Teaching and Learning Eighth Grade Mathematics Integers Using Video Clips: An Action Research

MANI WANGDI

Abstract

This study investigated the effectiveness of video clips in enhancing the learning achievement of eighth-grade students in mathematics at Sonamthang Lower Secondary School. An experimental method using a pre-test and post-test was employed as the research design. The experimental group comprised 28 eighth-grade students. Data were analysed in two parts: test score analysis and students' opinion analysis. Paired sample t-test and descriptive statistics were computed using Google Sheets Add-on XLMiner Analysis ToolPak to determine the differences in the pre-test and post-test scores. The results revealed that the pre-test mean was statistically insignificant, while the post-test mean showed a significant difference between the experimental and control group. Therefore, the study concludes that the use of video clips enhances students' test scores and also increases their ability to solve higher-order thinking questions. Further, students' opinion analysis indicated a preference for learning mathematics using video clips. As such, it was recommended that teachers use video clips as an instructional tool to enhance students' academic achievement and foster motivation.

Keywords: Video clips, higher-order thinking, COVID-19, mathematics, learning achievement

Introduction

With the onset of the COVID-19 pandemic in March 2020, all the schools and institutions across the country were closed, and teaching-learning shifted online through Google Classroom. Sonamthang Lower Secondary School (SLSS) in Samtse was no exception. While most students owned smartphones and were competent enough to use Google Classroom (GC), the online classes proved to be ineffective. As a result, their academic performance in grade eight for that year was relatively low, especially in Mathematics. In 2020, only 6.7% of the students scored between 80% and 100% in the annual examination compared to 27.6% in 2019 in the same range.

The assessment of mathematics performance of grade eight students of SLSS in the annual examination of 2018 and 2019 based on the four levels — beginning (1-19.9), approaching (20-49.9), meeting (50-79.9), and exceeding (80-100) were also not very encouraging (Bhutan Council for School Examinations & Assessment [BCSEA], 2020). For instance, the analysis showed that, in 2018, 48.8% of students were at the approaching level, while in 2019, the percentage decreased to 42.6%. This means only 2.7% and 4.7% of students in 2018 and 2019, respectively, achieved the exceeding level. This mediocre performance added to the growing concern about the decline in mathematics academic achievements at SLSS. PISA-D (PISA for Development) findings reported poor performance in mathematics across the country and recommended mathematics teachers to use diverse strategies and focus on student-centred learning (BCSEA, 2019). Despite this recommendation, the quality of learning remained the same, although access to education has expanded significantly in recent years (National Education Assessment Framework, 2019). Therefore, it is imperative for teachers to address this growing concern by improving their pedagogical practices.

SLSS has three Information and Communications Technology (ICT) laboratories and most of its classrooms are equipped with smart high-definition television screens. Students visit ICT laboratories frequently to gather resources for their project works and assignments. Most of the time, students watch educational YouTube videos, which suggests that YouTube videos are popular among SLSS students. Further, internet-based learning is on the rise with video clips being highly influential. Considering this, it is appropriate to use video clips to make teaching-learning more meaningful and current. Past studies (Namgyal & Kongmanus, 2018; Kolikant & Broza, 2010) on raising students' mathematics learning have demonstrated that using video clips has been effective. Effective teaching is important to bring out the best in students. However, rather than using hands-on materials, most teachers relied on textbooks and manuals as the primary resources for teaching (BCSEA, 2015). Video clips can be an effective tool for teachers to engage students so that students gain a deeper understanding of the concepts. However, the effectiveness of video lessons at SLSS was never examined. This encouraged me to explore video clips as a teaching tool drawing on Graham and Berry's (1992) claim that video clips help concretise abstract concepts by showing examples of real situations not readily available in the classroom.

The 2017 to 2020 result analysis record of SLSS maintained by the exam committee showed that the mean mark for mathematics (excluding the continuous assessment marks) remained below 51.47 highlighting a relatively poor performance. The test item analyses showed that students performed relatively low on the integer test items involving word problems. Therefore, the idea of investigating the effectiveness of video clips on learning mathematics especially, integers at SLSS was conceived. To guide this enquiry, the following question was posed: How does the use of video clips influence students' ability to carry out addition and subtraction of integers in grade 8 mathematics in Sonamthang Lower Secondary School?

