Impact of reducing contact learning hours during covid-19 on learners' attitude and achievement in mathematics. A case of three selected secondary schools in Lusaka District, Zambia.

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ABSTRACT

This study investigated the impact of reduced contact learning hours during COVID-19 on learners' attitude and achievement in mathematics. The study involved 105 students from three selected secondary school in Lusaka district of Lusaka province in Zambia. The students were randomly selected and three secondary schools were purposively selected for this study. In addition, three (3) administrators and fifteen mathematics teachers also participated in the study. A descriptive survey research design was adopted and data was collected using an achievement test and a questionnaire. Descriptive and inferential statistics were used to analyse quantitative data while themes were used for qualitative data collected through semi-structured interviews. The findings from past mathematics mock examinations revealed a significant difference in the mean scores between the pre COVID-19 period (M = 59.19; SD = 19.205) and during COVID-19 period (M = 49.99; SD = 13.050), (t – statistic = 3.870, p – value = 0.003 < 0.05). The results and findings of this study revealed that reducing contact learning hours had a negative impact on students' attitude and achievement towards mathematics. In the pre COVID-19 period students expressed a positive attitude towards mathematics and high achievement was observed in mathematics compared to the period during COVID-19 pandemic. Based on the findings of this study there is need to increase contact learning hours when teaching mathematics in order to mitigate the impact of the pandemic on students' learning.

Key words: Achievement, attitude, COVID-19, mathematics concept, reducing contact learning hours, secondary School.

1.0 INTRODUCTION

The outbreak of the novel coronavirus disease 2019 (COVID-19) in the world has created a number of disruptions in nearly all areas of human life. The education sector has not been an exception to the disruption. Educational institutions worldwide have undergone challenges brought about by the COVID-19 outbreak (World Bank, 2020). Researchers have revealed that in more than 100 countries worldwide schools, colleges and universities were closed as a way of containing the COVID – 19 pandemic (Onyema et al., 2020). This, the researchers argue left more than one billion learners out of school.

Kaffenberger (2020) points out that closures created irregularities in post-COVID-19 learning scenarios. There were learning loses revealed. The researcher estimated that learning levels would be lower due to reduced hours. For instance, the study argued that there

was a reduction of about one third in learning time (i.e. about one term outside of school per year). Dawadi et al. (2020) agree with other researchers and note that the performance of children who are recently out of school was lower than of children who continued to attend school. Furthermore, the foundational mathematical skills gap between these two groups widened with age. Researchers suggest that school closures prompted by COVID-19, which put most children out of school for extended periods in 2020, may likewise be having immediate adverse effects on children's learning and their acquisition of foundational skills.

In Vietnam, Tran et al. (2020), conducted a study that focused on sustainable learning during school suspension in Hanoi. The aim of this study was to investigate students' manners of studying at home during school suspension time as a result of COVID-19. The findings showed different learning habits of students with different socio-economic status and occupational aspirations during the diseases' outbreak. It also revealed that public schools were more affected by the pandemic due to poor infrastructure and inaccessibility of internet services. The study can be used as a foundation for future investigations on how to elevate students learning habits towards Sustainable Development Goal 4 (SDG4). Baker (2013), stated that when school closes for ten days or more it reduces the academic achievement with the biggest effect in mathematics. Onyema et al. (2020), researched on the impact of coronavirus pandemic on education. The finding of the study showed that COVID-19 has adverse effects on education including learning disruptions and decreased access to education. It also revealed that many educators and students relied on technology to ensure continued learning online during coronavirus pandemic. However, online education was hindered by poor infrastructures including, network, electricity, inaccessibility and unavailability issues and poor digital skills.

In Zambia, Government through the Ministry of Health announced on 17th March, 2020 the closure of all schools, colleges and universities in an attempt to control the spread of the COVID-19. The closures affected more than 4 million students in different ways (World Vision, 2020). Schools, colleges and universities remained closed until 1st June, 2020 for examination classes while for the rest of the students up until 11th September, 2020. During the period of closure, government had to keep the students engaged with school work through online learning. In order to accommodate all the subjects, educational authorities reduced the learning hours for many subjects including mathematics.

Online learning came with its own challenges. For instance it was not possible for all the students to have access to online platforms (Hapompwe et al., 2020). This could have been caused by other factors such as location of such students. Rural areas could not conduct online classes due to lack of facilities that support such learning e.g. power and internet connectivity. The urban students had also their share of challenges. One of the challenges was that the educational authorities had reduced the number of contact hours for all the subjects.

