

Flipping the classroom for improving students' engagement in learning and academic
achievement in Mathematics at the Ragnarök Girls Secondary School

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FLIPPING THE CLASSROOM FOR IMPROVING STUDENTS' ENGAGEMENT IN
LEARNING AND ACADEMIC ACHIEVEMENT IN SECONDARY SCHOOL
MATHEMATICS AT THE RAGNAROK GIRLS SECONDARY SCHOOL

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Abstract

As a Mathematics teacher at the institution in which this study was conducted, one of the challenges faced was that Form 2 students were not motivated nor interested in learning due to the traditional method of teaching. This resulted in a lack of students' engagement in learning, which negatively affected homework assignments submissions and by extension students' academic achievements in Mathematics. Therefore, it was in my interest to investigate how adopting the flipped classroom could affect the form two students' engagement in learning and academic achievements in Mathematics at the Ragnarök Girls' Secondary School.

This study was expected to enhance and improve my current teaching strategy in delivering the curriculum, and provide insight to other teachers including my colleagues pursuing the Masters in Education programme with the knowledge to increase students' engagement in learning and academic achievements in Mathematics.

Therefore, this study took the form of a mixed methods action research, quasi-experimental, single group, posttest only design. The independent variables were the use of videos and teacher-developed power points presentations for students and the dependent variables were students' engagement and academic achievement. The findings generated provided sufficient evidence to suggest, that there was an overall increase in students' engagement in learning whilst no significant differences in academic achievement were noted via the adoption of the flipped classroom approach.

Key words: Students' Engagement, Academic Achievement, Flipped Classroom.

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Chapter 1

Background

Over the past five years as a Mathematics teacher at the institution in which this study was conducted students particularly at the Form 2 level were observably sleeping, having unrelated conversations, not paying attention “zoning out”, slouching on their chairs, not asking, participating, nor responding to questions posed in class discussions about the topics taught. Alter, Walker and Landers (2013) described these and other behaviours like giving up easily on tasks, disrupting the flow of classes and displaying anti-social behaviours as indicators of disengaged and unmotivated students.

These behaviours were also reflected in the student's failure to attempt nor complete assigned homework. Thus making it difficult for the teacher to identify areas of difficulty and misconceptions. Good and Brophy (2003) argued that homework is an important extension to the concepts and lessons learnt from school teaching sessions, and can provide students with opportunities to reinforce, review and practice topics. Cooper (2007), Epstein and Voorhis (2001), added that by doing homework students will benefit from better retention of factual knowledge, increased and reinforced understanding of content, improved overall learning and development and, enhanced academic grades.

Further, Valle et al. (2016) argued that if students were unwilling to participate in supervised class discussions and activities, then the probability of their engagement in learning outside the confines of an educational environment would be significantly minimized.

Fletcher (2015) added that the lack of student engagement within and outside the school environment leads to passive attitudes and behaviours resulting in low self-esteem and interest in academics. Thus, students who are disengaged in learning over prolonged periods of time are more likely to fail academically and drop out of school than those who are actively involved throughout the learning environment (Randolph, Fraser & Orthner, 2004).

Consequently, improving students' engagement in learning has attracted significant attention over the years as a response to poor academic achievements and student motivation (Fredricks, Blumenfeld & Paris, 2004). Lee (2014) described student engagement as a multifaceted construct consisting of 3 major components (behaviour, emotional and cognitive engagement) that affect students' participation in class-related, social and co-curricular activities, sense of belonging at school and the level of investment in learning respectively. Bomia et al. (1997) defined student engagement as "students' willingness, need, desire and compulsion to participate in, and be successful in, the learning process" (p.294). Dary, Pickeral, Shumer and Williams (2016) described engaged students as those who are willing to put forward and invest their time, energy, and commitment to the learning environment both within and outside the classroom with the goal of achieving personal success academically, socially and emotionally.

For the students within this study, due to low parent's attendance during parents-teacher days and the number of times parents were unavailable to discuss matters related to their child's academic performance and behaviour in the classroom, the researcher concluded that adequate

parental support within these homes were not present. Thus, students did not feel accountable for their completion of homework nor assignments.

Another plausible reason why students were not adequately engaged in learning and lacked motivation in academics both within and outside of the classroom may have stemmed from the researcher's continuous use of the "one size fits all" strategy or the traditional pen and paper teaching method. Shivaramaiah (2018) described the traditional method of teaching as a form of lecturing where teachers and students operate with fixed perceived roles in which emphasis is placed on recitation, memorization and regurgitation. Likewise, Strauss (2016) described the traditional method of delivering homework as routinely assigned text book problem sets for student to complete. Hence, since this technique of teaching do not sufficiently stimulate students' interest in learning, teachers who solely adopt this method are setting students up for academic failure and simultaneously boredom (Strong; Thomas; Perini; & Silver, 2004).

Therefore, a viable solution of addressing lack of students' engagement in learning at the Form 2 level whilst simultaneously improving their academic achievements in Mathematics is the flipped classroom. In its simplest terms, the flipped classroom is a "contemporary pedagogical method that employs asynchronous video lectures and practice problems as homework, and active, group-based problem-solving activities in the classroom" (Bishop & Verleger, 2013, p.2).

Prior to this study, the researcher investigated the effectiveness of the flipped classroom on student learning outcomes in Secondary school Mathematics (Emrith, 2017). Results revealed

that approximately 85% of participants displayed general improvements in both engagement in learning activities, homework completion, utilization of technology for learning and academic achievements in Mathematics.

Thus, this present study sought to refine and expand the flipped classroom approach, using an action research approach, to further improve student engagement in learning and academic achievement in Mathematics by attending to the constraints encountered and the recommendations arising from the previous study.

Problem Statement:

Since the behaviours displayed by the Form 2 students at the Ragnarok Girls' Secondary School (pseudonym) are indicative of low levels of engagement in learning (Alter, Walker & Landers, 2013), and are associated with poor academic achievement (Randolph, Fraser & Orthner, 2004), then the major controllable contributing factor resides in the teaching technique utilized by the researcher. Therefore, the problem hypothesised that the researcher's reliance on traditional instruction did not adequately engage the Form 2 students in learning Mathematics. Consequently, students displayed passive attitudes towards learning and participation in learning activities inside and outside of the classroom, including symptoms of boredom, lack of interest and motivation. The researcher hypothesised, these behaviours contributed towards low academic achievement in Mathematics. Furthermore, apart from the study conducted prior to this research, there is a paucity of published research into the effect the flipped classroom can have

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on student engagement in learning and academic achievement in Secondary school Mathematics in Trinidad and Tobago.

Purpose of the Investigation:

The purpose of this mixed methods action research study therefore, was to improve the Form 2 students' engagement in learning and academic achievement in Mathematics at the Ragnarok Girls' Secondary School in the Port of Spain Educational district Trinidad, by adjusting the researcher's current traditional teaching technique to a contemporary approach via the flipped classroom.

Research Questions:

The Grand Tour Question:

How can adopting the flipped classroom in the teaching of Mathematics to form 2 students, affect their engagement in learning and academic achievement, at the Ragnarök Girls' Secondary School?

Sub Questions:

1. How can adopting the flipped classroom approach affect the form 2 students' engagement in learning Mathematics?
2. How can adopting the flipped classroom approach affect the form 2 students' academic achievement in Mathematics?

Significance of the study

This study has a multiplicity of significances. Most profoundly it sought to develop student autonomous and self-regulatory in learning behaviours to encourage them to think and learn for themselves which are crucial to the flipped classroom approach. The researcher also benefits from this study because of the opportunity to develop his pedagogical toolkit by experimenting with an approach that has been demonstrated to effectively improve students' engagement in learning and academic achievement across disciplines. Furthermore, within the researcher's school department, the intervention utilized may be able to assist teachers with the challenge of student's engagement and learning. Additionally, to my colleagues pursuing the Master's in Education programme at the University of the West Indies Trinidad; although their context may differ, some aspects from this study such as the use of technology, can be applied within their class setting to enhance student's engagement and participation in learning together with improving academic achievement in Mathematics.

Operational Definitions

Students' Engagement. This refers to "student's willingness, need, desire and compulsion to participate in, and be successful in, the learning process" (Bomia et al., 1997, p.294).

Academic Achievement. This is referred to "student's success in meeting short- or long-term goals in educationally purposeful activities" (York, Gibson & Rankin, 2015)

Flipped classroom. This is “a contemporary pedagogical method, which employs asynchronous video lectures and practice problems as homework, and active, group-based problem-solving activities in the classroom” (Bishop & Verleger, 2013, p.2).

Chapter Two- Literature Review

Defining Student Engagement

For many youths, schooling is central to their daily lives as it seeks to develop their long-term well-being through participation in academic and non-academic pursuits (William, 2003). Therefore students need to feel a sense of belonging at school (Finn, 1993) via the provision of opportunities to partake in school-related activities such as co-curricular activities (football, tennis, cricket, and karate), and engage in interclass collaborative learning activities and projects such as: Science fairs, Environmental and Food drives (William, 2003). Otherwise, students may participate in disruptive behaviours within the classroom by physically and/or verbally assaulting their teacher and peers, sleeping and/or snoring during class sessions, walking around the classroom without permission, and talking excessively making it difficult for the teacher and other students to concentrate (Daniels, 2019); as well as outside of the classroom by not doing homework nor completing assessments and projects (Williams, 2003). Consequently, students will fail academically and subsequently drop out of school (Randolph, Fraser & Orthner, 2004; Alter, Walker & Landers, 2013). Therefore, such negative attitudes and behaviours by students in and out of the classroom are indicators of disengagement and lack of motivation towards learning (Alter, Walker & Landers, 2013).

As a means of addressing such disengagement towards learning, enhancing student's participation and involvement in learning whilst creating an educational environment where students feel accepted and valued by their peers takes the forefront, as this in turn will have

significant improvements on students' academic achievements (Christenson, Reschly and Wylie, 2012); Lee, 2014; William, 2003). William (2003) described student engagement in learning as "students' attitudes towards schooling and their participation in school activities" (p.8).

Enhancing students' engagement in learning has attracted significant attention over the years as a possible antidote to poor academic achievements and students' motivation within the classroom (Dyer, 2015; Fredricks, Blumenfeld & Paris, 2004). Weimer (2011) argued that students are more involved in learning when they are interested and attracted to the work being taught. He added that students will, therefore, be persistent in discovering new concepts and reinforcing old ones despite various challenges and obstacles experienced such as low self-esteem, little to no parental support at home and various socio-economic factors. As such, given that the students within this study have similar challenging experiences, improving student engagement in learning takes the focus of this study.

Furthermore, student engagement not only encompasses the participation and contribution of students, but also it incorporates feelings and sense-making through activity-based learning strategies (Harper & Quaye, 2009). As such, Lee (2014) described student engagement as a multifaceted construct consisting of 3 major components (emotional/affective, behaviour and cognitive engagement) that affect students': affective reactions, sense of belonging at school; participation in class-related, social and co-curricular activities, and; internal level of investment in learning respectively. More so, Borman and Overman (2004), Lee (2014), Sirin and Rogers-Sirin (2004), Williams (2003) found that all three components of

students' engagement were significantly associated with changes in student's academic achievements and motivation towards learning.

Emotional engagement. Commonly known as affective engagement, emotional engagement refers to students' feelings, reactions towards tasks such as classroom activities and group projects, and sense of belonging in school (Finn, 1993; Williams, 2003). By extension, emotional engagement is concerned with students' likes, dislikes and interest towards various activities, in conjunction with their feelings of acceptance, inclusion, connectedness, respect and value by their peers and teachers at school (Fredricks et al., 2004). Positive emotional engagement, therefore, is associated with the willingness of students to study and participate in other school-related activities which in turn also yield improvements in academic achievement (DeVito, 2016; Shochet et al., 2006; Williams, 2003).

Behavioural engagement. Fredricks et al. (2004) and Williams (2003) described behavioural engagement as a wide range of behaviours at school which can be categorized into three dimensions: positive conduct (following classroom rules, avoiding disruptive behaviours and attending classes on time); involvement in learning (being persistent in learning by making significant efforts in their academic tasks, completing homework, asking and responding to questions and contributing to class discussions); and participation in school-related activities (joining sports groups/teams and/or student organizations). Students therefore who respond positively across all three dimensions of Behavioural engagements not only provide clear indicators of high levels of engagement in learning, but is consequently associated with high

levels of academic achievements and low levels student drop outs (Abbing, 2013; Nguyen, Cannata & Miller, 2016; Wang & Holcombe, 2010).

Cognitive engagement. This refers to “the quality of students’ psychological engagement in academic tasks, including their interest, ownership, and strategies for learning” (Davis, Summers & Miller, 2012, p.22). In other words, DeVito (2016) explained that positive cognitive engagement is concerned with students’ level of investment in learning and whether or not they are willing to master complex and difficult task via thought, determination and strategy. Furthermore, Al-Alwan (2014); Kamla-Raj and Ugur (2015) have reported a statistically significant positive correlation between cognitive engagement and academic achievement. In fact, Rodriguez and Boutakidis (as cited in Wara, Aloka & Odongo, 2018) found that the cognitive engagement amongst adolescent students attending a junior high school was significantly associated with high grade point averages (GPAs).

In general, students who were highly engaged in learning via their involvement and active participation in class activities, felt a sense of belonging and identification with the school, and are were willing to invest time, effort and energy into their learning, considered learning to add greater value and meaning to their future than those who were less actively involved in learning (DeVito, 2016; Lee, 2014). Consequently, those less engaged students considered their studies as “boring” and “useless” (Wara, Aloka & Odongo, 2018, p.62). Moreover, Mauro (2014) found that students were more engaged in the learning process when the teacher made the

lessons fun and interactive by providing opportunities to demonstrate their enthusiasm and energy towards class activities.

As such, given that students' engagement in all of its three associated dimensions (behavioural, emotional and cognitive) can improve academic achievement whilst simultaneously reducing students' misbehaviour, absenteeism and dropouts (Al-Alwan, 2014; Wara, Aloka & Odongo, 2018), more attention to enhancing students' engagement from educators and practitioners who design and implement various interventions at schools should be placed (Lee, 2014). As a result, getting students involved in learning by investigating how the adoption of the flipped classroom can affect students' engagement in learning and academic achievements in Secondary school Mathematics was the highlight of this study.

The Flipped Classroom

In this inevitably fast-changing environment, technology is creating a paradigm shift particularly within the classroom in schools around the world (Grypp & Luebeck, 2015). Educators are not only forced to change their traditional mode of the delivery of the curricula, but methods in which students can gain continuous access to the various learning materials apart from the classroom itself are also been examined (Craig, 2013). Staker and Horn (2012) highlighted that one approach that embraces the use of technology in education by delivering content and instructions to students online, whilst building concept engagement through application based activities, is the flipped classroom model.

Alvarez (2012) and Springen (2013) described the flipped classroom as a contemporary, instructional and interactive model in which students are introduced to various concepts that are presented as pre-recorded materials via the internet, teacher made videos or other audio-visual recordings after school hours (at home, in the library or wherever the instructional material can be accessed). After these students are engaged with these online learning materials directed to them by their teacher as homework, they are expected to arrive to class usually the very next day and collaborate with peers and the teacher in discussing and applying the materials. As well as extend the concepts they learned from the pre-recorded material during class time to clear up any misconceptions about the content (Saunders, 2014). Thus, what the students have traditionally done at home becomes what the student does in class and vice versa. Hence, the traditional nature of class work and homework are interchanged thereby giving rise to the term “flipped” (Ash, 2012).

As any pedagogic model, however, there are pros and cons to using the flipped classroom as a revolutionary and contemporary approach to learning. For instance, Acedo (2013) supported this intervention by saying that as long as students can privately gain access to the lecture materials at home or otherwise, they will have increased input and control over their own learning. Furthermore, Jerkins (2012) opined that if students utilized a video-based platform created by the educator, then they can work at their own pace and time without the rush of having to cover the work only during class sessions. As such, students can pause, rewind, and fast forward material and examine concepts in their own way without disrupting the flow of the

class. Therefore, this will promote student-centred learning by allowing students to participate in their own cognitive development in which they are able to own, and begin to appreciate the knowledge they achieve, which in turn builds their confidence and critical thinking skills (Acedo, 2013).

Conversely, Herreid and Schiller (2013) argued that students who solely adopted the traditional method of teaching and learning may be reluctant and oppose the idea of this new method. Additionally, Ash (2012) and Sams and Bergman (2013) argued that whilst students are viewing the online resources supplied by the educator, there exist the possibility that some students may be distracted by the abundance and readily unrelated information available via the internet thus neglecting the work materials provided. Consequently, students will return to class the next day unprepared. Moreover the students who come to school without watching the online resources will move at different speeds to that of those who examined the materials (Riveraa, 2015). As such, further problems may arise for both the teacher and students since frustration, disruption and boredom by those students may occur whilst the others are involved in the in-classroom activities (Thoms, 2012).

Despite the aforementioned arguments against the flipped model, Acedo (2013) stated that by implementing the flipped classroom students who recently or now entered high school will be excited and motivated in utilizing technology in the learning process. He further argued that students, particularly between the ages of 11 to 16 years, have not fully exhausted the traditional method of teaching. Thus, they will be willing to embrace new ways of learning

especially if technology is utilized and incorporated on an everyday basis in the learning materials. In fact, Sawang, O'Connor and Ali (2017) highlighted that effective implementation of technology during the teaching and learning process has great potential of increasing students' engagement level in learning as students will gain a deeper understanding of the topics taught, collaborate and interact with each other and direct their learning.

Furthermore, Saunders (2014) claimed that in order for the Mathematics content to be free from unnecessary distraction to the students, instruction and appealing resources must be designed adequately by the teacher so that students effectively interact within the classroom, construct their own understanding, and enjoy what they learn. Moreover, Alvarez (2012), Berrett (2012) and Trowler (2010) argued that interactive learning pedagogies such as the flipped model focus on learning activities which involve emotional (ownership), behavioural (participation), and cognitive (investment level) aspects. Thus by having students collaborate and interact with each other through digital spaces such as blogs, as well as engage in online activities such as games and quizzes, allows little to no time available for distraction.

Thakare (2018) stated that flipped classrooms today, have become an integral part of the educational industry at all levels from pre-primary to tertiary for the delivery of the curricula. He added the main goal of this non-conventional style of teaching and learning aims to decentralize the educator as the primary source of knowledge, thereby allowing teachers to spend time in class interacting with students rather than lecturing. Thus when students are exposed to eLearning platforms such as Khan's Academy, YouTube and TED, it provides opportunities for

students to interact and engage with the instructional materials as well as each other to a greater extent than what the traditional classroom provides (Pappas, 2012). Pappas (2012) further stated that while the traditional classroom is teacher-centered, the flipped classroom is student-centered as students are able to become learners who can think and learn for themselves and by themselves.

As a result, given the inherent nature of the flipped classroom as an alternative and interactive classroom not only increase student's academic achievements and critical thinking skills (Carini, Kuh & Klein, 2006; Brunzell & Horejsi, 2011; Fulton, 2012a); but also significantly enhances students' engagement in learning via the use of technology as compared to traditional lecture classes (Cronhjort, Filipsson & Weurlander, 2018); then utilizing the flipped classroom as a tool to improve students' engagement in learning and academic achievement in secondary school Mathematics seemed ideal.

Based on the aforementioned research, the utilization of the flipped classroom would indeed be suitable since the selected group of students to be examined through this research ranges from ages 12 to 14. Thus, the issue with the unwillingness to adapt to a new technique of learning and teaching was negated. Additionally, through the website created for the students by the teacher to access the online videos and other related materials (www.stfgcmathminds.weebly.com), a blog space was available for group chat and discussions amongst the students and teacher to extend the interactions and students' engagement in learning outside the classroom. This discussion forum was monitored everyday by the researcher to

ensure intelligent and school-related conversations occurred. Also, to reduce the distraction time, students were required to participate in online quizzes for each sub topic on the unit of work each day as well as view specific video presentations on the website' platform as part of their homework. Additionally, students were required to write journals describing their engagement, interest, views, feelings and attitudes towards this new approach to learning and website.

Chapter 3 - Methodology

Introduction

Allowing students to consume content in a very asynchronous manner not only increases their interest and motivation in learning, but also improves active participation, willingness to learn and academic achievements through the flipped classroom (Chowdhury, 2014). As such, the purpose of this study was to investigate how the adoption of the flipped classroom could affect the students' engagement in learning and academic achievements in Mathematics of a selected Form 2 class.

The preceding chapters explored the background of this study and the rationale for the intervention (the flipped classroom), as well as two pertinent research questions:

1. How can adopting the flipped classroom approach affect the form 2 students' engagement in learning Mathematics?
2. How can adopting the flipped classroom approach affect the form 2 students' academic achievement in Mathematics?

This chapter describes the methodology, the research design, participants, data collection strategies and instruments, data analysis techniques, and ethical considerations.

Research Design

Burns and Grove (2003) described research design as a blueprint for conducting a study where the results generated after completion are used for answering the research questions. For this study, an action research design was utilized. Action research is "a disciplined process of

inquiry conducted *by* and *for* those taking the action where the primary reason for engaging in action research is to assist the “actor” in improving and/or refining his or her actions” (Sagor, 2000, p. 9).

O'Brien (1998) further stated that there are four different types of action research: Traditional, Contextual, Radical and Educational that can be applied to any of the three different models used for action research: Kemmis (1982), Susman (1983) and Trist and Emery (1959) model. Thus, due to the nature of this study, an educational action research design seemed best as it allows educators to gain insight into the issues directly related to their classroom and by extension, bridge the gap between theory and practice (Johnson, 2012; Mills, 2011). Furthermore, McNiff (2002, p. 26) points out that, “action researchers are real people in real situations” who ask the question “how can I improve or change what I am doing?” As such, the investigation examined the current practice/s of what the researcher or practitioner did to improve what was being done, thus allowing the researcher to better understand the situation (Vaccarino et al, 2007). Simply put by O'Brien (1998), “action research is learning by doing” (p.3).

Through self-reflections therefore, researchers can evaluate their own work in order to make relevant changes where necessary. Selener (1997) stated that “change does not come about as a result of spontaneous acts, but through reflection on and understanding of specific problems within their social, political, and historical contexts” (p. 105). Thus, reflective practice is an essential component of action research as it allows researchers to plan what changes can be made

(if any), act on these changes, observe what takes place, then reflect once again, re-plan and so on (Vaccarino et al, 2007).

The Kemmis (1982) spiral model (Figure 1) consists of sequential cycles with four steps: plan, act, observe and reflect. This model allows opportunities for the analysis of a phenomenon in a greater depth each time, thereby resulting in greater understanding of the problem as well as the effectiveness of the action/s taken to resolve the problem (Kemmis & McTaggart, 2000 as cited in Denzin & Lincoln, 2005). This model will be used as the theoretical framework to guide this research.

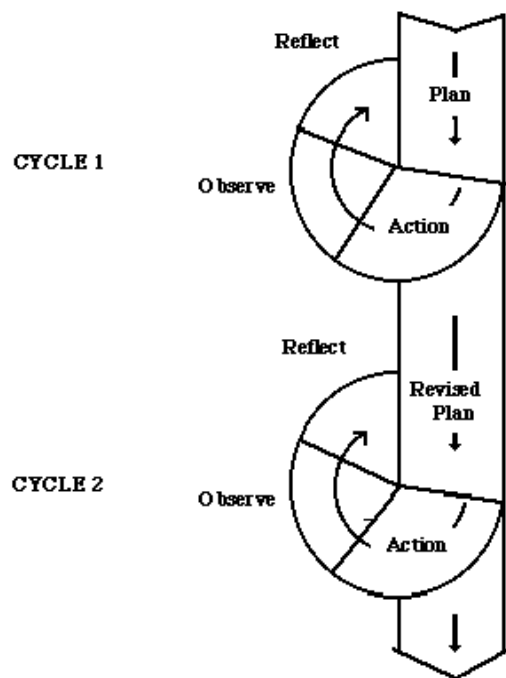


Figure 1. Action research protocol by Kemmis (1982) cited in Hopkins (1985)

This action research study took the form of a mixed methods, quasi-experimental, single-group, post-test only design to determine levels of students' engagement in learning and academic achievement in Mathematics via the flipped classroom.

Justification of the Design

Quasi-experimental Design. Abraham and MacDonald (2011) stated that a quasi-experimental research resembles a true experimental research in that there is manipulation of the independent variables. However, it differs significantly from a true experimental research since studies are usually conducted in its natural setting as opposed to a laboratory and, there is no control group nor random selection and assignment of participants. Cohen, Manion and Morrison (2007) added that in most educational research, a quasi-experimental design is best because random selection and assignment of schools and classroom are highly impractical. Thus, quasi-experimental design is often considered as a "compromised design" between a true and natural experiment (Cohen, Manion & Morrison, 2007, p.282).

Thus, a quasi-experimental design was implemented since this study falls under the educational paradigm, resembled an experimental research where the independent variables (asynchronous materials such as videos, songs and teacher-developed power point presentations) were manipulated, and was conducted in its natural setting (the classroom) rather than a laboratory. It however lacked the randomization process since the group of students utilized was purposefully selected and not randomly chosen due to time constraints and convenience of the participants. As such, one inherent weakness of this design was that the

statistical data generated can only be specific and not generalized due to lack of random selection of participants (Shuttleworth, 2008). However, Beth (2002) argued that despite quasi experiments lacking the random assignments, this method can be easily implemented since randomization can be difficult and time consuming. She added that quasi-experimental design most useful especially in the context to which the subjects are selected intentionally.

Single-Group. Nock, Michel, and Photos (2007) stated that through its flexibility and ease of use in the implementation and evaluation of interventions, single-group research design has the power to clearly and more efficiently demonstrate causal relationship between interventions and the behaviour changes with the participants as opposed to large sample designs. However, Danov and Symons (2008) argued that data analysis of single group designs in most instances are not only unreliable since different researchers may reach different conclusions about the same set of data, but also, overall judgements about the effectiveness of an intervention cannot be efficiently summarized and compared across groups.

Conversely, Price, Jhangiani, and Chiang (2014) and Scruggs and Mastropieri (2001) argued that utilizing a steady strategy or intervention combined with the use of several data collection instruments reduces such limitations of single group designs to a great extent. They stated that, as the number of data collection tools increases, the accuracy and precision of judgment based on the effectiveness of a treatment increases. Thus, the probability of determining the success or failure of an intervention across a wide range of situations and conditions via the use of single group designs are high. Additionally, single-group design not

only requires less resources and time as compared to large sample designs (Nock, Michel, and Photos, 2007), but is also “uniquely able to provide an experimental technique for evaluating interventions for the individual subject” (Cohen, Manion, & Morrison, 2007, p.285). Thus, since this study sought to evaluate the effects of a single intervention (the flipped classroom) by gathering data using nine data collection instruments spread over a four-week period, a single group design could be deemed suitable.

Post-Test Only Design. Shuttleworth (2009) stated that not only is the post-test only design the easiest design to use in education, it is illogical to test students on knowledge that was not previously taught in order to generate conclusive evidence in support of an intervention never used before. Conversely, Shadish, Cook and Campbell (2002) argued that because there is no pre-test nor comparison group in some instances in post-test only designs, it is not only difficult to determine the magnitude of the outcomes of a treatment, but whether such outcomes are due to the treatment itself or caused by some external factors such as maturation and other physiological and psychological reasons.

On the other hand, Knapp (2016) stated that the utilization of a pre-test is not sufficient to rule out alternative explanations apart from the treatment itself for the outcomes of an experiment. He explained that if a pre-test is given and the scores improved from the pre-test to the post-test, then that does not guarantee a treatment effect; it could be a practice effect. Moreover, Russell and Purcell (2009) made the claim that provided that there is the existence of tangible and reliable test scores to be compared, prior to the implementation of an intervention; a

post-test only is suitable for a quasi-experimental design. As a result, the Mathematics end of term one examination scores were utilized as the base scores in place of a pre-test. Thus, a post-test only design was utilized.

Mixed Methods. Wisdom and Creswell (2013) described mixed method research as an emergent methodology for conducting research that involves collecting, analyzing and systematically integrating or mixing both qualitative and quantitative data within a single investigation. Suter (2006) stated that “mixed methods research in education has great potential to influence ways of thinking about problems and practices in the teaching when both qualitative and quantitative data are used simultaneously” (p.65). Creswell (2009) added that when both types of data are used simultaneously, the researcher gains a greater understanding in both depth and breadth of the research problem in a manner in which neither method individually can provide.

