoption. Other obstacles include inadequate computer skills, unreliable internet connections, and weak internet signals, which can hinder effective e-learning deployment (Quadri et al., 2017).

*2.4 Benefits in the Implementation of E-learning in the Teaching and Learning Process*

E-learning offers numerous benefits, including access to unlimited information, critical thinking, and improved computer skills (Adeniyi et al., 2024; Tunmibi et al., 2015). E-learning also facilitates group activities, real-time problem-solving, and enhances creativity and imagination. E-learning is cost-effective, and facilitates relationships among learners, making it an ideal choice (Omozuawo, 2024; Owuor, Kogeda & Anele, 2013). It also allows teachers to reach multiple classes, and ensuring personalized learning experiences. Implementation of e-learning, learners can be given online and provide web base quizzes, that students can do at their own pace.

E-learning is easier, more effective, and helps develop computer skills (Arumugam, Saleem & Tyagi, 2024; Tunmibi, Adejobi & Ibrahim, 2015). It also fosters accountability between teachers and students, ensuring timely work preparation. E-learning is efficient and time-saving, as teachers can pre-assign tasks to students via email or the school portal, allowing them to view assignments and class schedules in advance. This approach helps students prepare and complete assignments more efficiently (Cao, 2023).

*2.5 Theoretical Framework*

The literature review highlighted the importance of content, pedagogy, and technical knowledge in integrating technology into teaching. This study adopted the TPACK (Technological, Pedagogical, Content, Knowledge) framework. Joko & Ami (2023) state that **t**eachers need knowledge in three major domains: content knowledge, pedagogical knowledge, and technological knowledge. To ensure successful e-learning implementation, a framework like the TPACK (Technological, Pedagogical, Content, Knowledge) framework is needed. This framework explains the complex relationship between content, pedagogy, and technology knowledge, emphasizing how these domains intersect to produce effective teaching (Ward & Benson, 2010). Zang and Tang (2021) explains that the TPACK framework is an effective approach for implementing educational technology and e-learning practices, emphasizing the importance of content and pedagogy as the foundation for successful e-learning.
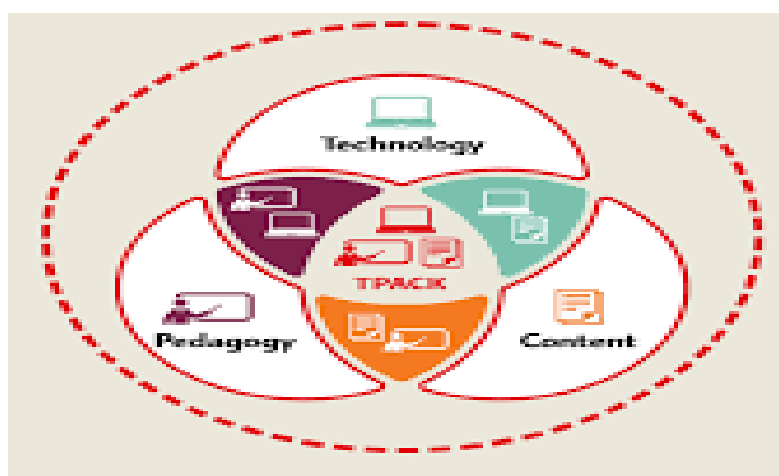


Figure 1.Technological Pedagogical Content Knowledge (TPACK) framework

The TPACK framework has been discussed widely in various studies involving the integration of technology in teaching and learning (Shafie, Majid & Ismail, 2019). Most researchers generated and developed self-reported TPACK　　　　　　measuring instruments based on the work of (Koehler & Mishra, 2009) to measure teachers' levels of TPACK. However, with the transformation in education revolving around 21st-century skills nowadays. It is then crucial to investigate whether teachers can apply TPACK while teaching 21$^{st}$-century skills or not (Shafie, Majid & Ismail, 019).

## 3. Methodology

This section includes the research methods and the design that were employed to effectively complete this research.

*3.1 Research Design*

This study investigates the challenges and benefits that affect the implementation of e-learning in Grade 8 Computer Studies teaching and learning. It follows an explanatory sequential mixed-methods design, which involves collecting, analyzing, and integrating quantitative followed by qualitative data collection in order to gain

a better understanding of the research problem (Ivankova, Creswell & Stick, 2006). The design consists of two phases: the quantitative phase, where quantitative data and results provide a general picture of the research problem, and the qualitative phase, which explains the quantitative phase. The study was conducted in the Khomas Region, Namibia, where the researcher selected relevant participants in the education sector in order to provide the necessary information. Surveys (for the quantitative phase) and interviews (for the qualitative phase) were employed. According to Pregoner (2024) employing more than one instrument heightens the reliability and trustworthiness of the acquired data.

A TPACK questionnaire was used in the quantitative phase. The questionnaire consisted of Likert scale and open-ended questions. On a metric scale, participants were asked to indicate their level of agreement (from strongly disagree to strongly agree) with the given statements. While in the qualitative phase purposive sampling was used to select teachers who have advanced computer skills and the learners who had computer studies as a subject in Grade 7. The qualitative phase was dependent on an analysis of the quantitative phase.

