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Teachers' Perceptions on the Effect of COVID-19 on Mathematics Performance in Tanzania

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Abstract
COVID-19 pandemic has affected every sector of human life, including health, global economy and education. In Tanzania the learning situation changed when the first case of COVID-19 infection was detected in the country on 16th March, 2020 in Arusha. This study examines teachers' perceptions on the effect of COVID-19 on mathematics performance to Standard 7 and Form 4 students in Tanzania schools. A purposive sampling was employed to select potential primary and secondary school mathematics teachers from 7 zones in Tanzania. To avoid the risk of contamination of the COVID-19 virus, mobile phone interviews were conducted among 18 mathematics teachers from 12 schools across 7 zones. Based on thematic analysis and the results from National Examination Council of Tanzania (NECTA), the findings of the study indicated that there is a slightly drop in the mathematics pass rate of Standard 7 and Form 4 students results in 2020 probably due to the 3 months school academic calendar disruption. It is still not clear how long the pandemic will exist in Tanzania and across the world. However, the study suggests that school head teachers with the support of the Ministry of Education should initiate various innovative interventions that will help all schools in the country to provide learning strategies to their students to improve mathematics performance. While the initiated interventions can be more efficient during COVID-19, they can also help during any other related pandemic in the future.
Keywords: COVID-19, mathematics performance, mathematics teachers, primary schools, secondary schools.
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1. Introduction

The whole world is disrupted, trembled and shaken by the coronavirus pandemic (COVID-19), which was declared in China, the city of Wuhan in December, 2019. COVID-19 cases are still severe in United State of America, United Kingdom, Brazil and India. COVID-19 cases in Africa remain reasonably low despite the continent has weak health infrastructure, with a population of about 1.5 billion. Experts from developed countries feared that the virus would rigorously impact the entire continent of Africa and destroy the African population. However, this is not the case and speculation is rising that the virus can barely survive in Africa due to its warmer climate that helps the worst of the health pandemic. As of 16th June, 2021, about 178 million confirmed cases and nearly 3.9 million deaths have been reported worldwide. Cases in Africa are about 3.2 % of the infections worldwide and 0.04% deaths (OECD, 2021). Despite the low spread of the pandemic in Africa, it is still affecting every sector of human life, including health, education and rapidly slowing down the global economy. Economists from various countries are working day and night trying to find ways of handling the economic effect caused by the pandemic. They are predicting and calculating various models, which are still sending shocking results in the global economy (Kraemer et al., 2020). A year after the emerging of COVID-19, scientists around the world have developed various possible vaccines to impart the body's immune system to slowing down the virus from harming our bodies. However, it is still not certain that the developed vaccines will diminish the disease within and across countries (Hopman et al., 2020; WHO, 2020). It is clearly that COVID-19 pandemic is still a challenging virus to all of us.

Governments' from different countries worldwide have trailed a quick resolution of reducing the spread of COVID-19 by locking down their citizens and introducing other measures to limiting social contact following the increasing number of reported death and restricted immigration. However, some of the resolutions that were necessary have affected the performance of different government sectors at different levels. Education is one of the sectors that have been affected by resolutions taken by governments where traditional teaching and examinations in schools have postponed and reduced face-to-face classroom interactions. Numerous e-learning platforms are introduced to enable interaction between teachers and students. Despite all the arrangements, it is clear that COVID-19 continues to cause problems, challenges and spread throughout many countries before a definite vaccine is found and distributed all over the world. While the COVID-19 is continuing to destroy the world, Tanzania is not spared by the virus.

It is natural for every country to foremost protect their children from severe infection of the pandemic as it is believed they are the main source of spread, which was the main reason schools were closed immediately after the first case of COVID-19 in every country worldwide (OECD, 2020). In Tanzania, the Minister of Health confirmed the first COVID-19 case on the 16th March, 2020 in Arusha. Following the confirmation of COVID-19, the Prime Minister announced the closure of all schools, colleges, universities and banned all public

gatherings. However, the country did not lock down its citizens. Due to the rapid increase of COVID-19 cases in Tanzania as it is around the world, the Tanzania government restricted inflow of flights to and from other countries in April, 2020 and the weekly updates of COVID-19 cases and deaths were announced by the Prime Minister. The last update of COVID-19 was officially announced in May, 2020, where there were 509 cases and 21 deaths (WHO, 2020).