Mertens and Hesse-Biber (2012) stated that the most advantageous characteristic of using a mixed methods approach, is that it generates a wide range of results which can be used to assist in the triangulation of the effectiveness of an innovation. Therefore the researcher is able to identify aspects of a phenomenon more accurately by approaching it from different vantage points using different methods and techniques (Hattangadi, 2018). Thus increasing the validity of the results generated as different perspectives can illuminate the issues being studied (Shorten & Smith, 2017). Additionally, Shorten and Smith (2017) and Wisdom and Creswell (2013) stated that mixed methods research reflects the participants' point of view as the findings are grounded

in the participants' experiences, provides strengths that offsets the inherent weakness of qualitative and quantitative research and, collects rich and comprehensive data to provide a complete overview of the phenomenon than either method would alone.

Hence, since this study sought to explore two outcomes of the flipped classroom; student engagement in learning which is mainly qualitative in nature (Steen-Utheim & Foldnes, 2017) and academic achievement which is mainly quantitative in nature (Ganyaupfu, 2013), a mixed methods approach seemed appropriate.

Independent and Dependent Variables

For this design, the independent variable was the use of asynchronous materials such as videos, songs and teacher-developed power point presentations for students via a teacher made website, whilst the dependent variables were students' engagement and academic achievement. Both numerical and non-numerical methods were utilized to collect and analyze the data.

Description of participants

The sample of students chosen for this study were a single class selected from the Form 2 level, comprising 43 female students ages ranged from 12 years to 14 years. This particular sample was purposefully selected because this was the only Form 2 class taught by the researcher. More so, purposive sampling seemed appropriate since it relies on the judgement of the researcher in selecting the participants to be studied (Sharma, 2017). Aryes (2019) added that purposive sampling allows opportunities to make generalizations from the data, target

individuals who have a shared set of characteristics, increases the validity of the information gathered as everyone within a population can be selected and, has a low margin of error.

In comparison with the researcher's other classes, this group seemed the most disengaged, talkative, submitted homework assignment during Mathematics class in term one much less frequently than the others classes and overall discipline level was very poor. Additionally, based on the Mathematics end of term one results, which will be used as base scores, the average score of this class was 60.10% with the lowest being 5% and the highest being 97%. Within those scores, 14 students attained scores above 70%, 10 students attained scores between 50% to 69% whilst 19 students attained scores below 50%. Thus, it was imperative to address their academic achievements.

Also, majority of the students generally seemed bored and uninterested in learning Mathematics. Fortunately, 42 students stated that they had internet access at home whilst one student did not. Thus, considering the flipped approach is dependent on internet access, this supported the use of the intervention. Special preparation were made by the researcher with the school's librarian for the single student to use the internet in the school's library on mornings before Mathematics class.

Setting

All of the lessons were taught in the same form 2F classroom which was a 20 by 20 feet air-conditioned room located at the upper floor of two stories block on the far western side of the school's compound with one door for both entrance and exiting. Also, the classroom cannot be

seen directly from the administrative block since it is separated by the students' washroom and assembly hall. To the left of the classroom the school's cafeteria can be viewed from a window. As such, the distraction level was mostly high when class period was approaching either break or lunch. The students were accommodated in individual desk and chairs joined in rows of two and three's. There was limited space to walk through the columns making group work restricted to three to six students where possible.

Strategy/Intervention

The unit of work taught during this study was Consumer Arithmetic. Students were required to view pre-recorded materials such as videos, songs and power point presentations at home or wherever students could have gained access to the internet. These videos and so on provided the students with theoretical and content based knowledge. They also had to participate in the daily online quiz directed to them by the teacher and comment on the online blog spot where, they would state their definitions and examples of the various concepts dealt with during class sessions all on a specific web site (www.stfgcmathminds.weebly.com) designed by the teacher. They were also required to write 40-50 word journals describing their enthusiasm and enjoyment in class, excitement and feelings with the class activities, thoughts and views about the website and this "new" teaching and learning style, ideas (if any) into how the website and/or teaching can be improved or adjusted and anything else (school related) they wish to express. These journals were to be emailed to the teacher on a specific email address (stfgcemrith@gmail.com). McDonald (2016) stated that effectively using technology during the

teaching and learning process is one of the most suitable techniques of improving student's engagement in learning as it sought to promote excitement, student collaboration, gamification and new learning experiences.

After the video materials were viewed, whole group and small group discussions occurred at the next class session in relation to those materials as well as the blogs and online quizzes. This enhanced, reinforced and clarified any misconceptions about the content. Interactive grouped class activities such as debates and role plays followed in relation to the online videos to allow the students to demonstrate what they have learnt from the videos. As such, what the students did traditionally at home became what the student did in class and vice versa. Hence, the traditional nature of class work and homework was considered "flipped", thus dubbing this intervention as the flipped classroom (Ash, 2012).

Research plan

Prior to the commencement of this study, permission was sought out and granted in written format to conduct this study by the University of the West Indies Ethics Committee Campus (Appendix A). Consultation and discussions then followed with the Ministry of Education Planning Division (Appendix B) and the school's principal (Appendix C) seeking permission to undertake the study at The Ragnarok Girls Secondary School. Also, the student's parents/guardians received consent letters (Appendix D) requesting permission and informing them of the nature of the study.

The unit of work on Consumer Arithmetic consisted of various sub topics which included: calculating cost price, selling price, profit, loss, discount, percentage profit and loss and sales tax. This was conducted over a four-week period from March 12th to April 04th 2019 comprised of 10 sessions (four 45-minutes sessions and six 90-minutes sessions) in which 42 students were utilized in the data presentation. Although the class contained 43 students, the parental permission forms were not returned from one student as she was absent for majority of the term due to serious family and personal issues.

A learning hierarchy (Appendix E), unit plan (Appendix F), and lesson plans (Appendix G) with the respective concept analysis forms (Appendix H) for each session based on this unit of work were prepared before the start of this study. At the beginning of every session, 5 to 7 minutes were allocated for students to work together in groups of two or three and discuss what they learned from the online materials. Whole and small group discussion between the teacher and students then followed in addition to interactive grouped class activities such as role plays and debates.

During the sessions, observations were made by the teacher whilst simultaneously the teacher's observational checklist was filled out. Also, throughout the research process the teacher's journal was completed. Moreover, student engagement questionnaires before and after the implementation of the intervention were administered in order to determine their initial and final levels of engagement respectively.

At the end of the 10 sessions, the students were given a summative achievement test on the unit of work covered whilst the teacher utilized the table of specification and mark scheme to tally their scores. Additionally, semi structured individual and focus group interviews were conducted to determine specific engagement levels in relation to the behavioural, emotional and cognitive components. Table 1 illustrates a more detailed description of the research plan.

Table 1. *Implementation Plan for the Flipped Classroom Intervention*

Task	Related to	Time	Resources	Success Criteria
1. Permission/Notices - Letter to Ministry of Education seeking permission - Letter to the principal and vice principal of Ragnarok Girls Secondary School notifying period of study	Overall Research	27 th January, 2019	- Paper - Computer - Printer	Letters & Email Approved

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- Letter to parents seeking permission - Email to Dr Richard Jones seeking permission to adapt an observational checklist				
2. Development of the website to be used : www.stfgcmathminds.webly.com	Overall Research	27 th January, 2019	Computer	Website approved
3. Developing Instruments List of instruments (teacher's observational checklist, student engagement questionnaire, semi structured & focus group interview protocol,	Research Question 1	28 th January, 2019	- Checklist form from Jones (2009) - Students Questionnaire - Paper - Computer	Instruments approved

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online blogs, teacher's journal and student journals)			• Printer	
4. Developing Instruments (summative achievement test & online quizzes	Research Question 2	1 st February, 2019	• Paper • Computer	Summative Test & Quizzes approved
5. Design Teaching Instruments (Learning Hierarchy, unit plan, lesson plans, concept analysis forms)	Research Question 2	1 st February, 2019	• Unit of work on Consumer Arithmetic consisting of 10 lessons	Unit of work approved
6. Administer Pre-Engagement Questionnaires	Research Question 1	11 th March, 2019	• Engagement Questionnaire	Students completed the questionnaire in class

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7. Start the Intervention	Research Questions 1 & 2	12 th March, 2019	• Unit of Work • Teacher's Observational Checklist • Teacher's Journal	Intervention Started
8. Administer Summative Achievement Test	Research Question 2	4 th April, 2019	• Test on Consumer Arithmetic	Students completed and hand-up test papers
9. Administer Post Engagement Questionnaires	Research Question 1	4 th April, 2019	• Engagement Questionnaire	Students completed the questionnaire in class
10. Conducted Focus grouped interviews	Research Question 1	4 th April, 2019	• Focus Group Interview Protocol	Students participated in the focus group

				interviews in class
11. Conducted semi-structured interviews	Research Question 1	4 th April, 2019	Semi-Structured Interview Protocol	Students participated in the semi-structured interviews in the library.

Data collection methods and instruments

Mohammad (2013) stated that in order to enhance the validity and reliability of the results obtained during a study and to make a conclusive judgment based on the effectiveness of an intervention, data must be collected from several instruments. Mason (2006) added that the utilization of multiple data collection tools not only allows validation of the data but also allows the researcher to gain a fuller picture of the subject under investigation. Thus if each tool produces similar results, then the phenomenon under investigation has been accurately measured (Monrad, 2013). She added that under the mixed methods paradigm, more is known about the research topic when both quantitative and qualitative data are integrated from multiple instruments. Therefore in this study, a total of nine instruments were utilized to provide data into how the flipped classroom affects the form two student engagement in learning and academic

achievement in Mathematics. Table 2 illustrates the instruments used for addressing each research question.

Table 2. *Instruments used for addressing each research question*

Research Questions	Data Sources	
	Numerical	Non-Numerical
1. How can adopting the flipped classroom approach affect the form 2 students' engagement in learning Mathematics?	• Student Engagement Questionnaire • Teacher's Observational Checklist • Online Blogs	• Teacher Journals • Student Journals • Student Interviews • Focus Group Interviews
2. How can adopting the flipped classroom approach affect the form 2 students' academic	• Online Quizzes • Summative Achievement Test	

achievement in Mathematics?		
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Student survey and Questionnaire (Appendix I). The researcher surveyed students to determine their initial and final levels of engagement in learning by administering questionnaires before and after the implementation of the flipped classroom model. Brennan and Williams (2004) argued that apart from knowing the level of effort, truth and thought in answering the questions, a questionnaire completed by students is confidential, easy to understand, analyze and generates conclusion. It is one of the optimal methods of acquiring information to assess the extent to which students are engaged, involved and interested in the particular task being examined (McLeod, 2018).

The questionnaire utilized in this study contained 10 questions which were divided into three sub sections; the teacher, the subject and level of engagement. All of the items were positively phrased in order to deviate from unnecessary confusion of the questions making it easier for the respondents to give the necessary information, and to increase the reliability and validity of the responses given (Salazar, 2015).

Each section contained five choices. Section I (the teacher) contained three questions ranged from very good to very poor. Section II (the subject) contained two questions ranged from strongly agree to strongly disagree. Section III (students' engagement) contained five

questions ranged from always to never. These three sections were critically examined to acquire a holistic overview of the problem.

Teacher observation and Checklist (Appendix J). The researcher conducted observations which were guided by a list student engagement criteria for each of the 10 sessions using a teacher's observational checklist. A teacher's checklist in research can be a powerful tool in answering and identifying the issue/s of concern for these reasons outlined by Jones (2009): it can be customized and utilized repeatedly to meet the specific objectives for the evaluation; it is specific in nature thus targets the precise behaviours or traits displayed by the students without providing unnecessary observations; and monitors progress throughout the study from the initial stage to the final in order for the teacher to recognize the areas in which development is required. As such, the teacher's observational checklist was adapted from Jones (2009) and the data generated addressed students' engagement in learning. Permission was sought out by the researcher and granted by Dr. Richard Dick Jones via email (Appendix K), to utilize the checklist for this study.

The checklist consisted of 12 items divided into three sections that examined the three engagement categories individual (emotional, behavioural and cognitive). Section I (emotional engagement) contained four items which examined students' body postures during class sessions, excitement towards learning, level of comfort in asking questions and their personal connection towards the various class activities.

Section II (behavioural engagement) contained four items which examined students' compliance with instructions, verbal participation in class discussions, volunteering to participation in class activities, and their level of collaboration with peers. Section III (cognitive engagement) also contained four items which examined students' independence in solving real world problems, their ability to create unique solutions to such problems, their confidence in expressing thoughts and ideas, and their ability to initiate class discussions. These three sections collectively gave significant insight into how the flipped approach affected the form two students engagement in learning Mathematics.

Teacher reflection and Journal (Appendix L). A major component in any action research is reflection, as practitioners are involved in ongoing cycles of planning, acting, observing and reflecting (Nugent, Malik & Hollingsworth, 2012). They further stated that in order to attain maximum student learning outcomes within the action research paradigm, teachers need to ask themselves some crucial questions such as: *Are my students learning?* , *Are my methods of teaching effective?* , *What difference does my teaching make in developing the knowledge and skills of my students?* *What changes are required to attain maximum student learning outcomes?*

Thus, in order to address such questions and to identify the levels of student engagement in learning whilst taking into account students' comments and suggestions both favorable and unfavorable regarding the intervention, daily journal entries were written by the researcher after each of the 10 sessions. Walker (2006) stated that using teacher's journal in research promotes

critical analysis of the information gathered, enhances reflection on a particular topic of interest, aid in recognizing the strengths, weaknesses and outcomes of various interventions implemented within the classroom; and is utilized to enhance and improve some specific trait/s identified by the teacher as problematic.

Student reflection and Journal (Appendix M). As part of their daily homework throughout the study, students were required to write 40 to 50 words journals for each class session describing their enthusiasm and enjoyment in class, excitement and feelings with the class activities, thoughts and views about the website, and suggestions as to how to improve the website and class activities. Such student feedback therefore provided further evidence as to how the flipped classroom affected their engagement in learning across the three categories (emotional, behavioural and cognitive).

Walker (2006) stated that due to its qualitative nature, journal writing promotes self-reflection and afford students opportunities to express their feelings, opinions and thoughts regarding their educational experiences. Such valuable feedback therefore not only allows the teacher to track areas in the curriculum and teaching that needs adjustments, but also identifies the students that may require additional support (Rehbein, 2017). Schweighofer (2018) added that during the process of journal writing, students move from being passive to active learners as it encourages them to take charge of their learning, make the connections to what is important to them, build their confidence, and help teachers to understand and learn more about their students.

Semi-Structured Student Interviews (Appendix N). In order to address the first sub research question which dealt with students' engagement in learning; rich and valuable data were collected from three purposefully selected form two students at the Ragnarok Girls' Secondary School using semi structured interviews. Purposive sampling allows the researcher to identify any extreme perspectives that are present in a population (Ayres, 2019). Of the three selected students, based on observations during the study, one portrayed high levels of engagement, the other medium level and the other low levels of engagement in learning. Thus they would have provided the richest possible data.

Alshenqeeti (2014) and Harrell and Bradley (2009) stated that semi-structured interviews are highly flexible and are particularly appropriate to gather qualitative data since, it indirectly permits the interviewees with the freedom to express their views and perceptions about a particular phenomenon in their own terms. However, Alsaawi (2014) and Teijlingen (2014) argued that semi structured interviews can be time consuming if not managed, planned and controlled sufficiently by the interviewer; requires high level of interviewing skills to solicit the relevant information required by the interviewer from the interviewee; and can infringe on the interviewee's privacy. Nevertheless, Berg (2007) indicated that due to its semi controlled and semi structured nature, semi structured interviews "allows for in-depth probing while permitting the interviewer to keep the interview within the parameters traced out by the aim of the study"(p.39). Likewise, Parris et al., (2012) specifically recommended a semi structured format using

open ended questions in educative arenas, as students will be free and feel comfortable to express their innermost feelings.

Focus Group Interviews (Appendix O). To further provide insight into how the flipped classroom affect student engagement in learning, two focus group interviews were conducted with students who were not interviewed individually. Eleven students were randomly selected and placed into the two groups with 6 members in one group whilst 5 members in the other. The focus group interviews were conducted prior to the individual interviews and took place inside of their quiet empty classroom. Each grouped interview lasted approximately 12 to 15 minutes. Keen (2006) stated that randomly selecting students to participate in any activity not only allow fairness in the selection process, but ensures that students do not feel marginalized along the way. She added that if a teacher were to only select the “top” performing students, then the other students may withdraw and be disengaged in any other activities the teacher may conduct in the future.

Schwab (2016) stated that focus group interviews are the best ways to exchange viewpoints and discuss disagreements between participants in ways that cannot be captured during face to face interviews. He further stated that it is most useful when there is the need to confirm analysis via triangulation with other data collection instruments. Cohen, Manion and Morrison (2007) added that since the participants in focus group interviews interact with each other rather than the interviewer, the participant's views as opposed to the research's agenda

predominates. Thus focus groups provides collective evidence in support of or discomfort with a theme, topic or intervention.

Conversely, Temkin (2007) argued that since most focus group interviews in education are conducted with a small sample size, the results gathered may not be a good representation of the larger population. They further stated that respondents may feel pressured in giving similarly results as their peers which can significantly skew the results. To address such drawbacks of this type of interview, the researcher conducted two focus groups with approximately one third of the total number of students present. He also ensured that the groups being interviewed were isolated from each other, comfortable within their own classroom, and made aware that they were free to express themselves without prejudice and victimization regardless of other participants' opinions.

Online Blog (Appendix P). To provide further evidence into how the flipped classroom affect student engagement in learning, students were required as another part of their daily homework, to post definitions and give working world examples of key concepts examined during class sessions on the "BlogSpot" which was available on the website. Morris (2018) and Thomson (2018) stated that utilizing blogs in education enhances students' independence towards learning, creativity, home-school connections, social and communication skills, critical thinking, participation self-reflections, and self-confidence to voice their opinions. Zinger and Sinclair (2013) added that blogging improves students' engagement in learning across all

dimensions (emotional, behavioural and cognitive) as students are given the opportunities to apply the knowledge and skills learned in one setting to another.

Online Quizzes (Appendix Q). As another aspect of student's daily homework and to further gather quantitative data into how the flipped classroom affect the form two students' academic achievements in Mathematics, 11 online quizzes were made available for students to complete after each subtopic for the unit of work covered. These online quizzes were created by the researcher using a free online quiz maker (FlexiQuiz) and were accessible for students on the website (www.stfgcmathminds.weebly.com). The quizzes were multiple choice format which allowed a broad range of content and higher order thinking skills to be tested in a single exam, quick and easy scoring, instant feedback and objective grading without rater bias (Weimer, 2018).

Students were required to register at the start of each quiz using their assigned number given to them by the teacher. Each quiz were timed and students were allowed two attempts per quiz. These two attempts were made possible by the researcher based on the feedback from students. They stated after the first attempt, they wanted the opportunity review the videos and retake the test. Also, the time limit for each quiz was based on the number of questions present. This was guided by Tookoian (2016) who suggested approximately 60 seconds per multiple choice item and an average of 10 items per quiz. This rigid time limit structure also served to reduce the possibility that students may look up the answers online. Also, for every attempt of each quiz, both the questions and choices were randomly arranged to minimize cheating and

maximize the effectiveness of the test (Fain, 2013). Upon completion of each quiz, a feedback page containing the student's results, time taken to complete the quiz, and worked solutions for each question was displayed and made available for students to download. This feedback page was automatically emailed to the researcher to track and record the progress of each student.

Summative assessment - Achievement Test (Appendix R). Tzurriel (2001) argued that standardized achievement test does not cater for disabled students nor does it reflect on students' behaviours. However, Linn and Gronlund (2000); Taras (2009) argued that achievement tests yields quantifiable information such as scores and proficiency levels, provides information regarding student's strengths and weaknesses in concept areas and, assesses student's progress especially in the instance where something new is implemented in the classroom. Thus, an achievement test consisting of 10 multiple choice items and two constructed response items were created by the teacher and administered to gather quantitative evidence into how can the adoption of the flipped classroom approach affect the form 2 students' academic achievement in Mathematics. It was used as an assessment *of* learning and ultimately as an "exit ticket" to evaluate students' content knowledge; as well as to provide a means for the teacher to track how well the students understood the topics taught.

The multiple choice response items were created using the 31 principles guidelines for designing and developing selected response questions outlined by Haladyna, Downing and Rodriguez (2002). This thereby allowed better item formation and validity of the overall summative test. To target the higher cognitive realm of the students in relation to application,

and analysis, two constructed response items were also created. Tankersley (2010) stated that constructed response items represent a complicated and difficult task that challenges students to think at a higher cognitive level.

To ensure that the summative achievement test measured an adequate sample of the class content and improve the validity of the teacher's evaluation, a table of specification (Appendix S) was developed and used. DiDonato-Barnes & Fives (2013) postulated that a table of specifications can help teachers map the amount of class time spent on each objective with the cognitive level at which each objective was taught, thereby helping teachers to identify the types of items they need to include on their tests. More so, Wolming and Wikstrom (2010) argued that a table of specification can also be used to help teachers frame the decision making process of test construction and, improve the validity of teachers' evaluations based on tests constructed for classroom use.

A mark scheme (Appendix T) was also utilized in the marking of the summative achievement assessment. Bloxhan and Boyd (2007) stated that mark scheme promotes fairness and consistency in marking assessment. As such, the utilization of a summative achievement test in conjunction with a table of specification and a marking scheme in this study provided tangible evidence in light of students' academic achievement in Mathematics.

Data Analysis

Questionnaire. Individual responses were tallied and tabulated at the end of the questionnaire by the teacher using the Likert scale suggested by Lamarca (2011). She stated that

the utilization of the Likert scale in research is the most universal method of collecting data since it is easily quantifiable, easily understood and allows computation of some Mathematical statistics such as means and standard deviation. As such, since there were five options within each section of the questionnaire, the favorable choices such as very good, strongly agree and always were weighted a score of 5, and the unfavorable choices such as very poor, strongly disagree and never were weighted with a score of 1. Thus, since the questionnaire contained 10 questions, the highest possible achievable score was 50 whilst the lowest was 10. Descriptive statistics, including range, mean and standard deviation were then computed, tabulated and compared for both the pre- and post-treatment scores. Inferential statistics via a paired samples t-test was also conducted to test the null hypothesis that there is no statistically significant differences between the pre and post questionnaire scores. This assisted in determining the difference in the level of student engagement in learning before and after the flipped classroom approach was implemented.

Teacher's Observational Checklist. Using a 5 point Likert scale as suggested by Lamarca (2011), each of the 12 items were ranked from *always* to *never* where the *always* choice attaining a score of 5 whilst the *never* choice attained a score of 1. Thus since there were three categories with 4 items each, the highest possible score on each category was 20 whilst the lowest was 4. Therefore, the total overall score for each checklist was 60. Descriptive statistics, including range, mean and standard deviation were then computed and tabulated for the 10 sessions.

Davis, Summers and Miller (2012) claimed that in order to clearly identify and determine whether or not students are actively engaged in learning, interconnectedness between and amongst the three major engagement categories (emotional, behavioural and cognitive) must exist. Thus, a Pearson's correlation was also conducted and compared across the three engagement categories to test the null hypothesis that there is no statistically significant differences between the three categories of student engagement in learning. Fundamentally, a Pearson's correlation summarizes in a single value the degree the independent and dependent variables correlate and direction of the correlation (Filipowich, 2018).

Teacher's Journal. As each of the 10 sessions unfolded, the teacher kept a journal and counted the amount of times various phrases were written describing the general flow and pace of the class, the engagement of the students in relation to small and large group work activities, various non-verbal gestures of students signalling their excitement, willingness to learn and/ or any discomfort experienced, student's thoughts, views and suggestions about the flipped approach and the website, and any other indications (verbal or non-verbal) as to how the approach could be enhanced and / or tailored to meet the needs of the students.

Coding therefore was also used as the prime technique in analyzing such textual data in order to identify the richness and complexities of the experiences of the flipped classroom approach in relation to engagement in learning. Moreover, Richards and Morse (2007) stated that coding can be described as a heuristic process of organizing and sorting data, to which it can serve as a way to label, compile and organize the information generated. Additionally, Saldana

(2009) described coding as a way “to arrange things in a systematic order, to make something part of a system or classification, to categorize” (p. 08).

Manual coding was utilized using: different colors (as light green, light blue, navy blue, purple, pink, mint green and gray); In Vivo codes (conduct, involvement in learning, participation, feelings, identity, willingness); and descriptions of those codes as the first cycle of coding. The second cycle of coding involved collapsing those In Vivo codes into three categories: Behavioural, Emotional and Cognitive to holistically gauge students' engagement in learning. These codes and categories were the final product after the initial codes and categories were recoded and re-categorized by the researcher to ensure seamlessness between the data gathered and the purpose of this study. Moreover, Abbott (2004) cleverly likens the process of recoding and re-categorizing to “decorating a room; you try it, step back, move a few things, step back again, try a serious reorganization, and so on” (p. 215). Furthermore, as highlighted by Marshall and Rossman (1999), it was ensured that these final categories were internally consistent (codes were linked in one way or the other) and externally divergent (categories were distinct and unique). Thus, the coding process enabled the research to show the richness and complexities of students' engagement in learning.

Student Journals. After each class session, students were required to write and email journals to the teacher at stfgcemrith@gmail.com as part of their homework. The number of journals submitted per student were then counted to determine how many students completed this aspect of their daily homework. Since these journals were used to further address the second

research question, manual coding was also used to analysis such textual data. All of the colours, In Vivo codes and categories used to analysis the teacher's journals, were also used to analyse the students' journals.

Student and Focus Grouped Interviews. Combining both individual and focus group in interviews during analysis enhances data richness and depth of inquiry (Lambert & Loiselle, 2008). Utilizing a recording app on his phone, the researcher recorded the responses from all of the interviewees and then transcribed those responses onto a Microsoft Word document. This ensured the most accurate representation of the verbal responses of the interviewees (Harrell & Bradley, 2009). Manual coding identical to the analysis of the teacher and student journals, was also the prime technique in analyzing such textual data in the interviewees' transcript in order to identify the form two students' engagement in learning.

Online Blogs. Students were required to state their definitions and list two working world scenarios of the various concepts taught during class sessions as part of their daily homework on the website's "BlogSpot". The teacher would have then made comments, refine their definitions and clarify any misconceptions where necessary. Frequency counts therefore was the primary method of analyzing such data. The researcher counted the number of times students made individual contributions, added to each other's post, and/or used the platform to ask for assistance from either their fellow colleagues or the teacher. Since there were 10 sessions, each of the 42 students were required to post 10 times giving a total of 420 contributions for the entire study. Percentages will then be computed based on the number of contributions made by the

students, to the total number of contributions for the entire study. Carlberg (2014) and Manikanda (2011) stated that although frequency counts and percentages are not reliable in drawing specific conclusions, it can provide a holistic overview and summary of the occurrences of interest, and help the researcher visualize how the variables behave in a given data set. Thus, an overall judgment was then made in relation to students' participation in homework activities and using the website platform for added support outside of school.

Online Quiz. As part of their daily homework, students were required to participate in online quizzes at home or wherever they can gain internet access after school. They were allowed two attempts per quiz. Thus an average score was computed for each student for each of the 11 online quizzes. The number of A's (74.5% to 100%), B's (65.5% to 74.4%), C's (49.5% to 65.4%), D's (34.5% to 49.4%) and F's (0% to 34.4%) were then computed, categorized and tabulated based the school's grading scheme. Duquia, Bastos, Bonamigo, González-Chica and Martínez-Mesa (2014) stated that expressing values as percentages enables the researcher to conveniently compare information from different sources, quantify changes over time, and determine the amount by which a variable may have increased or decreased following a percentage change. Thus, a bar graph representing the information gathered was then plotted and comparisons across the 11 quizzes as well as the results from the summative test in relation to student's performance were conducted.

Summative Achievement Test. A post-intervention achievement test was utilized and the results generated were compared with the scores achieved from the Mathematics end of term

one examination results (base scores). For both the base scores and post intervention examination, various descriptive statistics including the range, mean and standard deviation were computed, tabulated and a comparison amongst these values were examined, highlighting major increases and decreases. Inferential statistics via a paired samples t-test was also conducted to test the null hypothesis that there is no statistically significant differences in the posttest scores as it relates to the base scores. Additionally, the overall percentages for both examinations were classified utilizing the school's grading scheme whereby the changes in grades from the base scores to the post intervention scores were recorded.