Table 1. Visual display for the explanatory sequential study design procedure

| Phase | Procedure | Outcome |
|---|---|---|
| **Quantitative Data collection** | ● Randomly<br>● Sent out a self-administered survey to 12 computer studies teachers and 90 computer studies learners at 6 selected schools | N=102<br>Numeric data |
| **Quantitative Data analysis** | ● Descriptive frequency, tables, graphs<br>● SPSS software | Descriptive statistics |
| **Connecting Quantitative and Qualitative Phases** | ● Purposively selecting 2 teachers from each school and 5 learners from each school, at 6 selected schools.<br>● Developing interview questions | N =42<br>Interview protocol |
| **Qualitative Data collection** | ● Interview with individual participants. 12 computer studies teachers and 30 grade 8 computer studies learners. | Interview transcripts and recorded |
| **Qualitative Data analysis** | ● Coding and thematic analysis | Codes and themes |
| **Integration of quantitative and qualitative phase** | ● Interpretation and explanation of the quantitative and qualitative results. | Discussion Implication Future research |

## 4. Results

*4.1 Teacher Findings on the Challenges of the Implementation of E-learning*

Table 2. Computer Studies teachers e-learning environments

| Questions | Yes | No |
|---|---|---|
| Do you have access to a computer at home? | 66.7% | 33.3% |
| Are you familiar with the e-learning environment? | 50.0% | 50.0% |
| Do you know platforms that are flexible, free, affordable and easy to use for online classes? | 50.0% | 50.0% |

The study found that 66.7% of the respondents had access to a computer at home, while 33.3% of the respondents did not have access to a computer at home. The study also discovered that 50% of the respondents are familiar with the e-learning environment, while the other 50% of the respondents are not familiar with the e-learning environment. Lastly, the study found that half (50%) of the respondents know platforms that are flexible, free, affordable, and easy to use for online classes, while the other half did not.

4.1.1 E-learning Platforms Usually Used by the Teacher

Teachers were asked about the e-learning platform they use for Computer Studies. Responses were as follows: 33.3% created a WhatsApp group for the learners; 33.3% used Zoom; and the other 33.3% used other (Google Classroom) e-learning platforms. During the interview (qualitative data), teachers were asked if they were using any e-learning platforms in their teaching and learning, and the qualitative data confirms that. Three teachers elaborated below:

*TS1.1: "Making use of Zoom and WhatsApp.", TS5.5: "Yes, Google Classroom, and WhatsApp."*

*TS6.6: "Not yet, but we tried WhatsApp, which excluded some students."*

Table 3 below, presents quantitative data on teachers' computer skills as well as data from the TPACK instrument. The table shows the statements on extra training for teachers on computer skills, and a TPACK questionnaire was used in the quantitative phase, consisting of a section for selection on a Likert scale whereby 5= strongly agree, 4= agree, 3=neutral, 2= disagree and lastly 1=strongly disagree.

Table 3. Statements on extra training in computer skills and the TPACK survey

| Statements on extra training in computer skills | Strongly Agree | Agree | Neutral | Disagree | Strongly Disagree |
|---|---|---|---|---|---|
| The Ministry of Education provides in-service training/workshop for computer studies Teachers. | 50.0% | 16.7% | 16.7% | 16.7% | 0 |
| I often attended all the workshops/in-service training offered by the Ministry of Education. | 33.3% | 33.3% | 33.3% | 0 | 0 |
| The workshop covers all the topics indicated in the syllabus. | 33.3% | 16.7% | 16.7% | 33.3% | 0 |
| Teaching Computer Studies is more practical than theory. | 50.0% | 0 | 16.7% | 16.7% | 16.7% |
| I believe that my learners have the required IT equipment to participate in e-learning. | 16.7% | 16.7% | 16.7% | 0 | 50.0% |
| I believe learners have the necessary IT skills and competency to participate in e-learning and online assessment. | 0 | 0 | 66.7% | 16.7% | 16.7% |
| Do you think learners have proper internet access to use e-learning successfully? | 16.7% | 0 | 16.7% | 16.7% | 50.0% |
| Do you believe that your school can make e-learning work? | 16.7% | 83.3% | 0 | 0 | 0 |
| Do you believe that the IT infrastructure at your school can support e-learning? | 0 | 16.7% | 33.3% | 50.0% | 0 |

Teachers were given different statements; they either had to strongly agree, agree, state if they are neutral, disagree, or strongly disagree. The following number of responses were recorded, indicating that the respondents strongly agreed with the statements. Half (50%) of the respondents strongly agreed that the Ministry of Education provides in-service training and workshops for Computer Studies and that teaching Computer Studies is more practice than theory. The minority (16.7%) of the respondents strongly agreed that they believe that the learners have the

required IT equipment to participate in e-learning.

They think learners have proper internet access to use e-learning successfully, and they believe that the school can make e-learning work. A total of 83.3% was recorded as the majority number of teachers who agreed with the statement that they believe that the school can make e-learning work, followed by 33.3% of the respondents who agreed that they often attend all the workshops and in-service training offered by the Ministry of Education. The lowest number of respondents was 16.7%, who strongly agreed with the statements stating that the Ministry of Education provides in-service training and Computer Studies workshops. The teachers' workshop covers all the topics indicated in the syllabus. It is believed that the learners have the required IT equipment to participate in e-learning. they believe the IT infrastructure at the school can support e-learning. No respondents agreed with the other statements.