Critical Friend

The researcher discussed the preliminary ideas of this study with Dr. Tshewang Rabgay who was then pursuing a PhD on Action Research at Monash University, Australia. To improve the researchers' educational practices, he agreed to be the learning partner. Dr. Tshewang was deeply interested in this study and provided honest and critical feedback. He offered an alternative interpretation of the data and sought plausible explanations. As a facilitator, guide, and supporter, Dr. Tshewang played a pivotal role in supporting the researcher until the study's completion.

Literature Review

This study was based on constructivist learning theory promulgated by Vygotsky — that learners construct knowledge rather than just passively taking in information. The goal of teaching is to provide students with experiences that facilitate the construction of knowledge. Constructivist learning theory argues that learning is a social process where students and teachers work together to build knowledge. According to Varul (2013), "constructivism is student-centred" (p. 1316) where students construct their understanding and knowledge of the world based on their unique experiences. As per the report on the state of video in education by Kaltura (2018), a New York-based software company founded in 2006, videos change the role of lecturers to facilitators of active learning. The report also revealed that out of 1,500 teachers, an astounding 92% believed that incorporating video clips enhances the learning experience.

Similarly, research conducted in the 1950s described videos as expensive technology rarely used in classroom teaching. However, in modern times, as technology becomes less expensive and readily available, videos have become an attractive tool in instructional practices. As videos deal

with more than one meaning simultaneously, and caters to the senses of sight and sound (Ni et al., 2019), Cruse (2006) and Donkor (2011) described videos as an effective educational tool. Besides, Lalian (2019) found that the incorporation of videos in mathematics education had more emphasis on cognitive aspects than affective aspects. Interestingly, researchers also discovered that instructional videos increased learners' interest in the subject, as well as motivation to learn as they provided visual aid and demonstrated the concepts using concrete examples (Bravo et al., 2011; Gaudin & Chalies, 2015; Park & Jung, 2016; Varul 2013). Further, Kolb (2015) who wrote extensively in favour of experiential learning, believed learning does not occur when a learner reads, writes, talks, and hears about the realities of what is studied. In contrast, he proclaimed that learning occurs when the learner is directly in contact with the realities of what is studied. In traditional classroom teaching, the researcher observed that learners only read, write, talk, and hear the realities of what is studied. However, the use of video clips offers the dual advantages of learning through sight and hearing. It offers learners the opportunity to connect their experiences with the realities of what students studied through sight and hearing.

Researchers such as Cruse (2006), Fujioka (2017), MacLean (2017), Sharma (2018), Sykes and Emma (2012), and Wijnker (2018) supported the use of video clips as a learning tool and provided a variety of strategies to use them. Some of the common ones included the following strategies:

- Setting goals before watching the video clip to keep students accountable and attentive;
- Giving students time to reflect by pausing the video clip (allowing students to take notes and solve problems);
- Refraining students from doing tasks like writing notes or answering questions while they watch;
- Avoiding the use of content-overloaded video clips; and
- Screening videos shorter than 6 minutes or including teacher intervention or student collaboration if the video exceeds 6 minutes.

The above strategies were adopted during the intervention. Video clips enable students to delve deeper into the content and build a firm foundation for learning to provide a pleasant learning experience. As we search for solutions for students' poor performances in mathematics, using video clips as an instructional tool can be an alternative strategy to raise their learning achievement. Therefore, this study examined if video clips can improve students' mathematics achievement and also determine if they can be used as a learning tool to tap into the enthusiasm of students.

Methods

The researcher adopted an experimental method using a pre-test and post-test to investigate the effectiveness of video clips on students' performance in mathematics. The Control Group (CG) and Experimental Group (EG) were chosen based on students' performances in the mid-term examination. The class with more failures in the mathematics examination were chosen as the EG, and the class with fewer failures as the CG. Pre-test and post-test were administered to both CG and EG while the researcher collected the opinions of using video clips in the classroom from the EG via a survey questionnaire based on four levels of opinions namely 1). Strongly Disagree, 2). Somewhat Disagree, 3). Somewhat Agree, and 4). Strongly Agree. Data were analysed using the Google Sheets add-on XLMiner Analysis ToolPak developed by Frontline Systems Incorporated.