Data Integration

Fetters, Curry and Creswell (2013) stated that "the fit of integration describes the extent the qualitative and quantitative findings cohere" (p. 2134). Thus, integrating both forms of data enhances the value of mixed methods research whereby the quantitative findings can be used to assess the validity of the qualitative data and vice versa (Bryman, 2006; Fetters, Curry & Creswell, 2013). This study adapted a convergent (sometimes referred to as concurrent) mixed methods design where both qualitative and quantitative data were collected, analysed separately and then merged. In educational research, a convergent mixed method design is ideal as it is fundamentally used to overcome the weaknesses in one technique with the strengths of another (Warfa, 2016). Thus allowing the researcher to confirm and cross-validate the overall findings.

For this study, each of the nine instruments used for collecting data were analysed separately and then combined to gain insight into the research questions. For instance, common

trends were examined from the seven instruments used to gather data into how the flipped classroom could affect students' engagement in learning. These patterns highlighted the frequency and extent to which students were emotionally, behaviourally, and cognitively engaged in learning during the study. Thus, if each instrument displayed high levels of Behavioural engagement for example, then this would justify that the intervention was successful in improving students' participation in the various class activities.

Similarly, for the second research question that explored academic achievements, the two instrument used (online quizzes and summative test) were analysed individually and then combined to make a judgement whether the intervention was successful in improving student's academic achievements in mathematics.

Ethical Considerations

"Ethical considerations pervade the whole process of research" (Cohen, Manion & Morrison, 2007 p. 57). Hence for this study, several forms of ethical considerations were taken into account. Firstly, permission was sought out and granted in written format to conduct this study by the University of the West Indies Ethics Committee Campus, The Ministry of Education Planning Division, the school's district supervisor III, and the school's principal.

Informed consent defined by Diener and Crandall (1978) as "the procedures in which individuals choose whether to participate in an investigation after being informed of facts that would be likely to influence their decisions" (p.52), was sought out and granted by both the

parents/guardians of the students and the students themselves. These consent forms were essentially signed contracts for participation in this research study.

More so, in accordance with the National Commission for the Protection of Human Subjects of Biomedical and Behavioural Research (1978), all stakeholders involved were made aware of the purposes, contents and procedures of the research, any foreseeable risks and negative outcomes, discomfort or consequences and how they will be handled, benefits that might derive from the research, right to voluntary non-participation, withdrawal and rejoining the project, rights and obligations to confidentiality and non-disclosure of the research, participants and outcomes, disclosure of any alternative procedures that may be advantageous, and opportunities for participants to ask questions about any aspect of the research.

Anonymity and confidentiality of participants are two central ethical research practices all researchers must adhere to when designing and implementing research (Wiles, Crow, Heath & Charles, 2008). Thus, throughout the study, participants' names were kept anonymous, a pseudonym was used for the school and all data gathered were kept confidential for the duration of the study. The names of the participants were replaced with numbers. So, for all of the data collection instruments, participants were required to use their assigned number in place of their actual names which ensured no one apart from the researcher (since he was the teacher of the class), could make the link between the participant and the information provided.

The researcher therefore maintained confidentiality throughout the study by ensuring all original data were retained in paper or electronic format for at least five years from the date of

publication. Also, all printed materials (questionnaires, summative test, and teacher's checklist) were kept in a fire-safe storage device and all non-printed materials (online quizzes, student blogs, students' journals, teacher's journals, transcripts from the interviews) were kept in a password-protected electronic storage device. Essentially all the data gathered were only used for the purpose of this research and for the researcher's eyes.

Chapter Four- Presentation and Analysis of Findings

For this study, the flipped classroom approach was implemented as a means of addressing the grand tour question of *how can adopting the flipped classroom in the teaching of Mathematics to form 2 students, affect their engagement in learning and academic achievement, at the Ragnarok Girls' Secondary School*. The findings will be presented by research questions through the respected data collection instruments.

Research Question 1: *How can adopting the flipped classroom approach affect the form 2 students' engagement in learning Mathematics?*

Pre and post-intervention questionnaires on students' engagement, a teacher's observational checklist, semi-structured individual interviews, focus grouped interviews, student's journals, teacher's journal and online blogs were all utilized to determine how the adoption of the flipped classroom approach can affect the form 2 students' engagement in learning Mathematics.

Pre and post-intervention questionnaires on students' engagement. Of the 38 students who completed the self-report post-intervention engagement questionnaire, 30 (78.9%) reported higher scores than the pre-intervention questionnaire (see Figure 2). This suggested that there were overall improvements in relation to group activities, homework completion and utilizing technology for learning as compared to the pre-intervention questionnaire scores.

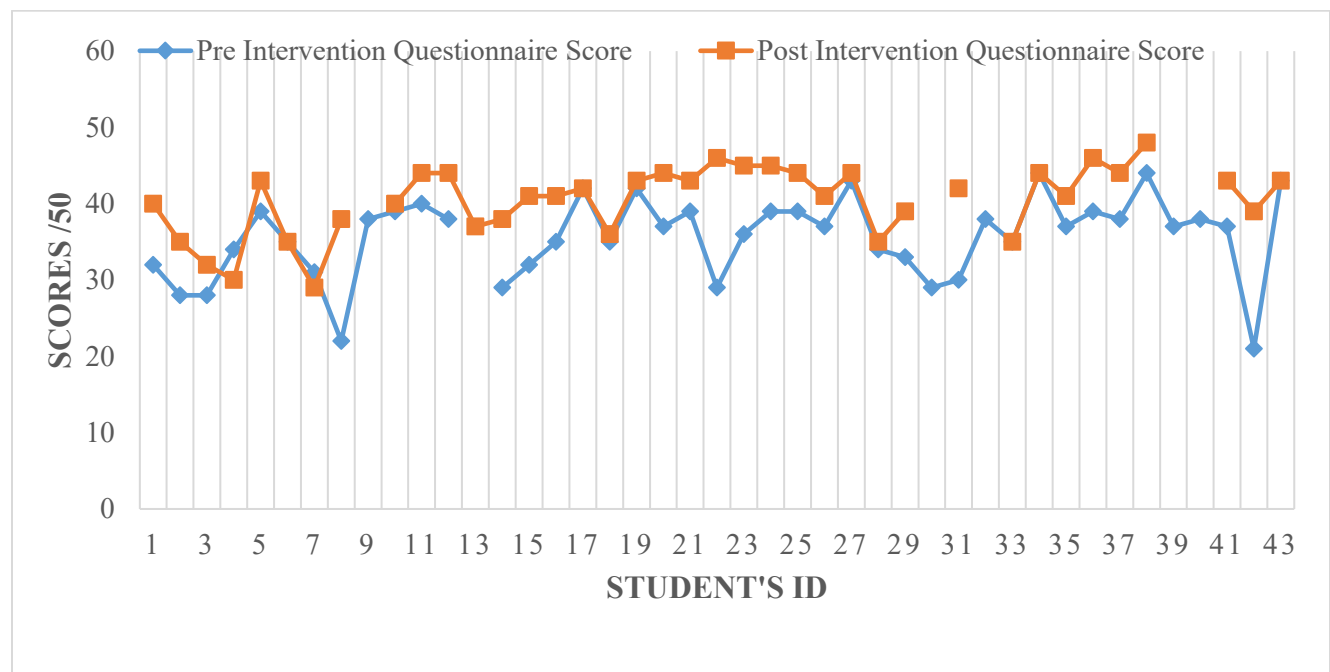


Figure 2. Line graph of pre- and post-intervention questionnaire scores

From the graph, it is evident that Students 1, 8, 14, 22, 31 and 42 in particular reported substantially higher post-intervention engagement scores. Only Students 4 and 7 (4.8 %) reported a decrease in the scores which suggested unfavorable responses towards the intervention. Students 6, 17, 33, 34 and 43 (11.9%) however, attained the same scores in both the pre and post intervention questionnaire which indicated no changes their engagement in learning Mathematics.

Further analyses were conducted via descriptive statistics to compare the pre-intervention with the post-intervention self-report engagement questionnaire scores. Observably, the range dropped from 23 to 19 since the minimum score increased by approximately 20% from 21 to 29.

Also the maximum score increased by approximately 10% from 44 to 48. These values are summarized in Table 3.

Table 3. *Descriptive Statistics of Pre and Post-Intervention Questionnaire Scores*

	N	Range	Minimum	Maximum	Mean	Std. Deviation
Pre-Intervention Questionnaire Score	42	23	21	44	35.60	5.401
Post-Intervention Questionnaire Score	38	19	29	48	40.50	4.549

An increase in the mean value was noted from 35.60 to 40.50 which further signalled an increase in overall students' reported engagement in learning by approximately 12 %. A slightly narrower spread of values can also be seen via the standard deviation as it shifted from 5.40 in the pre-intervention questionnaire scores to 4.50 in the post-intervention questionnaire scores. Thus, a fair amount of students were much closer to the mean score in the post-intervention questionnaire than the pre-intervention questionnaire which suggested overall enhancement of student engagement in learning.

A paired samples t-test was also conducted to test the null hypothesis that there is no statistically significant differences in student self-reported engagement in learning after the flipped classroom approach was implemented. There was a statistically significant difference in the scores, $t(36) = -6.15$, $p < .001$, from the pre-intervention questionnaire ($M = 35.54$, $SD = 5.61$) and the post-intervention questionnaire ($M = 40.59$, $SD = 4.57$). The researcher therefore failed to accept the null hypothesis.

Teacher's Observational Checklist. The checklist examined the three categories of engagement (emotional, behavioural and cognitive) highlighted by Lee (2014). Figure 3 displayed the scores results generated from each of the teacher's checklist across each category of engagement for all 10 sessions. It demonstrates high levels of student engagement in learning across the three categories in all 10 sessions since the scores on majority of the checklists were near the maximum.

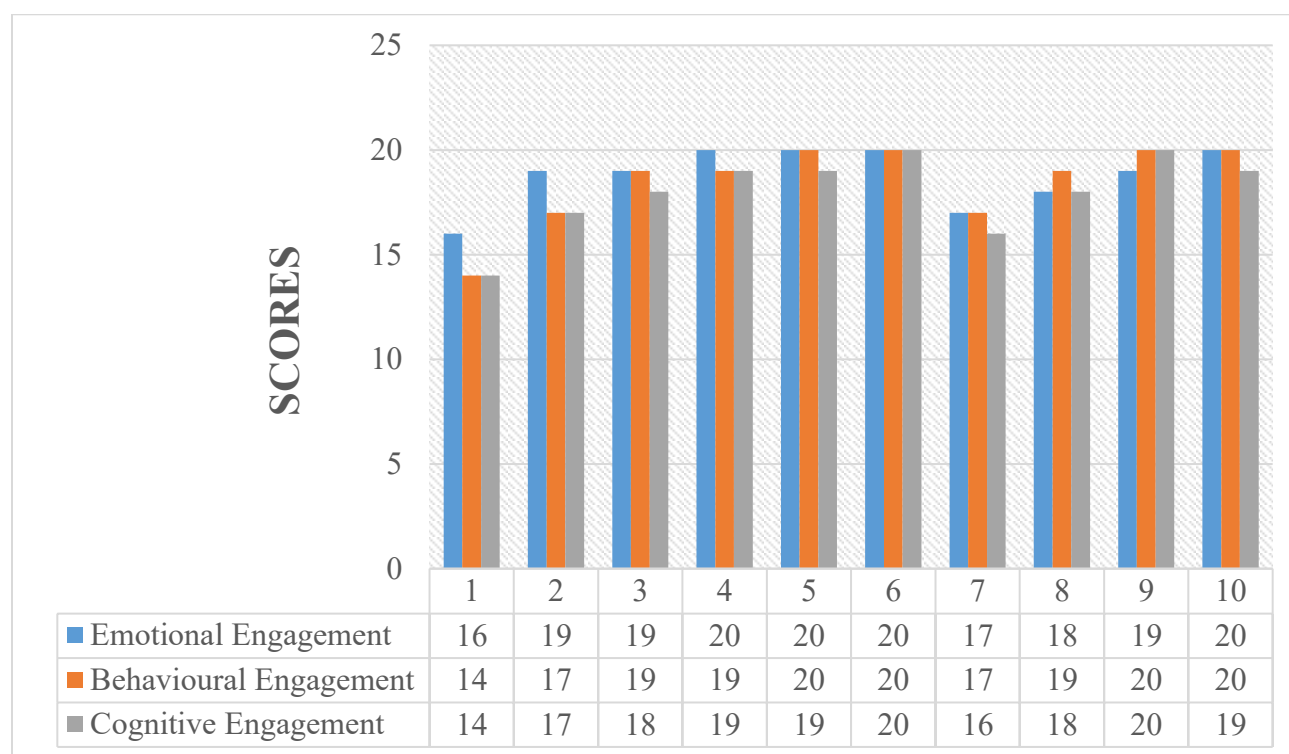


Figure 3. Bar graph of Teacher's Observational Checklist Scores for 10 Sessions

Emotional and behavioural engagement amongst students consistently increased for the first 6 sessions, dropped a bit during the 7th and increased again for the final 3. During the 7th session, some students encountered difficulties working in groups whereby differences in

opinions were present amongst the members and were not able to be resolved. This may have led to various levels of disengagement in participation by some of the students. Although it maintained overall high scores throughout the 10 sessions, cognitive engagement attained the lowest score amongst the three categories. The 6th session attained a perfect score of 20 point each on all three categories of engagement thereby generating a total of 60 point on the checklist. During the 6th session, a debate arose for the first time. Students were excited and made significant contribution towards the discussions which may have resulted in the perfect engagement score on the checklist. The first session attained the lowest overall score of 44 points.

Pearson's pairwise correlations were investigated to test the null hypothesis that there is no relationship among the different engagement categories. Since there are three categories, two will be compared at a time thereby generating three unique combinations to be examined. The correlation results are illustrated in Table 4 and in all 3 cases, the researcher failed to accept the null hypothesis.

Table 4.				
<i>Correlations matrix showing Pearson's r among the different engagement categories</i>				
		Emotional Engagement	Behavioural Engagement	Cognitive Engagement
Emotional Engagement	Pearson Correlation	1	.852**	.885**

	Sig. (2-tailed)		.002	.001
Behavioural Engagement	Pearson Correlation	.852**	1	.963**
	Sig. (2-tailed)	.002		.000
Cognitive Engagement	Pearson Correlation	.885**	.963**	1
	Sig. (2-tailed)	.001	.000	
	N	10	10	10
**. Correlation is significant at the 0.01 level (2-tailed).				

There was a statistically significant, positive relationship between emotional and behavioural engagement $r = .852$, p (two-tailed) $< .01$. Thus, while students were actively participating in class activities such as whole class discussions, collaborative work and role plays, students were simultaneously, emotionally engaged. This was indicated by their excitement and enthusiasm towards such activities, level of comfort in asking or answering questions, portrayal of positive body language such as sitting in an upright position, eyes on teacher and nodding of their heads, and having personal connections towards the various tasks.

Also, there was a statistically significant, relationship between emotional and cognitive engagement $r = .885$, p (two-tailed) $< .01$. Thus, whilst students generally displayed interest and comfort towards the various class activities and were had personal connections with those tasks, they exhibited aspect of self-regulated learners as they were able to initiate class discussion and

solve problems with minimal assistance from the teacher or peers. An overall increase in students' critical thinking skills was also noted as students were able to work independently and had a sense of belonging as their opinions and contributions mattered.

Additionally, there was a statistically significant, strong positive relationship between behavioural and cognitive engagement $r = .963$, p (two-tailed) $< .01$. Thus, while students were participating and were actively engaged in role plays and debates in the classroom that also allowed students to become more independent learners. Having collaborated with their colleagues, the knowledge and skills gained, also increased their critically thinking skills allowed them to initiate class discussions, share ideas and opinions with confidence.

Teacher's Journal. At every stage of any action research, a major factor to ensure optimal implementation of an intervention or strategy is self-reflection (Vaccarino et al, 2007). Thus, as each of the 10 sessions unfolded, the teacher kept a journal and counted the amount of times various phrases were written describing the generally flow and pace of the class, the engagement of the students in relation to small and large group work activities, various non-verbal gestures of students signalling their excitement, willingness to learn and/ or any discomfort experienced, student's thoughts, views and suggestions about the flipped approach and the website, and any other indications (verbal or non-verbal) as to how the approach could be enhanced and / or tailored to meet the needs of the students.

The findings suggest that the majority of the students for the 10 sessions liked the flipped approach as a teaching and learning tool. This was indicated 28 times during the study where

students displayed their excitement, enthusiasm and general interest towards the flipped model. On 14 occasions, students who initially stated that they preferred to work individually, joined or formed other small groups and began collaborating. This signalled that student began feeling a sense of belonging and acceptance as their ideas thoughts and opinions were valued. Thus the number of time students were emotionally engaged in learning during the study was 42 times.

Table 5 shows the key phrases from some of the teacher's journal entries (raw data), assigned codes for those phrases; a description of the assigned codes; and the categories (emotional, behavioural and cognitive) in which those codes were placed (see Appendix L for full list of teacher journal entries).

Table 5. *Summary Coding of Transcripts for Teacher's Journals*

Categories	Description	Codes	Direct Quotes	Frequency
Emotional	Student's likes, ease of	User-	Students generally	28
Engagement	use, interest and thought in using the flipped approach during teaching.	Friendliness	seemed excited, enthusiastic and displayed high levels of interest and enjoyment towards the class activities.	

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	Students develop a sense of belonging and bond with each other via their interaction with the various group activities such as role plays, debates and presentations during class	Group Membership	Student who usually worked individually willing joined or formed a group to which they can interact, share ideas and felt a sense of inclusion	14
Behavioural Engagement	Working together with peers to solve various problems, create working world scenarios via role plays, debates, and pictures	Collaboration	Students worked together in groups to create very unique and creative working world scenarios	33
	Student's individual level of contributing in the classroom by	Participation	With minimal prompts students willingly asked	15

	answering or asking questions		and answered question related to the topics discussed	
	Disagreements, problems and issues encountered whilst students were working in groups	Conflict	Student experienced difficulties communicating with other colleagues whilst working in groups.	2
Cognitive Engagement	Students exhibited confidence, expressed thoughtful ideas and can initiate and complete task with limited coaching	Autonomy	Students initiated, took control of the class discussions and worked independently where necessary	28

Students developed a		Student made	
depth of information that	Critical	valuable	11
they can make	Thinking	suggestions as to	
recommendations to		enhance the	
enhance or extend the		flipped approach	
flipped technique to		as well as the	
other subject areas.		website.	

Students worked together with peers to solve various problems even to them by the teacher, create working world scenarios via role plays, debates, and pictures on their own approximately 33 of 35 times during the study. This was the highest “score” noted within the teacher’s journal for the 10 sessions. Thus via the flipped model students were afforded multiple opportunities to interact, share ideas, learn and help each other in the various task.

However whilst such frequent collaboration and participation in class activities was highly visible and encouraged, it may have led to the 2 occurrences of conflict between group members. These 2 conflict incidents coincided with when the groups were switched for the second time, which students highlighted during the interviews. It seems when students were placed in a particular group at the beginning of any session, a bond was formed. Thus by rearranging the students after makes it difficult and challenging to readjust to “new” personalities of the other students within the other group.

Students were also engaged cognitively, a total of 39 of 40 times in which 28 times they exhibited confidence, expressed thoughtful ideas, initiated and complete task with limited coaching. Students who seemed passive prior to this study were now actively involved in learning. Additionally, students made suggestions to improve and enhance the flipped strategy by displaying high levels of critical thinking and creativity 11 times during the study.

Comparing the three categories of engagement, Table 5 demonstrated that students were more engaged in learning through collaboration, and participation in class activities than through feelings, acceptance and confidence in learning. However it is highly plausible that the other aspects of engagements may have enhanced and improved behavioural engagement which resulted in the high number of times.

Examining the results generated from the pre and post-intervention questionnaires on students' engagement, the teacher's observational checklist, semi structured individual interviews, focus grouped interviews, student's journals, online blogs and teacher's journals, the adoption of the flipped classroom approach improved the form 2 students' engagement across the three categories (emotional, behavioural and cognitive) in learning Mathematics.

Students' Journals. For all 10 sessions student were required to email the teacher, journals between 40-50 words describing their experiences, interacting, thoughts and feelings towards this new teaching technique. This allowed student to be more open in their responses and the freedom to express themselves more privately as opposed to interviews and focus groups. The results revealed that 21 of 42 participates submitted journals with only 5 of 21

students submitted all 10 journals; 6 of 21 students submitted 7 to 9 journals; 9 of 21 students submitted 4 to 6 journals and only 1 student submitted less than 3 journals.

Table 6 shows a summary of the key phrases from some of the student's journal entries (raw data), assigned codes for those phrases; a description of the assigned codes; and the categories (emotional, behavioural and cognitive) in which those codes were placed (see Appendix M for full list of quotes)

Table 6. *Summary Coding of Transcripts for Student's Journals*

Categories	Description	Codes	Direct Quotes
Emotional	Student's personal preferences	Technology	Student 36:
Engagement	between the flipped approach and the traditional approach	Orientation	<i>I prefer pen and paper in class work where I</i>
	Student's likes, dislikes, ease of use, interest and thought about the flipped approach	User-Friendliness	<i>can sit and take the time to analyse work and understand it.</i>
	Students develop a sense of belonging and bond with each other via their interaction with the various group activities	Group Membership	Student 23: <i>I love viewing the online recordings it</i>

	such as role plays, debates and presentations		<i>encourages me and I to comprehend the inquiries better.</i> <i>Student 16:</i> <i>I love the fact that children in my class that didn't usually converse, did. And I feel that if this method is upheld mathematics sessions would bring our class closer together without anyone's awareness.</i>
Behavioural Engagement	Working together with peers to solve various problems, create working world scenarios via role plays, debates, and pictures	Collaboration	<i>Student 33:</i> <i>...class was enjoyable working with my group was also enjoyable as</i>

		<i>we got along pretty well...</i>
Student's individual level of contributing from 0 (not contributing) to 5 (highly contributing) towards class activities such as group work, and individual worded problems.	Participation	<i>Student 6:</i> <i>I participate more in class now than I did before because of the fun class activities that we have.</i>
Disagreements, problems and issues encountered whilst students were working in groups	Conflict	<i>Student 39:</i> <i>I do not like to work in groups or pairs so that was the bad part of it for me. I rather do my work on my own, that way I can focus. When working with others I</i>

*have to wait on them
and that's really
annoying.*

Cognitive	Willingness and determination	Persistence	Student 6:
Engagement	to master complex task, and problems		<i>I get the whole concept of it more but I have to keep trying to get better</i>

Students have control over their pace of learning to attain solid understanding of the content materials	Autonomy	Student 31:
		<i>If you got something wrong you got another chance and saw where your mistakes were...</i>

Students developed a depth of information that they can make	Critical Thinking	Student 16:
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recommendations to enhance

More plays and games

the flipped technique

would improve the class.

Approximately 20 of the 21 students who submitted journals (95%), preferred the flipped model of teaching as it was more interactive, enjoyable, interesting and found that the use of technology enhanced their engagement level as it was easier for them to remember the various content material. Student 36 stated that she preferred the pen and paper in class work where she can sit and take the time to analyze work and understand it.

Approximately 86% of the students agreed that the flipped method allowed more frequent interaction with their peer than before, increased their participation in class activities such as role plays and generally learnt from each other's style of doing questions. The remaining 14% stated that they preferred to work alone. Similar to the findings from the individual interviews, student 27 again stated via her journal that although working in groups allowed her to identify the areas in which she needed to improve, she preferred to work alone as group work is sometimes problematic. The other student number 39 stated that working alone helps her to focus at a much greater extent and not be burdened by waiting on her colleagues to move ahead. Student number 33 stated due to the lack of cooperation by other students she preferred to work individually.

Approximately 76% of the students agreed that the group work session and by extension the flipped model brought the class together thereby creating a sense of belonging and bond with each other as students had fun participating in the role play activities.

Majority of the students affirmed that their level of participation improved significantly via the flipped approach since they enjoyed this approach to a greater extent. Particularly student number 14 stated *"I answered questions way more than I usually do"* and number 6 who stated *"I participate more in class now than I did before because of the fun class activities"* confirms this claim.

All students who submitted journals acknowledged that the flipped approach allowed them to control the pace at which their learning took place thereby becoming self-regulated learners in the process. Clear demonstration of critical thinking was also evident as students were able to pinpoint areas in which the flipped approach could have been improved.

Student and Focus Group interviews. Of the 14 selected students, three were purposefully selected to be interviewed individually (Students 27, 23 and 36) as they displayed low, medium and high levels of engagement respectively during the study, and 11 were randomly selected to be interviewed via two focus groups. One group contained five members (Students 3, 6, 12, 14 and 35) whilst the other contained six (Students 21, 22, 24, 25, 37 and 38). The focus group interviews were held first and each student amongst the 14 chosen were unique. Both forms of interview were conducted after the completion of the summative assessment test,

to gather specific insight into how the adoption of the flipped classroom approach could affect the form 2 students' engagement in learning Mathematics.

Students generally preferred the flipped model of teaching as it was more interactive, interesting and found that the use of technology enhanced their engagement level in various ways such as interacting with their peers more frequent than before, participating in role plays and generally learning from each other. However, three students preferred the traditional style over the flipped approach as the traditional method contained more questions to be solved, allowed more opportunities to write notes and it is generally a quieter classroom.

Table 7 depicts a summary of key phrases from some of the interviewees (raw data), assigned codes for those phrases; a description of the assigned codes; and the categories (emotional, behavioural and cognitive) in which those codes were placed for both the individual and focus group interviews (see Appendix O for full list of quotes).

Table 7. *Summary Coding of Transcripts for Individual and Focus Group Interviews*

Categories	Description	Codes	Direct Quotes
Emotional	Student's personal preferences	Technology	Student 23 (Individual):
Engagement	between the flipped approach and the traditional approach	Orientation.	[I prefer] <i>the flipped classroom...</i> [because] <i>I</i>

Student's likes, dislikes, ease of use, interest and thought about the flipped approach	User- Friendliness	<i>rather do it by the technology</i>
Students develop a sense of belonging and bond with each other via their interaction with the various group activities such as role plays, debates and presentations	Group Membership	<i>I enjoyed every single aspect.</i> <i>Student 21 (Focus Group):</i> <i>I personally prefer the traditional method</i> <i>Student 27 (Individual):</i> <i>Yes it's more fun!</i> <i>It's interesting, very interesting!</i> <i>I find its interactive</i> <i>...a lot of us didn't use to you know sit down and chat with each other and that (group work) brought the class</i>

			<i>closer...it kinder builds a bond...</i>
Behavioural	Working together with peers to	Collaboration	Student 23(Individual):
Engagement	solve various problems, create working world scenarios via role plays, debates, and pictures		<i>I enjoy working in the groups...working with others helped me and it helped the class also...</i>
	Student's individual level of contributing from 0 (not contributing) to 5 (highly contributing) towards class activities such as group work, and individual worded problems.	Participation	Student 27(Individual): [My level of participation was] <i>three</i> , <i>cause I participated in the first group activity.... the second group activity we did, I didn't do anything</i>
	Disagreements, problems and issues encountered whilst		[Some groups] ... <i>they don't want me to come and join them, they</i>
		Conflict	

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	students were working in groups		turning away, they talking to each other instead of talking to me.
Cognitive	Willingness and determination	Persistence	Student 27 (Individual):
Engagement	to master complex task, and problems		..you get to go home and watch videos and understand and keep on...
	Students have control over their pace of learning to attain solid understanding of the content materials	Autonomy	Student 37 (Focus Group):
			...even though you doing work you still being able to see other ways of doing it like without a teacher in front of you ...like when you are home ...

Students developed a depth of information that they can make recommendations to enhance the flipped technique	Critical Thinking	<i>Student 35 (Focus Group):</i> <i>I think it should have more than one websites....it would help you to learn your work better...cause you learn more</i>
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All 14 students agreed that the group work session and by extension the flipped model brought the class together thereby creating a sense of belonging and bond with each other as students had fun participating in the role play activities. Student 27 however, expressed concern when switching students between groups various forms of conflict (highlighted in pink) arose. She felt unwelcomed by some grouped as they turn away and not included her in the discussions. Also student 37 stated that some students tend to give up easy and exclude themselves from grouped discussions. Thus when creating activities for different groups, the task should be adequately challenging enough to allow students to participate in discussions but not so challenging to detach or discourage students from learning

All students affirmed that the flipped approach allowed them to control the pace at which their learning took place thereby becoming self-regulated learners in the process. Demonstration of critical thinking was also evident as student were able to pin point areas in which the flipped

approach could have been improved. Students 23 and 27 recommended more interactive and attractive videos, and student 36 recommended the addition of game based activities to improve engagement in learning.