In the press conference, the late president of Tanzania announced the resuming of all activities from 1st June, 2021, including universities, colleges, sports, house of worships, airports and Advanced Level secondary schools (A-Level), in particular Form 6 students whose examinations were suspended due to the school closures. The announcement was a result of a significant reduction of COVID-19 transmission, according to the Ministry of Health in Tanzania (ibid). Still primary schools and Ordinary Level secondary schools (O-Level) were yet to reopen. The closure of primary and O-Level schools meant that over 14 million students ended first term of the 2020 academic year without sitting for their mid-term tests as majority of schools administered these tests at the end of March each year, to evaluate students' knowledge and understanding in the first quarter of the academic year.

On one hand, the prolonged school closures for primary and O-Levels are vital pillar of the social distancing tools to alleviate the spread of the disease and evade an acceleration of cases that may add tension on health services. Schools are areas where a large number of children gather, play and learn academic and non-academic matters. It has been suggested that school closures serve a purpose, specifically if COVID-19 cases are school-based, to reduce the risk of children contracting the disease and eliminate tracing. On the other hand, extended school closures interrupted the learning process, which has imminent cost of reversing gains in learning results. The school closures were heavily felt by Standard 7 and Form 4 teachers who were under pressure to ensure their students are well prepared before sitting for national examinations; Primary School Leaving Examinations (PSLE) and Certificate of Secondary Education Examinations (CSEE) respectively. Students were also stressed because their examinations were around the corner and they had limited time to prepare themselves due to the loss of school contact hours. This could affect students' performance as well as the education trend for 2021 academic year.

On 15th June, 2020 the government of Tanzania announced that there is only 13% of active cases of COVID-19 pandemic left and 21 deaths in the country. Due to the little percentage of COVID-19 transmission, the late president urged the resuming of the retained schools (pre-primary, primary and O-Level) and other social-economic activities from 29th June, 2020.The late president clearly insisted the existence of COVID-19 and urged all schools, colleges and universities to follow safety guidelines issued by the Ministry of Health in Tanzania to prevent the spread of the pandemic (URT, 2020). COVID-19 education was taught at schools. Students are educated and reminded to often washing their hands with soap, wear face masks whenever necessary and observing social distancing. After the schools re-opening, the Ministry of Education urged to all primary and secondary schools to prolong the second term length to 18th December, 2020 and an addition of two extra hours in the daily school timetable to compensate the time loss during school closures. However, some teachers were overloading students with lengthy untaught mathematics homework after school hours, which have a negative effect on mathematics performance (Nyamizi & Lotto, 2018).

1.1Measures taken after school closures

COVID-19 pandemic has been a catalyst in the way teaching and learning is conducted worldwide. Many countries all over the world have been rapidly changed their traditional way of teaching and learning in the classrooms to e-learning teaching following the school closures. In Tanzania, the Ministry of Education provide directives to primary and secondary school head teachers to organise learning materials dedicated to the delivery of education during school closures. Few days after the school closures subject teachers prepared reading materials and packages of questions to students. The reading materials provided were guidelines for what was yet to be covered due to the pandemic. Students were required to answer all the questions provided and parents were requested to supervise their children. Various schools urged students to submit their work on the re-open day.

Another measure that was taken was the use of the delivery of educational programmes through local radio stations. With a large number of homes having access to radios, the Ministry of Education commended more than 34 community radios to broadcast educational programs for primary and secondary schools at different times and days (Peter, 2020). Moreover, there were also educational programs conducted through educational television programs. In addition, the government eliminated fee charges to its national library to enable free accessibility of learning materials and publications from the Tanzania Institute of Education (TIE) shortly after school closures. These arrangements helped students who could not access television and radio educational programmes to use textbooks and other hard copy learning materials in their studies. To top it all, e-learning platforms and appropriate use of internet on smartphones, laptops, desktops and tablets were introduced to help students have access to their teachers through zoom discussions, text messages, whatsapp conversations, Google

classroom and other online media. These initiatives are reliable with Basilala and Kvavadze (2020) study on transition to e-learning education in schools during COVID-19, whose findings shown that educational television programs, online portal, zoom, EduPage platform and other online media that can be used at home for e-learning education purposes were useful and supported by Georgia government.