Participants

Two sections of grade eight (8 D and 8 B) were selected for the study since the researcher taught Mathematics to these two sections. Grade 8 D was selected as the EG because, in the mid-term examination, 14 out of 28 students failed in Mathematics. Grade 8 B was chosen as the CG since it had only four failures in the Mathematics examination. Both sections comprised 28 students each, but the number of males and females differed. There were 15 males and 13 females in 8 D, and 16 males and 12 females in 8 B.

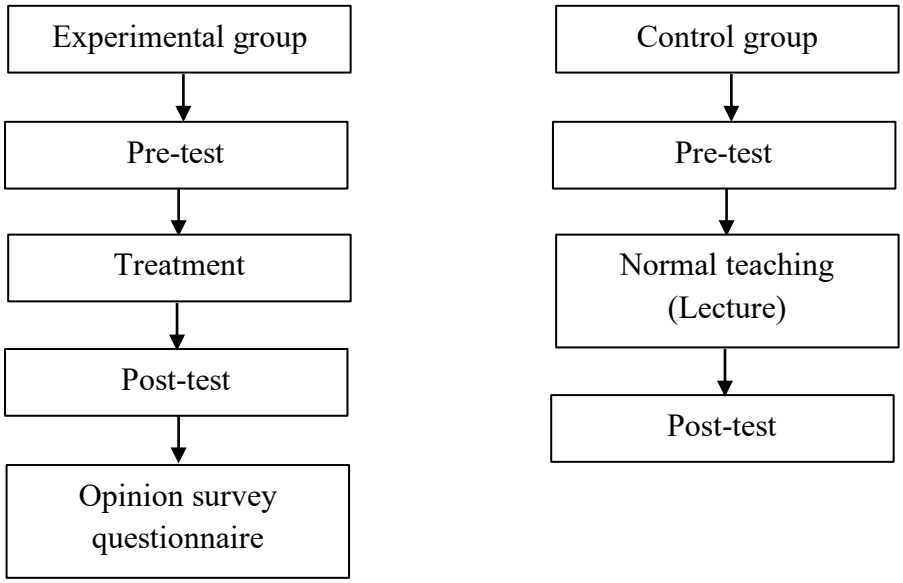
SLSS houses 1,149 students, of which 580 are males and 569 females. These students were taught by 68 teachers (25 males and 43 females). The school is divided into two campuses - upper and lower. The upper campus houses lower primary classes (pre-primary to four) and the lower campus houses upper primary classes (five to eight). There are 553 students on the lower campus (273 females and 280 males).

Research Design

This study adopted an experimental method using a pre-test and post-test because the researcher wanted to examine the effectiveness of incorporating video clips on grade 8 students' learning achievement in Mathematics. Figure 1 illustrates the research design. First, a pre-test was administered to both EG and CG. EG was taught using video clips while CG was taught using the normal teaching method. Then post-test was administered to both EG and CG followed by the collection of opinions from EG via a survey questionnaire.

Figure 1

Illustration of the Research Design



Data Collection Tools

This study employed three tools to collect data, namely pre-test and post-test (Appendix I), a quiz test, and an Opinion questionnaire as detailed below.

Pre-test and Post-test

Before the intervention, a pre-test comprising ten questions on adding and subtracting integers was administered to both EG and CG to examine their prior knowledge. At the end of the intervention period, the researcher administered the post-test to both CG and EG. CG was taught using normal teaching methods while video clips were incorporated in the teaching of EG. Finally, a comparison was drawn between the pre-test and post-test scores - not to determine if the EG improved, but rather to assess if the EG showed more improvement than the CG.

Quiz Test

Besides the pre-test and post-test, a quiz test designed as per Bloom's Taxonomy's six levels of questioning (Appendix II) was administered to both EG and CG after the first video lesson to examine the effectiveness of video clips. 50% of the marks were apportioned for the lower-order thinking skills (remembering, understanding, and applying) and 50% for the higher-order thinking skills (analysing, evaluating, and creating). Colleagues from the mathematics department assessed the validity of the test questions and changes were made as per their feedback.