Student 21 stated that she likes a combination of the two approaches and adopts both techniques in her studying. This illustrates that exposing students to another approach gives students choice in learning, which they can choose or combine both methods to enhance their learning. Student 3 was one who preferred the traditional system for homework as the class sometimes can be very loud. This signalled that more classroom control is required when adopting the flipped approach in the classroom.

Improvements in class participation was also noted by most students via the flipped approach since they enjoyed this approach to a greater extent. Student 23 stated *"I enjoyed every single aspect."* Student 27 stated *Flipped classroom... [is] more interesting...[and]..it's more fun"* Student 38, stated that her participation level since the commencement of this study was the same as prior to this approach but at the same time enjoyed the flipped technique to a greater degree. She stated *"The flipped classroom...[is] more interactive, more entertaining, more enjoyable..."* The responses from the interviews indicated overall improvement in student engagement in learning across the three categories of engagement (emotional, behavioural and cognitive) via the flipped approach during the study.

Online Blogs. As part of their homework via the flipped approach, students were required to participate in the online discussions on the website

(www.stfgcmathminds.weebly.com), where they would have stated their definitions and understanding of the various concept taught during class sessions. The teacher would have then made comments, refine their definitions and clarify any misconceptions where necessary. However, analysis of the online blogs revealed that only 10 of 42 students (24%) made significant contributions by stating their definitions and list two working world scenarios of the various concepts taught during class sessions. The remaining 76% either agree with statements made by other students (1 Student), asked for assistance in other topic areas not related to the current unit of work (1 Student) or did not contribute at all (30 Students). Of the 4 aspects of student's daily homework (view online videos, participate in online quiz, complete student journal and contribute on the blog spot), the blog contributions was the least.

Summary of findings. This section sought to provide answers to the first research question in relation to how the adoption of the flipped classroom could affect the form two students' engagement in learning Mathematics. Based on the results gathered, the flipped classroom approach significantly improved students' engagement in learning across the three engagement categories examined (emotional, behavioural and cognitive). This was evident because students actively participated in the various class activities such as class discussions, role play and debates, student became self-regulated and independent learners who were able to complete task with limited coaching whilst having the confidence to ask for assistance or offer support to other colleagues during in the process.

Of the seven data collection tools utilized to gather data for the first research question, six highlighted notable increases in students' engagement in learning Mathematics via the flipped classroom. Majority of the students preferred the flipped model over the tradition as it allowed them to control the pace of their learning, incorporated technology and gave them opportunities to collaborate with their peers. The online blogs although it also showed improvement in students' engagement in learning, it was not a true representation of the entire class since only 12 of 42 students made contributions online.

Research Question 2: *How can adopting the flipped classroom approach affect the form 2 students' academic achievement in Mathematics?*

A post intervention summative examination which lasted 45 minutes was administered on the last day of the second academic term. Students were also required to complete 11 online quizzes based on the unit of work covered during the course of this study to gather quantitative evidence into how the adoption of the flipped classroom approach affect the form 2 students' academic achievement in Mathematics.

Online quizzes. Quantitative data were gathered during the study via 11 online quizzes to determine how the flipped classroom approach affect the form 2 students' academic achievement in Mathematics. These scores were kept separate from the posttest scores and students were required to complete these online quizzes after each subtopic for the unit of work covered. Although each quiz was weighted differently based on the number of questions, the scores were standardized using the school's grading scheme for appropriate comparison amongst the quizzes.

Codes were used to represent each quiz (see Table 8).

Table 8. *Codes used to represent each online quiz and percentage of student participation.*

Quiz Name	Quiz Code	Student Participation (%)
Consumer Arithmetic	C.A	91%
Cost and Selling Price	C&S	81%
Profit and Loss Amount	P&L AMT.	79%
Cost Price, Selling Price, Profit and Loss Amount	C, S, P, L AMT.	45%
Profit and Loss Percentage	P&L %	57%
Cost Price, Selling Price, Profit and Loss Percentage # 1	C, S, P, L % # 1	33%
Cost Price, Selling Price, Profit and Loss Percentage # 2	C, S, P, L % # 2	29%
Discount Amount and Discount Percentage # 1	D AMT. & D% # 1	26%

FLIPPING THE CLASSROOM FOR IMPROVING STUDENTS' ENGAGEMENT IN
LEARNING AND ACADEMIC ACHIEVEMENT IN SECONDARY SCHOOL
MATHEMATICS AT THE RAGNAROK GIRLS SECONDARY SCHOOL

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Discount Amount and Discount	D AMT. & D% # 2	31%
Percentage # 2		
Taxation	T	24%
Sales Tax	S.T	12%

The results from these online quizzes indicated that students' academic achievements were generally high. Figure 4 outlines the overall performance of the students in each of the 11 online quizzes.

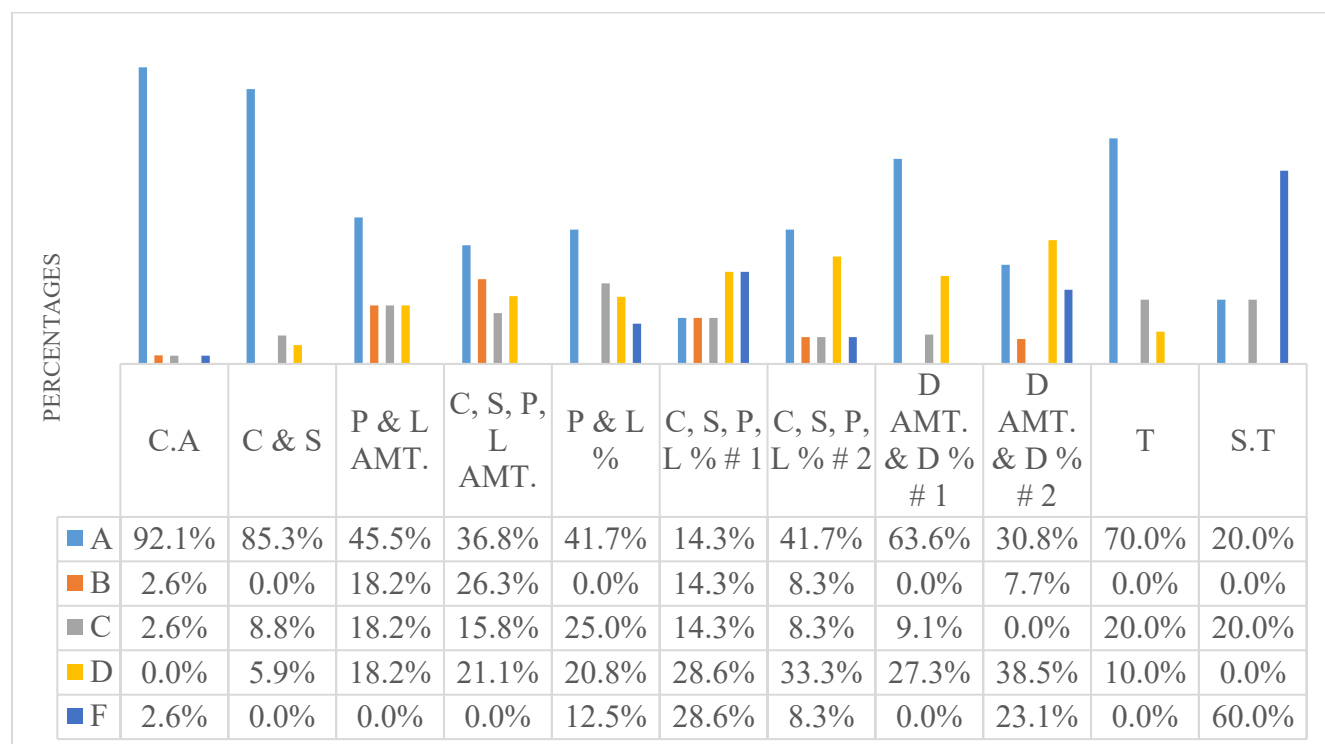


Figure 4. Bar graph of students' grade in the 11 online quizzes

Figure 4 indicated that 8 of the 11 quizzes (72.7%), students achieved a great amount of A's than any other grades. The amount of B's, C's were similar throughout whilst only few students acquired D's and F's. In fact in 5 quizzes (45.5%), no student attained a grade F and in 2 quizzes no student got a grade D. Thus students' academic achievement on the online quizzes were significantly high.

However, the last quiz (Sales Tax) not only displayed the lowest student participation level (12%), but also the worst performing with 60 % of the students attaining a grade F. This may have arisen due to the constant daily quizzes students were required to participate in. Thus, the overuse of online quizzes may have reduced students' interest and engagement level causing the few students who attempted this quiz to simply guess the answers.

The online quizzes although highlighted a significant amount of A's and B's, it is not sufficient to conclude that the flipped classroom was successful in improving students' academic achievements. It could have been since students were at home or wherever they could have had access to the quizzes, they may have used class notes, videos and the internet to look up the answers. However, the online quizzes provided a snapshot of what students knew and could do during the unit of work.

Post intervention summative examination. Comparing with the base scores 14 of 38 students (37%) who wrote the posttest demonstrated improvements in academic achievement. Four students in particular, 22, 24, 34 and 37 improved approximately 100 % as compared to their previous scores. Conversely, 24 of 38 students (63%), had a decrease in marks. The marks

of five students in particular, 17, 25, 27, 41 and 43 decreased approximately 100% as compared to their previous score. A closer look at these scores can be seen in Figure 5.

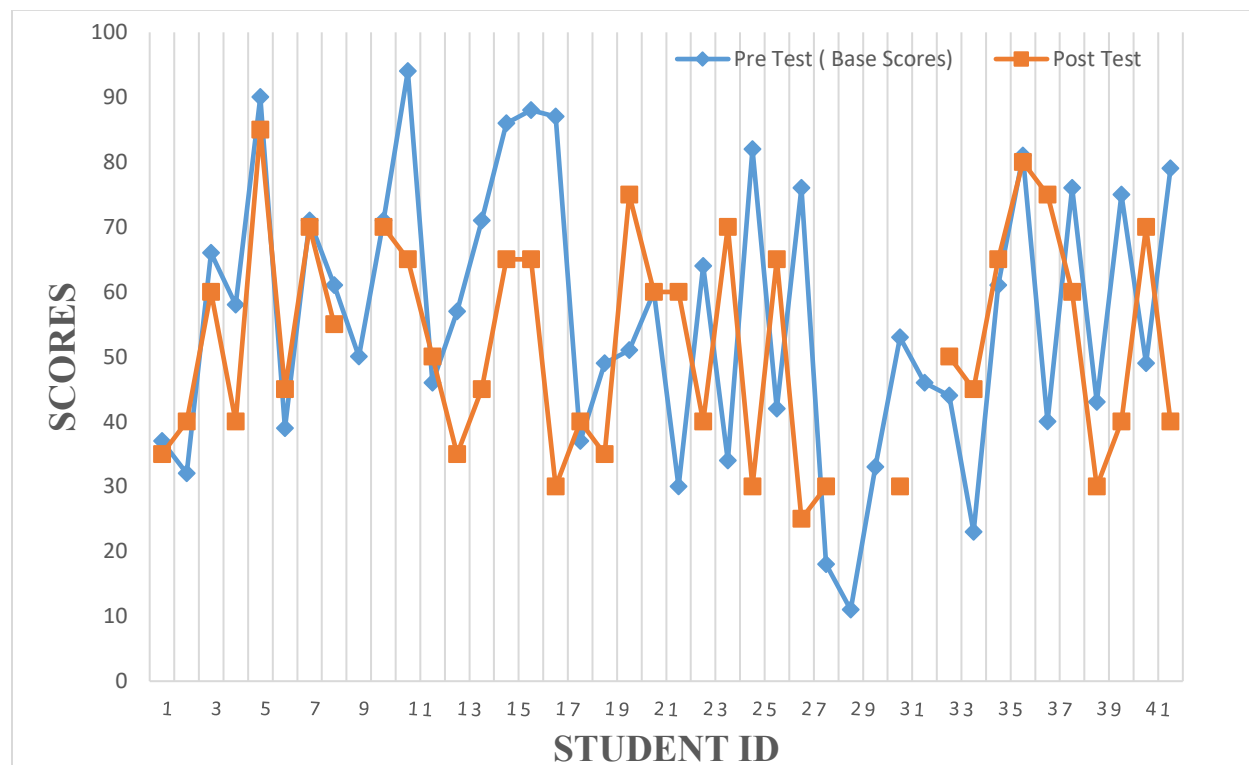


Figure 5. Line graph of base scores and post-intervention examination scores

Comparing this study's results with the base scores, a 48% decrease in the improvement of academic achievement was noted whilst a 48% increase in academic underperformance were acquired. Further analysis can be conducted via descriptive statistics illustrated in Table 9.

Table 9. Descriptive Statistics of Based Score and Post Test Scores

	N	Range	Minimum	Maximum	Mean	Standard Deviation
Base Scores	42	83	11	94	56.21	21.156

Posttest Scores	38	60	25	85	51.84	16.742
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Although Figure 5 highlighted a significant decline in academic achievements, Table 9 at various levels suggested otherwise. From the base scores to the posttest scores, the range moved from 83 to 60 since the minimum score increased from 11 to 25 (56% increase), whilst the maximum score decreased from 94 to 85 (10% decrease). This suggested that more students who attained low scores in the end of term one examination, were able to attain better scores in the posttest. Conversely, less students who attained high scores in the end of term one examination were able to maintain their high scores. Thus the intervention appeared more beneficial to low performing students as opposed to high performing students.

Also, a decrease in the mean value was noted from 56.21 to 51.84 which signalled a mere 7.8% decrease in the class performance. However, a much smaller spread of values can be seen via the standard deviation as it shifted from 21.156 in the end of term one test to 16.742 in the posttest. Thus, more students were closer to the mean score in the posttest than the end of term one test which suggested improvements in overall academic achievement.

Inferential statistics via a paired samples t-test was also conducted to test the hypothesis that there was no statistically significant differences in the posttest scores as it relates to the end of term one test scores. There was no statistically significant difference in the scores for the end of term one test ($M = 58.45$, $SD = 20.43$) and the posttest ($M = 51.84$, $SD = 16.74$) conditions; $t(37) = 1.72$, $p = 0.92$. The researcher therefore failed to reject the null hypothesis.

Further analysis was sought via the school's grading scheme (see Table 10), in which percentages were used for both the end of term one test and posttest scores.

Table 10. *Ragnarok Girls' Grading Scheme*

Grade	Percentage Range
A	74.5% - 100%
B	65.5% - 74.4%
C	49.5% - 65.4%
D	34.5% - 49.4%
F	0% - 34.4%

Using the school's grading scheme, the results indicated that students' academic achievements were higher in the end of term one test than in the posttest (see Figure 6).

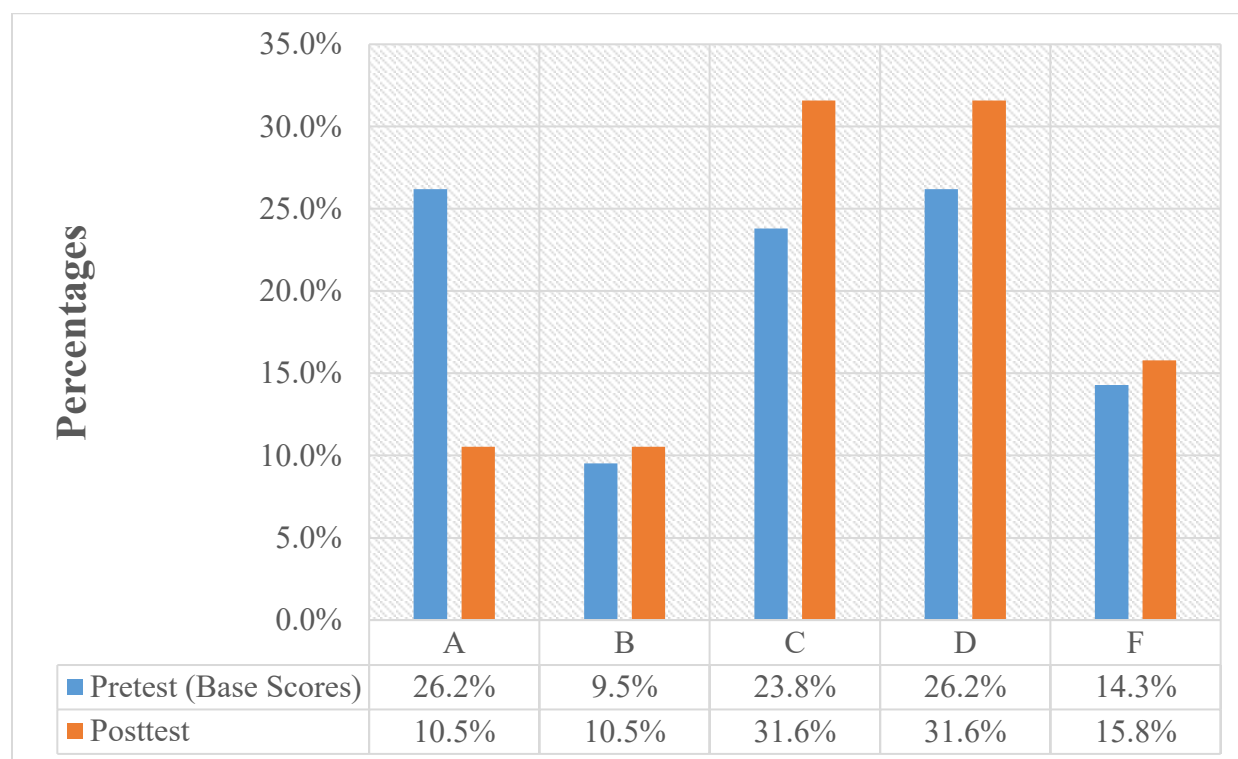


Figure 6. Bar graph of base scores and post-intervention examination scores using school's grading scheme

Figure 6 demonstrates a major decrease in the amount of grade A's (15.7%), mere increases in the amount of grade B's (1%) and F's (1.5%) and noticeable increases in the amount of grade C's (7.8%) and D's (5.4%) from the base scores to the posttest scores.

Summary of findings. This section sort to provide answers to the second research question in relation to how the adoption of the flipped classroom could affect the form two

students' academic achievement in Mathematic. Based on the results gathered, flipped classroom did not significantly improve the form two students' academic achievements in Mathematics. However, the intervention was more favored by low performing students as opposed to high performing students. Although the scores in the online quizzes were significantly high, it was not sufficient to suggest greater improvements in students' academic achievement as opposed to the summative test. It was the case since a minority of students participated in all of the quizzes. However, it allowed students to practice the work learned along the course of study in preparation for the summative test. In relation to the scores of posttest, when compared with the based scores, no significant differences in academic achievement were noted.

Chapter 5 – Discussion

The purpose of this mixed methods action research study was to investigate how adopting the flipped classroom in the teaching of Mathematics to form 2 students, could affect their engagement in learning and academic achievement, at the Ragnarok Girls' Secondary School. A multiplicity of instruments therefore, were used to gather both qualitative and quantitative data. Data collected that emerged from each data collection tool which were analyzed separately, were all integrated to provide answers to the grand tour question via the two sub research questions:

1. How can adopting the flipped classroom approach affect the form 2 students' engagement in learning Mathematics?
2. How can adopting the flipped classroom approach affect the form 2 students' academic achievement in Mathematics?

In this chapter, the reported findings will be discussed with respect to the theoretical underpinnings examined earlier and existing research. The discussion of students' engagement in learning will be structured under three main headings: emotional engagement, behavioural engagement and cognitive engagement as these were the three main areas of focus in relation to student engagement in learning throughout the study.

Emotional Engagement

The majority of the students (93%) preferred the flipped classroom approach as a pedagogical tool for teaching and learning as it was more interactive, technologically advanced, interconnected with other subject areas such as theatre arts and visual arts. It allowed them to

remember the content material to a great extent, and made doing homework much easier compared to the traditional technique. The findings from this study were aligned with Mason, Shuman and Cook (2013) who stated the students gravitate more towards blended learning strategies such as the flipped model compared to the traditional, as it encompasses technology which promotes deeper learning and higher levels of student engagement and course satisfaction. Students within the study specifically during the interviews that the flipped model helped them to remember the various concepts being taught. Such findings supported Gilboy, Heinrichs and Pazzaglia (2014) who stated that the flipped classroom through its abundance of active learning strategies is the ideal technique for improving students' understanding in learning and retention of information. In relation to homework, majority of the student preferred the flipped approach of doing homework as it allowed them to take control over the manner and pace in which learning occurred. Likewise McGivney-Burrelle and Xue (2013), and Carney, Ormes, and Swanson (2015) highlighted students' generally favourable response towards the flipped classroom because they can access video lectures as part of their homework prior to class, feel confident in class discussions and are likely to understand the concepts better.

Most students (88%) further acknowledged that the strategy brought the class together by creating a bond with each other as they interacted with the various group activities such as role plays, debates and presentations during class. This was evident when they highlighted being able to recognize their colleague's unique, insightful and valuable contributions towards the various task which made communication amongst them easier and refreshing. Kahu (2013),

and Wimpenny and Savin-Baden (2013) highlighted that the social interactive nature embedded within the flipped model, allowed students to develop high levels of appreciation for each other's opinions within the classroom, which in turn allow students to feel a sense of belonging, acceptance and connection with their peers.

Behavioural Engagement

As many as 86% of the students affirmed that the change from the traditional pedagogical approach of classroom discourses, allowed opportunities for them to gain advance knowledge of the content material not only by themselves but also through frequent interaction with their colleagues. They further acknowledged that through such collaborative efforts and with minimal challenges in some cases, they were able to solve difficult worded problems at a much faster rate than before whilst building on each other's strengths and weakness in the process. These findings supported those of Morgan (2014), who stated that due to its interactive nature, the flipped model boosts the confidence of students to work together and solve the problem collaboratively. It also adds as social benefit for students' interpersonal interaction and builds diversity understanding among students, as suggested by Tucker (2012). Students in their journals and interviews that collaborating with their peers on a regular bases allowed them to understand how their colleagues are thinking.

It was also noted that the weaker students learnt how to apply the knowledge form the videos and PowerPoint presentations to various tasks from the stronger students. Simultaneously, the stronger students themselves learnt new and unique techniques of solving problems simply

by assisting others. These findings supported Zaka, Fox and Docherty (2019) who stated that through the flipped approach, students are afforded a multiplicity of opportunities to support each other when either learning independently using online discussions forums, or collaboratively within the class itself in order to reassure one another that they were on the right track. Thus students were able to build on each other's strengths.

Furthermore, significant increases in student participation in class activities and completion of homework were also noted. With minimal prompts almost all students (95%) willingly participated in class discussions by asking and answering pertinent question related to the topics discussed. The majority of the students (93%) were eager to work with their colleagues particularly for the role play activities and formed groups independent of the teacher's prompts. These findings were aligned with Jamaludin and Md-Osman (2014) who reported that when students are engaged with the materials provided in the flipped classroom their interest, enjoyment, involvement and participation in class activities increases, as they try to make connections with their own experiences.

Contradictory to the researcher's expectations of this study, Foldnes (2016) stated that collaboration under the flipped paradigm is not guaranteed as some designs may rely mostly on students' own independent study. During the implementation therefore, the teacher noted these conflicts students experienced and made adjustments to reduce the issues, by not having students switch between groups and allowing students to form themselves in groups.

In fact, three students (7%) experienced difficulties working and collaborating with other colleagues within the classroom. The lack of communication amongst members, not willing to share ideas and not making significant contributions towards the task at hand were some of the issues that emerged. Such challenges were mainly reported during the second wave of interchanging group members which initially lead these students to work alone. Perhaps students were more comfortable with together with only one group as opposed to the mixing and interchanging groups. Also some members may have felt uncomfortable working with certain other students due to past experiences working in groups for other subjects. Thus the memories of their bad encounter/s may have left a stigma. Some of these reason supported Gilboy, Heinrichs and Pazzaglia (2014), who stated that interchanging and using different active learning strategies within the flipped model degrades concentration and communication within groups as students will be focusing on the process rather than the tasks.

However, on 10 occasions 7% of students who initially stated that they preferred to work individually as well as those who got disengage due to the interchange aspect, eventually joined or reformed other small groups and began collaborating and working together on the various class activities. These findings supported Jamaludin and Md-Osman (2014) whereby through the continuous use of the flipped model in conjunction with an abundant of class activities and frequent use of technology, has the power to get unwilling students involved in learning as they will have fun, enjoy learning new things and feel good in class.

In relation to homework activities, 93% of students either accessed or downloaded the videos and the formula sheets, 24% participated in online blog discussions, 50% submitted their journals, and 38% participated in at least 5 of 11 online quizzes. Thus although students verbally stated that they preferred the flipped classroom, the majority did not take an active role in the online blogs, submission of journals nor online quizzes. The researcher expected that since students they would have taken a dynamic role in these online activities considering the technological uses. This lack of student participation echoes the works of Marra et al. (2016). They pointed out that while technology can be used to successfully assist student collaboration, it cannot guarantee participation in all of its related activities nor assure improved learning outcomes. They further explained that when students are engaged in collaborative activities, they are mostly in the presence of each other which encourages them to work together. However, when activities are given as homework and are to be completed individual outside the confines of the educational environment, students have a tendency to procrastinate, choose which activities they prefer to complete, or not participate at all. Thus, this lack of accountability outside the classroom could have been a reason for the fluctuations in the homework participation. Whilst the participation within the classroom was profound, participation in most of the homework activities (online blogs, online quizzes and student journals) were dismal.

Cognitive Engagement

All of the students acknowledged their appreciation that the flipped approach afforded them the flexibility to control the pace at which their learning took place. They stated that since

they were able to pause, rewind and replay the videos at any point in time, their focus, concentration and understandings of the lecture content were enhanced. These findings supported those of Gilboy, Heinrichs and Pazzaglia (2014) who stated that since the flipped model allow students to study anywhere, anytime and at their own pace, they are more likely to understand the concepts to greater extent than the directive and fast pace nature of the traditional approach. This study's findings further supported Zaka, Fox and Docherty (2019) who added that the flipped classroom not only offers unique opportunities to address the educational needs of students that requires more time to engage with the course material, but also allow students who are fast learners to move ahead and extend their understanding with more in-depth learning.

Generally as students were discussing their transition to becoming more independent learners during the interviews and what was written on their journals, some of them noted that they often searched for additional support material for the recorded lectures that they were watching. For instance student 23 who was interviewed individually stated “...*the flipped method you can do it like any time, any time. Even if you stay home, you can still do it and even if you still don't understand, you can look at other videos like on YouTube to help...*” Also Student 24 who was a focus group interviewee stated that “...*you could go and watch the video... you get to understand it more and if I still don't get it, then I ask Google...*” This therefore demonstrated students taking control of their learning by wanting to enhance their understandings of the content material and wanting to know more than what was provided on the website.

These findings supported Gilboy, Heinrichs and Pazzaglia (2014) who stated that since one of the main premise of the flipped classroom is based on the constructivist theory of learning, students are provided with the flexibility to take responsibility towards their own learning. Therefore student will take the initiative to perform their own research and locate additional learning resources to advance their knowledge and skill, thereby becoming active and self-regulated learners in the process. Students also noted that having confidence that their questions would be answered in the scheduled classes and that they were able to get one-on-one support and reassurance in class, motivated them during their independent study. Amiri et al. (2013) pointed out that active learning strategies such as the flipped model, has been positively linked to higher levels of student motivation, confidence and critical thinking.

Overall, based on the results generated from this study, one can conclude that the flipped classroom approach had a positive impact on students' engagement in learning as students generally appreciated and valued the student-centered and self-paced approach (Bergman & Sams, 2017), opportunities to ask and answer more questions in class (Amiri et al., 2013), control over their pace, independence and freedom of self-driven learning (Gilboy, Heinrichs & Pazzaglia, 2014; Zaka, Fox & Docherty, 2019); increased engagement in class activities (Enfield, 2013); increase in self-confidence (Amiri et al., 2013); and opportunities to better collaboration with peers (Morgan, 2014).