So far, little has been investigated in Tanzania regarding COVID-19 effects on the performance of mathematics to Standard 7 and Form 4 students, who sat for national examinations in October and November, 2020 respectively. The main purpose of this study was to explore teachers' perceptions on the effects of COVID-19 on mathematics performance to Standard 7 and Form 4 before sitting for national examinations. Considering the fact that COVID-19 still exists, the results of the study are significant to mathematics instructors in the preparation of their students for the coming national examinations. The results provide useable information that supports various studies related to COVID-19 and education. Furthermore, the study could also provide relevant information to the head teachers to train teachers to deal effectively with the effect of COVID-19 and any other related pandemics in the education sector.

2. Literature Review

Studies on COVID-19 in education reveal that large contamination of COVID-19 is only possible if an individual contact with the infected person (Biswas et al., 2020). A study by Uscher-Pines et al. (2020) show that during influenza pandemic, public vindication approaches, including social distancing may highly slow down the spread of virus in schools and nearby communities. However, the currently research on school practices worldwide has mainly focused on prolonged school closure than encouraging social distancing in primary and secondary schools. In this regard, the existing evidence is too little for schools to develop social distancing policy (if any) and procedures.

Abdulamir & Hafidh (2020) insist that in the case of pandemic that has not much spread and sufficient precautions are not taken seriously, it is likely that the course of the pandemic to change very fast in the negative direction. All necessary measures must be applied and implemented to avoid the vast spread of the pandemic. On similar view, Faherty et al. (2019) discuss social distancing practises in schools, including the physical re-arrangement of number of students in a classroom, creating opportunities for distance learning in few days and limiting group works movement of students in class. This view was also supported by Ash (2014) who indicated that distance learning is crucial on influenza pandemic. In these situations, technologies such as internet, television, radio smartphones, email communication are potential devices to be used. Anastasiades et al. (2010) insist on the use and implementation of the Interactive Video Conferencing (IVC) system in elementary schools in Greece during influenza crisis. It was evidenced that IVC shows a vital role in supporting joint synchronous learning events at a distance. Germann et al. (2019) argue on the opportunities for school closures and prolonging of lockdown period during the influenza pandemic to stop the spreading until the implementation of the suitable vaccines. However, students' performance was not discussed in all these studies.

2.1 Experience in Mathematics education

In mathematics education, Perienen (2020) investigates factors that are mostly contributed to the use of technology by mathematics teachers in Mauritius. The study revealed that mathematics teachers are regularly participated in e-learning pedagogy and often engaged in the use of technology. However, the results to e-learning learning are not pleasing. Burke (2020) postulates that online teaching and learning entails skills that need to be developed to support students' mathematical thoughts and learning. Students improve in mathematics and learn well if appropriate and efficient technological tools are applied and well maintained.

Sintema (2020) studied the effect of COVID-19 on the performance of grade 12 Zimbabwean students in Science, Technology, Engineering and Mathematics (STEM) subjects. The results from this study revealed a likely drop in the pass rate of secondary school students in 2020 national examinations.

The primary and secondary school's education system in many developed and developing countries is characterised mostly by traditional classroom which necessitates the students to attend lessons daily. Furthermore, research on e-learning education suggest that online education is new in many primary and secondary schools, and traditional schoolings should be encouraged. This is also the case in Tanzanian schools. However, the situation in education system has changed due to COVID-19 infection. Majority of developed countries have locked down their population. In a situation where students are restricted from going to school as investigated by Germann et al. (2019), the only alternative to achieve their education is to move from traditional to modern education, where the use of e-learning is essential. In this case the availability of computers or smartphones and internet coverage in the population is crucial. Most of the developed countries managed to adapt the online education with minor distractions (UNESCO, 2020). For example, in Georgia, 86% of Georgian population are connected to the internet. About 75% of the population has computers at home in urban areas. However, in rural areas where families do not have computers, smartphones are used as a substitute to allow online education to all students (MES, 2020). The situation is reverse in most developing countries, including

Tanzania.