Researchers have argued that effectiveness of instructional time has a positive impact on the students' achievement towards all subjects that includes mathematics (Hanushek, 2015; Lavy, 2015). Therefore, instructional time is a period of time during which a school is responsible for a student and a student is required or expected to be actively engaged in some learning activities (www.lawinsider.com). Early in 2014, Scheerens was aware of the importance of instructional time and added that allocation of time to specific subjects varies from country to country. However, reduced contact learning hours was seen to be disadvantageous to both the students and teachers in that there was reduced interpersonal contact. This it was argued could lead to having students that were less externally motivated to engage in learning activities.   This has been observed from studies conducted in other countries. For instance, in a study conducted in Maryland it was revealed that snowfall led to students being at school for few days which consequently resulted in low students' performance in reading and mathematics (Marcotte & Hemelt, 2008). On the other hand, increasing instructional hours leads to high performance. This was confirmed by Lavy (2015) in his study and noted that an additional hour per week over the school year in the

main subjects raises test scores by around 6% of a standard deviation. Hence, knowing the impact of reduced learning hours on students' attitude and achievement in mathematics in a Zambian context is a study of significant value to mathematics education. It is important in that it may help find appropriate solutions of alleviating the problem caused by COVID - 19.

1.1 Theoretical/Conceptual framework

The current study adopts Albert Bandura's (1986) Social learning theory or social cognitive theory. The theory focuses on what people learn from observing, modelling, imitating the behaviors, attitudes and interacting with other people. Social learning theory focus on how both environmental and cognitive factors interact to influence human learning and behavior. Observational learning is a major component of Bandura's social learning theory. In his theory, he emphasized on the importance of four conditions necessary in any form of observing and modeling behavior. The four conditions are attention, retention, reproduction and motivation. Each of the four components is well articulated in his theory. For instance, he argues that attention is necessary for learning since students cannot learn if they are not focused on the task at hand. If they see something different in some way, they are more likely to pay attention. Social cognitive theory further asserts that learning occurs in a social context with a dynamic and reciprocal interaction of the person, environment, and behavior. The interaction, therefore should not only be confined to the classroom but even outside the classroom. This is where online learning comes in. students can learn in different environment contexts other than the classroom.

1.2 Purpose of the Study

The purpose of the study was to investigate the impact of reducing contact learning hours during COVID-19 on learner's attitude and achievement toward Mathematics in three selected secondary schools of Lusaka district, in Zambia. Thus, the study examined the attitude of learners and their achievement scores in past mathematics mock examination. The study was guided by two broad research questions:

- What is the impact of reduced contact learning hours on learners' attitude and achievement towards mathematics in three selected secondary schools in Lusaka district in Zambia?
- What is the teachers' attitude towards teaching mathematics with the reduced contact learning hours in three selected secondary schools in Lusaka district in Zambia?

2.0 METHOD

2.1 Research Design

The study was a descriptive survey designed to assess the impact of reduced contact learning hours during COVID-19 on learners' attitude and achievement towards mathematics in three selected secondary schools of Lusaka District in Zambia. Descriptive design was a strategy appropriate for obtaining the exact information concerning the status of a phenomenon.

2.2 Research Participants

Three classes were randomly selected from different secondary schools (2 single sex schools and one mixed school) for the study. A Grade12 class with 35 learners from a boys' secondary school, a Grade 12 class with 35 learners from a girls' secondary school and a Grade 12 class with 35 learners (19 male and 16 female) from a mixed secondary (co-education) school were purposively selected. All the three classes took Mathematics 4024. The average age of the participants was 17 years. The total number of the sample size of the participants was 105 Grade 12 students, three (3) school Administrators' and fifteen (15) mathematics teachers from the selected secondary schools. The study comprised a total of 123 participants from three selected secondary schools in the District.

2.3 Research Instruments

The instruments employed in this study were the 5 points Likert scale instrument, interview schedule and mock examination. The questionnaire was developed by the researcher. The instrument has 24 items whose responses are indicated in a 5 point Likert scale ranging from 1 representing strongly disagreed to 5 representing strongly agreed. The questionnaire and interview schedule were used in this study for the purpose of measuring attitude. The 2019 mock examination results was used to assess the students achievement in mathematics in the pre COVID-19 period and 2020 mock examination results were used to assess students 'achievement in mathematics during COVID-19 pandemic. An interview guide of open-ended questions was used to collect detailed information from fifteen selected students from three selected secondary schools to determine their attitudes towards mathematics in the pre COVID-19 and during COVID-19 period.