Opinion Questionnaire

The third tool employed in this study was the opinion questionnaire (Appendix III). Two sets of opinion questionnaires were administered - set A comprised questions on students' opinions on the mathematics lessons taught using video clips and set B comprised questions on their learning preferences - whether they enjoyed watching the entire video clip and then take notes and discuss or pause the video clip several times for note-taking and discussions. My critical friend, Dr. Tshewang verified the survey questions and necessary changes were made based on his feedback.

Intervention

Three videos namely 1). Maths Antics's video on adding and subtracting integers, 2). Khan Academy's video on adding and subtracting negative numbers, and 3). video on adding and subtracting integers using a simple method were downloaded from YouTube and used with the EG. Amongst the many video clips on adding and subtracting integers on YouTube, the researcher selected these video clips because the content creators were native English speakers, and they used language that was appropriate for grade eight students. One of the senior colleagues who teaches in the same school assessed the video content and observed that the clips were relevant. He has been teaching mathematics for over 25 years. The first video explained the concepts and rules of adding and subtracting integers by highlighting real-life examples. It also showed how to solve integer questions using number lines. The second video explained basic operations of integer signs using number lines but did not relate its content to any real-life examples. The third video similarly presented the concepts as the second video but demonstrated the concepts explicitly. The parts of the video clip that did not correspond to the learning objectives were removed using Edpuzzle

Google Chrome extension (version 5.0.2). Edpuzzle extension allows users to edit YouTube videos and screen record, embed quiz questions in the video and assign them to students.

Procedure

First, the pre-test comprising ten questions on adding and subtracting integers were administered to both EG and CG. Then the researcher taught EG using video clips and CG using traditional lecture methods of dialogue and discussion. The treatment procedure took six 40-minute periods, which lasted for a week. Three video clips were shown to the EG as part of the lessons as mentioned in the preceding paragraph under intervention.

While screening the video clips, strategies proposed by Cruse (2006), Fujioka (2017), MacLean (2017), Sharma (2018), Sykes and Emma (2012), and Wijnker (2018), were implemented such as pausing the video clip to 1) give students time to think and make connections, 2) guess answers to the problems presented in the video clip, and 3) pause the video to encourage discussions. Besides, a ground rule to avoid doing other tasks while watching the clips was also implemented. The researcher communicated the learning objectives before the commencement of the lessons and made students aware of what needed to be achieved at the end of the video lesson. At the end of the intervention period, the post-test was administered to both groups. It comprised 10 questions with a maximum mark of 10. Finally, a comparison was drawn between the pre-test and post-test scores - not to see whether EG improved, but whether EG improved more than CG. After every video lesson, the researcher uploaded the video clips in EG's GC so that they can access them from any device with an internet connection, but did not upload the video clips in CG's GC. Instead, the worksheets and materials used in the classroom were uploaded.

Data Analysis Approach

Data were analysed in two parts - the first focused on the analyses of the test scores and the second involved analysing students' opinion. To determine the differences in the pre-test and post-test scores, the researcher computed paired sample t-test and descriptive statistics using Google Sheets add-on XL Miner Analysis Tool Pak developed by Frontline Systems Incorporated. The analysis results of this add-on go parallel with Microsoft Excel's add-in: Analysis Tool Pak. XL Miner Analysis Tool Pak has been featured in many textbooks, videos, statistics, and courses. Moreover, graphs showing the performance of each student on the quiz test allowed visual examinations. Data collected through three sources achieved triangulation and allowed the researcher to cross-check for consistency.

Findings

The pre-test mean (5.25) of CG was slightly higher than EG (5.14) with a SD value of 1.71 and 2.21, respectively. However, the post-test mean of EG (7.88) was significantly higher than CG (6.96) with SD value of 2.24 and 2.02, respectively. In the quiz test, EG performed exceedingly better in higher-order thinking questions and slightly better in the lower-order thinking questions than CG. On the four sentiment levels (Strongly Disagree = 1, Somewhat Disagree = 2, Somewhat Agree = 3, Strongly Agree = 4), EG's average level opinions on the use of video clips revealed somewhat agree with values ranging from 3.14 to 3.60. However, of the four sentiment levels, strongly agree had the highest average score with 7.14 and strongly disagree had the least average score with 0.25.