2.2 Conceptual framework

To understand the relevant motivational issues that play a role in investigating teachers' views on Standard 7 and Form 4 mathematics performance in 2020, the study adapted Context-Input-Process-Output (CIPO) framework, established by Scheerens in 1990. The CIPO conceptual framework clarifies the usefulness of school operations that lead to improving student performance. The framework operates as analytical model to review the quality of teaching. It comprises of 4 components that define teaching as a production scheme in which inputs are reassigned into outputs through a process that is all influenced by a context. The context involves teaching aids, teaching materials and the use of technological devices that influence learning among students in the classroom. The input refers to knowledge level of students at the beginning and time consumption. The process involves initiatives of pedagogical approaches and knowledge gain to receive output. The output contains the results, such as continuous test and national examination results and within school student achievements. Therefore, the context provides input, gives resources for the process and sets necessities to the output. All these 4 components of the CIPO model are correlated with each other.

2. Methodology

This study applied a qualitative approach in gathering, managing and interpreting data in order to escalate a depth understanding of the teachers' views on mathematics performance for 2020 academic year. The qualitative approach is used to explore how the phenomenon happens and describe the nature of an individual's experience (Creswell, 2017). In this context, the positive and negative perceptions of teachers and the requirements to participate in the study were examined.

2.1Research design and data collection methods

Purposive sampling method was utilized to sample potential primary and secondary school mathematics teachers from 7 zones in Tanzania. The zones considered in this study are coastal, northern, lake, central, southern highlands, southern and western. Participants were selected based on specific standards, such as having at least 15 years of teaching experience in mathematics, having knowledge of COVID-19 pandemic from any reliable source(s) and being a primary school or secondary school mathematics teacher with a diploma or bachelor degree in mathematics education. The sample consists of 18 mathematics teachers, 8 from primary schools and 10 from secondary schools.

Semi-structured interviews were employed through smartphones to avoid the risk of contamination of the COVID-19. The interview had 10 questions formulated in English, translated in Kiswahili for easy understanding. Both the English and Kiswahili versions were given to mathematics education and language experts for clarity of items before interviewing the participants. The experts agreed to all the questions and a piloting study was conducted for validity, enthusiastic and reliability of the data. The mobile phone interviews took15 minutes to each interviewee.

For this study, the researcher interviewed 18 mathematics teachers from 12 schools across 7 zones. Table 1 shows participants' pseudonyms along with their school levels. The participants belong to urban, rural, private and public schools. The participants were asked to provide their views on the effects of COVID-19 pandemic to Standard 7 and Form 4 mathematics performance in 2020 national examinations, give strategies they put in place to assist these students to efficiently get prepared for their national examinations and explain how they thought they have achieved those strategies. Furthermore, participants were asked to provide recommendations to the Ministry of Education to ensure Standard 7 and Form 4 candidates are not threatened by COVID-19 pandemic or any other related pandemics in the future. Due to the tight schedule that participants had after schools re-opened, about 90 % of the interview data collection processes were completed on 15th December, 2020 after students sat for the national examinations. The results of Standard 7 and Form 4 were released on 23rd December, 2020 and 5th March 2021 respectively. This delayed the whole process of data analysis.

Table 1: Participants and schools

Pseudonym	Zone	School
Ashura	Coastal	Primary
Chande	Southern	
Kono Nyati	Central	
Shija Nyanzige	Lake	
Rwezaura	Western	
Sokoine	Northern	
Sarah	Lake	Secondary
Nyangombe		
Mariam	Southern	
Josephat	Northern	
Moringe		
Mashavu	Coastal	
Zawadi Ndugai	Central	
Nyaitoju	Western	
Suleiman	Southern highland	

The Standard 7 and Form 4 national examination results of 2019 and 2020 were also examined to see whether teachers' perceptions reflected the actual results. The results were collected from the online National Examination Council of Tanzania (NECTA) system, which is a government institution established by the Tanzanian parliamentary Act. No 21 of 1973 for the purpose of administering all national examinations and their results in Tanzania. The collected data include percentage pass marks in PSLE and CSEE mathematics examinations results for 210 primary schools and 210 secondary schools across 7 zones in Tanzania. The year 2019 and 2020 were preferred for performance comparison because there was a 3 months school closures in the year 2020 due to COVID-19 pandemic and therefore, it was important to see the difference in performance between these 2 consecutive years.