Although the majority disagrees that the government provides workshops for Computer Studies teachers, during the interview, their response to whether the Ministry of Education organises workshops for Computer Studies teachers was positive. The quantitative results are supported by the qualitative results below:

TS2.2: *"Yeah, they do, and it's like a yearling. There's always Computer Workshop, but they only focus on the higher grades, not the lower grades. They've only focused on the syllabus of the higher grades, like grades 11 and 10, but currently, with their lower grades, they don't have it. Previously, it was done countrywide, but now it is done by region. it's like each region, not just one, like a combination of certain regions coming for a workshop at a certain time for a certain period."*

TS3.3: *"Yes, the NIED program. There are workshops that are done through that. The whole country. I think there are only limited teachers."*

They were also asked about how frequently the school computer is maintained by the Ministry of Education. Responses were as follows, according to TS1.1, TS3.3, and TS5.5:

TS1.1: *"One has to call them to come, but mostly they don't come when you call them. However, they do have a workshop where schools can take the computers for maintenance.*

TS3.3: *"I fix it, just by myself, yeah. Yes, software, hardware, everything. So, my additional*

*double jobs"*

TS5.5: *"The school maintains the hardware and software of the computer lab.". They have someone who comes in to fix it."*

4.1.2 TPACK Survey

The questions contained in the TPACK instrument covered the seven TPACK components.

It included Pedagogical Knowledge (PK), Content Knowledge (CK), Pedagogical Content Knowledge (PCK), Technology Knowledge (TK), Technological Content Knowledge (TCK), Technological Pedagogical Knowledge (TPK), and TPACK (Widyasari, Masykuri, Mahardiani, Saputro &Yamtinah, 2022).

4.1.3 Technology Knowledge

Technology Knowledge entails knowing the best form of technology that can be used to make learning and teaching more meaningful (Bwalya & Rutegwa, 2023). Teachers should be familiar with the technological tools that can be used to learn and teach Computer Studies.

The table below shows the statements on the TPACK questionnaire that were used in the quantitative phase, consisting of a section for selection on a Likert scale whereby 5= strongly agree, 4= agree, 3=neutral, 2= disagree and lastly 1=strongly disagree.

Table 4. Statements on TK

| Statements on TK | Strongly Agree | Agree | Neutral | Disagree | Strongly Disagree |
|---|---|---|---|---|---|
| I know how to solve my own technical problems. | 33.3% | 0 | 50.0% | 16.7% | 0 |
| I can easily learn technology. | 66.7% | 16.7% | 0 | 16.7% | 0 |
| I keep up with important new technologies. | 66.7% | 16.7% | 0 | 16.7% | 0 |
| I frequently play around the technology. | 50.0% | 16.7% | 16.7% | 0 | 16.7% |
| I know about a lot of different technologies. | 50.0% | 33.3% | 0 | 16.7% | 0 |
| I have the technical skills I need to use technology. | 50.0% | 33.3% | 0 | 16.7% | 0 |

Teachers were given different statements. They either had to strongly agree, agree, state if they are neutral, disagree, or strongly disagree. The following number of responses were recorded, indicating that the respondents strongly agreed with the statements. The majority (66.7%) of the respondents strongly agreed that they can learn technology easily and that they keep up with important new technologies. Half (50%) of the respondents strongly agreed that they frequently play around with technology, they know about a lot of different technologies, and they have the technical skills they need to use technology. This was followed by 33.3% of the respondents who agreed that they know how to solve their own technical problems. The lowest number of respondents, 16.7%, was recorded to have agreed with the statements stating that they can learn technology easily, they can keep up with important new technologies, and they frequently play around with the technology.

The following section presents the findings of CK of Computer Studies

### 4.1.4 Content Knowledge (CK) of Computer Studies

Santos and Castro (2021) refer to content knowledge as the body of knowledge and information that teachers teach and that students are expected to learn in a given subject or content area.

Table 5. Statements on CK

| Statements on CK | Strongly Agree | Agree | Neutral | Disagree | Strongly Disagree |
|---|---|---|---|---|---|
| I have sufficient knowledge of Computer Studies. | 83.3% | 0 | 16.7% | 0 | 0 |
| I can use technological ways of thinking. | 66.7% | 16.7% | 0 | 16.7% | 0 |
| I have various ways and strategies for developing my understanding of Computer Studies. | 0 | 16.7% | 0 | 16.7% | 66.7% |

Teachers were given different statements. They either had to strongly agree, agree, state if they are neutral, disagree, or strongly disagree. The following number of responses were recorded, indicating that the respondents strongly agreed with the statements. The majority (66.7%) of the respondents strongly agreed that they can use technological ways of thinking. The lowest number of respondents, 16.7%, was recorded to have agreed with the statements stating that they can use a technological way of thinking, and lastly, they have various ways and strategies of developing their understanding of Computer Studies. No respondents agreed with the other statements. The minority, with 16.7% of respondents, had a neutral view on the statements that stated that they have sufficient knowledge about Computer Studies. The majority of 66.7% of respondents strongly disagreed with the statements that they have various ways and strategies of developing their understanding of Computer Studies. No respondents strongly disagreed with the other statements.

### 4.1.5 PK (Pedagogical Knowledge)

Teachers need to know how to deliver Computer Studies to learners in addition to the subject's content. Pedagogical knowledge is the teachers' deep knowledge about the process and practices or methods of teaching and learning (Santos & Castro, 2021).

Table 6. Statements on PK

| Statements on PK | Strongly Agree | Agree | Neutral | Disagree | Strongly Disagree |
|---|---|---|---|---|---|
| I know how to assess student performance in a classroom. | 66.7% | 16.7% | 0 | 16.7% | 0 |
| I can adapt my teaching based on what students currently understand or do not understand. | 66.7% | 16.7% | 0 | 0 | 16.7% |
| I can adapt my teaching style to different learners. | 66.7% | 16.7% | 16.7% | 0 | 0 |
| I can assess student learning in multiple ways. | 50.0% | 16.7% | 16.7% | 16.7% | 0 |
| I can use a wide range of teaching approaches in a classroom setting. | 66.7% | 16.7% | 16.7% | 0 | 0 |
| I am familiar with common student understandings and misconceptions. | 66.7% | 0 | 16.7% | 16.7% | 0 |
| I know how to organise and maintain classroom management. | 66.7% | 16.7% | 16.7% | 0 | 0 |

The majority of 66.7% of the respondents strongly agreed with all the statements, with only 50% of the respondents strongly agreeing with the statements that teachers can assess student learning in multiple.