2.4 Reliability of the Instruments

The reliability of the instruments was determined using Cronbach's Alpha through the SPSS version 16 software. According to Plowright (2011), a reliability of at least 0.5 is normally accepted as a measure of reliability for the instruments. A Cronbach's Alphas of 0.630 was reported for the sample of 105 grade 12 students. Therefore, the Students Attitude Questionnaire was considered reliable and appropriate to collect the relevant data to answer the research questions for the current study. The reliability of the past mock examination results and Attitude Questionnaire were determined using the test-retest method of one week interval. The scores they had obtained from the previous mock examination were correlated. The pilot study of the Attitude Questionnaire was applied to 45 grade 12 students of different selected secondary schools in Lusaka District.

2.5 Research Procedure

Since the achievement results of the participants were obtained from past mock examination results, only the Attitude questionnaire was administered to the participants in all the three schools. The participants were allowed to answer or complete the instrument administered to them within the time allocated. All the participants completed the instrument as instructed. Learners completed all items in the questionnaire by indicating their honest response with a Tick (√) in the appropriate column corresponding the key provided: 1 = strongly disagree,   2 = disagree,   3 = undecided,   4 = agree,   5 = strongly agree.

3.0 RESULTS AND FINDINGS

The results of analyzing the data set obtained are presented starting with those for attitude and followed by those for achievement. The questionnaire data and Achievement scores were analyzed for trends using the SPSS version 16.

3.1. Learners' attitude towards mathematics during pre COVID-19

The attitude questionnaire was administered to the learners in order to assess learners' attitude towards mathematics during pre COVID - 19. The results of analyzing the learners' attitude towards mathematics during pre COVID-19 are shown in Table 3.1.

Table 3.1: Responses of the learners during pre COVID -19 period (n = 105)

s/n	Statements	% Rating				
		SD	D	U	A	SA

1	I am one who enjoys learning mathematics.	5.7	17.1	5.7	39.1	32.4
2	I enjoy asking questions and participating fully in mathematics lessons.	7.6	17.1	4.8	33.3	37.1
3	I am interested in learning and want to learn more in mathematics lessons.	4.8	1.9	3.8	38.1	51.4
4	I find learning mathematics very simple and enjoyable.	4.8	6.7	10.5	44.8	33.3
5	I like learning mathematics lessons and I look forward to learn more.	3.8	11.4	7.6	37.2	40.0
6	I spend lots of time to practice mathematics or work on mathematics assignments	8.6	10.5	9.5	40.0	31.4
7	I understand topics in mathematics easily.	7.6	11.4	9.5	45.8	25.7
8	I feel confident in my abilities to solve mathematics questions	5.7	13.3	10.5	52.4	18.1
9	I am interested and willing to acquire further knowledge of mathematics.	1.9	5.7	2.9	30.5	59.0
10	I enjoy learning mathematics because it helps develop my mind and helps me think more clearly in general.	3.8	4.8	7.6	37.4	46.4
11	I might consider taking mathematics for my future career.	9.5	13.3	10.5	27.6	39.1

The result of the study in Table 4.1 shows respondents' attitudes toward mathematics during pre COVID -19 period. Findings in Table 4.1 indicate that 71.5% of respondents were in agreement to items 1"I am one who enjoys learning mathematics''22.8% of respondents were in disagreements to the statement while 5.7% undecided.

Generally, the analysis of responses in the pre COVID-19 period showed that over 75% of the students had a positive attitude towards learning mathematics. For example the statement "I find learning mathematics very simple and enjoyable'' and the learners responses were given as follows. Of the students responding (n = 105), those that strongly agreed or agreed to the statement stood at (33.3%) and (44.8%) respectively and when put together gives a total of (78.1%) of all those who said that they enjoyed learning mathematics, (10.5%) was undecided, (4.8%) and (8.6%) of the learners strongly disagreed and disagreed to the statements respectively.