2.2 Ethical considerations

This research study considered honest and ethical standards of research by observing maximum confidentiality of the respondents' and their schools' identities. All participants were provided with informed consent form and volunteered their time for the interview. Participants were also well informed about the study, their involvement in the study, the objectives of the study and their right to continue or withdraw from the study at any time without being questioned. Pseudonyms were used in data reporting to protect the participants' identities and school names throughout the study.

2.3 Data Analysis

The analysis of semi-structured interview questions was performed using thematic analysis. The method is useful in analysing audio, written and verbal communication (Heish & Shannon, 2005). In this study the results from interviews were systematically transcribed, coded and relationship of words and meanings were analysed by the researcher and an independent researcher to evade biasness. The thematic analysis assist in identifying main patterns, themes and aspects found in the study as described by Bryman (2008). Thematic analysis is essential in analysing personal data on individual perceptions. Therefore, the method is relevant in analysing teachers' perceptions on the expected performance in mathematics national examination results for the year 2020 to Standard 7 and Form 4 students. The study identified 6 themes, which are elaborated in the findings.

3. Findings

This research explores teachers' perceptions on the effects of COVID-19 on mathematics performance to Standard 7 and Form 4. When the answers of the participants were scrutinised, 6 themes were emerged within the scope of the study in relation to CIPO conceptual framework. The themes and conceptual framework are summarised in Table 2.

Table2: Themes and conceptual framework

Conceptual framework (CIPO)	Theme	Teacher's name
Context	1. Exploring COVID-19 effects in mathematics performance	Ashura, Suleiman, Chande, Zawadi, Sarah, Mariam, Kono
	2. Suggestion and resources needs	Mariam, Shija, Nyati
Input	3. Improving students' performance in mathematics	Josephat, Mashavu
Process	4. Promoting strategies to assist students in national examinations	Rwezaura, Ndugai, Nyanzige, Sokoine
Output	5. General mathematics performance in previous years	Ashura, Chande, Kono, Shija, Rwezaura, Sokoine, Nyanzige, Nyati, Sarah, Nyangombe, Moringe
	6. Concerns about mathematics results	Ashura, Chande, Kono, Shija, Rwezaura, Sokoine, Nyanzige, Nyati, Sarah, Nyangombe, Moringe, Suleiman, Mariam, Zawadi, Ndugai, Josephat, Mashavu, Nyaitoju

The first lens in the CIPO conceptual framework is that of context, which involves teaching aids, teaching materials and the use of technological devices in the classroom. This framework relates to the first and second themes in Table 2. The subsequent quotes express various teachers' views on the effect of COVID-19 and teachers' suggestions to the Ministry of Education in improving the mathematics performance. Many teachers express lack of substantial teaching materials and teaching aids. Students had no enough contact hours to consult their teachers on the difficulties they encountered in their individual studying hours during and after school closures. They further explained how they thought COVID-19 could affect Standard 7 and Form 4 mathematics performance in 2020 academic year:

> **Interviewer**: what is your view on the effect of COVID-19 to Standard 7 and/or Form 4 mathematics performance in 2020 national examination?
> **Ashura**: in fact, the performance could be average due to lack of learning aids to students, especially technology devices during school closures. However, few students especially in urban schools might perform well because many had home schooling from their parents, relatives or tuition teachers throughout the period of school closures. On the other hand, students from rural schools might have very poor results because teachers are scarce and majority of their parents are illiterates. Therefore, they are expected to revise what they have just been taught before school closures which might not be the same case with students from urban schools.
> **Suleiman**: The Form 4 mathematics results might be highly affected this year (2020) due to the fact that academic year calendar is abruptly disturbed by the untimely 3 months school closures in the country. There might be high drop in the pass mark percentage.
> **Chande**: Standard 7 national examination results might be affected because students did not start early the continuous test in March, 2020 due to school closures, the effect started with non-administration end of mid-term tests. Students went home untested of what they learnt in the first 3 months of schooling. This could affect them psychologically and their preparation for the examination could also be affected. My concern is whether they learnt at home because majority of students in my zone are in government schools and coming from poor families and therefore it is very unlikely for them to have access in technology devices.
> **Zawadi**: normally students learn and study efficiently when they are able to consult their subject teachers, provided with the appropriate learning materials whenever they need in the school compound. Due to school closures, it was not easy for them to receive explanations from teachers when they faced difficulties during their individual study at home. I even wonder if they followed the educational programmes offered on TV and radio. Indeed, their school study timetable have been greatly affected because they could not participate in the classroom and also could not attend obligatory school preparations.