Out of all the statements, none of the respondents agreed with the statement that they are familiar with common student understandings and misconceptions, while only 16.7% of the respondents agreed with all the other statements. About 16.7% of the respondents were recorded to have a neutral view on all the statements except for the statements that stated that respondents know how to assess student performance in a classroom and that they can adapt their teaching based on what students currently understand or do not understand.

Moreover, 16.7% of respondents disagreed with the statement that they know how to assess student performance in a classroom, they can assess student learning in multiple ways, and lastly, they are familiar with common student understandings and misconceptions, while no respondents disagreed with the other statements. Only one person strongly disagreed with the statement that she/he can adapt his or her teaching based on what students currently understand or do not understand, while no respondent strongly disagreed with the other statements.

After teachers have acquired both content and pedagogical knowledge of Computer Studies, the next question is whether or not teachers can combine the two types of knowledge. The findings regarding the teachers' combination of content and pedagogical knowledge will be covered in more detail in the following section.

4.1.6 PCK (Pedagogical Content Knowledge)

PCK is a combination of parts (intersection) between knowledge of subject matter content (content knowledge/CK) with knowledge of pedagogy (pedagogical knowledge/PK). PCK is an idea that arises from the belief that teaching requires more than just imparting knowledge about the subject matter or content to students (Sa'adah & Yusup, 2023).

Table 7. Statements on PCK

| Statements on PCK | Strongly Agree | Agree | Neutral | Disagree | Strongly Disagree |
|---|---|---|---|---|---|
| I know how to select effective teaching approaches to guide student thinking and learning in Computer Studies. | 50.0% | 16.7% | 16.7% | 16.7% | 0 |

Only 50% of the respondents strongly agreed with the statements that stated that teachers know how to select effective teaching approaches to guide student thinking and learning in Computer Studies. While 16.7% of respondents agreed with the statements, 16.7% were recorded as having a neutral view. Furthermore, 16.7% of respondents disagreed with the statement, with no respondents strongly disagreeing.

The results of pedagogical content knowledge in the section above were discussed. Additionally, the researcher is interested in learning whether the teacher knows how to choose the most appropriate technological tools to present Computer Studies content in the section that follows. The next section is the findings regarding the TCK.

4.1.7 TCK (Technological Content Knowledge)

TCK is the process of integrating content with the appropriate technology. The teacher must be familiar with the finest technological tools available for presenting specific subject-related knowledge (Cetin-Berber & Erdem; 2015; Mishra & Koehler, 2006).

Table 8. Statements on TCK

| Statements on TCK | Strongly Agree | Agree | Neutral | Disagree | Strongly Disagree |
|---|---|---|---|---|---|
| I know about technologies that I can use for understanding and doing Computer Studies. | 66.7% | 16.7% | 16.7% | 0 | 0 |

The majority of the respondents (66.7%) strongly agreed with the statements that says teachers know about technologies that they can use for understanding and doing Computer Studies, 16.7% agreed, and 16.7% responded neutrally. No one strongly disagreed.

The following is the section on technological pedagogical knowledge findings.

4.1.8 TPK (Technological Pedagogical Knowledge)

TPK is a series of understandings about how learning changes as a result of using technology to support active learning and can aid in and facilitate understanding of the subject matter's concepts. In this component, the teacher must not only comprehend how technology is used in learning but also comprehend how pedagogical competencies

are applied when using technology to learn (Joko & Ami, 2023). In this context, the teacher should be capable of thinking of the appropriate technological tools to use and techniques for presenting Computer Studies content.

Table 9. Statements on TPK

| Statements on TPK | Strongly Agree | Agree | Neutral | Disagree | Strongly Disagree |
|---|---|---|---|---|---|
| I can choose technologies that enhance the teaching approaches for a lesson. | 33.3% | 50.0% | 0 | 16.7% | 0 |
| I can choose technologies that enhance students' learning for a lesson. | 33.3% | 50.0% | 0 | 0 | 16.7% |
| My teacher education program has caused me to think more deeply about how technology could influence the teaching approaches I use in my classroom. | 66.7% | 16.7% | 16.7% | 0 | 0 |
| I am thinking critically about how to use technology in my classroom. | 16.7% | 50.0% | 16.7% | 0 | 0 |
| I can adapt the use of the technologies that I am learning about to different teaching activities. | 66.7% | 16.7% | 16.7% | 0 | 0 |
| I can select technologies to use in my classroom that enhance what I teach, how I teach and what students learn. | 50.0% | 33.3% | 16.7% | | 0 |
| I can use strategies that combine content, technologies and teaching approaches that I learned about in my coursework in my classroom. | 33.3% | 50.0% | 16.7% | 0 | 0 |
| I can provide leadership in helping others to coordinate the use of content, technologies and teaching approaches at my school and/or district. | 50.0% | 16.7% | 16.7% | 16.7% | 0 |
| I can choose technologies that enhance the content of a lesson. | 66.7% | 16.7% | 16.7% | 0 | 0 |

The majority of 66.7% of respondents strongly agreed with the statements that the teacher's education program has caused them to think more deeply about how technology could influence the teaching approaches they use in the classroom; they can adapt the use of the technologies that they are learning about to different teaching activities; and they can choose technologies that enhance the content for a lesson, while the minority of 16.7% of the respondents strongly agreed with the statement that they are thinking critically about how to use technology in their classroom.