For example, on item 8 "I like learning mathematics lessons and I look forward to learn more" the students responses for the pre COVID-19 were given as follows. Those that strongly agreed or agreed to the statement stood at (52.4%) and (18.1%) respectively and when put together gives a total of (70.4%) of all those who said that they like learning mathematics, 7.6% were undecided, (5.7%) and (13.3%) of the students strongly disagreed and disagreed to the statement respectively.

The overall results on the research questionnaire indicate that learners expressed a more positive attitude towards mathematics during pre COVID-19 period because of enough contact learning hours. Most (77.78%) of the respondents liked, felt satisfied and showed positive attitude towards mathematics with enough contact learning hours.

3.2. Learners' attitude towards mathematics during COVID-19

The attitude questionnaire was administered to the learners during COVID -19 in order to assess whether there was any change in learners' attitude towards mathematics. The results of analyzing the learners' attitude towards mathematics during COVID-19 are shown in Table 3.2.

Table 3.2: Responses of the learners during COVID-19 (n = 105)

s/n	Statement	% Rating				
		SD	D	U	A	SA
1	I understand topics in mathematics easily during covid-19 period with few periods at school.	33.3	42.9	4.8	11.4	7.6
2	I learn mathematics well when we have few period at school during covid-19. (i.e. Three periods per week.)	28.6	40.0	10.5	13.3	7.6
3	I am enjoying learning mathematics using e-learning platforms such as Edu TV and WhatsApp during covid-19	34.3	27.6	8.6	16.2	13.3
	I am not interested and willing to acquire further knowledge of mathematics with less contact period during COVID-19.	2.9	23.8	14.3	35.2	23.8
5	I become disinterested whenever it is time for mathematics lesson during COVID-19.	6.6	4.8	12.4	41.0	35.2
6	Mathematics is interesting especially now with less period at school during COVID-19.	30.5	38.1	12.4	13.3	5.7
7	It is stressful when I am studying mathematics alone during covid-19 with less period at school.	15.2	17.1	11.5	29.5	26.7
8	I enjoy asking questions and participating fully in mathematics lessons especially now with less periods.	18.1	32.4	12.4	21.9	15.2
9	When I come across mathematics questions that I do not understand, I still try to learn them during COVID-19.	35.2	17.2	7.6	18.1	21.9
10	I am interested in learning mathematics and want to learn more with less contact hours during COVID-19.	26.7	34.3	7.6	17.1	14.3
11	I am able to solve mathematics without my mathematics teacher's help with less difficult during covid-19 pandemic.	26.7	39.0	9.5	16.2	8.6

The students' responses to the attitude questionnaire had changed modestly from pre COVID-19 period to the COVID-19 period. The result of the study indicate that 10.5 % of respondents were in agreement to item 2 "I learn mathematics well when we have few period at school,''68.6 % of respondents were in disagreement to the statement while 10.5% were undecided. The high percentage (68.6%) showed that there was a negative attitude towards mathematics among learners. 76.2% of the participants indicated that they did not understand topics in mathematics easily while 19.0% agreed that they understood topics in mathematics and 4.8% were undecided.

The results indicated that 34.3% of the respondents strongly disagreed while 27.6% of the respondents disagreed to item "I am enjoying learning mathematics using e-Learning platforms such as Edu TV and WhatsApp during COVID-19" This translate to 61.9% of the respondents saying that they did not enjoy learning mathematics using Edu TV and WhatsApp during COVID-19. Only a small percentage (29.5%) agreed to the statement while 8.6 % were undecided. A good number (76.2 %) of the respondents indicated that they became disinterested whenever it was time for mathematics lessons while 11.4 % were interested and 12.4 % were not sure whether they were interested or not to learn whenever it was time for mathematics lessons. Results show that 63.8% of respondents saying that

they do not make any attempts at learning mathematics questions they do not understand. Only a small percentage (28.6%) agree to the statement while 7.6% were undecided.

It is possible that this negative impact on achievement could be a results of the negative attitudes exhibited during COVID-19 pandemic. This is evident in post-intervention interviews with students. Three excerpts of interviews (written without editing) suffice to illustrate the point:

Excerpt 1:

> No it is not good, I think now mathematics is difficulty because we cannot spend
>
> enough time at School, form the new system I am not accustomed to. The lessons
>
> are not taught the way I am not used to. This has reduces my productivity and cause
>
> my lose concentration at class during mathematics.(Student 3)

Excerpt 2:

> Hah mathematics is difficult now with few hours, some of mathematics topics
>
> are difficult to understand, some problems arise from the fact that our mathematics
>
> Teacher covers the topics quickly due to reduced contact learning hours now.
>
> (Student 6)

Excerpt 3:

> From my experience I believe that the home work that they provide is the key to
>
> keep pupils actively engaged. However, homework is not the best method for assessing
>
> the students because it does not give a true picture. The attitude toward mathematics
>
> during the period of COVID -19 has been bad. Reason the belief, thoughts,
>
> feelings and past experience together with lack of teachers instructions especially
>
> when you give them exercise for making (Teacher 3).