In agreeing with other teachers, Sarah, the head of mathematics department in secondary school, Mariam and Kono indicated their fear that there might be a massive failure in mathematics results in 2020 because majority of students had not completed the syllabus due to school closures, they also went home without mathematics textbooks, so they only revised topics that they covered in their exercise books.

In relation to the effect of COVID-19, Mariam, Shija and Nyati from southern, lake and central zones respectively thought that the Ministry of Education should put more efforts to ensure students are proceeding well in their preparations of national examinations.

> **Interviewer**: what do you think the Ministry of Education could have done better to ensure finalist students are not threatened by this pandemic?
>
> **Mariam**: in my view I think the Ministry of Education could often provide online workshops related to COVID-19 and education or any other pandemic to mathematics teachers to ensure that they are well aware of the disease and know how to effectively assist their students to sufficiently get prepared for their final examinations during the pandemic. They could reschedule the examination timetable to end of January 2021 to provide enough time for teachers and students to cover the syllabus. In our school we could not cover all mathematics topics in Form 4 and we fear on the 2020 national examination results.

Shija and Nyati also had a view that the effect of COVID-19 could negatively affect 2020 mathematics results to their students because many teachers in rural and urban schools struggled to complete the syllabus without considering students ability. They generally suggested that all teachers in the country should be motivated and encouraged in their daily responsibilities to ensure students are receiving adequate learning. Moreover, the government should employ more mathematics teachers and raise the monthly wages.

The second and third lens in the CIPO conceptual framework is that of input and process respectively. The input refers to knowledge level of students at the beginning and time consumption. The process involves initiatives of pedagogical approaches and knowledge gain to receive output. These frameworks narrate to the third and fourth themes in Table 2. When teachers were inquired how they expect to improve students' performance for 2020 academic year and how will they achieve their expectations, majority of them expressed various strategies put in place to assist their students to do better.

> **Interviewer**: The general national examination results for mathematics in Standard 7 and Form 4 has been improved for the last 3 years (2017, 2018, and 2019). With the risk that COVID-19 has postures; Do you think you could still be able to improve (do better) in mathematics performance this year (2020)?
>
> **Josephat:** I am positive that students in private schools will still perform better despite of school closures because their parents have online facilities to assist or support their children at home. However, many students are engaged in public schools. Though, we should understand the commitment of a student to learn in the absence of a teacher is a challenge. Very few students study independently without the involvement of a teacher and they perform well. As such we (teachers) strongly believe the results might be negatively affected despite the efforts we put in place to improve their performance. Our school collaborated with other secondary schools in Northern zone to put forward various strategies, but we all have similar feeling that students might not do well this year.
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> **Mashavu**: I think we might be able to maintain the good performance we had for the last 3 consecutive years, if we console our students and encourage them not to fear much on their studies due to COVID-19 pandemic. However, I cannot quantify the percentage improvement. I understand the fear is very much present. Since the school reopened in June, 2020, I managed to review all the topics we covered before the school closures and taught only topics that most of the questions are asked in the examination.

When asked about appropriate strategies they put in place to assist Standard 7 and/or Form 4 students to efficiently prepare for their national examinations, Rwezaura (the head of mathematics department in western zone), Ndugai and Sokione focused on interventions that they ponder should be put in place to ensure smooth preparation of examinations.

> **Interviewer**: What strategies did you put in place to assist Standard 7 and/or Form 4 students to efficiently prepare for their national examination?
>
> **Rwezaura**: students need to be prepared psychologically and we have to provide the best teaching. We have to adjust our teaching according to the time left before examination to retain our good results. We have planned for teachers to teach extra classes in the afternoon during the week and some would volunteer to teach during weekends to compensate the time students have stayed at home.