Pre-test and Post-test Result

The pre-test mean of CG and EG were 5.25 and 5.14 with a SD value of 1.71 and 2.21, respectively, informing that CG was slightly better than EG before the intervention. However, the post-test mean of EG was significantly higher with 7.88 compared to CG with 6.96 after the intervention. The p-value as mentioned in Table 1 reported that the t-test is less than 0.05 indicating that the differences between the pre-test and post-test means of CG and EG after the intervention were statistically significant. Therefore, the result of the test score analysis showed that the pre-test means of EG and CG were slightly different. However, the post-test means of EG were significantly higher than CG. The analysis is presented in Table 1.

Table 1

Pre-test and Post-test Comparison of EG and CG

	Experimental group		Control group	
	Pre-test	Post-test	Pre-test	Post-test
Mean	5.14	7.88	5.25	6.96
SD	2.21	2.24	1.71	2.02
Sig. (t-test)	Pre-test (0.854)		Post-test (0.01)	

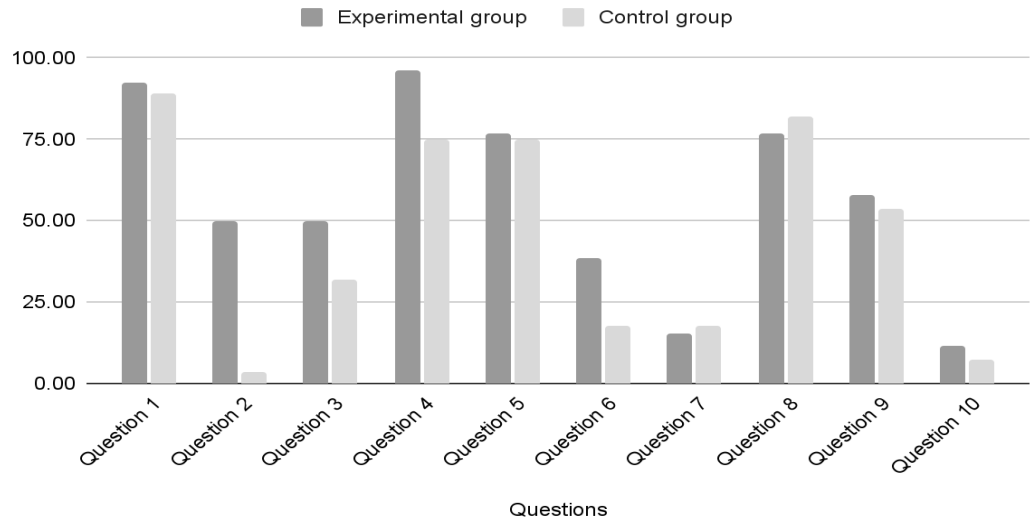
Significance level: <0.05- significant, >0.05- not significant

Quiz Test Result

Figure 1 showed the comparison of quiz test scores between EG and CG. The results indicated that EG excelled in terms of higher-order thinking questions (2, 3, 4, & 6) indicating that the use of video clips enhanced students' analytical, creative, and evaluative thinking skills. Additionally, EG's test scores for lower-order thinking questions were slightly higher than CG's except for question 7.

Figure 1

Quiz Test Result Comparison Between EG and CG



Opinion Survey Result

The analysis of students' opinions in EG indicated that most students enjoyed learning mathematics through video clips as evidenced from the high average mean score of 3.40 as reflected in Table 2. For instance, 42.85% (n=28) of the participants Strongly Agreed that they preferred learning mathematics using video clips, while 39.28% and 14.28% Somewhat Agreed and Somewhat Disagreed, respectively, to learn mathematics using video clips. On the responses regarding students' preference on learning mathematics using video clips, the average opinion level ranged between 3.14 and 3.60 indicating students Somewhat Agreed to learn mathematics using video clips. Of the four sentiment levels, Strongly Agree had the highest average score with 7.14 points and Strongly Disagree had the least average score with 0.25 points. Moreover, Table 3 showed 85.71% (24 students out of 28) preferred pausing video clips several times for discussion and note-taking rather than watching the entire video clip and then completing the discussion and note-taking.