Excerpt 4:

> Students and parents / guardians are in position of mobile devices or smartphone,
>
> that's makes advantageous in helping the teachers and students engage in teaching
>
> and self-regulated learning. In addition to that, majority of students are enjoy the
>
> comfort of the home while learning important concepts in mathematics. The launch
>
> of television education channel dedication to carry educational context in form of
>
> lessons in various subject area. Although it is not as good as having long hours of
>
> face-to-face, at school it is good for me and am convinced students are learning
>
> well without any challenge (School administrator 2).

3.3. Students' achievement in mathematics

For the pre COVID-19 period, past mock examination results for mathematics was used to determine achievement levels of students and during COVID-19 pandemics past mock examination results were compared to determine the achievement for students.

Table 3.3 students' achievement results

Group	N	Mean	Std. Deviation	Std. Error Mean	t	df	Sig. (2-tailed)
Pre covid-19	105	59.19	19.205	1.867	3.870	104	0.003
During covid-19	105	49.99	13.050	1.271			

The pre COVID-19 period (PC19) had 105 participants with a mean of 59.19 and standard deviation of 19.21 while during COVID-19 period (DC19) had 105 participants with a mean of 49.99 and standard deviation of 13.05. The mean difference between the two groups was 9.20. The comparison between the pre COVID-19 and during COVID-19 pandemic showed that there was a marked difference in students' achievement in favor of the pre COVID-19 period that had a higher mean. To determine the statistical significance of the mean difference, in order to affirm the impact of COVID-19 pandemic that included reference to reduced contact learning hours, pre COVID-19 and during COVID-19 pandemic scores were compared using a t-statistic at the significance level of 0.05. That is t – statistic 3.870, p- value = $0.003 < 0.05$.

4.0 DISCUSSION AND CONCLUSION

A substantial body of literature documents that reduced contact learning hours at secondary schools has the ability to foster negative attitude and low achievement towards mathematics among student (Azevedo et al., 2020; Lavy, 2015; Hebebci et al., 2019; Upoalkpajor Bawa & Upoalkpajor, 2020). This study was a descriptive survey research and the major objective of this study was to assess the effects of corona virus on education and suggest strategies to cushion the long time effects of COVID-19 pandemic outbreak on the Zambia education system. A student can develop a positive attitude towards mathematics because he or she learns to associate positive experience with mathematics (Yara, 2009). Following the evidence from students' responses and attitude questionnaire, it has been revealed that students became less attentive in class and also inactively involved in classroom activities when contact learning hours was reduced. The reduction in learning hours could have been contributed to the unsatisfactory achievement levels.

This study has demonstrated that reducing contact learning hours is not beneficial for mathematics learning. Furthermore, students showed a decline in concept development and demonstrated negative attitude towards mathematics that reflects a lack of students' values, self- confidence, and satisfaction (Aucejo et al. 2020). In this study, the slightly reduced contact learning hours at secondary school results in students being demotivated and having lower attitudes necessary for sustained productive learning of mathematics. Evidently, from the students' responses it was established that students develop a negative attitude towards mathematics. This implied that learning was taking place under unfavourable conditions for effective engagement with the subject matter. Furthermore, the findings of the study showed that the impact of changes in contact learning hours during COVID-19 pandemic is greater for disadvantaged

students than for advantaged students. This is as a result of having fewer family resources and lack of access to on line learning resources to offset learning losses.

In conclusion, this study was limited to three secondary schools in Lusaka district. Therefore, its results and findings cannot be generalized to all the schools in the district or in the country. That being the case, other researchers may carry out similar studies to assess the impact in other places. In addition, studies may be conducted to i) examine financing of secondary schools by the Government of the Republic of Zambia during COVID-19 pandemic, ii) compare the learning losses during COVID – 19 of grant aided secondary schools to public secondary schools.

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