On the other hand, Ndugai explained strategies that she hopes would boost Form 4 students in examination performance.

> **Ndugai**: what we first did when our students resumed classes was to look at all the topics needed to be covered in Form 4. Then we provided a lot of classroom assignments and homework based on these topics. Students had a lot of work to do and we managed to compensate for the time lost for learning. Moreover, we continued with online learning

through whatsapp and zoom three times per week. We also have extra classes on the weekends. However, we realised some of the students are not participating in online learning.

Nyanzige: our department prepared various strategies to ensure our Standard 7 perform well in their national examinations. The first strategy was to encourage students that they are capable to do well in their examinations. Various techniques were provided to students to be able to answer questions. Most of the time mathematics lessons were conducted through presentations, students were divided into small groups and were given questions to discuss in their groups and present in the classroom. Students were provided breakfast and lunch at school to ensure that they are not hungry. We also introduced mathematics morning preparations and students were asked to attend classes on Saturdays.

Sokoine: we have introduced a mathematics club where female and male students compete in various mathematics questions. We realised that gender competition helped our students to work hard and challenge one another in mathematics lesson. We also have introduced frequent mathematics tests and quizzes that help our students to perform well.

The fourth idea in the CIPO conceptual framework is that of output, which contains the results, including continuous test and national examination results. This framework relates to the fifth and sixth themes in Table 2. The results of interviews conducted in November-December, 2020 to head teachers across 7 zones indicate that on average the general mathematics performance in their schools in 2019 was grade A in primary schools and 75% in secondary schools.

All the interviews were conducted before the national examinations. Now that the results have been released, it was significant to contrast what was said during the interview with the actual results. Table 3 shows the NECTA mathematics results of 2019 and 2020 to 210 secondary schools from 7 zones across the country. In general students performed better in 2019 compared to 2020. Apart from the Lake and Northern zones, which have an increment of 6% and 3% average pass rate in 2020 respectively, other zones have dropped in their performance as perceived by many teachers in the interview. Coastal and Western zones showed a slightly drop by 1% in 2020 compared to 2019. Mathematics pass rates for Central and Southern Highland zones have dropped by 5% in 2020. The mathematics performance in Southern zone seems not to be affected by the 3 months school closures in 2020. The percentage pass rates for 2019 and 2020 was similar (46%). It can also be observed that there is a relatively high number of students sat for the Form 4 mathematics national examination in 2020 compared to 2019. However, this does not reflect on the high pass rates in 2020.

Table 3: NECTA Mathematics results of 210 secondary schools across 7 zones

Year	Number of students	Zone	Average pass rate (%)	Drop/Increment
2019 2020	2425 2542	Central	52 47	Drop (5%)
2019 2020	3718 4060	Coastal	73 72	Drop (1%)
2019 2020	2793 2787	Lake	55 61	Increment (6%)
2019 2020	3349 3093	Northern	62 65	Increment (3%)
2019 2020	3473 3144	Southern Highland	64 61	Drop (5%)
2019 2020	2188 2261	Southern	46 46	Constant
2019 2020	2500 2853	Western	61 60	Drop (1%)

The NECTA results for mathematics and science subjects in 210 primary schools across 7 zones in academic year 2020 has dropped by 0.65 % and 0.33% respectively compared to 2019 (Mhagama, 2020). However, there was a slightly pass rate increment in mathematics (0.3%) to Lake zone in 2020 compared to 2019.

4. Discussion

The findings of this research mainly indicated that COVID-19 pandemic could have a negative impact on mathematics examination results for 2020 academic year. One of the reasons for this anticipated trend as mentioned by the participants in the interview are loss of contact hours due to school closures for primary and secondary schools. Uscher-Pines et al. (2020) described that during influenza pandemic, social distancing, specifically home schooling highly slow down the spread of virus in primary and secondary schools. Ash (2014) supported that distance learning is crucial on influenza pandemic. However, appropriate measures should be

considered to ensure students participation in e-learning. In this study, participants stated that school closures during COVID-19 pandemic could reduce the spread of virus. However, they were concerned that majority of students had not completed the syllabus and they stayed home for 3 months without mathematics textbooks. Many of these students lacked sufficient learning aids and therefore, revised topics covered in their exercise books. Some participants insisted that few students especially in urban schools could perform well because they had home schooling from their parents, relatives or tuition teachers throughout the period of school closures. On the other hand many students from rural schools could perform poor because home schooling is scarce. Therefore, they are expected to revise what they have just taught before school closures which might not be the same case with students from the urban schools.