Table 2

Student Opinion Analysis Result

Sl No	Indicators	Level of opinions				Average level of opinions
		Strongly Disagree	Somewhat Disagree	Somewhat Agree	Strongly Agree	
1	I learn more when mathematics lessons are taught using video clips.	0	3	15	10	3.25
2	I enjoy mathematics lessons when taught using video clips.	0	2	9	17	3.60
3	I like mathematics lessons more when taught using video clips than the mathematics lessons taught without using video clips.	3	4	10	11	3.14
4	I would prefer mathematics lessons to be taught using video clips.	4	1	11	12	3.60
Average						3.40

Table 3

Students' Preference for Learning Mathematics using Video Clips

Sl No	Indicator	Number of students
1	I like to watch the entire video clip without pausing it and then do the note-taking and discussion.	4
2	I like to watch the video clip and pause it several times for discussions and note-taking.	24

The percentages reflected in the Opinion Survey Result section were obtained by calculating the percentage of students who responded to each item on the survey in each of the four opinion levels (Strongly Disagree, Somewhat Disagree, Somewhat Agree, and Strongly Agree). For example, for the statement "I learn more when mathematics lessons are taught using video clips," 10 out of 28 students strongly agreed, which corresponds to 42.85% (rounded to two decimal places). These percentages are also reflected in Table 2, which presents the survey results in a tabular format. The decision that 3.40 is a high average mean score was based on the fact that it falls between the "Somewhat Agree" and "Strongly Agree" opinion levels, indicating that most students agreed or strongly agreed with the statements on the survey related to learning mathematics through video clips. Table 3 is not explicitly connected to the results presented in Table 2, but supports the idea that students prefer pausing video clips for discussion and note-taking, as 85.7% of the participants preferred this method.

Discussion and Conclusion

This study had two major findings. First, incorporation of video clips showed improvements in eighth-grade students' test scores. Second, video clips increased students' ability to solve higher-order thinking questions in mathematics. The first finding was evident from the post-test scores presented in Table 1. The post-test mean (7.88) of EG was higher than CG (6.96) even though the pre-test mean (5.14) of EG was lower than CG (5.25). The SD of EG and CG was 2.21 and 1.71, respectively. This finding was consistent with Cruse's (2006) study that students studying mathematics through video clips performed better because video clips played an important role in creating conditions through which greater cognitive learning took place. Further, Graham and Berry (1992) found that video clips concretised abstract concepts using examples of actual situations. One reason for this gain could be because video clips shift the role of the teacher to facilitators of active learning (Kaltura, 2018), leading to improved test scores. Using video clips in the classroom aligns with constructivist learning theory, where learners are actively involved in knowledge creation based on their unique experiences. The gain in test scores was also evident from students' opinions presented in Table 2. For instance, in EG, none of the respondents strongly disagreed with the first and second indicators in Table 2. Only two and three respondents stated that they somewhat disagreed with these indicators, respectively. On the other hand, almost all the respondents expressed that they enjoyed learning mathematics using video clips.

The second finding revealed that video clips increased students' ability to solve higher-order thinking questions in mathematics. This is because using video clips enabled students to learn through sight and hearing. According to Ni et al. (2019), video clips dealt with over more than one meaning simultaneously and handled the senses of sight and hearing. In addition, MacLean (2017) pointed out that video clips minimised cognitive load by providing visual proof. Other researchers such as Bravo et al. (2011), Gaudin and Chalies (2015), Park and Jung (2016), and Varul (2013) posited that video clips increased learners' interest in the subject, as well as motivated them to learn. The other plausible reason for this increased ability could be setting goals before watching the clip and pausing it to allow students reflection time as proposed by Cruse (2006), Fujioka (2017), MacLean (2017), Sharma (2018), Sykes and Emma (2012), and Wijnker (2018). Guo et al. (2014) noted that giving students time to pause the video clips promoted student engagement and discussion because the information was presented in small pieces (as cited in MacLean, 2017). It was evident from students' opinions in Table 3 that they preferred pausing the video clip several times for discussions and note-taking rather than playing the entire video clip at one go. Therefore, students learned to solve higher-order thinking questions better through video clips because they enabled the senses of sight and hearing.