Of the six respondents, half (50%) agreed with the statements that they can choose technologies that enhance the teaching approaches for a lesson, they can choose technologies that enhance students' learning for a lesson, they are thinking critically about how to use technology in my classroom, and they can use strategies that combine content, technologies, and teaching approaches that they learned about in their coursework in my classroom. This was followed by 33.3% of the respondents who agreed with the statements that they can select technologies to use in their classroom that enhance what they teach, how they teach, and what their students learn. About 16.7% of the respondents agreed with the other statements.

Lastly, in order to successfully implement e-learning with Computer Studies learners, teachers must be able to combine technology, pedagogy, and content knowledge. The findings on TPACK are listed in the table below (Technology Pedagogy Content Knowledge).

4.1.9 TPACK (Technology Pedagogy and Content Knowledge)

TPACK involves an understanding of the complexity of relationships among students, teachers, content, technologies, and practices (Archambault & Crippen, 2016).

Table 10. Statements on TPACK

| Statements on TPACK | Strongly Agree | Agree | Neutral | Disagree | Strongly Disagree |
|---|---|---|---|---|---|
| I can teach lessons that appropriately combine Computer Studies, technologies and teaching approaches. | 50.0% | 16.7% | 16.7% | 16.7% | 0 |

Half (50.0%) of the respondents strongly agreed with the statements that they can teach lessons that appropriately combine Computer Studies, technologies and teaching approaches. About 16.7% of the respondents agreed with the statement. Furthermore, 16.7% of the respondents were recorded as having a neutral response to all the statements. More so, 16.7% of the respondents disagreed with the statement that says that they can teach lessons that appropriately combine Computer Studies, technologies, and teaching approaches, while no respondent showing strongly disagreed.

The qualitative data below support the quantitative findings. During the interview, two of the teachers shared the following perspectives on the challenges with e-learning:

TS3.3: *"The challenges are that it's expensive and equipment is needed to properly set it." It is costly. Also, the use of Internet facilities is needed in most or some cases, depending on what type of e-learning we are doing. And all of this requires resources and funding, which government institutions like us are not capable of providing".*

TS4.4: *"The most challenging factor that we are experiencing is number one: the lack of hardware and software that is needed to incorporate e-learning. Because this requires mobile devices, be they smartphones, tablets, or computers, and not all kids can afford them. Given the economic forecast that we are in and the types of parents that we have, we find in our society. "Most of them are really not there from a poor background, so it's difficult to get the devices that are required and also include the Internet itself to access e-learning."*

*4.2 Teachers Findings on the Benefits of the Implementation of E-learning*

4.2.1 The Teachers' Opinion on the Benefits of E-learning Being Implemented in Schools

The researcher sought the respondents' opinions about the benefits of implementing e-learning in schools. Some teachers stated that if e-learning is implemented, learners can easily communicate with them anytime and anywhere because it is flexible and convenient 24/7. They also stated that the implementation can help some learners learn at different paces and that the learners will benefit if they have the required facilities. The implementation will be advantageous to learners as they will get to learn at their own pace while teachers will just be providing the study materials via the link. This was also a benefit to some teachers, as this will support the goal of the 4th Industrial Revolution.

The qualitative findings support the quantitative findings. During the interviews, three of the teachers stated the following:

TS1.1: *"No stress; the learner will learn twice—by the teacher and by themselves."*

TS3.3: *"e-learning benefits" I would say it allows learners to learn at their own pace. We don't need to rush if they don't get something; they can always go through it. Uhm, it reduces the workload for teachers because some of the lesson planning and other things are already done. So, you just draw from it instead of having to reconstruct all of those things again. Yeah, I think I will just stop at that. Those two, for now.*

TS5.5: *"I can have more resources, such as videos, notes, and pictures, ready for my class at any time." Learners can revise their work on their own and at their own pace. Unlike if a learner does not understand in class, he or she cannot revert back to what the teacher said. and it is easy to teach a larger group."*

*4.3 Learners Findings on the Challenges of the Implementation of E-learning*

The table below shows the statements on Information Communication Technology, consisting of a section for selection on a Likert scale whereby 5= strongly agree, 4= agree, 3=neutral, 2= disagree and lastly, 1=strongly disagree.

Table 11. Statements on ICT

| Statements | Strongly Agree | Agree | Neutral | Disagree | Strongly Disagree |
|---|---|---|---|---|---|
| I make use of a computer during the Computer Studies period, two to six times per week. | 0 | 21.4% | 57.1% | 14.3% | 7.1% |
| Computer studies is more practical. | 21.4% | 50.0% | 28.6% | 0 | 0 |
| I use technology tools (computer, smart board) in my learning 1-3 times per week. | 35.7% | 21.4% | 7.1% | 14.3% | 21.4% |
| I often receive assignments/tasks that require me to use a computer. | 21.4% | 14.3% | 21.4% | 35.7% | 7.1% |
| I consider technology important to use in my learning. | 57.1% | 14.3% | 0 | 21.4% | 7.1% |

| | | | | | |
|---|---|---|---|---|---|
| I have internet access and a laptop/desktop computer smartphone at home. | 7.1% | 26.6% | 0 | 21.4% | 42.9% |
| I use the internet for my learning. | 0 | 7.1% | 7.1% | 21.4% | 64.3% |
| I believe that I am ready for e-learning. | 57.1% | 7.1% | 14.3% | 14.3% | 7.1% |
| I believe that I have the required IT equipment to participate in e-learning. | 21.4% | 7.1% | 21.4% | 28.6% | 21.4% |
| I have the necessary IT skills and competency to participate in e-learning and online assessment. | 42.9% | 14.3% | 21.4% | 14.3% | 7.1% |
| I have proper internet access to use e-learning successfully. | 14.3% | 42.9% | 14.3% | 21.4% | 7.1% |
| My school can make e-learning work. | 21.4% | 14.3% | 35.7% | 14.3% | 14.3% |
| My school can afford the budget for using e-learning in teaching and learning. | 14.3% | 21.4% | 0 | 0 | 64.3% |
| The IT infrastructure at my school can support e-learning. | 7.1% | 35.7% | 21.4% | 0 | 35.7% |