Academic Achievement

The results generated from the post intervention summative test in this study did not indicate a significant difference in student's academic achievement in Mathematics when compared with the end of term one examinations scores. These findings contradicted the findings from several other studies, including, Al-Alwan (2014); Carini, Kuh and Klein (2006); Kamla-Raj and Ugur (2015); Mauro (2014); Saunders (2014); Springen (2013); Trowler (2010); Wara, Aloka and Odongo (2018); Weurlander, Cronhjort and Filipsson (2017), who all reported significant improvement in students' academic achievement via the flipped model.

A plausible reason for such outcome may have stemmed from student's lack of participation in the online quizzes. These quizzes were meant for students to extend the knowledge of the various concepts explored in the videos and practiced in class, to ultimately prepare them for the summative test. Thus since majority of the students did not participate in this aspect of their daily homework, students would have not benefited from the multiple opportunities they would have had to practice what they have learnt during class sessions as highlighted by Luebben (2010). Hence the scores from the summative test were not sufficient to suggest improvements in academic achievement via the flipped model.

These findings supported Wara, Aloka and Odongo (2018); Weurlander, Cronhjort and Filipsson (2017), who stated that since a major component of the flipped classroom relies on students independence to engage with online materials, if students do not participate, this will result in an overall decrease in learning outcomes. Additionally, although frequent use of online

quizzes as part of teaching technique provides multiple opportunities for students to practice what they have learnt during class sessions (Luebben, 2010), Weimer (2018) argued that it may simultaneously provide unprepared students opportunities to guess the responses without significant thought.

However, although significant improvements in academic achievement were not reported via the flipped model, more students were able to attain scores closer to the mean value in the posttest than in the end of term one test which signaled a more equitable distribution of the scores. This was seen where the scores of weaker performing students increased whilst simultaneously maintaining the higher performing students' scores were either maintained or decreased in some instances. In fact the results from the posttest were more successful than the end of term one test in improving the academic achievements of low performing students as opposed to high performing ones. Such findings were similar to Saunders (2014); Mc Lean et al., (2016); Weurlander, Cronhjort and Filipsson (2017) who stated that the flipped model sought to develop the whole class academic achievements of all students and not just the high performing ones. The results therefore did not indicate any statistical outliers as did in the end of term one test. Hence the perception of the "highest performing student" and the "lowest performing student" was nonexistent via the flipped model. This may have resulted from students' ability to control the pace in which learning occurred which was provided through the flipped model.

Close examination of the online quizzes however provided a better idea of what students knew and could do during the unit of work. The majority of the students achieved general

improvements in academics in the online quizzes whilst a minority displayed unfavorable results. However, although in the online quizzes an overall increase in the amount of grade A's were achieved whilst the amount of grade C's, D's and F's decreased, it is not sufficient to suggest that the flipped model was responsible for improved students' academic achievement in Mathematics. These quizzes were to be completed in the absence of the teacher. Thus students may have used their notes or the internet to look up the answers which may have contributed towards the high scores.

Overall, no statistically significant differences in student's academic achievement in Mathematics via the flipped model were noted. However significant increases in students' emotional, behavioural and cognitive engagement in learning were attained.

Limitations and Recommendations for Improvement of the design

The researcher acknowledged the limited time frame for this study. Although students were favorable towards the intervention in relation to their engagement in learning, there is need to confirm these findings with a longer and more extensive research study. Four weeks is not enough to make generalizations of the effectiveness of the flipped model in another context. However it was the maximum available time within the school's context for the researcher to implement the study. Thus it is recommended that future research on the flipped classroom should be conducted over an extended period. This will allow more comprehensive quantitative data and more descriptive qualitative data to be gathered in order to gain deeper understanding

and insight as to how the flipped approach affect students' engagement in learning and academic achievement in Mathematics (Bryman & Bell, 2011).

Although class size was not mentioned by any of the students, it is an important factor according to Kerr (2015) to ensure successful implementation of the flipped model. She suggested a 30:1 student teacher ratio (depending on attendance rate) to enable the lecturer to provide students with individual support. This was a major limitation in this study as the class size was 40% (42:1) above Kerr's (2015) recommended ratio which hindered the academic benefits that comes with the flipped model. All of the other classes in which the researcher taught were approximately the same. Therefore to increase the potential benefits that the flipped classrooms proposes, it is recommended to utilize smaller size classes as suggested by Kerr (2015). Perhaps if the researcher's class was divided into two groups with one being a control group and the other exposed to the flipped model, then more favorable results specifically in relation to students' academic achievements may have been gathered.

In spite of the 42 students utilized in this study which was above Kerr's (2015) recommended student to teacher ratio, it was below Hackshaw's (2008) lower limit of 50 participants. Thus another limitation was that enough participants was not available to provide sufficient evidentiary support of the benefits of the flipped classroom highlighted by Kamla-Raj and Ugur (2015); Mauro (2014); Saunders (2014); Springen (2013); Trowler (2010). However, this class was the researcher's only class at the time that was not in preparation for any major national examination such as the National Certificate Secondary Education (NCSE), Caribbean

Secondary Education Certificate (CSEC) and Caribbean Advanced Proficiency Examination (CAPE). Thus the researcher was limited to only one usable class that allowed minimal disruptions. Although there will still be implications, if a similar study were to be conducted in the future, it is recommended to use a larger sample size involving multiple classes to be in accordance with Hackshaw's (2008) lower limit of 50 participants, whilst maintaining Kerr's (2015) students to teacher ratio of 30:1. Hence significant amount of findings would be gathered to generate great insight into conclusive statements in light of how adopting the flipped classroom in the teaching of Mathematics to form 2 students, can affect their engagement in learning and academic achievement.

Another limitation was the flipped classroom reliance on student's able to use, understand technology and have access to the internet (Acedo, 2019). Prior to the commencement of the intervention, the researcher ensured that all students had access to the internet at home. One student however stated that she did not have internet access. Provision was then made by the researcher for her to use the computer with internet access on a daily basis in school's library before each class session. This therefore allowed her to view the related videos and participate in the various online activities in preparation for class.

However, no form of training to students was provided for any of them to use the website before the commencement of the study due to the limited time frame mentioned. Although clear instructions as to how to use the website and its counterparts were given by the researcher during class sessions and these instructions were placed on the website, there is the possibility that some

student still may not have understood these instructions and would be embarrassed to ask the teacher. Thus in order to ensure successful implementation of the flipped classroom, it is recommended that the implementer of the intervention continuously help students understand the what, why, and how as they pertain to the flipped classroom (Gilboy, Heinrichs & Pazzaglia, 2014), taught how to work in groups effectively (Burke, 2011) and how to self-direct their learning (Warburton and Volet, 2013). Students will therefore be made aware of their expectations, roles and responsibilities as a student in the process, and may also reduce the number of times conflict may occur whilst collaborating with their peers. In fact although the information was already given, one student still asked verbally during class how to access the blog spot whilst another used the blog spot to request the researcher's email to send their journals. This may have contributed to the low submission of student journals and participation on the online quizzes. Furthermore, Bergmann (2016) and Chasteen (2017) stated in order to achieve success from the flipped model, a class session prior to the start of the implementation process and even during, be allocated for students to gain hands on training on the E-learning platform which is intended to be used. They added that teachers need to prepare the students for the flipped approach by setting clear expectations and outlining the responsibilities of each student, list the benefits that students will gain along the way, highlight the consequences that may arise from lack of compliance, and create an environment for students with the freedom to make suggestions and recommendations throughout the process.

Conclusion

This study sought to investigate how the adoption of the flipped classroom in the teaching of Mathematics to form two students, affected their engagement in learning and academic achievement, at the Ragnarok Girls' Secondary School. The findings support the potential of the flipped approach to enhance students' engagement in learning (Birbal & Hewitt-Bradshaw, 2016). To increase the robustness of the study, a multiplicity of tools were used to gather both qualitative and quantitative data. The findings of this study indicate that the implementation of flipped classroom was more successful in improving students' engagement in learning than academic achievements in Mathematics at the form two level.

Although learning in the flipped classroom was a new approach for majority of the students in this study, they generally seemed to enjoy and preferred this student-centered, self-paced, self-regulating, collaborative and technologically advanced approach to teaching and learning as oppose to the traditional technique. Phillips and Trainor (2014) found that although the majority of millennial students are mostly exposed to lecture-based learning, they prefer learning by-doing in education. Thus, this increase in students' emotional engagement with the material provided in the flipped classroom thorough their interest and enthusiasm towards the intervention, subsequently increased their behavioural engagement within the classroom. Hence, students willingly participated in class discussions by answering and asking pertinent questions based on the content materials, and collaborated with other class members to solve various problems and create working world scenarios via role plays and debates with only two reported instances of conflict.

Consequently, students developed a sense of autonomy as they had control over their pace of learning which therefore led to an increase in their willingness and determination to master complex task and problems independently. Thus an overall increase in students higher order critical thinking skills followed, giving rise to general improvements in students' cognitive engagement in learning. As such when these findings were corroborated with earlier findings, together they suggested that students' engagement in learning across the three categories of engagement examined in this study (emotional, behavioural and cognitive) significantly increased in a flipped classroom setting.

However, while technology can be used to assist student collaboration, participation, interest and motivation in learning, it cannot guarantee improved learning outcomes (Marra, Steege, Tsai, & Tang, 2016). In this study, no significant differences in academic achievements were reported between the posttest and end of term one test. However, the intervention was successful in creating a more equitable distribution of the scores as students were able to attain scores closer to the mean value in the posttest than in the end of term one test. Additionally, the flipped model was more successful in improving the academic achievements of low performing students as opposed to high performing students. This therefore led the researcher to believe in the works of McLean et al. (2016) who stated that the utilization of examination scores to measure students' academic achievements may not be an appropriate measure of the flipped classroom model on student learning.

To this end, this study contributed evidence that the flipped model significantly increased students' engagement in learning, whilst no significant differences in academic achievements in form two Mathematics at the Ragnarok Girls' Secondary School were reported.

Implications for Researcher and other Teachers or Administrators

This study enhanced my teaching abilities and equipped me with the skills to improve students' engagement in learning Mathematics and academic achievements. Also, the intervention utilized may be able to assist teachers within my department who are having difficulty getting students engaged in learning. For example, a similar website and blog space can be created for other subject areas which would allow students to have control over their learning, interact and share their responses as a class. Moreover, departments can create a school's website so that teachers and administrators can upload work related materials for the students to have access. As such, by digitalizing the teaching materials, the amount of paper will be reduced and the issue of losing notes will be negated. Thus increasing the productivity of the school.

Additionally, allowing students to be exposed to online testing as early as form one, can be beneficial considering the current shift by the Ministry of Education in Trinidad and Tobago to implement e-testing for national examinations in the year 2020. This can therefore act as a catalyst to better prepare students for such national examinations than the traditional approach.

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Appendix A

Approval from U.W.I Campus Research Ethics Committee


THE UNIVERSITY OF THE WEST INDIES
ST AUGUSTINE, TRINIDAD AND TOBAGO, WEST INDIES
CAMPUS RESEARCH ETHICS COMMITTEE
TEL.: (1-868) 662-2002 ext. 82755 Email: campusethics@sta.uwi.edu

8 March 2019

Dr Sharon Jaggernauth (Kiran Emrith)
School of Education
Faculty of Humanities and Education
Email: sharon.jaggernauth@sta.uwi.edu; kiranemrith@gmail.com

Dear Dr Jaggernauth,

Ref: CEC950/02/19
Flipping the Classroom for Improving Students' Engagement in Learning and Academic Achievement in Secondary School Mathematics.

I am pleased to advise that your application for research on the above captioned topic has been approved on behalf of Campus Research Ethics Committee, St. Augustine.

Sincerely


Surendra Arjoon (Prof.)
Chairman
Campus Ethics Committee

/cs

Appendix B

Approval from Ministry of Education Planning Division



Government of the Republic of Trinidad and Tobago
MINISTRY OF EDUCATION
Educational Planning Division
Education Towers, No.5 St. Vincent Street, Port of Spain, Trinidad
1.868.622.2181 Ex. 2339

1st April 2019

Mr. Kiran Emrith
#216 Beaucarro Village
McBean
Couva

Dear Mr. Emrith,

Your request to conduct research entitled **"Flipping The Classroom for Improving Students Engagement in Learning and Academic Achievement in Secondary School Mathematics"** has been approved by the Chief Education Officer of the Ministry of Education.

This approval will allow you the researcher to start the project in 2019 and continue into 2020. Approval from the Ministry permits the researcher to administer questionnaires, conduct post summative test and semi structured interviews with teachers and students at St. Francois Girls' College within the Port-of-Spain and Environs Educational District of Trinidad.

Attached is a letter of confidentiality, which is to be completed and returned to the Educational Planning Division of the Ministry of Education by the person conducting their research.

Should you require additional information please contact Mrs. Huldah Balchan-Bissoo, Research Officer I, Educational Planning Division at 622-2181 ext. 2339 or email huldah.balchan-bissoo@moe.gov.tt.

Yours Respectfully,

Mrs. Lisa Henry-David
Director
Educational Planning Division
Ministry of Education



FLIPPING THE CLASSROOM FOR IMPROVING STUDENTS' ENGAGEMENT IN
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Government of the Republic of Trinidad and Tobago
MINISTRY OF EDUCATION
Educational Planning Division
Education Towers, No.5 St. Vincent Street, Port of Spain, Trinidad
1.868.622.2181 Ex. 2339

I, KIRAN SMITH
of University of West Indies School of Education
(Association, N.G.O, School/University) solemnly and sincerely affirm and declare
that:

1. I will conduct research only in accordance with the approval granted by the
Ministry of Education.
2. I will not, without due authority of the Ministry of Education in any manner
whatsoever, publish or communicate any facts of information acquired during
the course of my study / research or programs implemented by my organization
/ association.
3. I must treat with the strictest confidence all information that I obtain during the
course of my research / study or programme implementation.
4. That a copy of all data so retrieved must be stored in full with the Ministry of
Education whether published or not.

(Signed) [Signature]
Declarant



Declared before me this 1st day of May

(Signed) Terrence Williams

FLIPPING THE CLASSROOM FOR IMPROVING STUDENTS' ENGAGEMENT IN
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Government of the Republic of Trinidad and Tobago
MINISTRY OF EDUCATION
Educational Planning Division
Education Towers, No.5 St. Vincent Street, Port of Spain, Trinidad
1.868.622.2181 Ex. 2339

March 15th 2019

Mr. Harrilal Seecharan
Chief Education Officer
Ministry of Education

mm
22/3/19

Request to Conduct Research at Schools

In accordance with the Policy on the Provision of Supplemented Education Programmes/ Activities and the Conducting of Research by External Providers, **Mr. Kiran Emrith** has submitted his research proposal for review and approval. The research outline submitted has met the basic application format for proposals as laid out in the above policy.

The Applicant is a student at The University of the West Indies, pursuing the Master of Education Programme with Concentration in Curriculum. The research is entitled "**Flipping The Classroom for Improving Students' Engagement in Learning and Academic Achievement in Secondary School Mathematics**".

The Applicant's underlying reason for developing his study is "improve form two students' engagement in learning and academic achievement".

Mr. Emrith has identified St. François Girls' College to conduct his study and I am submitting this application for consideration to be approved, please be guided accordingly.

Yours Respectfully,


.....
Mrs. Lisa Henry-David
Director
Educational Planning Division
Ministry of Education



Appendix C

Approval from School's Principal

Parental Permission Letter

Dear Parent or Guardian,

I am Mr. K Emrith from St. Francois Girls' College. Currently, I am the Mathematics teacher for 2F and I am conducting a research project through the University of the West Indies (U.W.I) School of Education on the extent to which the flipped classroom affects students' engagement in learning and yield positive changes in academic achievement in Mathematics. The School's principal is aware of my research project, which is part of my teacher professional development, and has given her consent for me to conduct this study. As such, I am requesting permission to include your child in this research project in order to enhance the learning outcomes of the class as well as to create a better learning environment for your child.

Participation in this study is voluntary. Your decision about whether to allow your child to participate will not affect the services normally provided to your child by the school; she will still participate in class activities and assessments, but data collected from her will not be included in my research report. Any information that is obtained in connection with this study will remain confidential, and no identifying information about your child will be presented in my report.

Kindly detach, complete the attached consent form, and return it to me via your daughter.

Should you have any questions or need further information or clarification, I can be contacted through the school at 624-7468 or email: stfgc@stfgc.com (personal)

Signature:  Name: Ms. Jennifer Givens (Principal)

Signature:  Name: Mr. K Emrith (Mathematics Teacher)

PARENTAL INFORMED CONSENT FORM

Instructions: Tick the appropriate box below to indicate your consent regarding your daughter's participation in Mr. Emrith's action research about the use of the flipped classroom in the teaching of mathematics. Sign, detach the form and return to Mr. Emrith via your daughter.

I _____, parent/guardian of _____

☒ **Grant permission**

☐ **Do not grant permission**

For my daughter/ward to participate in Mr. Emrith's study at St. Francois Girls' College:

Signature of Parent/Guardian: _____ Date: _____

Appendix D - Parental Consent Form

 THE UNIVERSITY OF THE WEST INDIES ST. AUGUSTINE, TRINIDAD AND TOBAGO, WEST INDIES CAMPUS ETHICS COMMITTEE PARENT/GUARDIAN CONSENT FORM Phone: 645-3232 Ext: 8021 Email: campusethics@sta.uwi.edu	
Title of Research:	Flipping the Classroom for Improving Students' Engagement in Learning and Academic Achievement in Secondary School Mathematics
Investigators:	Dr. Sharon Jaggernauth and Mr. K Emrith
Your child /ward is being asked to be in a research study. We ask that you read this form and ask any questions that you may have before allowing your child to participate in this study.	
What are the things I should know about this study in which I am allowing my child/ward to participate? (explain procedures and tasks; identify any procedures that are experimental, how children will be selected)	
The purpose of this research is to improve form two students' engagement in learning and academic achievement in Mathematics by adjusting the current traditional teaching technique to a contemporary approach via the flipped classroom. The unit of work taught during this study will be Consumer Arithmetic where by students will view pre-recorded materials such as videos, songs and power point presentations at home or wherever students could gain access to the Internet on a specific web site (www.stfgcmathminds.weebly.com) designed by the teacher. After these materials were viewed, whole group and small group discussions will occur at the next class session in relation to the materials viewed, to enhance, reinforce and clarify any misconceptions about the content.	
How much time will it take for my child/ward to participate in this study?	
The research will take 3 weeks to cover the relevant content materials.	
What will happen to my child/ward during the study?	
She will be engaged in a series of fun class activities, discussions and assessments to which her engagement in learning and academic achievement will improve.	
Will my child get hurt in the study?	
No harm in any manner will be caused.	

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What if I don't want my child/ward to be in the study?

Your decision about whether to allow your child to participate will not affect the services normally provided to your child by the school; she will still participate in class activities and assessments, but data collected from her will not be included in the research report.

Can he/she be withdrawn from the study?

Yes. Your child at any point in time can withdraw from the study.

Who should I contact if I have any questions to ask concerning my child's/ward's participation? (provide name, phone number and email contact of the researcher)

You can contact me; Mr. K Emrith via: The school: 624-3468/621-3711 and/or Personal e-mail: stfgcemrith@gmail.com.

Indicate **Yes** or **No** for the following:

I give consent for my child to be audio-taped during this study

- ☐ Yes
☐ No

I give consent for my child to be video-taped during this study

- ☐ Yes
☐ No

Signatures

Before deciding if you want your child to be in the study, ask any question you may have. You are also free to ask any question during the study. If you sign your name below, it means that you agree to allow your child to take part in this research study.

Print Your Name

Age

Your Signature

Date

Signature of Second Witness

Date

This document was approved by
Campus Ethics Committee on:

8 March 2019

By Chairman:

Stefan

This document expires on:

7 March 2020



Appendix E

Learning Hierarchy

FLIPPING THE CLASSROOM FOR IMPROVING STUDENTS' ENGAGEMENT IN
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Appendix F

Unit Plan on Consumer Arithmetic

<u>Teacher Name:</u> Kiran Emrith	<u>School Name:</u> Ragnarok Girls Secondary School	<u>Class</u> <u>ass</u> : 2F
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Unit Plan: Consumer Arithmetic

Duration: 4 Weeks (10 sessions)

Unit Objectives:

At the end of this unit students will be able to :

1. Use technology at home (or wherever students can gain access to the internet) via the teacher made website (www.stfgcmathminds.weebly.com), to define and state working world examples of consumer arithmetic, cost price of an item, selling price of an item, marked price of an item, profit of an item, loss of an item, discount of an item and the various types of taxes, on the website's Blog Spot.
2. Engage in online quizzes at home (or wherever students can gain access to the internet) via the teacher made website (www.stfgcmathminds.weebly.com), based on consumer arithmetic, cost price of an item, selling price of an item, marked price of an item, profit of an item, loss of an item, discount of an item and the various types of taxes

3. Develop their writing skills by writing journals (40 - 50 words) at home (or wherever students can gain access to the internet) about each Mathematics class describing their: enthusiasm and enjoyment in class, excitement and feelings with the class activities, thoughts and views about the website and this "new" teaching and learning style, ideas (if any) into how the website and/or teaching can be improved or adjusted, and anything else (school related) they wish to express. These journals will be emailed to the teacher: stfgcemrith@gmail.com
4. Apply the knowledge from the website by collaborating with their peers during class sessions to create working world scenarios involving the application of consumer arithmetic and its related topics such as cost price of an item, selling price of an item, marked price of an item, profit gained on an item, loss incurred on an item, discount reduced off an item and various types of taxes using drama, posters, memes, songs and debates
5. Collaborate with their peers to identify and derive the formulas for computing profit, loss and discount amount given cost price and selling price of an item
6. Work collaboratively with their peers or individually to compute profit, loss and discount amount using the formulas given the cost price and selling price of an item
7. Collaborate with their peers to identify and derive the formulas for computing profit, loss and discount as a percentage given cost price, selling price and marked price of an item
8. Work collaboratively with their peers or individually to compute cost price, selling price and marked price of an item given either profit amount or percentage, loss amount or percentage and discount amount or percentage

9. Work collaboratively with their peers or individually to compute the selling and cost price of an item given the sales tax
10. Work collaboratively with their peers or individually to solve word problems involving cost and selling price of an item; profit and loss amount of the cost price of an item; profit and loss percentages of the cost price of an item; discount amount and percentage of the selling price of an item; the amount of sales tax paid on purchased items and the sales tax applied on an item.
11. Begin to appreciate the applications of consumer arithmetic and its related topics such as cost price of an item, selling price of an item, profit of an item, loss of an item, discount of an item and the various types of taxes in working world applications via their collaboration with their peers and video presentations

Pre-knowledge:

Evaluate arithmetic operations involving directed numbers; identify face value; place value and value of numbers; long division on numbers; concept of indices; calculating percentages; simplifying simple algebraic expressions; solving simple algebraic equations; calculating simple interest given principal, rate and time and/or any variations of these variables.

Sessions/Lessons:

Session 1: Concept of Consumer Arithmetic

Session Objectives: 45 Minutes

At the end of this Session students will be able to :

1. Define consumer arithmetic from a video presentation
2. List other concepts which are related to consumer arithmetic such as cost price, selling price, profit, loss and discount.
3. Create working world applications of consumer arithmetic using drama
4. Begin to appreciate the importance and purpose of consumer arithmetic in working world applications via the video and dramatic presentations

Teacher Lesson resources: Laptop, Speakers, Wi-Fi access, Projector ,Necessary Cables Plastic Bag,
Simple Items found in a grocery (snacks, muffins, and cookies), Markers, and Duster

Students Lesson resources: Mathematics Notebook, Writing materials (pens, pencils etc.)

Teaching strategy: Role Play, Whole Class Discussion, Video Presentation & Direct Instructions

Role Play:

Teacher creates a real life scenario in which he pretends to be an entrepreneur selling grocery items. He decided to sell these items in order to purchase a new vehicle. All of the items which were being sold were

bought from a wholesale distributor. Thus, some of the items he sold at a higher price compared to the price he bought it for and some items at a lower cost for various reasons.

Whole Class Discussion:

A whole class discussion will then take place concerning the scenario.

Video Presentation:

Since it is the students' first experience with the flipped classroom, the teacher showed a short video presentation from his website (www.stfgcmathminds.weebly.com) regarding consumer arithmetic and how it relates to other topics such as cost price, selling price, profit, loss and discount.

Direct Instructions:

The teacher places students in groups of four's to create a real life scenario portraying the concept of consumer arithmetic using drama.

Student activity: Whole Class Discussion & Small Group Work / Role play

Whole Class Discussion:

Students will be involved in a whole class discussion with the teacher concerning the scenario after the dramatic presentation.

Video Presentation:

Students will be engaged in the viewing of a video presentation from the teacher made website (www.stfgcmathminds.weebly.com) regarding consumer arithmetic and how it relates to other topics such as cost price, selling price, profit, loss, discount and various types of taxes

Small Group Work / Role Play:

Students will work in groups of four's to create a real life scenario portraying the concept of consumer arithmetic using drama

Formative Assessment:

The teacher groups students in fours and ask them to create and present a working world scenario similar to the one observed at the beginning of the class to highlight the following points:

1. Consumer arithmetic
2. Other concepts relating to consumer arithmetic such as cost price, selling price, profit, loss, discount and taxes
3. Purpose and uses of consumer arithmetic in the working world

Homework: Students will be required to visit the teacher made website www.stfgcmathminds.weebly.com and complete the following tasks:

1. View and make small notes on the cost price of an item, selling of an item, profit and loss incurred during a transaction videos in preparation for the next class session
 2. Participate in the online quiz # 1: consumer arithmetic online quiz
 3. Comment on the Blog Spot (on the website platform) where they will state their definition of consumer arithmetic and give two examples of how consumer arithmetic can be applied in the working world.
 4. Write a journal (40 - 50 words) about today's Mathematics class describing their: enthusiasm and enjoyment in class, excitement and feelings with the class activities, thoughts and views about the website and this "new" teaching and learning style, ideas (if any) into how the website and/or teaching can be improved or adjusted, and anything else (school related) they wish to express. These journals are to be emailed to the teacher: stfgcemrith@gmail.com
-

Sessions/Lessons:

Sessions 2:

Concept of Cost Price, Selling Price, Profit and Loss Amount incurred on a transaction

Session Objectives: 90 Minutes

At the end of this Session students will be able to :

1. Define the cost price of an item based on the video presentations viewed from the website
2. Define selling price of an item based on the video presentations viewed from the website
3. Identify other names to refer to cost price of an item based on the video presentations viewed from the website
4. Identify other names to refer to selling price of an item based on the video presentations viewed from the website
5. Differentiate between the cost price and selling price of an item via dramatic presentation
6. Define profit amount incurred on transaction based on the video presentations viewed from the website
7. Identify other names to refer to profit amount incurred on a transaction based on the video presentations viewed from the website
8. Define loss amount incurred on transaction based on the video presentations viewed from the website

9. Identify other names to refer to loss amount incurred on a transaction based on the video presentations viewed from the website
10. Differentiate between the profit and loss amount incurred on a transaction via dramatic presentation
11. Apply the knowledge from the website by collaborating with their peers to create working world scenarios involving the concepts of cost price of an item, selling price of an item, profit and loss amount incurred on transaction using drama
12. Begin to appreciate the importance and application of cost price, selling price of an item, profit and loss incurred on a transaction in working world applications via the dramatic presentations

Teacher Lesson resources: Markers, Duster

Students Lesson resources: Mathematics Notebook, Writing materials (pens, pencils etc.)

Teaching strategy: Questioning, Direct Instructions & Whole Class Discussion

Questioning:

The teacher questions the students about the concepts of cost price of an item, selling price of an item, profit and loss incurred on a transaction based on the video presentations on the website. These questioning techniques is mainly twofold: to clarify any misconceptions about the concepts presented in the videos and, to ensure and monitor if students are viewing the videos for homework.

Direct Instruction # 1:

The teacher randomly selects 3 students and assigns specific roles (a manufacturer, dealer # 1 and dealer # 2) for them based on a scenario created by the teacher. Scenario: It's Carnival time and a manufacturer is selling carnival costumes for \$500 per costume. Dealer # 1 then buys 100 costumes from the manufacturer and sells them for \$ 800 per costume. Dealer # 2 buys 100 of the costumes from the same manufacturer and sells them for \$ 300 per costume since some of the outfits got torn whilst transporting. The teacher allows the 3 students to enact the scenario in front of the class whilst the other students look on.

Direct Instruction # 1:

The teacher places students in groups of four's to create another real world scenario portraying the concept of cost price, selling price, profit and loss incurred during a transaction.