Anastasiades et al (2010) and Perienen (2020) emphasised on the use of technology devises, such as television, radio, smartphones, etc. during influenza crisis in primary schools and the engagement of teachers in e-learning pedagogy to support students' mathematical skills, thoughts and learning. In this study, participants were concerned on teachers' involvement on e-learning teaching process. Their capacity of conducting e-learning, level of their knowledge and skills in the use of technology, their access to technology and the use of language of instruction (English in secondary schools and English medium primary schools) online was a challenge. Unreliable electricity supply particularly in rural homes and unstable internet connection were among major issues hinders teachers to teach and support their students at home. Participants were also concerned if their students followed the educational programmes offered on televisions and different radio stations at home. One of the participant insisted that many students in particular from rural areas could not participate in any form of e-learning during the school closures. The shifting of teaching format from tradition to online was also observed to increase the level of strain and worry among teachers in Tanzania schools as it was in various parts of the world (UNESCO, 2020)

The Ministry of Education and NECTA did not provide enough time for the examination preparations as was viewed by participants that the national examination timetable could have been rescheduled to end of January 2021 to provide enough time for teachers to cover the syllabus as many of the schools could not cover all the topics in Form 4 and they feared on the results. Therefore, the limited period within which students were supposed to learn and prepare themselves for examinations could probably affect the performance.

Participants stated that mathematics results are highly to be affected in terms of students' performance in the Standard 7 and Form 4 national examinations and majority of the interviewed teachers anticipate a large drop in the performance of Form 4 students in 2020 academic year. However, teachers stepped up on their preparations and attentiveness in covering the negative effects of COVID-19 pandemic by preparing students psychologically that COVID-19 would not affect their examination results and enhancing various pedagogical strategies in ensuring that Standard 7 and Form 4 are well prepared for the examinations. Despite that teachers perceptions were revealed, but the results of national examination for 2020 academic year show a drop of less than 6% in mathematics to Form 4 and only 0.65% to Standard 7 compared to 2019.

Many subjects in primary and secondary schools were affected by COVID-19 pandemic. However, mathematics could be the utmost affected subject probably due to its pedagogical nature. Mathematics teaching requires physical interaction between a teacher and students to enhancing mathematical concepts, skills and thinking strategies that are useful in day-to-day life and support learning across the curriculum (Mhagama, 2020). Mathematics teachers utmost prefer traditional teaching in the classroom in order to assist students make sense of the numbers, patterns, shapes they see in mathematics textbooks and be able to relate in the world around them. In order for all these to be achieved successfully, the teacher must be physically present in the classroom to control, manage and closely monitor students' attention during the lesson. In the classroom, students are practically taught different ways of handling numerals in a progressively digital world, which makes an essential impact to their intellectual development, development as successful learners and promoting learning environment.

5.Conclusion and Future work

This research captured mathematics teachers teaching experiences to Standard 7 and Form 4 students in relation to the current knowledge of COVID-19 pandemic in Tanzania. The study has established effect of COVID-19 to Standard 7 and Form 4 mathematics performance for the year 2020 national examinations. It is still not clear how long the pandemic will exist in the country and all over the world. However, there is hope that Tanzanian teachers with support of the Ministry of Education will innovate various intervention actions that will help all schools in the country to learn smoothly during COVID-19 or any other related pandemic in future. The future of our children lies in effective education.

The findings of the interviews and online NECTA examination results expose various new lines of similar research. It is hoped that there is still more to investigate on the possible impact of COVID-19 in education in general at national level. The findings of this study could also be validated by other researchers using mixed approach method in data collection to provide a deeper understanding of the impact of this pandemic on

education and training teachers how to overcome the effect of the pandemics of such kinds in the future. Other researchers could further conduct studies on the students' perceptions of the effect of COVID-19.

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