The majority (57.1%) of the respondents are neutral about whether they make use of computers during their Computer Studies period (2–6 times per week), followed by 14.3% who disagree and 7.1% who strongly disagree. The other 21.4% agreed that they make use of a computer during a Computer Studies period 2–6 times per week. About 21.4% of the respondents indicated that they strongly agree that Computer Studies are more practical, while 50% agreed and the other 28.6% are neutral with the statement. Regarding the use of technological tools, 35.7% of the respondents strongly agreed, followed by 21.4% who agreed and strongly disagreed, respectively. Only 14.3% of the respondents disagreed that they use technology tools (computer, smart board) in their learning 1–3 times per week. About 35.7% of the respondents disagreed that they often receive assignments or tasks that require them to use a computer, while 21.4% strongly agreed and neutral, respectively. About 57.1% of the respondents strongly considered technology important to use in learning; 21.4% of the respondents disagreed, and only 7.1% strongly disagreed. With regards to having internet access and a laptop, desktop computer, or smartphone at home, 42.9% strongly disagreed, followed by 26.6% of the respondents who agreed, and the remaining 21.4% disagreed.

The section that follows presents quantitative data on learners' points of view on the challenges of implementing e-learning at their school, supported by qualitative data.

4.3.1 The Learners' Opinion on the Challenges of Implementing E-learning in School

The study sought the challenges of implementing e-learning in schools. As part of the challenges indicated, learners that they did not have modern mobile devices, and live in places with no electricity. Additionally, they highlighted that getting airtime is hard for some, and some parents do not have access to smartphones or other devices. Learners also indicated a challenge that not all of them are familiar with computers, so it will be hard for them to connect to e-learning unless they receive training. Another challenge was the poor concentration of learners during e-learning. Furthermore, learners showed that e-learning will be a challenge as it requires self-motivation and proper time management skills, and most learners will find it difficult because it mainly focuses on theory and is not practical.

The qualitative results listed below support the quantitative research. One of the participants remarked:

LS1.1: *"I wouldn't have that confidence because at school you might be encouraged by a friend to do your homework at school, but now you're alone at home with no one to help you."*

LS1.2, another participant, stated:

*"It's to make the learners' work easier, like at the time of COVID-19, we're not supposed to go to school, but they brought up this big idea of learning from home, so it's just something simple for the learner."*

Some also mentioned that not everyone has access to an internet connection, while other respondents indicated that some people may have phones with problems or may not have their phones on them. In addition, they also noted that the learners can memorise answers from previous questions, while some expressed that there might not be internet sometimes or that it can be slow during the time slot set for a certain program, subject, or assessment. Furthermore, respondents also indicated that it is very expensive, and some learners do not know how to use laptops. Bad weather was also indicated by some respondents, whereby, according to them, can affect the connection.

In addition, learner LS2:1 answered by saying*: "They may have those that students cannot afford, and parents*

*may not be able to afford a computer or internet access.”*

While the second learners

LS2.5 added that: *“Learners may use other apps instead of learning.”*

Learners are more concerned about other learners that do not have access to computers and smartphones and the fact that not everyone knows how to use smartphones and computers. This will then make it hard for them to connect to e-learning unless they receive training on the use of such technology. Therefore, the possibility of some learners being left out should not be overlooked. Another challenge for e-learning is less control of the learners by the teachers, where learners can intentionally disobey what the teacher is saying.

The qualitative findings stated below supported this. The following are three of the learners' responses to the challenges of e-learning:

LS3.1: *It's like some students will take advantage of this and play games and will not take their studies seriously if they do not have that motivation. Also, it is expensive to have a laptop or internet connection.*

LS3.2: *The challenge of e-learning is laziness. e-learning can make you lazy because you will keep on postponing until you do get to do your work, and the other one is that it is easy to get distracted. You are supposed to concentrate on your work, but you are actually doing other things. It actually allows cheating when you write your test online because you have a book to look up the answer.*

LS3.3: *Some learners don’t know how to use laptops, for example, so e-learning provides improvement. It gives you the experience of using a laptop.*

As part of the challenges indicated, learners noted that getting airtime is hard for some, and some parents do not have access to smartphones or other devices. Learners also indicated a challenge of not all of them being familiar with computers, so it will be hard for them to connect to e-learning unless they receive training. Another challenge was the poor concentration of learners during e-learning. Furthermore, learners showed that e-learning will be a challenge as it requires self-motivation and proper time management skills, and most learners will find it difficult because it mainly focuses on theory and is not practical. Some learners also stated that there will not be much feedback from them as the learner-teacher interaction is limited.