Mathematics' new normal curriculum (NNC) instructional guide for grade eight developed during the COVID-19 pandemic has integrated ICT as a tool for learner education (Royal Education Council [REC], 2021). NNC instructional guide provides teachers with a plethora of YouTube video links and recommends the use of computer software to facilitate deep learning. It is encouraging to use both because they enable students' active engagement in knowledge creation. Additionally, the use of video clips maximises discussion time, as abstract concepts are simplified using authentic examples. In contrast, talking and reading about real things without having a direct sense of sight and touch of the concepts not only uses more instructional time but also has minimal benefit on the learners (Kolb, 2015). Therefore, the use of video clips introduces variations in teaching-learning methods for both teachers and students. It was evident from the preceding sections that before the intervention, EG was academically weaker compared to CG. However, after the intervention, EG not only showed gains in test scores but also showed increased ability to solve higher-order thinking questions. Considering the foregoing reasons, the researcher would recommend mathematics teachers to use video clips most of the time to increase students' academic achievement and foster motivation. Moreover, similar studies can be conducted in other subjects to investigate the effectiveness of incorporating video clips on students' learning achievements.

Through this study, the researcher could examine the impact of video clips on students' learning in the mathematics class. Not only did the students show growth in their ability to answer higher-order thinking questions, but video clips also gave them the motivation to learn mathematics. Due to the positive results observed, the researcher will continue to use video clips as a means to enhance students' learning.

Limitations

This study has the following limitations:

Intervention Period

This study was undertaken at the height of the COVID-19 pandemic which caused significant disruptions to face-to-face teaching. Given the abruptness of the situation, the researcher had to cut short the intervention period. Despite this limitation, the results are still applicable because the use of video clips, as pointed out in the preceding sections, had a positive impact on students' learning. However, similar studies in the future must strive for a longer intervention period to obtain more reliable results.

Assessment of Video Content

The periodic lockdowns as a measure to contain the spread of COVID-19 virus caused concerns for SLSS teachers. This meant that the teachers were engaged for the entire school hour preparing emergency lessons, which made it difficult to find time to collaborate with colleagues to evaluate the relevance of video content. As a result, only one senior colleague could assess the validity of its content. In future studies, it would be beneficial to involve multiple assessors to validate the video content.

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APPENDIX I

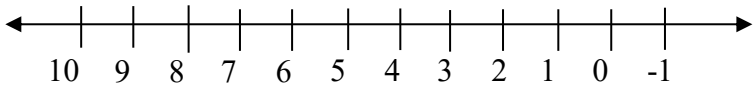
A. Pre-test and post-test question

The following questions were administered during the pre-test and post-test.

Answer the following questions.

1). Model the addition problem on the number line below to find the sum.

5 + (-2) =



2). A test has 20 questions. It awards 3 points if the answer is correct and takes away 1 point if the answer is incorrect. Dechen answered 5 questions incorrectly. How many points did she lose?

3). The price of potatoes for 1kg dropped by Nu 3 per day for 5 days in a row. How much did the price of 1kg potato change in total after 5 days?

4). When you subtract one negative integer from another, will your answer be greater than or less than the integer you started with? Explain your reasoning and give an example.

5). A seal is swimming in the ocean 5 feet below sea level. It dives down 12 feet to catch some fish. Then, the seal swims 8 feet up towards the surface with its catch. What is the seal's final elevation relative to sea level?

6). Jose earned 50 points in a video game. He lost 40 points, earned 87 points, then lost 30 more points. Write and evaluate an expression to find his final score in the video game.

7). Find the value of -6 + 15 + 15.

8). Determine which expression has a greater value.

-12 + 6 - 4 or -34 - 3 + 39

9). The temperature on a winter night was -9°C. The temperature rose by 8°C when the sun came up. When the sun set again, the temperature dropped by 6°C. Write and evaluate an expression to find the temperature after the sun set.