Whole Class Discussion:

A whole class discussion with the teacher will then follow each role play scenarios concerning the concepts of cost price, selling price, profit and loss amount incurred during the scenarios.

Student activity: Observations, Whole Class Discussion & Small Group Work / Role Play,

Observations:

During the role play, students who are not participating at the time will be observing and taking notes of the important information such as the cost price and selling price of the items for each dealer and the profit and loss incurred for each dealer from the play

Whole Class Discussion # 1:

A whole class discussion with the teacher will then follow the role play from the beginning of the class session concerning the concepts of cost price, selling price of items, profit and loss incurred during the transactions.

Small Group Work / Role Play :

The teacher groups students in fours and ask them to create and present a scenario similar to the one observed at the beginning of the class to highlight the cost price and selling price of items, profit and loss amount incurred during a transaction.

Whole Class Discussion # 2:

A whole class discussion with the teacher will follow each role play scene concerning the concepts of cost price, selling price of items, profit and loss incurred during the transactions. Students will be allowed to constructively criticize each other's presentations to enhance each other's understanding of the various concepts whilst clarifying any misconceptions along the way.

Formative Assessment:

The teacher groups students in fours (10 groups of 4 students and 1 group of 3 students) and ask them to create and present (each group will have 3-4 minutes to present their piece) a scenario similar to the one observed at the beginning of the class to highlight the following points:

1. Cost price of an item
2. Selling price of an item
3. Other names to refer to cost price and selling price of an item
4. Instances where a dealer will sell products at a price less than the cost price of an item (Loss)
4. Instances where a dealer will sell products at a price more than the cost price of an item (Profit)

Homework: Students will be required to visit the teacher made website www.stfgcmathminds.weebly.com and complete the following tasks:

1. View and make small notes on the videos related to the computation of profit and loss amounts incurred during a transaction given the cost price and selling of an item in preparation for the next class session
2. Participate in Online quizzes # 2 & # 3 : Cost price/selling price quiz and profit/loss amount quiz
3. Comment on the Blog Spot (on the website platform) where they will state their definition of cost price of an item, selling price of an item, profit and loss incurred during a transaction and give two examples of how these concepts can be applied in the working world.
4. Write a journal (40 - 50 words) about today's Mathematics class describing their: enthusiasm and enjoyment in class, excitement and feelings with the class activities, thoughts and views about the website and this "new" teaching and learning style, ideas (if any) into how the website and/or teaching can be improved or adjusted, and anything else (school related) they wish to express. These journals are to be emailed to the teacher: stfgcemrith@gmail.com

Sessions/Lessons:

Session 3:

Compute Profit and Loss Amount given Cost Price and Selling Price of Items

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Session/Lesson Objectives: 45 Minutes

At the end of this Session/Lesson students will be able to :

1. State the Formula for computing Profit Amount given the Selling Price and Cost Price item based on the video presentations viewed from the website
2. State the Formula for computing Loss Amount given the Selling price and Cost price item based on the video presentations viewed from the website
3. Compute Profit Amount given Selling price and Cost Price via collaboration with their peers
4. Compute Loss Amount given Selling price and Cost Price via collaboration with their peers
5. Begin to appreciate the importance and application of cost price, selling price of an item, profit and loss incurred on a transaction in working world applications via collaboration

Teacher Lesson resources: Markers, Duster, Laptop, Projector, Necessary Connection Cables

Student Lesson resources: Mathematics Note Book, Writing Materials (pens, pencils, etc.)

Teaching strategy: Direct Instructions, Questioning & Whole Class Discussion

Direct Instructions # 1:

Teacher allows students to work in pairs to discuss the online videos related to the computation of profit and loss amount incurred on a transaction given cost price and selling price of items.

Direct Instructions # 2:

Teacher presents a series of questions on the projector screen for students in groups of fours to compute the profit and loss amounts given cost price and selling price of items.

Questioning:

The teacher questions the students about the formulas for computing the profit and loss amounts given the cost price and selling price of items, based on the video presentations on the website. These questioning techniques is mainly twofold: to clarify any misconceptions about the concepts presented in the videos and, to ensure and monitor if students are viewing the videos for homework.

Whole Class Discussions :

This leads to an interactive discussion with the teacher and students to enhance the students' understanding of the computation profit and loss amount incurred on a transaction

Student activity: Pair-Pair Discussion, Whole Class Discussion & Small Group Work

Pair-Pair Discussion:

Students will be working in pairs to discuss the online videos related to the computation of profit and loss amounts incurred on a transaction given the cost price and selling price of items.

Whole Class Discussion:

The class will be involved in a whole group discussion with the teacher concerning the computation of profit and loss amount incurred on a transaction given the selling price and cost price of items.

Small Group Work

Student will work in groups of fours to apply their knowledge to solve problems involving the profit and loss amount incurred on a transaction, and cost price and selling price of items.

Formative Assessment:

Student will work in groups of fours to apply their knowledge to solve problems involving the profit and loss amount incurred on a transaction, and cost price and selling price of items.

1. A merchant sold a table fan for \$ 375 at a loss of \$ 50. Find the Cost Price of a fan.
2. A book seller bought 12 copies of a book. He sold each of them at \$ 20 and thus made a profit of \$ 24 by selling all the books. What was the Cost Price of a book?
3. A refrigerator is sold at \$ 10525 at a profit of \$ 925. What was the Cost Price of the refrigerator?
4. A boom seller sold 50 books for \$ 890.00 and earned a profit of \$ 90.00. Find the Cost Price of 50 books.
5. Derek bought cloth for \$ 800. He spent \$ 200 for stitching a shirt. He sold the shirt for \$ 1175. Find the profit.
6. The cost of a cycle is \$ 950 and that of a scooter is \$ 23,500. He sold them together for \$ 25,000. Find his profit.

7. Ron bought a cycle for \$ 800 and sold it at a loss of \$ 160. What is his selling price?
8. A cycle was bought for \$ 1225 and sold at a gain of \$ 100. Find the Selling Price of the cycle.
9. A radio is bought at \$ 550 and sold at a profit of \$ 35 after spending \$ 20 on its repairs. Find the Selling Price
10. Selling Price = Cost Price - _____.
11. Cost Price = Selling Price + _____.
12. Cost Price + _____ = Selling Price
13. Selling Price + _____ = Cost Price
14. When Cost Price > Selling Price = _____
15. When Selling Price > Cost Price = _____

Homework:

Students will be required to visit the teacher made website www.stfgcmathminds.weebly.com and complete the following tasks:

1. View and make small notes on the videos related to the concepts and computation of profit and loss percentages in preparation for the next class session
2. Participate in online quiz # 4: Cost price, selling price, profit and loss amount quiz.

3. Comment on the Blog Spot (on the website platform) where they will state the steps involved in computing the profit and loss amount given the cost price and selling price of items and give two examples of how these concepts can be applied in the working world.
4. Write a journal (40 - 50 words) about today's Mathematics class describing their: enthusiasm and enjoyment in class, excitement and feelings with the class activities, thoughts and views about the website and this "new" teaching and learning style, ideas (if any) into how the website and/or teaching can be improved or adjusted, and anything else (school related) they wish to express. These journals are to be emailed to the teacher: stfgcemrith@gmail.com

Sessions/Lessons:

Session 4: Concept and Computation of Profit & Loss Percentage on a Transaction

Session/Lesson Objectives: 90 Minutes

At the end of this Session/Lesson students will be able to :

1. Define profit as a percentage of the cost price of an item based on the video presentations from the website

2. State the Formula for computing Profit Percentage given the Profit Amount and the Cost Price of an item based on the video presentations from the website
3. Define loss as a percentage of the cost price of an item based on the video presentations from the website
4. State the Formula for computing Loss Percentage given the Loss Amount and the Cost Price of an item based on the video presentations from the website
5. Differentiate between Profit Percentage and Loss Percentage on a Transaction via collaboration with peers
6. Compute Profit Percentage given Profit Amount & Cost Price via collaboration with peers
7. Compute Loss Percentage given Loss Amount & Cost Price via collaboration with peers
8. Begin to appreciate the importance and purpose of the concepts and computation of profit & loss as a percentage of the cost price of an item in working world applications via collaborative work

Teacher Lesson resources: Markers, Duster, Laptop, Projector, Necessary Connection Cables

Student Lesson resources: Mathematics Note Book, Writing Materials (pens, pencils, etc.)

Teaching strategy: Direct Instructions, Guided Instructions, Questioning & Whole Class Discussion

Direct Instructions # 1:

Teacher allows students to work in pairs to discuss and compare notes based the online videos related to the concept and computation of profit and loss percentages incurred on a transaction given cost price and the profit and loss amount.

Direct Instructions # 2:

Teacher allows students to form groups of fours to create and present word problems based on the profit and loss percentages given the cost price and the profit and loss amounts.

Questioning:

The teacher questions the students about the concepts of profit and loss percentages and the formulas for computing the profit and loss percentages given the cost price and profit and loss amounts, based on the video presentations on the website. These questioning techniques is mainly twofold: to clarify any misconceptions about the concepts presented in the videos and, to ensure and monitor if students are viewing the videos for homework.

Whole Class Discussions:

This leads to an interactive discussion with the teacher and students to enhance their understandings of the concepts and computation profit and loss percentages incurred on a transaction given the cost price and the profit and loss amounts.

Guided Instructions:

The teacher displays on the projector screen two questions related to the computation of profit and loss percentage given the cost price and the profit and loss amounts (One question each). He then guides the students how to perform the computation using the necessary steps and formulas.

Question # 1 (Related to Profit): Mr. Jones bought an electrical stove from a manufacturer for \$ 4500. He then sold it to his neighbour for \$6235. Calculate his:

1. Profit amount on the transaction
2. Profit Percentage of the cost price of the item.

Question # 2 (Related to Loss): Mr. Roberts bought a gas cooker for \$945 and sold it to a customer for \$ 803.25 due to damage. Calculate his:

1. Loss amount on the transaction
2. Loss percentage of the cost price of the item

Student activity: Pair-Pair Discussion, Whole Class Discussion, Observations & Small Group Work

Pair-Pair Discussion:

Students will be working in pairs to discuss the online videos related to the concepts and computation of profit and loss percentages incurred on a transaction given the cost price and profit and loss amounts.

Whole Class Discussion:

The class will be involved in a whole group discussion with the teacher concerning the concepts and computation of profit and loss percentages incurred on a transaction given the cost price and profit and loss amounts.

Observations:

During the teacher's demonstration of how to compute the profit and loss percentages given the cost price and profit and loss amount, the students will be observing and taking notes of the important information such as the steps and application of the formulas involved in the computation.

Small Group Work

Student will work in groups of fours to apply their knowledge to create and present word problems involving the profit and loss amount percentages on a transaction given the cost price and profit and loss amounts. Each group will present their word problem at the front of the class for the other students to compute.

Formative Assessment:

Student will work in groups of fours to apply their knowledge to create and present word problems involving the profit and loss amount percentages on a transaction given the cost price and profit and loss.

The worded questions must contain the following:

1. An everyday scenario
2. A transaction that incurs as profit
3. Computation of profit percentage
4. A transaction that incurs a loss
5. Computation of loss percentage

Each group will present their worded problem at the front of the class for the other students to compute.

Homework:

Students will be required to visit the teacher made website www.stfgcmathminds.weebly.com and complete the following tasks:

1. View and make small notes on the videos related to the computation of the cost price of an item given the profit and loss percentage in preparation for the next class session
2. Participate in online quiz # 5: Profit & Loss Percentage quiz.
3. Comment on the Blog Spot (on the website platform) where they will state the definitions of profit and loss percentage and the steps involved in computing the profit and loss percentage given the cost

price and profit and loss amounts. They are also required to give two examples of how these concepts can be applied in the working world.

4. Write a journal (40 - 50 words) about today's Mathematics class describing their: enthusiasm and enjoyment in class, excitement and feelings with the class activities, thoughts and views about the website and this "new" teaching and learning style, ideas (if any) into how the website and/or teaching can be improved or adjusted, and anything else (school related) they wish to express. These journals are to be emailed to the teacher: stfgcemrith@gmail.com

Sessions/Lessons:

Session 5: Computing Cost Price of an item given Selling Price and Profit or Loss Percentages

Session/Lesson Objectives: 90 Minutes

At the end of this Session/Lesson students will be able to :

1. State the formulae for computing cost price of an item given the profit percentage and selling price of an item based on the video presentation on the website.
2. Work collaboratively with peers or individually to compute cost price of an item given the profit percentage and selling price of an item

3. State the formulae for computing cost price of an item given the loss percentage and selling price of an item based on the video presentation on the website
4. Work collaboratively with peers or individually to compute cost price of an item given the loss percentage and selling price of an item
5. Begin to appreciate the importance and purpose of computing cost price of an item given loss, profit percentage and selling price of an item in working world applications via collaboration

Teacher Lesson resources: Markers, Duster, Laptop, Projector, Necessary Connection Cables

Student Lesson resources: Mathematics Note Book, Writing Materials (pens, pencils, etc.)

Teaching strategy: Direct Instructions, Guided Instructions, Questioning & Whole Class Discussion

Direct Instructions # 1:

Teacher allows students to work in pairs to discuss and compare notes based on the online videos related to the formulas and the computation of cost price of an item given the profit or loss percentage, and the selling price of an item.

Direct Instructions # 2:

Teacher allows students to work individually to solve worded problems related to computing the cost price of an item given the profit or loss percentage and selling price of an item.

Questioning:

The teacher questions the students about computing the cost price of an item given the profit or loss percentage and selling price of an item based on the video presentations on the website. These questioning techniques is mainly twofold: to clarify any misconceptions about the concepts presented in the videos and, to ensure and monitor if students are viewing the videos for homework.

Whole Class Discussions:

This leads to an interactive discussion with the teacher and students to enhance their understandings of the computation of the cost price of an item given the profit or loss percentage and selling price.

Guided Instructions:

The teacher displays on the projector screen two questions related to the computation of the cost price of an item given the profit or loss percentage and selling price. (One question to compute cost price given profit percentage and the other with loss percentage). He then guides the students how to perform the computation using the necessary steps and formulas.

Question # 1 (Related to Profit): By selling an article for \$9200, a man gain 15%. Find the cost price of the article.

Question # 2 (Related to Loss): A laptop is sold for \$6800 at a loss of 15%. Find the cost price of the laptop.

Student activity: Pair-Pair Discussion, Whole Class Discussion, Observations & Small Group Work

Pair-Pair Discussion:

Students will be working in pairs to discuss the online videos related to the computation of the cost price of an item given the profit or loss percentage and selling price.

Whole Class Discussion:

The class will be involved in a whole group discussion with the teacher concerning the computation of the cost price of an item given the profit or loss percentage and selling price.

Observations:

During the teacher's demonstration of how to compute the cost price of an item given the profit or loss percentage and selling price, the students will be observing and taking notes of the important information such as the steps and application of the formulas involved in the computation.

Individual Work

Student individually to apply their knowledge to solve two worded problems related to computing the cost price of an item given the profit or loss percentage and selling price of an item

Question # 1 (Given Profit %): A store owner buys a television from the manufacture and sells it for \$ 2400 at a profit of 20%. Calculate the cost price of the television.

Question # 2 (Given Loss %): At a beauty salon, the owner sells long wigs for \$210, incurring a 25% loss. Calculate the cost price of the wigs.

Formative Assessment:

Student will work in groups of 4's or individually to apply their knowledge to solve a series of worded problems related to computing the cost price of an item given the profit or loss percentage and selling price of an item

Each group and each student who are working individually, will present one of the worded problem at the front of the class for the other students to verify the answers and clarify any misconceptions.

1. By selling an article for \$810, a loss of 10 percent is suffered. Find its cost price.
2. By selling two each for \$600 each; a shopkeeper gains 20 percent on one watch and loses 20 percent on the other. Find Cost Price of each watch
3. At a gift shop, the owner sells 10 GB flash drives for \$210, incurring a 30% loss. Calculate the cost price of the flash drive
4. Articles bought at 5 for \$4 are sold at 4 for \$5; find
 1. the cost-price of one article
 2. the cost price of 20 articles
5. By selling an article for \$825, a person loses equal to $\frac{1}{3}$ of its selling price. Find the cost price of the article.
6. A book was sold for \$575 thereby gaining 15%. Find the cost price of the book.
7. An article bought for \$620 is sold for \$780. Second article bought for \$575 is sold for \$437 and the third article bought for \$805 is sold for \$883. Find the total cost price of all the three articles.
8. A bag was sold for \$324 thereby gaining 8%. Find the cost price of the bag.

9. A store owner buys a couch set from the manufacture and sells it for \$ 15,620 at a profit of 35%.
Calculate the cost price of the couch set.
10. A man bought some toys at the rate of 10 for \$ 400 and sold them at 8 for \$ 350 Find his gain or loss percent.

Homework:

Students will be required to visit the teacher made website www.stfgcmathminds.weebly.com and complete the following tasks:

1. View and make small notes on the videos related to the computation of the selling price of an item given the profit and loss percentage in preparation for the next class session
2. Participate in online quiz # 6: Computing Cost Price, Selling Price, Profit & Loss Percentage # 1 quiz.
3. Comment on the Blog Spot (on the website platform) where they will state the formulas and steps involved in computing the cost price of an item given the selling price and profit or loss percentage
They are also required to give two examples of how these concepts can be applied in the working world.
4. Write a journal (40 - 50 words) about today's Mathematics class describing their: enthusiasm and enjoyment in class, excitement and feelings with the class activities, thoughts and views about the website and this "new" teaching and learning style, ideas (if any) into how the website and/or

teaching can be improved or adjusted, and anything else (school related) they wish to express. These journals are to be emailed to the teacher: stfgcemrith@gmail.com

Sessions/Lessons:

Session 6: Computing Selling price of an item given the Cost price and Profit or Loss Percentage

Session/Lesson Objectives: 90 Minutes

At the end of this Session/Lesson students will be able to :

1. State the formulae for computing selling price of an item given the profit percentage and cost price of an item based on the video presentation on the website.
2. Work collaboratively with peers or individually to compute selling price of an item given the profit percentage and cost price of an item
3. State the formulae for computing selling price of an item given the loss percentage and cost price of an item based on the video presentation on the website
4. Work collaboratively with peers or individually to compute selling price of an item given the loss percentage and cost price of an item

5. Begin to appreciate the important and purpose of computing selling price of an item given loss, profit percentage and cost price of an item in working world applications via collaboration

Teacher Lesson resources: Markers, Duster, Laptop, Projector, Necessary Connection Cables

Student Lesson resources: Mathematics Note Book, Writing Materials (pens, pencils, etc.)

Teaching strategy: Direct Instructions, Guided Instructions, Questioning & Whole Class Discussion

Direct Instructions # 1:

Teacher allows students to work in pairs to discuss and compare notes based the online videos related to the formulas and the computation of selling price of an item given the profit or loss percentage, and the cost price of an item.

Direct Instructions # 2:

Teacher allows students to work individually to solve worded problems related to computing the selling price of an item given the profit or loss percentage and cost price of an item.

Questioning:

The teacher questions the students about computing the selling price of an item given the profit or loss percentage and cost price of an item based on the video presentations on the website. These questioning

techniques is mainly twofold: to clarify any misconceptions about the concepts presented in the videos and, to ensure and monitor if students are viewing the videos for homework.

Whole Class Discussions:

This leads to an interactive discussion with the teacher and students to enhance their understandings of the computation of the selling price of an item given the profit or loss percentage and cost price.

Guided Instructions:

The teacher displays on the projector screen two questions related to the computation of the selling price of an item given the profit or loss percentage and cost price. (One question to compute cost price given profit percentage and the other with loss percentage). He then guides the students how to perform the computation using the necessary steps and formulas.

Question # 1 (Related to Profit %): A salesman buys a home theatre system from a manufacturer for \$ 2500 and sells it for a profit of 25%. How much did he sell the home theatre system for?

Question # 2 (Related to Loss %): A shopkeeper buys a vending machine for \$ 2000. He then sells it at a loss of 35% due to technical difficulties. Determine the selling price of the vending machine.

Student activity: Pair-Pair Discussion, Whole Class Discussion, Observations & Small Group Work

Pair-Pair Discussion:

Students will be working in pairs to discuss the online videos related to the computation of the selling price of an item given the profit or loss percentage and cost price.

Whole Class Discussion:

The class will be involved in a whole group discussion with the teacher concerning the computation of the selling price of an item given the profit or loss percentage and cost price.

Observations:

During the teacher's demonstration of how to compute the selling price of an item given the profit or loss percentage and cost price, the students will be observing and taking notes of the important information such as the steps and application of the formulas involved in the computation.

Individual Work

Student individually to apply their knowledge to solve two worded problems related to computing the selling price of an item given the profit or loss percentage and cost price of an item

Question # 1: (Given Profit %): An entrepreneur buys a computer game from a manufacturer for \$ 500. Calculate the selling price if he makes a profit of 20%

Question # 2: (Given Loss %) A businessman bought a personal computer for \$ 8000. The computer's case was damaged during transportation so he decided to sell it for a loss of 10%. Determine the selling price of the computer.

Formative Assessment:

Student will work in groups of 4's or individually to apply their knowledge to solve a series of worded problems related to computing the selling price of an item given the profit or loss percentage and cost price of an item

Each group and each student who are working individually, will present one of the worded problem at the front of the class for the other students to verify the answers and clarify any misconceptions.

1. A watch is bought for \$1400 and is sold at a loss of 15%. Find its selling price.
2. Apples are bought at 20 for \$60. If they are sold at $33\frac{1}{3}$ percent profit. Find:
 1. selling price of each apple
 2. S.P. of 8 apples
3. A toy is bought for \$840. At what price must it be sold in order to lose $12\frac{1}{2}\%$?
4. An article bought for \$350 is sold at a profit of 20%. Find its selling price.
5. A fruit seller bought oranges at \$22.50 per dozen and sold them at a loss of 8 percent. How much will a customer pay for:
 1. one orange
 2. 40 oranges
6. Shelly bought a dress for \$150 and sold it to Jenny there by suffering a loss of 10%. Find the selling price of the dress.
7. By selling a chair for \$372, Daisy loses 7%. At what price must she sell it to gain 10%.

8. Mike bought a laptop for \$800 and sold it to Jack there by suffering a loss of 12%. Find the selling price of the laptop.
9. A dealer bought a couch set for \$ 1500. However, the couch set was damaged in transporting it to the costumer. Determine the selling price if the dealer incurred a loss of 40%.
10. A businessman bought a dinning set for \$ 5000 and sold it for a profit of 50%. Determine the selling price of the dinning set.

Homework:

Students will be required to visit the teacher made website www.stfgcmathminds.weebly.com and complete the following tasks:

1. View and make small notes on the videos related to the concepts of discount amount and discount percentage in preparation for the next class session
2. Participate in online quiz # 7: Computing Cost Price, Selling Price, Profit & Loss Percentage # 2 quiz.
3. Comment on the Blog Spot (on the website platform) where they will state the formulas and steps involved in computing the selling price of an item given the cost price and profit or loss percentage
They are also required to give two examples of how these concepts can be applied in the working world.
4. Write a journal (40 - 50 words) about today's Mathematics class describing their: enthusiasm and enjoyment in class, excitement and feelings with the class activities, thoughts and views about the

website and this "new" teaching and learning style, ideas (if any) into how the website and/or teaching can be improved or adjusted, and anything else (school related) they wish to express. These journals are to be emailed to the teacher: stfgcemrith@gmail.com

Session 7: Concept of Discount Amount, Marked Price of an item & Discount Percentage on a Transaction

Session/Lesson Objectives: 45 Minutes

At the end of this Session/Lesson students will be able to :

1. Define Discount Amount based on the video presentations from the website
2. Define Marked price of an item based on the video presentations from the website
3. Define Discount Percentage based on the video presentations from the website
4. Apply the knowledge from the website by collaborating with their peers to create working world scenarios involving the concepts of discount amount, marked price of an item, and discount percentage on transaction using drama
5. Begin to appreciate the importance and application of discount amount, marked price of an item, and discount percentage incurred on a transaction in working world applications via the dramatic presentations

Teacher Lesson resources: Markers, Duster

Student Lesson resources: Mathematics Note Book, Writing Materials (pens, pencils, etc.)

Teaching strategy: Questioning, Direct Instructions & Whole Class Discussion

Questioning:

The teacher questions the students about the concepts of discount amount, marked price, discount percentage incurred on a transaction based on the video presentations on the website. These questioning techniques is mainly twofold: to clarify any misconceptions about the concepts presented in the videos and, to ensure and monitor if students are viewing the videos for homework.

Direct Instruction # 1:

The teacher randomly selects 3 students and assigns specific roles (shopkeeper # 1, shopkeeper # 2 and a customer) for them based a scenario created by the teacher. Scenario: Its Carnival time and the shopkeepers is having a massive blowout sale by reducing the cost of their costumes. One shopkeeper is giving a 50% discount and the other is reducing each it by \$ 40. The teacher allows the 3 students to enact the scenario in front of the class whilst the other students look on.

Direct Instruction # 1:

The teacher places students in groups of four's to create another real world scenario portraying the concept of discount amount, marked price and discount percentage incurred during a transaction.

Whole Class Discussion:

A whole class discussion with the teacher will then follow each role play scenarios concerning the concepts of discount amount, marked price and discount percentage incurred during the scenarios.

Student activity: Observations, Whole Class Discussion & Small Group Work / Role Play,

Observations:

During the role play, students who are not participating at the time will be observing and taking notes of the important information such as the marked price of the items for each dealer and the discount amount and discount percentage offered to the customer.

Whole Class Discussion # 1:

A whole class discussion with the teacher will then follow the role play from the beginning of the class session concerning the concepts of discount amount, marked price and discount percentage incurred during the scenarios.

Small Group Work / Role Play :

The teacher groups students in fours and ask them to create and present a scenario similar to the one observed at the beginning of the class to highlight the concepts of discount amount, marked price and discount percentage incurred during the scenarios.

Whole Class Discussion # 2:

A whole class discussion with the teacher will follow each role play scene concerning the concepts of discount amount, marked price and discount percentage incurred during the transaction. Students will be allowed to constructively criticize each other's presentations to enhance each other's understanding of the various concepts whilst clarifying any misconceptions along the way.

Formative Assessment:

The teacher groups students in fours (10 groups of 4 students and 1 group of 3 students) and ask them to create and present (each group will have 3-4 minutes to present their piece) a working world scenario similar to the one observed at the beginning of the class to highlight the following points:

1. Discount amount offered to customers
2. Discount percentage offered to customers
3. Marked price and selling price of items
4. Reasons why shop owners offer discount in their businesses
5. Different names used to represent discounts

Observing students will be allowed to constructively criticize or praise the presenting groups

Homework:

Students will be required to visit the teacher made website www.stfgcmathminds.weebly.com and complete the following tasks:

1. View and make small notes on the videos related to the computation of marked price of items given the discount percentage and the selling price, as well as the computation of the selling price of items given the discount percentage and marked price of items in preparation for the next class session
2. Participate in online quiz # 8: Discount Amount and Discount Percentage # 1 quiz.
3. Comment on the Blog Spot (on the website platform) where they will state the definitions of discount amount, marked price of an item and discount percentage on a transaction. They are also required to give two examples of how these concepts can be applied in the working world.
4. Write a journal (40 - 50 words) about today's Mathematics class describing their: enthusiasm and enjoyment in class, excitement and feelings with the class activities, thoughts and views about the website and this "new" teaching and learning style, ideas (if any) into how the website and/or teaching can be improved or adjusted, and anything else (school related) they wish to express. These journals are to be emailed to the teacher: stfgcemrith@gmail.com

Session 8: Computing Marked Price and Selling Price given the Discount Percentage

Session/Lesson Objectives: 90 Minutes

At the end of this Session/Lesson students will be able to :

1. State the formula for computing the marked price of an item given the selling price and discount percentage based on the video presentation from the website

2. Work collaboratively with peers or individually to compute the marked price of an item given the selling price and the discount percentage
3. State the formula for computing the selling price of an item given the marked price and discount percentage based on the video presentation from the website
4. Work collaboratively with peers or individually to compute the selling price of an item given the marked price and the discount percentage.
5. Begin to appreciate the importance and purpose of computing the marked price and selling price given the discount percentage in working world applications via collaboration.

Teacher Lesson resources: Markers, Duster, Laptop, Projector, Necessary Connection Cables

Student Lesson resources: Mathematics Note Book, Writing Materials (pens, pencils, etc.)