During the interview (qualitative results), learner LS4.1 stated:

*"Teaching someone through a computer is not the same as teaching in person; for example, you would not be able to explain properly through the computer; some children would not understand; some children would require special attention; and you would gain nothing." "I prefer going to school; I don’t like e-learning."*

Some participants added, during the interview (qualitative results) that:

LS5.2: *“Some people will not have access to the internet because they don’t have a phone, or some people might have a phone but they don’t have access to the internet.”*

Furthermore, during the interview (qualitative results), participants explained in detail the challenges encountered in the implementation of e-learning.

LS6.2: *"Not all students can afford e-learning because it might be too expensive to pay for Wi-Fi and computers."*

LS6.3: *"Notifications from other apps, such as Instagram, WhatsApp, and TikTok, can distract you".*

LS6.5: *"Kids can copy, and they can search for answers online so that they can answer."*

*4.4 Learners Findings on Benefits of the Implementation of E-learning*

quantitative data on the benefits of e-learning for learners was presented first, followed by qualitative data that was explained in depth.

4.4.1 The Learners’ Opinion on the Benefits of Implementing E-learning in school

The researcher sought to find out the respondents’ opinions about the benefits of implementing e-learning in schools. Some learners showed that if e-learning is implemented, they can get extra information on the subject he or she is struggling with; e-learning saves time, so textbooks will not be useful, especially now that they are scares at school. Some learners indicated that, with e-learning, one is free to ask questions and it is easier to complete school assignments.

Some learners showed that if e-learning is implemented, they can get extra information on the subject they are struggling with. Apart from that, learners feel like e-learning saves time and money on stationery and textbooks as

they will not be needed anymore. Some learners indicated that with e-learning, one is free to ask questions, and it is easier to complete school assignments because one has access to the internet.

The quantitative results are supported by the qualitative below, Learner LS3.2 responded during the interview by saying: *"The advantages of e-learning are that you can learn in your own space; it is much easier to have access to the internet because you can look for answers or conduct research; you have access to teachers' files, so you don't have to go to school and talk to the teacher; and you can interact with the teacher or any other learner at any time."*

While LS3.3 stated that *"some learners understand better when watching YouTube videos than when the teacher teaches in class."*

Some learners' opinions on the benefits of e-learning include that it will keep the children interacting with school while being safe at home. It will also show parents that schools care about their children's education. Lastly, some learners took the implementation of e-learning as a way for them to cut costs on transportation to school and on buying books as they could access all the materials they needed on e-learning, yet have access to learning.

The quantitative results are supported by the qualitative results below. During the interview with the learner, LS4.3 stated that:

*"Learners can get more knowledge through the technology they are using and can study on their own time."* They can also get more information if you don't want to go to school.

Some learners showed that if e-learning is implemented, they will not have to carry textbooks but instead download them, and they can have one-on-one sessions with teachers. Some went on to say that having the internet makes things easier. Some learners showed that if e-learning is implemented, they will not have to carry textbooks but instead download them, and they can have one-on-one sessions with teachers. Some said that having the internet makes things easier.

The quantitative results are supported by the qualitative results below.

LS5.1: *"In my own opinion, you do have to come to school and carry your textbooks, and you can even download, let me say, booklets online and use them for learning."*

And the second learner LS5.2 responded: *"The benefits of e-learning will be good for people who have phones, because some people who do not have phones will not benefit from it."*

During the interview (qualitative results), learners LS6.1 and LS6.3 expressed their opinions on the benefits of the implementation of e-learning as follows:

LS6.1: *"Gives the student the advantage of learning digitally".*

LS6.3: *"The benefit of e-learning is that you can access your summary from anywhere, anytime".*

## 5. Discussion

Discussion of Teachers' and Learners' Findings

### 5.1 Teachers' Findings

Research sub-question 1 (RQ1): What challenges were identified by teachers in the implementation of e-learning of Computer Studies in Grade 8 in the teaching and learning process?

Although 66.7% of the teachers noted that learners do not have proper internet access to use e-learning successfully, all (100.0%) of them believe that their schools can make e-learning work even though the IT infrastructure at the schools cannot fully support e-learning. Regarding the knowledge of technology, only 33.3% of the teachers know how to solve their own technical issues, although 66.7% frequently play around with technology. Other researchers indicated that the use of artificial intelligence ( Abulibdeh, Zaidan & Abulibdeh, 2024) and machine learning ( Forero-Corba & Negre Bennasar, 2024) can better enhance elearning.

About 83.3% of the teachers use strategies that combine content, technologies, and teaching approaches. Other researchers indicated that the use of immersive experiences (Serrano-Ausejo & Mårell-Olsson, 2023) and gamification (Saygı & Zeybek, 2024) helped coordinate the use of content, technologies, and teaching approaches at schools and/or districts. A total of 66.7% of the teachers also informed the researcher that they teach lessons that appropriately combine Computer Studies, technologies and teaching approaches. The challenges indicated by teachers are that it is expensive, and equipment is needed to properly set it. However, in another study by Adeniyi et al., 2024), specifies that a lack of technical support was noted as being very stressful for the teacher, which may affect the teacher's willingness of the adoption of ICT, which can be enhanced by the adoption of collaboration

and social learning (Arumugam, Saleem & Tyagi, 2024), in order to improve the adoption of ICT.

Another challenge is the lack of hardware and software needed to incorporate e-learning. Similarly, Agrawal (2015) states that many scholars revealed that the lack of funds to obtain the necessary hardware and software is one of the reasons teachers do not use technology in their classes. The review of literature related to the challenges of the implementation of e-learning has revealed that several related studies have been carried out in other developing countries. For instance, Al-Sartawi & Hannoon (2024) point out that the majority of e-learning initiatives implemented in Sub-Saharan countries tend to fail, partially or totally due to various barriers to e-learning in developing countries. The absence and/or inadequacy of infrastructure is a barrier to access among students in developing countries.