10). Sonam collects data about how many customers enter and leave a store every hour. He records a positive number for customers entering the store each hour and a negative number for customers leaving the store each hour.

Time	Entering	Leaving
1PM to 2PM	30	-12
2PM to 3PM	14	-8
3PM to 4PM	18	-30

During which hour did more customers leave than arrive?

APPENDIX II

B. Quiz Test Question

The following quiz test was administered after the first video lesson.

Direction: Each question is followed by four possible choices of responses. Choose the most correct response and circle its corresponding alphabet.

1). (-2) + (-8) =

a) 10
b) -10
c) 6
d) -6

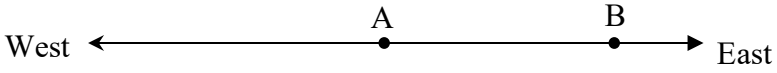
2). The table below shows the temperature change in Thimphu over a 3-hour period.

Time	**Change in temperature**
8 am to 9 am	-3^0C
9 am to 10 am	-1^0C
10 am to 11 am	4^0C

Pelzom noticed that the temperature at 8 am was -5^0C. What was the temperature of Thimphu at 11 am?

a) -5^0C
b) 5^0C
c) 13^0C
d) -13^0C

3). Sangay goes 17km towards the east from point A to point B. From B, she moves 30 km towards the west along the same road. By which integer will you represent her final position from A?



a) 13 km
b) -13 km
c) 47 km
d) - 47 km

4). Atish is sitting at the topmost step. He found a pencil lying at the 7th step. To pick the pencil up, he walks 2 steps down and 1 step up in every move. In how many moves will he pick up the pencil?

a) 5
b) 5 and a half

c) 6
d) 6 and a half

5). 5 - (-7) =
a) 12
b) -12
c) 2
d) -2

6). In a spelling test quiz, positive marks are given for correct answers and negative marks are given for incorrect answers. If Pema's scores in three successive rounds were 15, −3, and −5, what was his total score at the end?
a) 7
b) -7
c) 12
d) 17

7). The temperature of Trashiyangtse started at 4^0C. It fell 2^0C every hour until it was -6^0C. How many degrees did the temperature fall?
a) 10^0C
b) -10^0C
c) 2^0C
d) -2^0C

8). 2 + (-6) =
a) 8
b) -8
c) 4
d) -4

9). Order the following temperatures from least to greatest.

	-15^0C	-25^0C	15^0C	5^0C
a)	-15^0C	-25^0C	15^0C	5^0C
b)	-25^0C	-15^0C	5^0C	15^0C
c)	15^0C	5^0C	-15^0C	-25^0C
d)	5^0C	-15^0C	-25^0C	15^0C

10). (-3) - (-9) =
a) 12
b) -12
c) 6
d) -6

APPENDIX III

3. Opinion Survey Questionnaire

The following opinion survey questionnaire was used to collect students' opinions on the use of video clips

A. Here is a list of statements. Select the response that indicates your level of agreement by putting a tick mark.

Sl No	Indicators	Strongly disagree	Somewhat disagree	Somewhat agree	Strongly agree
1	I learn more when math lessons are taught using video clips.				
2	I enjoy math lessons when taught using video clips.				
3	I like math lessons more when taught using video clips than the lessons taught without using video clips.				
4	I would prefer math lessons to be taught using video clips.				

B. Select the response that indicates your preference by putting a tick mark in the 'response' column. Which one do you prefer?

Sl No	Indicator	Response
1	I like to watch the entire video clip without pausing it and then do the note-taking and discussion.	
2	I like to watch the video clip and pause it several times for discussions and note-taking.	

About the Author

MANI WANGDI is a mathematics teacher at Samtse Lower Secondary School, located in Samtse Dzongkhag. He graduated from Samtse College of Education, Royal University of Bhutan in 2010, majoring in Mathematics and Primary Curriculum Studies. Mani has a keen interest in employing Blended Learning 2.0 using a wide range of interactive digital tools. He is also interested in initiating citizen science programmes in schools, championing the use of EdTech among his teacher colleagues, and conducting action research to enhance learning-teaching and assessment practices.