Teaching strategy: Direct Instructions, Guided Instructions, Questioning & Whole Class Discussion

Direct Instructions # 1:

Teacher allows students to work in pairs to discuss and compare notes based on the online videos related to the formulas and the computation of selling price and marked price of an item given the discount percentages.

Direct Instructions # 2:

Teacher allows students to work individually to solve worded problems related to computing the selling price and marked price of an item given the discount percentage

Questioning:

The teacher questions the students about formulas and computation of the selling price and marked price of an item given the discount percentage based on the video presentations on the website. These questioning techniques is mainly twofold: to clarify any misconceptions about the concepts presented in the videos and, to ensure and monitor if students are viewing the videos for homework.

Whole Class Discussions:

This leads to an interactive discussion with the teacher and students to enhance their understandings of the formulas and computation of the selling price and marked price of an item given the discount percentage

Guided Instructions:

The teacher displays on the projector screen two questions related to the computation of the selling price and marked of an item given the discount percentage. (One question to compute marked price given discount percentage and selling price and the other question to compute selling price given the discount percentage and the marked price). He then guides the students how to perform the computation using the necessary steps and formulas.

Question # 1 (Calculate the M.P): After allowing a discount of 8% on a toy, it is sold for \$ 216.20. Find the marked price of the toy.

Question # 2(Calculate the S.P): The marked price of a water cooler is \$ 4650. The shopkeeper offers an off-season discount of 18% on it. Find its selling price.

Student activity: Pair-Pair Discussion, Whole Class Discussion, Observations & Small Group Work

Pair-Pair Discussion:

Students will be working in pairs to discuss the online videos related to the computation of the marked price and selling price of an item given the discount percentage.

Whole Class Discussion:

The class will be involved in a whole group discussion with the teacher concerning the computation of the selling price and marked price of an item given the discount percentage.

Observations:

During the teacher's demonstration of how to compute the marked price and selling price of an item given the discount percentage, the students will be observing and taking notes of the important information such as the steps and application of the formulas involved in the computation.

Individual Work

Student will be working individually to apply their knowledge to solve two worded problems related to computing the marked price and selling price of an item given the discount percentage.

Question # 1(Calculating M.P): A tea set was bought for \$ 528 after getting a discount of 12% on its marked price. Find the marked price of the tea set.

Question # 2 (Calculating S.P): The marked price of a Stove is \$ 5250. The shopkeeper offers a blow out discount of 22% on it. Find its selling price.

Formative Assessment:

Student will work in groups of 4's or individually to apply their knowledge to solve a series of worded problems related to computing the selling price and marked price of an item given the discount percentage or any combination of such concepts.

Each group and each student who are working individually, will present one of the worded problem at the front of the class for the other students to verify the answers and clarify any misconceptions.

1. A dinning set was bought for \$ 1520 after getting a discount of 12% on its marked price. Find the marked price of the dinning set.
2. A dealer purchased a fan for \$ 1080. After allowing a discount of 25% on its marked price, he gains 25%. Find the marked price of the fan.
3. Find the single discount which is equivalent to two successive discounts of 20% and 5%.
4. The marked price of a laptop is \$ 11500. The shopkeeper offers an off-season discount of 33.33% on it. Find its selling price. .
5. The marked price of a television is \$ 18500. A dealer allows two successive discounts of 20% and 5%. For how much is the television available?
6. How much per cent above the cost price should a shopkeeper mark his goods so that after allowing a discount of 10% on the marked price, he gains 8%?

7. A fruit seller has oranges at \$22.50 per dozen and decides to give a discount of 2% per orange before the oranges begins to rot. How much will a customer pay for:
 1. one orange
 2. 20 oranges
8. The labelled price on an ergonomic chair is \$ 950. The store offers a 12% discount. What is the selling price of the chair?
9. A shopkeeper marked a dinner set for \$1000. He sold it at \$900. What percent discount did he give?
10. In a shop of ready-made garments, a dress is marked at \$1350 and is available for \$954. Find the discount given by the shopkeeper and express it as percent.

Homework:

Students will be required to visit the teacher made website www.stfgcmathminds.weebly.com and complete the following tasks:

1. View and make small notes on the videos related to the concepts taxations and the various types of taxes in preparation for the next class session
2. Participate in online quiz # 9: Discount Amount and Discount Percentage # 2 quiz.
3. Comment on the Blog Spot (on the website platform) where they will state the formulas and steps involved in computing the marked price selling price of an item given the discount percentage. They are also required to give two examples of how these concepts can be applied in the working world.

4. Write a journal (40 - 50 words) about today's Mathematics class describing their: enthusiasm and enjoyment in class, excitement and feelings with the class activities, thoughts and views about the website and this "new" teaching and learning style, ideas (if any) into how the website and/or teaching can be improved or adjusted, and anything else (school related) they wish to express. These journals are to be emailed to the teacher: stfgcemrith@gmail.com
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Session 9 : Concept of Tax & Sales Tax

Session/Lesson Objectives: 45 Minutes

At the end of this Session/Lesson students will be able to :

1. Define Tax based the video presentation on the website
2. Identify different types of taxes based on the video presentation
3. Define Sales Tax based on the video presentation on the website
4. Apply the knowledge from the website by collaborating with their peers to create working world scenarios involving the concepts of Tax, the various types of taxes and Sales Tax on transactions using drama
5. Begin to appreciate the importance and application of Tax, the various types of taxes and Sales Tax on a transactions in working world applications via the dramatic presentations

FLIPPING THE CLASSROOM FOR IMPROVING STUDENTS' ENGAGEMENT IN
LEARNING AND ACADEMIC ACHIEVEMENT IN SECONDARY SCHOOL
MATHEMATICS AT THE RAGNAROK GIRLS SECONDARY SCHOOL

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Teacher Lesson resources: Markers, Duster

Student Lesson resources: Mathematics Note Book, Writing Materials (pens, pencils, etc.)

Teaching strategy: Questioning, Direct Instructions & Whole Class Discussion

Demonstration:

The teacher walks into class and starts to collect all forms of fees from students such as bathroom fees, networking fees, and locker fees. He has a list of the students' names and he informs them who paid in full and who is outstanding. He also informs them about the consequence if these fees are not paid such as they will not have access to the lockers and internet. Also if the bathroom fee is not paid, maintenance and up keep of the bathroom cannot be done.

Questioning:

The teacher questions the students about the concepts of taxes, the various types of taxes and sale tax on transactions based on the video presentations on the website. These questioning techniques is mainly twofold: to clarify any misconceptions about the concepts presented in the videos and, to ensure and monitor if students are viewing the videos for homework.

Direct Instruction # 2:

The teacher places students in groups of four's to create another real world scenario portraying the concept of taxes and sales tax incurred during a transaction.

Whole Class Discussion:

A whole class discussion with the teacher will then follow each role play scenarios concerning the concepts of tax and sales tax incurred during the scenarios.

Student activity: Observations, Whole Class Discussion & Small Group Work / Role Play,

Observations:

During the role play, students will be observing and taking notes of the important information such as the type of taxes portrayed in the scenario, how it was used, and the amount that was charged.

Whole Class Discussion # 1:

A whole class discussion with the teacher will then follow the role play from the beginning of the class session concerning the concepts of taxes and sales tax incurred during transactions

Small Group Work / Role Play :

The teacher groups students in fours and ask them to create and present a scenario similar to the one observed at the beginning of the class to highlight the concepts of tax and sales taxes incurred during transactions.

Whole Class Discussion # 2:

A whole class discussion with the teacher will follow each role play scene concerning the concepts of tax and sales tax incurred during the transaction. Students will be allowed to constructively criticize each other's presentations to enhance each other's understanding of the various concepts whilst clarifying any misconceptions along the way.

Formative Assessment:

The teacher groups students in fours (10 groups of 4 students and 1 group of 3 students) and ask them to create and present (each group will have 3-4 minutes to present their piece) a working world scenario similar to the one observed at the beginning of the class to highlight the following points:

1. Taxes customers must pay
2. Taxes business or store owners must pay
3. Reasons why persons must pay taxes
4. Describing at least two other types of taxes that individuals must pay on a regular basis

Observing students will be allowed to constructively criticize or praise the presenting groups

Homework:

Students will be required to visit the teacher made website www.stfgcmathminds.weebly.com and complete the following tasks:

1. View and make small notes on the videos related to the computation of cost price and selling price of item exclusive and inclusive of VAT in preparation for the next class session

2. Participate in online quiz # 10: Taxation quiz.
3. Comment on the Blog Spot (on the website platform) where they will state the definitions of tax, sales tax and list at least two other types of taxes individuals must pay on a regular basis. They are also required to give two examples of how these concepts can be applied in the working world.
4. Write a journal (40 - 50 words) about today's Mathematics class describing their: enthusiasm and enjoyment in class, excitement and feelings with the class activities, thoughts and views about the website and this "new" teaching and learning style, ideas (if any) into how the website and/or teaching can be improved or adjusted, and anything else (school related) they wish to express. These journals are to be emailed to the teacher: stfgcemrith@gmail.com

Session 10: Computation involving selling price, cost price and VAT

Session/Lesson Objectives: 90 Minutes

At the end of this Session/Lesson students will be able to:

1. State the formula for computing the cost price of an item that is exclusive of VAT given the selling price and VAT based on the video presentation from the website
2. Work collaboratively with peers or individually to compute the cost price of an item that is exclusive of VAT given the selling price and VAT

3. State the formula for computing the selling price of an item that is inclusive of VAT given the cost price and VAT based on the video presentation from the website
4. Work collaboratively with peers or individually to compute the selling price of an item that is inclusive of VAT given the cost price and the VAT
5. Begin to appreciate the importance and purpose of computing the cost price and selling price given the VAT in working world applications via collaboration.

Teacher Lesson resources: Markers, Duster, Laptop, Projector, Necessary Connection Cables

Student Lesson resources: Mathematics Note Book, Writing Materials (pens, pencils, etc.)

Teaching strategy: Direct Instructions, Guided Instructions, Questioning & Whole Class Discussion

Direct Instructions # 1:

Teacher allows students to work in pairs to discuss and compare notes based the online videos related to the formulas and the computation of cost price (exclusive of VAT) and selling price (inclusive of VAT) of an item given VAT

Direct Instructions # 2:

Teacher allows students to work individually to solve worded problems related the computation of cost price (exclusive of VAT) and selling price (inclusive of VAT) of an item given VAT

Questioning:

The teacher questions the students about formulas and computation of cost price (exclusive of VAT) and selling price (inclusive of VAT) of an item given VAT based on the video presentations on the website. These questioning techniques is mainly twofold: to clarify any misconceptions about the concepts presented in the videos and, to ensure and monitor if students are viewing the videos for homework.

Whole Class Discussions:

This leads to an interactive discussion with the teacher and students to enhance their understandings of the formulas and computation of cost price (exclusive of VAT) and selling price (inclusive of VAT) of an item given VAT

Guided Instructions:

The teacher displays on the projector screen two questions related to the computation of cost price (exclusive of VAT) and selling price (inclusive of VAT) of an item given VAT (One question to compute cost price that is exclusive of VAT given selling price and VAT and the other question to compute selling price that is inclusive of VAT given the selling price and the VAT). He then guides the students how to perform the computation using the necessary steps and formulas.

Question # 1 (Calculate the C.P): Find the cost price of a motorbike which was bought for \$ 36300 after paying a sales tax at the rate of 10%

Question # 2(Calculate the S.P inclusive of VAT): The printed price of a bicycle is \$ 4200. The rate of sales tax on it is 10%. Find the price at which the cycle can be purchased inclusive of VAT

Student activity: Pair-Pair Discussion, Whole Class Discussion, Observations & Small Group Work

Pair-Pair Discussion:

Students will be working in pairs to discuss the online videos related to the computation of cost price (exclusive of VAT) and selling price (inclusive of VAT) of an item given VAT

Whole Class Discussion:

The class will be involved in a whole group discussion with the teacher concerning the computation of cost price (exclusive of VAT) and selling price (inclusive of VAT) of an item given VAT

Observations:

During the teacher's demonstration of how to compute the cost price (exclusive of VAT) and selling price (inclusive of VAT) of an item given VAT, the students will be observing and taking notes of the important information such as the steps and application of the formulas involved in the computation.

Individual Work

Student will be working individually to apply their knowledge to solve two worded problems related to computation of cost price (exclusive of VAT) and selling price (inclusive of VAT) of an item given VAT.

Question # 1(Calculating C.P): A refrigerator is marked for sale at \$ 17600 inclusive of sales tax at the rate of 10%. Calculate the cost price on the refrigerator.

Question # 2 (Calculating S. P): A printing machine for is being sold for \$5136 at sales tax of 7%. Calculate the selling price of the printing machine.

Formative Assessment:

Student will work in groups of 4's or individually to apply their knowledge to solve a series of worded problems related to the computation of cost price (exclusive of VAT) and selling price (inclusive of VAT) of an item given VAT or any combination of such concepts.

Each group and each student who are working individually, will present one of the worded problems at the front of the class for the other students to verify the answers and clarify any misconceptions.

1. The printed price of a DVD player is \$ 7500. If a sales tax of 8% is realised from the buyer, find the price at which the DVD player is sold?
2. The listed price of a refrigerator is \$ 9700. If a sales tax of 6% is charged from the buyer, find the selling price of the refrigerator.
3. The price of a colour TV is \$ 13440, inclusive of sales tax. If the printed price of the colour TV be \$ 12000 then find the rate of sales tax.
4. Rahul buys a pair of shoes whose marked price is \$ 500. He has to pay a sales tax of \$ 40. Find the rate of sales tax.

5. The selling price of an article becomes $\frac{27}{25}$ times the listed price due to the inclusion of sales tax.
Find the rate of sales tax.
6. The price of a camera is \$ 9810 inclusive of sales tax. If the rate of sales tax is 9%, find the printed price of the camera.
7. The rate of sales tax on trousers is 10%. One can buy a pair of trousers at \$ 660. What is the marked price?
8. The rate of sales tax on the marked price of an article is 6% and it is available at \$ 371. If the rate of sale tax increases 8%, find the price at which the article is available.
9. If the rate of sales tax reduces by 4%, the selling price of an article comes down by \$ 100. Find the marked price of the article.
10. The price of a TV set inclusive of sales tax of 9% is 17407. Find its marked price. If the sales tax is increased to 13%, how much more does the customer pay for the TV set?
11. Last year, an article was sold with a sales tax of 10% on the marked price. This year, the rate of sales tax becomes 12%. What is the percentage in the amount that a customer has to pay this year to buy it if the marked price remains the same?

Homework:

Students will be required to visit the teacher made website www.stfgcmathminds.weebly.com and complete the following tasks:

1. Participate in online quiz # 10: Sales Tax quiz.

2. Comment on the Blog Spot (on the website platform) where they will state the formulas and steps involved in the computation of cost price (exclusive of VAT) and selling price of an item (inclusive of VAT) given VAT. They are also required to give two examples of how these concepts can be applied in the working world.
3. Write a journal (40 - 50 words) about today's Mathematics class describing their: enthusiasm and enjoyment in class, excitement and feelings with the class activities, thoughts and views about the website and this "new" teaching and learning style, ideas (if any) into how the website and/or teaching can be improved or adjusted, and anything else (school related) they wish to express. These journals are to be emailed to the teacher: stfgcemrith@gmail.com.
4. Review all the topics covered in relation to consumer in preparation for their final examination.

Appendix G

Lesson Plans

SCHOOL OF EDUCATION, UNIVERSITY OF THE WEST INDIES, ST. AUGUSTINE

MATHEMATICS LESSON PLAN

Teacher: Mr. K Emrith

Date: 12-03-19	Class: 2F	Time: 45 Minutes
Unit: Consumer Arithmetic		
Topic: Introduction to Consumer Arithmetic		
Pre-knowledge: Evaluate arithmetic operations involving directed numbers; identify face value; place value and value of numbers; long division on numbers; concept of indices; calculating percentages; simplifying simple algebraic expressions; solving simple algebraic equations; calculating simple interest given principal, rate and time and any variations of these variables		

OBJECTIVES: Pupils will:	Classification
5. Define consumer arithmetic from a video presentation	K
6. List other concepts which are related to consumer arithmetic such as cost price, selling price, profit, loss and discount.	K
7. Create working world applications of consumer arithmetic using drama	Integration

8. Begin to appreciate the importance and purpose of consumer arithmetic in working world applications via the video and dramatic presentations	Aff.
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SET INDUCTION: *(Time: 3 minutes)*

Teacher creates a real life scenario in which he pretends to be an entrepreneur selling grocery items. He decides to sell these items in order to purchase a new vehicle. All of the items which were being sold were bought from a wholesale distributor. Thus, some of the items he sold at a higher price compared to the price he bought them at and some items at a lower cost for various reasons.

Resources required: Markers, Duster, Plastic Bag, Simple Items found in a grocery (snacks, muffins, and cookies)

SECTION 1 *(Time: 22 minutes)*

Content: Concept of Consumer Arithmetic

Teaching Points:

1. It is a field of Mathematics
 2. It involves consumer- people who purchase items for living, comfort and pleasure
 3. It utilizes various arithmetic skills - basic mathematical skills (+, -, $\times$, $\div$)
-

4. It is applicable to working world scenarios; purchasing items, making investment, taking a loan, making down payments 5. It aids in decision making.		
Method:		
Teaching Strategy:	Student Activity	Resources
Role Play: Teacher creates a real life scenario in which he pretends to be an entrepreneur selling grocery items. He decided to sell these items in order to purchase a new vehicle. All of the items which were being sold were bought from a wholesale distributor. Thus, some of the items he sold at a higher price compared to the price he bought it for and some items at a lower cost for various reasons. Whole Class Discussion:	Whole Class Discussion: Students will be involved in a whole class discussion with the teacher concerning the scenario after the dramatic presentation. Video Presentation: Students will be engaged in the viewing of a video presentation from the teacher made website regarding consumer arithmetic and how it relates to other topics such as cost price, selling price, profit, loss, discount and various types of taxes Small Group Work / Role Play:	Teacher: Laptop, Speakers, Wi-Fi access, Projector, Necessary Cables Plastic Bag, Simple Items found in a grocery (snacks, muffins, and cookies), Markers, and Duster Student: Mathematic Notebook, writing materials (pens, pencils etc.) Video presentation:

A whole class discussion will then take place concerning the scenario. Video Presentation: Since it is the students' first experience with the flipped classroom, the teacher showed a short video presentation from his website regarding consumer arithmetic and how it relates to other topics such as cost price, selling price, profit, loss and discount. Direct Instructions: The teacher places students in groups of four's to create a real life scenario portraying the concept of consumer arithmetic using drama.	Students will work in groups of four's to create a real life scenario portraying the concept of consumer arithmetic using drama	www.stfgcmathminds.weebly.com
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Sectional Review: *(Time: 2 minutes)*

1. What is consumer arithmetic?
2. What are some other concepts related to consumer arithmetic?
3. What is the purpose and importance of consumer arithmetic?

Questions & Answers :

1. Based on the scenario observed, what was the dealer doing? – Selling items
2. Why was he selling items? – To purchase a car
3. What other reasons a dealer will sell items? – To gain a profit, make money, live comfortably
4. What is a profit? – Gain in money
5. How can someone gain money? – Selling items or products more than the original cost of it
6. What types of products can be sold? – All sorts; furniture, grocery items, cars, house, land
7. Who will these products be sold to? – People
8. What name can be used to describe people who purchase items? – Consumers
9. When purchase items what sort of mathematical operations will be involved? – $(+, -, \div, \times)$
10. What are these operations called? – Arithmetic operations
11. What topic in Mathematics that can be used to describe consumers who use arithmetic operations in working world situations? – Consumer Arithmetic
12. When can consumer arithmetic applied? – When purchasing items, making investment, taking a loan, making down payments
13. When entering a store and the price of an item is scene, what name is given to that price? Selling price
14. Is that the original amount the store owner buys the item for? – No
15. What name is given to that original price? – Cost price
16. What other concepts can be linked to consumer arithmetic? – Profit, Loss, Tax, Percentages, Wages
17. Can consumer arithmetic helps to make decisions about a purchase? – Yes

18. How so? – Calculating the price of the original amount and comparing to the selling price to know if it is a good buy; when buying items on hire purchase if it is wise to do so.

CLOSURE: (*Time: 3 minutes*)

1. State some examples where consumer arithmetic is applied?
2. What are some other concepts related to consumer arithmetic?
3. What is the purpose and importance of consumer arithmetic?

FINAL EVALUATION: (*Time: 15 minutes*)

The teacher groups students in fours and ask them to create and present a working world scenario similar to the one observed at the beginning of the class to highlight the following points:

5. Consumer arithmetic
6. Other concepts relating to consumer arithmetic such as cost price, selling price, profit, loss, discount and taxes
7. Purpose and uses of consumer arithmetic in the working world

Reasonable level of Achievement:	Objective
1. 40/43 Students will define consumer arithmetic 2. 40/43 Students will list other concepts related to consumer arithmetic 3. 40/43 Students will use drama to portray the concepts of consumer arithmetic 4. 40/43 Students will begin to appreciate the importance and purpose of consumer arithmetic in working world applications	1 2 3 4
CONTINUOUS EVALUATION (HOMEWORK): Students will be required to visit the teacher made website www.stfgcmathminds.weebly.com and complete the following tasks:	
5. View and make small notes on the cost price of an item, selling of an item, profit and loss incurred during a transaction videos in preparation for the next class session 6. Participate in the Online Quiz # 1 : consumer arithmetic quiz 7. Comment on the Blog Spot (on the website platform) where they will state their definition of consumer arithmetic and give two examples of how consumer arithmetic can be applied in the working world. 8. Write a journal (40 - 50 words) about today's Mathematics class describing their: enthusiasm and enjoyment in class, excitement and feelings with the class activities, thoughts and views about the website and this "new" teaching and learning style, ideas (if any) into how the website and/or teaching	

can be improved or adjusted, and anything else (school related) they wish to express. These journals are to be emailed to the teacher: stfgcemrith@gmail.com

TEACHER EVALUATION OF THE LESSON:

TUTOR'S COMMENTS:

MATHEMATICS LESSON PLAN

Teacher: Mr. K Emrith

Date: 14-03-19	Class: 2F	Time: 90 Minutes
Unit: Consumer Arithmetic		
Topic: Introduction to cost price, selling price, profit and loss amount incurred on a transaction.		
Pre-knowledge: Evaluate arithmetic operations involving directed numbers; identify face value; place value and value of numbers; long division on numbers; concept of indices; calculating percentages; simplifying simple algebraic expressions; solving simple algebraic equations; calculating simple interest given principal, rate and time and any variations of these variables and the concept of consumer arithmetic.		

OBJECTIVES: Pupils will:	Classification
1. Define the cost price of an item based on the video presentations viewed from the website	K
2. Define selling price of an item based on the video presentations viewed from the website	K
3. Identify other names to refer to cost price of an item based on the video presentations viewed from the website	K
4. Identify other names to refer to selling price of an item based on the video presentations viewed from the website	K
5. Differentiate between the cost price and selling price of an item via dramatic presentation	K

6. Define profit amount incurred on transaction based on the video presentations viewed from the website	K
7. Identify other names to refer to profit amount incurred on a transaction based on the video presentations viewed from the website	K
8. Define loss amount incurred on transaction based on the video presentations viewed from the website	K
9. Identify other names to refer to loss amount incurred on a transaction based on the video presentations viewed from the website	K
10. Differentiate between the profit and loss amount incurred on a transaction via dramatic presentation	K
11. Apply the knowledge from the website by collaborating with their peers to create working world scenarios involving the concepts of cost price of an item, selling price of an item, profit and loss amount incurred on transaction using drama	K
12. Begin to appreciate the importance and application of cost price, selling price of an item, profit and loss incurred on a transaction in working world applications via the dramatic presentations	K
	Integration
	Aff.

SET INDUCTION: *(Time: 5 minutes)*

The teacher randomly chooses 3 students and assign specific roles to each of them (A manufacturer, dealer #1 and dealer #2). He creates a 2 scenario where a manufacturer is selling carnival costumes for \$500 of per costume and 2 local dealers are purchasing these costumes.

Scenario # 1: Dealer # 1 buys 100 costumes from the manufacturer and sells them for \$ 800 per costume. Scenario # 2: Dealer # 2 buys 100 of the costumes from the same manufacturer and sells them for \$ 300 per costume since some of the outfits got torn whilst transporting. After the role play by the 3 students a whole class discussion will take place concerning the concepts of cost price, selling price of items, profit and loss amount incurred during the transaction. This scenario will be used to highlight the various concepts of cost price, selling price, profit and loss amount incurred during a transaction.

Resources required: Markers, Duster

SECTION 1 *(Time: 10 minutes)*

Content: Concept of Cost Price of an item

Teaching Points:

6. It is the initial or original amount of money
7. It is the manufacturer's cost to produce an item
8. It is also referred to the manufacturer or factory price

Method:

Teaching Strategy:

Student Activity

Resources

Questioning: The teacher questions the students about the concept of cost price of an item based on the video presentation from the website. These questioning techniques is mainly twofold: to clarify any misconceptions about the concepts presented in the videos and, to ensure and monitor if students are using viewing the videos for homework. Whole Class Discussion: A whole class discussion with the teacher will then follow concerning the concepts of cost price of items.	Small Group Work / Role Play : Three randomly selected students will participate in acting the scenario above based on their assigned roles (a manufacturer, dealer # 1 and dealer # 2). Observations: During the role play, the rest of the students will observe and take notes of the important information from the play. Whole Class Discussion: A whole class discussion with the teacher will then follow concerning the concepts of cost price of items based on the role play and the website videos.	Teacher: white board, white board markers and duster. Student: note book, writing materials (pens, pencils etc.)
Sectional Review: <i>(Time: 2 minutes)</i> 4. What is meant by cost price of an item?		

5. What are other words to refer to cost price of an item?

Questions & Answers :

1. From Cost Price video, what is meant by the term the cost price of an item? – The cost for a manufacturer to produce an item.
2. From the first scenario, what is the price dealer # 1 paid for each costume from the manufacturer? - \$ 500
3. From the second scenario, what is the price dealer # 2 paid for each costume from the manufacturer? - \$ 500
4. What words can be used to represent this cost? – Cost price, original price/amount, initial price, factory price, manufacturer's price
5. What is the amount the dealer sells the item for? - \$ 800
6. What words can be used to represent this cost? – Selling price, marked price, market value
7. Which of the two prices are higher?- The selling price
8. What are some reasons the dealer will sell at a higher cost?- To acquire more money, to make a profit

SECTION 2 (*Time: 10 minutes*)

Content: Concept of Selling Price of an item

Teaching Points:

1. It is the amount of money a dealer sells an item
2. It is the price a consumer pays for an item from a merchant/dealer
3. It is also referred to the marked price, or market value

4. It is the price after deductions or additions are made on the cost price of an item

Method: Teaching Strategy:	Student Activity	Resources
Questioning: The teacher questions the students about the concept of selling price of an item based on the video presentation from the website. These questioning techniques is mainly twofold: to clarify any misconceptions about the concepts presented in the videos and, to ensure and monitor if students are using viewing the videos for homework. Whole Class Discussion:	Observations: During the role play, the rest of the students will observe and take notes of the important information from the play. Whole Class Discussion: A whole class discussion with the teacher will then follow concerning the concepts of selling price of items based on the role play and the website videos.	Teacher: white board, white board markers and duster. Student: note book, writing materials (pens, pencils etc.)

A whole class discussion with the teacher will then follow concerning the concept of selling price of items.		
Sectional Review: <i>(Time: 2 minutes)</i> 1. What is meant by selling price of an item? 2. What are other words used to describe selling price of an item? Questions & Answers: 1. From Selling Price video, what is meant by the term the selling price of an item? – The cost for a manufacturer to produce an item. The amount of money a dealer sells an item or amount of money a consumer purchases and item. 2. From the first scenario, what amount did the dealer # 1 sold his costumes? - \$ 800 3. From the second scenario, what amount did the dealer # 2 sold his costumes? - \$ 300 4. What is this price called? - Selling price, marked price, market value 5. Which of the two prices are higher?- The cost price 6. Therefore what can be said about the business transaction?- Less money was acquired, a loss was made 7. What was the reason a loss was made? – Some of the outfits were torn 8. What can be other reasons someone may sell items for a loss? – Product is out of style/demand, the dealer is in debt/medical reasons so needs money fast.		