The next section presents the findings of the teachers from the quantitative and qualitative data for research Question 2: What benefits were identified by teachers in the implementation of e-learning of Computer Studies in Grade 8 in the teaching and learning process?

Research Sub-question 2 (RQ 2): What benefits were identified by teachers in the implementation of e-learning of Computer Studies in Grade 8 in the teaching and learning process?

The study sought the benefits of e-learning for teachers. About 66.67% of the teachers showed that e-learning allows them to stay connected to their learners and their parents, and the use of new technologies gives them the freedom to experiment in their teaching practice, such as the use of gamification and immersive experiences (Omuzuawo, 2024; Saygı & Zeybek, 2024). Moreover, 50.0% of the teachers highlighted the flexibility of a variety of different resources, such as videos, text, presentations and quizzes, as another benefit of e-learning to them. In conclusion to the teachers' interview, the researcher sought their views on the benefits of implementing e-learning in schools. Teachers opine that learners can easily communicate with them anytime and in their comfort zones.

The study, however, was not limited to the teachers' findings. In the following section, the researcher analyses the quantitative and qualitative findings of the learners concerning the study's sub-questions as well.

### 5.2 Learners' Findings

Research Sub-question 1 (RQ1): What challenges were identified by learners in the implementation of e-learning of Computer Studies in Grade 8 in the teaching and learning process?

During the COVID-19 lockdown, 50.6% of the learners used to communicate with their teachers through a WhatsApp group and 14.5% through cell phones, while 15.6% never contacted their teachers during the COVID-19 lockdown. The majority (53.2%) of the learners had ICT in Grade 7, and only 46.8% did not have ICT in Grade 7. Many of the learners who took part in the study have access to computers at home, but only 35.1% have internet access at school.

About 73% of the respondents used technology tools (computer, smart board) in their learning 1 - 3 times per week, and they rarely receive assignments or tasks that require them to use a computer, where by the use AI and machine learning can enhance learning (Ferrero-Corba & Negre, 2024). Many learners do not have internet access and a laptop or desktop computer or smartphone at home, and they do not use the internet in learning. Moreover, 57.2% of the learners have the necessary IT skills and competency to participate in e-learning and online assessment, and 35.7% of the learners said that their school can make e-learning work. Only a few schools can afford the budget for using e-learning in teaching and learning; about 64.3% of the learners indicated that their schools cannot afford the budget for using e-learning in teaching and learning. According to Wargadinata, Maimunah, Eva & Rofiq (2020), online learning is effective as it facilitates the use of various applications such as "WhatsApp," "Zoom," and "Google Classroom". Further, Wargadinata et al. (2020) concurred that internet access and internet packages restrict the effectiveness of online learning. A study by Muhammad and Kainat (2020) found that internet access problems, a lack of interaction between teachers and students, and a lack of technological facilities challenged the efficacy of online learning.

Regarding the study of the challenges of implementing e-learning in schools, learners noted that, they have no access to mobile devices, and some people live in places with no electricity. This is in contrast to the findings by other scholars who indicated that the challenges to accessing online learning are less because both learners and teachers have experienced the excellent opportunity of knowing and interacting with educational technology tools such as mobile-based learning, computer-based learning, and web-based learning (Pellegrini, Uskov & Casalino, 2020).

Lastly, the next section presents the findings of the learners from the quantitative and qualitative data for research Sub-question 2: What benefits were identified by teachers and learners in the implementation of e-learning of Computer Studies in Grade 8 in the teaching and learning process?

Research sub-question 2 (RQ2): What benefits were identified by learners in the implementation of e-learning of Computer Studies in Grade 8 in the teaching and learning process?

The researcher sought the respondents' opinions about the benefits of implementing e-learning in schools. Respondents further indicated that e-learning is convenient and flexible in terms of time and place and also provides a more comfortable learning environment, where by AI and adaptive learning can enhance learning (Enoch, Abraham & Singaram, 2022). The findings of the study are supported by Surjono, Muhtadi & Trilisiana (2019), who state that e-learning can produce a flexible and distributed learning system. Students will be able to choose the time and location in which they study because they are not required to attend a certain place at a specific time. The study also revealed that it will improve their technical skills and that it will be low-cost since one does not have to travel to school. In addition, some learners noted that with e-learning, they can learn quickly because no one will disturb them.

## 6. Conclusion

The study identified major challenges faced by teachers and learners in implementing e-learning in schools, which included limited internet, computer access, lack of technical assistance, and lack of motivation to engage in e-learning platforms. Other challenges include academic, administrative, and technical issues. However, the study also found that e-learning is beneficial for both teachers and learners, as it ensures easy communication between students. E-learning provides rich resources in different subjects for both teachers and learners. The study also found that learners prefer e-learning as it provides the convenience of time and place. Overall, e-learning is a valuable tool for both teachers and learners.

## 7. Recommendations

### 7.1 Future Research Recommendations

This study recommends the following studies to be carried out:

➢ To examine teachers' perceptions about online challenges and affordances

➢ To interogate different strategies on how to improve online teaching, through the use of AI and adaptive learning.

➢ To investigate and verify the critical factors affecting the successful implementation of e-learning in both rural and urban schools.

**Competing interests**

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

**Informed consent**

Obtained.

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The Publication Ethics Committee of the Canadian Center of Science and Education.

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The data that support the findings of this study are available on request from the corresponding author. The data are not publicly available due to privacy or ethical restrictions.

**Data sharing statement**

No additional data are available.

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