SECTION 3 <i>(Time: 10 minutes)</i>		
Content: Concept of Profit Amount incurring during a transaction Teaching Points: 1. It is the amount of money gained 2. It is made when the selling price is greater than the cost price 3. It is the difference between the cost price and selling price of an item 4. It is also referred to financial gain, benefit, surplus, excess, interest		
Method:		
Teaching Strategy:	Student Activity	Resources
Questioning: The teacher questions the students about the concept of profit amount incurred during a transaction based on the video presentation from the website. These questioning techniques is mainly twofold: to clarify any misconceptions about the concepts presented in the videos and, to ensure and monitor if students are using viewing the videos for homework.	Observations: During the role play, the rest of the students will observe and take notes of the important information from the play. Whole Class Discussion: A whole class discussion with the teacher will then follow concerning the concepts of profit amount incurred on a transaction	Teacher: white board, white board markers and duster, role play script. Student: note book, writing materials (pens, pencils etc.)

Whole Class Discussion: A whole class discussion with the teacher will then follow concerning the concept of profit amount		
Sectional Review: <i>(Time: 2 minutes)</i> 1. What is meant by the term profit amount on a transaction? 2. What are other words to refer to profit amount on a transaction? 3. How would one know when a profit is attained? 4. How to compute profit amount on a transaction? 5. What are some reason for acquiring a profit from a transaction? Questions & Answers : 1. In the first scenario what is the price dealer # 1 paid for the costume from the manufacturer? - \$ 500 2. What is the amount the dealer sells the item for? - \$ 800 3. Which of the two prices are higher?- The selling price 4. Therefore what can be said about the business transaction?- More money was acquired, a profit was made		

5. From the videos observed how do you all know a profit was acquired? –Selling price > Cost price
6. How can the profit be calculated? –Selling price – Cost price
7. What is the purpose of acquiring a profit? –Financial gain, make more money, buy a car

SECTION 4 (*Time: 10 minutes*)

Content: Concept of Loss Amount incurred on a Transaction

Teaching Points:

1. It is the amount of money lost by a dealer or supplier
2. It is made when the cost price is greater than the selling price of an item
3. It is the difference between the cost price and selling price of an item
4. It is also referred to financial drop, decrease, reduction

Method:

Teaching Strategy:

Student Activity

Resources

Questioning:

The teacher questions the students about the concept of loss amount incurred during a transaction based on the video presentation from the website. These questioning techniques is mainly twofold: to clarify any

Observations:

During the role play, the rest of the students will observe and take notes of the important information from the play.

Whole Class Discussion:

Teacher: white board, white board markers and duster, role play script.

Student: note book, writing materials (pens, pencils etc.)

misconceptions about the concepts presented in the videos and, to ensure and monitor if students are using viewing the videos for homework. Whole Class Discussion: A whole class discussion with the teacher will then follow concerning the concept of loss amount	A whole class discussion with the teacher will then follow concerning the concepts of loss amount incurred on a transaction	
Sectional Review: (<i>Time: 2 minutes</i>) 1. What is meant by the term loss amount on a transaction? 2. What are other words to refer to loss amount on a transaction? 3. How would one know when a loss is attained? 4. How would one compute loss amount on a transaction? 5. Why would someone want to have a loss? Questions & Answers: 1. From the second scenario, what is the price the dealer pays for the outfit from the manufacturer?- \$ 500 2. What is the amount the dealer sells the item for?- \$ 300		

3. Which of the two prices are higher?- The cost price
4. Therefore what can be said about the business transaction?- Less money was acquired, a loss was made
5. From the videos observed how do you all know a loss occurred? – Cost Price > Selling price
6. How can the loss be calculated? Cost Price – Selling Price
7. What are some reasons why a loss would occur? - Product is out of style/demand, the dealer is in debt/medical reasons so needs money fast.

CLOSURE: *(Time: 3 minutes)*

1. What is the difference between the cost price and selling price of an item?
2. What are other names used to refer to the cost price of an item?
3. What are other names used to refer to the selling price of an item?
4. If the Selling price > Cost Price of an item, what occurs?
5. What are some reasons why a dealer will sell products at a price more than the cost price?
6. If the Cost Price > Selling Price of an item what occurs?
7. What are some reasons why a dealer will sell products at a price less than the cost price?

FINAL EVALUATION: *(Time: 39 minutes)*

The teacher groups students in fours (10 groups of 4 students and 1 group of 3 students) and ask them to create and present (each group will have 3-4 minutes to present their piece) a scenario similar to the one observed at the beginning of the class to highlight the following points:

1. Cost price of an item
2. Selling price of an item
3. Other names to refer to cost price and selling price of an item
4. Instances where a dealer will sell products at a price less than the cost price of an item (Loss)
5. Instances where a dealer will sell products at a price more than the cost price of an item (Profit)

Reasonable level of Achievement:	Objective
1. 40/43 Students will define cost price of an item	1
2. 40/43 Students will define selling price of an item	2
3. 40/43 Students will state other names for cost of an item	3
4. 40/43 Students will state other names for selling price of an item	4
5. 40/43 Students will differentiate between the cost price and selling price	5
6. 40/43 Students will define profit amount incurred on transaction	6
7. 40/43 Students will identify other names to refer to profit amount incurred on a transaction	7
8. 40/43 Students will define loss amount incurred on transaction	

9. 40/43 Students will Identify other names to refer to loss amount incurred on a transaction	8
10. 40/43 Students will differentiate between the profit and loss amount incurred on a transaction via dramatic presentation	9
11. 35/43 students will be able to apply the knowledge from the website by collaborating with their peers to create working world scenarios involving the concepts of cost price of an item, selling price of an item, profit and loss amount incurred on transaction using drama	10
12. 42/43 students will begin to appreciate the importance and application of cost price, selling price of an item, profit and loss incurred on a transaction in working world applications via the dramatic presentations	11
	12
CONTINUOUS EVALUATION (HOMEWORK):	
Students will be required to visit the teacher made website www.stfgcmathminds.weebly.com and complete the following tasks:	
1. View and make small notes on the videos related to the computation of profit and loss amounts incurred during a transaction given the cost price and selling of an items in preparation for the next class session 2. Participate in Online quizzes # 2 & # 3 : Cost price/selling price Quiz and profit/loss amount Quiz	

3. Comment on the Blog Spot (on the website platform) where they will state their definition of cost price of an item, selling price of an item, profit and loss incurred during a transaction and give two examples of how these concepts can be applied in the working world.
4. Write a journal (40 - 50 words) about today's Mathematics class describing their: enthusiasm and enjoyment in class, excitement and feelings with the class activities, thoughts and views about the website and this "new" teaching and learning style, ideas (if any) into how the website and/or teaching can be improved or adjusted, and anything else (school related) they wish to express. These journals are to be emailed to the teacher: stfgcemrith@gmail.com

TEACHER EVALUATION OF THE LESSON:

TUTOR'S COMMENTS:

MATHEMATICS LESSON PLAN

Teacher: Mr. K Emrith

Date: 18-03-19	Class: 2F	Time: 45 Minutes
Unit: Consumer Arithmetic		
Topic: Compute Profit and Loss Amount given Cost Price and Selling Price of Items		
Pre-knowledge: Evaluate arithmetic operations involving directed numbers; identify face value; place value and value of numbers; long division on numbers; concept of indices; calculating percentages; simplifying simple algebraic expressions; solving simple algebraic equations; calculating simple interest given principal, rate and time and any variations of these variables, concept of consumer arithmetic, cost price and selling price of an item, profit and loss amount incurred on a transaction.		

OBJECTIVES: Pupils will:	Classification
1. State the Formula for computing Profit Amount given the Selling Price and Cost Price item based on the video presentations viewed from the website	K
2. State the Formula for computing Loss Amount given the Selling price and Cost price item based on the video presentations viewed from the website	K
3. Compute Profit Amount given Selling price and Cost Price via collaboration with their peers	AT

4. Compute Loss Amount given Selling price and Cost Price via collaboration with their peers	AT.
5. Begin to appreciate the importance and application of cost price, selling price of an item, profit and loss incurred on a transaction in working world applications via collaboration	Aff.

SET INDUCTION: *(Time: 2 minutes)*

Teacher recaps the concepts from the previous class concerning the cost price, selling price of an item, profit and loss amount incurred on a transaction.

Resources required: Laptop, Speakers, Projector, Necessary Connection Cables

SECTION 1 *(Time: 10 minutes)*

Content: Computing profit amount given cost price and selling price of an item

Teaching Points: Steps in computing profit amount given cost price and selling price of an item

1. Read the question at least two times
-

2. Write down the values which represent the cost price and selling price 3. Determine which of the two values is greater 4. If the selling price is greater than the cost price then Profit Amount = Selling Price – Cost Price		
Method:		
Teaching Strategy:	Student Activity	Resources
Direct Instructions: Teacher allows students to work in pairs to discuss the online videos related to the computation of profit amount incurred on a transaction given cost price and selling price of items. Questioning: The teacher questions the students about the formulas for computing the profit amounts given the cost price and selling price of items, based on the video presentations on the website. These questioning techniques is mainly twofold: to clarify any misconceptions about the concepts	Pair-Pair Discussion: Students will be working in pairs to discuss the online videos related to the computation of profit amounts incurred on a transaction given the cost price and selling price of items. Whole Class Discussion: The class will be involved in a whole group discussion with the teacher concerning the computation of profit amount incurred on a transaction given the selling price and cost price of items.	Teacher: Markers, Duster, Laptop, Projector, Necessary Connection Cables Student: note book, writing materials (pens, pencils etc.)

presented in the videos and, to ensure and monitor if students are using viewing the videos for homework. Whole Class Discussion: This leads to an interactive discussion with the teacher and students to enhance the students' understanding of the computation profit incurred on a transaction		
Sectional Review: <i>(Time: 2 minutes)</i> 1. What is the formula for computing profit amount given the cost price and selling price? 2. What are the steps involved in computing profit amount given the cost price and selling price? Questions & Answers : 9. Recall from the role play form the previous class, in the first scenario what is the price dealer # 1 paid for the costume from the manufacturer? - \$ 500 10. What is the amount the dealer sells the item for? - \$ 800		

11. Which of the two prices are higher?- The selling price
12. Therefore what can be said about the business transaction?- More money was acquired, a profit was made
13. From the videos observed how do you all know a profit was acquired? –Selling price > Cost price
14. How can the profit be calculated? –Selling price – Cost price
15. What is the purpose of acquiring a profit? –Financial gain, make more money, buy a car

SECTION 2 (*Time: 10 minutes*)

Content: Computing Loss Amount given cost price and selling price of an item

Teaching Points: Steps in computing loss amount given cost price and selling price of an item

1. Read the question at least two times
2. Write down the values which represent the cost price and selling price
3. Determine which of the two values are greater
4. If the cost price is greater than the selling price; Loss Amount = Cost Price – Selling Price

Method:		
Teaching Strategy:	Student Activity	Resources
Direct Instructions: Teacher allows students to work in pairs to discuss the online videos related to the	Pair-Pair Discussion: Students will be working in pairs to discuss the online videos related to the	Teacher: Markers, Duster, Laptop, Projector, Necessary Connection Cables

computation of loss amount incurred on a transaction given cost price and selling price of items. Questioning: The teacher questions the students about the formulas for computing the loss amounts given the cost price and selling price of items, based on the video presentations on the website. These questioning techniques is mainly twofold: to clarify any misconceptions about the concepts presented in the videos and, to ensure and monitor if students are using viewing the videos for homework. Whole Class Discussion: This leads to an interactive discussion with the teacher and students to enhance the students' understanding of the computation loss incurred on a transaction	computation of loss amounts incurred on a transaction given the cost price and selling price of items. Whole Class Discussion: The class will be involved in a whole group discussion with the teacher concerning the computation of loss amount incurred on a transaction given the selling price and cost price of items.	Student: note book, writing materials (pens, pencils etc.)
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Sectional Review: *(Time: 2 minutes)*

1. What is the formula for computing loss amount given the cost price and selling price?
2. What are the steps involved in computing loss amount given the cost price and selling price?

Questions & Answers :

1. From the second scenario for the role play in the previous class, what is the price the dealer pays for the outfit from the manufacturer?- \$ 500
2. What is the amount the dealer sells the item for?- \$ 300
3. Which of the two prices are higher?- The cost price
4. Therefore what can be said about the business transaction?- Less money was acquired, a loss was made
5. From the videos observed how do you all know a loss occurred? – Cost Price > Selling price
6. How can the loss be calculated? Cost Price – Selling Price
7. What are some reasons why a loss would occur? – Damaged goods, products about to expire.

CLOSURE: *(Time: 2 minutes)*

1. What determines if a profit is incurred on a transaction?
2. What are the steps involved in computing profit amount given the cost price and selling price?
3. What determines if a loss is incurred on a transaction?

4. What are the steps involved in computing loss amount given the cost price and selling price?

FINAL EVALUATION: *(Time: 17 minutes)*

Student will work in groups of fours to apply their knowledge to solve problems involving the profit and loss amount incurred on a transaction, and cost price and selling price of items.

1. A merchant sold a table fan for \$ 375 at a loss of \$ 50. Find the Cost Price of a fan.
2. A book seller bought 12 copies of a book. He sold each of them at \$ 20 and thus made a profit of \$ 24 by selling all the books. What was the Cost Price of a book?
3. A refrigerator is sold at \$ 10525 at a profit of \$ 925. What was the Cost Price of the refrigerator?
4. A book seller sold 50 books for \$ 890.00 and earned a profit of \$ 90.00. Find the Cost Price of 50 books.
5. Derek bought cloth for \$ 800. He spent \$ 200 for stitching a shirt. He sold the shirt for \$ 1175. Find the profit.
6. The cost of a cycle is \$ 950 and that of a scooter is \$ 23,500. He sold them together for \$ 25,000. Find his profit.
7. Ron bought a cycle for \$ 800 and sold it at a loss of \$ 160. What is his selling price?
8. A cycle was bought for \$ 1225 and sold at a gain of \$ 100. Find the Selling Price of the cycle.
9. A radio is bought at \$ 550 and sold at a profit of \$ 35 after spending \$ 20 on its repairs. Find the Selling Price

10.

- i. Selling Price = Cost Price - _____.
- ii. Cost Price = Selling Price + _____.
- iii. Cost Price + _____ = Selling Price
- iv. Selling Price + _____ = Cost Price
- v. Cost Price > Selling Price = _____
- vi. Selling Price > Cost Price = _____

Reasonable level of Achievement:	Objective
1. 40/43 Students will be able to state the Formula for computing Profit Amount given the Selling Price and Cost Price item based on the video presentations viewed from the website	1
2. 40/43 Students will be able to state the Formula for computing Loss Amount given the Selling price and Cost price item based on the video presentations viewed from the website	2
3. 38/43 Students will be able to compute Profit Amount given Selling price and Cost Price via collaboration with their peers	3
4. 38/43 Students will be able to compute Loss Amount given Selling price and Cost Price via collaboration with their peers	

5. 40/43 Students will be able to begin to appreciate the importance and application of cost price, selling price of an item, profit and loss incurred on a transaction in working world applications via collaboration	4 5
CONTINUOUS EVALUATION (HOMEWORK): Students will be required to visit the teacher made website www.stfgcmathminds.weebly.com and complete the following tasks: 1. View and make small notes on the videos related to the concepts of profit and loss percentages in preparation for the next class session 2. Participate in online quiz # 4: Cost price, selling price, profit and loss amount quiz. 3. Comment on the Blog Spot (on the website platform) where they will state the steps involved in computing the profit and loss amount given the cost price and selling price of items and give two examples of how these concepts can be applied in the working world. 4. Write a journal (40 - 50 words) about today's Mathematics class describing their: enthusiasm and enjoyment in class, excitement and feelings with the class activities, thoughts and views about the website and this "new" teaching and learning style, ideas (if any) into how the website and/or teaching can be improved or adjusted, and anything else (school related) they wish to express. These journals are to be emailed to the teacher: stfgcemrith@gmail.com	

TEACHER EVALUATION OF THE LESSON:
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TUTOR'S COMMENTS:

MATHEMATICS LESSON PLAN

Teacher: Mr. K Emrith

Date: 19-03-19	Class: 2F	Time: 90 Minutes
Unit: Consumer Arithmetic		
Topic: Concept and Computation of Profit & Loss Percentage on a Transaction		
Pre-knowledge: Evaluate arithmetic operations involving directed numbers; identify face value; place value and value of numbers; long division on numbers; concept of indices; calculating percentages; simplifying simple algebraic expressions; solving simple algebraic equations; calculating simple interest given principal, rate and time and/or any variations of these variables, concept of consumer arithmetic, cost price and selling price of an item, profit, loss amounts, computing profit and loss amounts on transaction given the cost and selling price of an item.		

OBJECTIVES: Pupils will:	Classification
1. Define profit as a percentage of the cost price of an item based on the video presentations form the website	K
2. State the Formula for computing Profit Percentage given the Profit Amount and the Cost Price of an item based on the video presentations form the website	K
3. Define loss as a percentage of the cost price of an item based on the video presentations form the website	

4. State the Formula for computing Loss Percentage given the Loss Amount and the Cost Price of an item based on the video presentations from the website	K
5. Differentiate between Profit Percentage and Loss Percentage on a Transaction via collaboration with peers	K
6. Compute Profit Percentage given Profit Amount & Cost Price via collaboration with peers	K
7. Compute Loss Percentage given Loss Amount & Cost Price via collaboration with peers	
8. Begin to appreciate the importance and purpose of the concepts and computation of profit & loss as a percentage of the cost price of an item in working world applications via collaborative work	AT
	AT
	Aff.

SET INDUCTION: *(Time: 2 minutes)*

Teacher recaps the concepts from the previous classes to clarify any previous misconceptions about any of the related topics such as computation of profit and loss amount given the cost price and selling price of items.

Resources required: Laptop, Speakers, Projector, Necessary Cables

SECTION 1 *(Time: 10 minutes)*

Content: Concept of profit percentage on a transaction

Teaching Points:

1. It is a percentage
2. It represents the profit amount as a percentage
3. It is the relationship between profit amount and cost price of an item
4. It is calculated by dividing the profit by the cost price then multiply by 100%
5. It is usually used to read and displayed on various charts such as a pie chart.

Method:

Teaching Strategy:

Student Activity

Resources

Direct Instructions:

Teacher allows students to work in pairs to discuss and compare notes based the online videos related to the

Pair-Pair Discussions:

Students will be working in pairs to discuss the online videos related to the concepts of

Teacher: white board
white board marker
and duster

concept of profit percentages incurred on a transaction given cost price and the profit amount. Questioning: The teacher questions the students about the concepts of profit percentages based on the video presentations on the website. These questioning techniques is mainly twofold: to clarify any misconceptions about the concepts presented in the videos and, to ensure and monitor if students are viewing the videos for homework. Whole Class Discussion: This leads to an interactive discussion with the teacher and students to enhance their understandings of the concepts profit percentages incurred	profit percentages incurred on a transaction given the cost price and profit amounts. Whole Class Discussion: The class will be involved in a whole group discussion with the teacher concerning the concept of profit percentages incurred on a transaction given the cost price and profit amounts.	Student: note book, writing materials (pens, pencils etc.)
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on a transaction given the cost price and the profit amounts.		
Sectional Review: (<i>Time: 2 minutes</i>) 1. What is meant by the term profit percentage on a transaction? 3. What is the purpose of computing profit percentage on a transaction? 4. What is the formula for computing profit percentage on a transaction? Questions & Answers : 1. What is the cost price of an item? – Manufactures price to produce an item 2. What is the selling price of an item? – Price at which a merchant sells an item to his/her customers 3. What is a profit on a transaction? – Money gained in a transaction 4. How is a profit on a transaction acquired? - When the Selling Price > Cost Price 5. What is the formula for computing profit amount given the cost price and selling price of an item? – Profit Amount = Selling Price – Cost Price		
SECTION 2 (<i>Time: 10 minutes</i>)		
Content: Computing profit percentage given the cost price and selling price of an item Teaching Points: Steps in computing profit percentage given the cost price and selling price of an item 1. Read the question at least two times		

2. Identify the cost price and selling price of the item/s 3. Determine if a profit is incurred, 4. Calculate the profit amount 5. Divide the profit amount by the cost price of the item 6. Multiply this amount by 100%		
Method:		
Teaching Strategy:	Student Activity	Resources
Direct Instructions: Teacher allows students to work in pairs to discuss and compare notes based the online videos related to the computation of profit percentages incurred on a transaction given cost price and the profit amount. Questioning: The teacher questions the students about the formulas for computing the	Pair-Pair Discussion: Students will be working in pairs to discuss the online videos related to the computation of profit percentages incurred on a transaction given the cost price and profit amounts. Whole Class Discussion: The class will be involved in a whole group discussion with the teacher concerning the computation of profit percentages incurred on a transaction given the cost price and profit amounts. Observations:	Teacher: Markers, Duster, Laptop, Projector, Necessary Connection Cables Student: Mathematics Note Book, Writing Materials (pens, pencils, etc.)

profit percentages given the cost price and profit amounts, based on the video presentations on the website. These questioning techniques is mainly twofold: to clarify any misconceptions about the concepts presented in the videos and, to ensure and monitor if students are viewing the videos for homework. Whole Class Discussions: This leads to an interactive discussion with the teacher and students to enhance their understandings of the concepts and computation profit percentages incurred on a transaction given the cost price and the profit amounts. Guided Instructions:	During the teacher's demonstration of how to compute the profit percentages given the cost price and profit amount, the students will be observing and taking notes of the important information such as the steps and application of the formulas involved in the computation.	
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The teacher displays on the projector screen one question related to the computation of profit percentage given the cost price and the profit amount. He then guides the students how to perform the computation using the necessary steps and formulas. Question # 1 (Related to Profit): Mr. Jones bought an electrical stove from a manufacturer for \$ 4500. He then sold it to his neighbour for \$6235. Calculate his: - Profit amount on the transaction - Profit Percentage of the cost price of the item.		
Sectional Review: <i>(Time: 1 minute)</i> What are the steps in computing profit percentage given cost price and selling price of an item?		
SECTION 3 <i>(Time: 10 minutes)</i>		

Content: Concept of Loss Percentage Teaching Points: 1. It is a percentage 2. It represents the loss amount 3. It is the relationship between loss amount and cost price 4. It is calculated by dividing the loss amount by the cost price then multiply by 100% 5. It is easy to read and display the information on various charts such as a pie chart.		
Method: Teaching Strategy:	Student Activity	Resources
Direct Instructions: Teacher allows students to work in pairs to discuss and compare notes based the online videos related to the concept of loss percentages incurred on a transaction given cost price and the loss amount. Questioning: The teacher questions the students about the concepts of loss	Pair-Pair Discussions: Students will be working in pairs to discuss the online videos related to the concepts of loss percentages incurred on a transaction given the cost price and loss amounts. Whole Class Discussion: The class will be involved in a whole group discussion with the teacher concerning the concept of loss percentages incurred on a	Teacher: white board, white board markers and duster Student: note book, writing materials (pens, pencils etc.)

percentages based on the video presentations on the website. These questioning techniques is mainly twofold: to clarify any misconceptions about the concepts presented in the videos and, to ensure and monitor if students are viewing the videos for homework. Whole Class Discussion: This leads to an interactive discussion with the teacher and students to enhance their understandings of the concepts loss percentages incurred on a transaction given the cost price and the loss amounts.	transaction given the cost price and loss amounts.	
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Sectional Review: (*Time: 2 minutes*)

1. What is meant by the term loss percentage?
2. What is the purpose of computing loss percentage?
3. What is the formula for computing loss percentage?

Questions & Answers :

1. What is the cost price of an item? – Manufacturer's price to produce an item
2. What is the selling price of an item? – Price at which a merchant sells an item to his/her customers
3. What is a loss incurred on a transaction? – Money reduced / not gained on a transaction
4. How is a loss on a transaction acquired? - When the Selling Price < Cost Price
5. What is the formula for computing profit amount given the cost price and selling price of an item? –
$$\text{Loss Amount} = \text{Cost Price} - \text{Selling Price}$$

SECTION 4 (*Time: 10 minutes*)

Content: Computing Loss Percentage given cost price and selling price

Teaching Points: Steps in computing loss percentage given the cost price and selling price

1. Read the question at least two times
2. Identify the cost price and selling price of the item/s
3. Determine if a loss is incurred,
4. Calculate the loss amount
5. Divide the loss amount by the cost price of the item
6. Multiply this amount by 100%

Method:		
Teaching Strategy:	Student Activity	Resources
Direct Instructions: Teacher allows students to work in pairs to discuss and compare notes based the online videos related to the computation of loss percentages incurred on a transaction given cost price and the loss amount. Questioning: The teacher questions the students about the formulas for computing the loss percentages given the cost price and loss amounts, based on the video presentations on the website. These questioning techniques is mainly twofold: to clarify any	Pair-Pair Discussion: Students will be working in pairs to discuss the online videos related to the computation of loss percentages incurred on a transaction given the cost price and loss amounts. Whole Class Discussion: The class will be involved in a whole group discussion with the teacher concerning the computation of loss percentages incurred on a transaction given the cost price and loss amounts.	Teacher: Markers, Duster, Laptop, Projector, Necessary Connection Cables Student: Mathematics Note Book, Writing Materials (pens, pencils, etc.)

misconceptions about the concepts presented in the videos and, to ensure and monitor if students are viewing the videos for homework. Whole Class Discussions: This leads to an interactive discussion with the teacher and students to enhance their understandings of the concepts and computation loss percentages incurred on a transaction given the cost price and the loss amounts. Guided Instructions: The teacher displays on the projector screen one question related to the computation of loss percentage given the cost price and the loss amount. He then guides the students how to perform the computation using the necessary steps and formulas.	Observations: During the teacher's demonstration of how to compute the loss percentages given the cost price and loss amount, the students will be observing and taking notes of the important information such as the steps and application of the formulas involved in the computation.	
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Question # 2 (Related to Loss): Mr. Roberts bought a gas cooker for \$945 and sold it to a customer for \$ 803.25 due to damage. Calculate his: - Loss amount on the transaction - Loss percentage of the cost price of the item		
Sectional Review: <i>(Time: 1 minute)</i> What are the steps in computing loss percentage given cost price and selling price?		

CLOSURE: <i>(Time: 2 minutes)</i> - What is profit percentage on a transaction? - What is the purpose of computing profit percentage on a transaction? - What is the formula for computing profit percentage given the cost price and selling price of an item? - What are the steps involved in computing profit percentage given the cost price and selling price of an item? - What is loss percentage on a transaction?

10. What is the purpose of computing loss percentage on a transaction?
11. What is the formula for computing loss percentage given the cost price and selling price of an item?
12. What are the steps involved in computing loss percentage given the cost price and selling price of an item?

FINAL EVALUATION: *(Time: 40 minutes)*

Student will work in groups of four (10 groups of 4 students and 1 group of 3 students) to apply their knowledge to create and present (each group will have 2 minutes to present their piece) word problems involving the profit and loss amount percentages on a transaction given the cost price and profit and loss. The worded questions must contain the following:

1. An everyday scenario
2. A transaction that incurs as profit
3. Computation of profit percentage
4. A transaction that incurs a loss
5. Computation of loss percentage

Each group will present their worded problem at the front of the class for the other students to compute.

Reasonable level of Achievement:

Objective

FLIPPING THE CLASSROOM FOR IMPROVING STUDENTS' ENGAGEMENT IN
LEARNING AND ACADEMIC ACHIEVEMENT IN SECONDARY SCHOOL
MATHEMATICS AT THE RAGNAROK GIRLS SECONDARY SCHOOL

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1. 40/43 Students will be able to define profit as a percentage of the cost price of an item based on the video presentations form the website	1
2. 40/43 Students will be able to state the Formula for computing Profit Percentage given the Profit Amount and the Cost Price of an item based on the video presentations form the website	2
3. 40/43 Students will be able to define loss as a percentage of the cost price of an item based on the video presentations form the website	3
4. 40/43 Students will be able to state the Formula for computing Loss Percentage given the Loss Amount and the Cost Price of an item based on the video presentations form the website	4
5. 38/43 Students will be able to differentiate between Profit Percentage and Loss Percentage on a Transaction via collaboration with peers	5
6. 38/43 Students will be able to compute Profit Percentage given Profit Amount & Cost Price via collaboration with peers	6
7. 38/43 Students will be able to compute Loss Percentage given Loss Amount & Cost Price via collaboration with peers	7
8. 40/43 Students will be able to begin to appreciate the importance and purpose of the concepts and computation of profit & loss as a percentage of the cost price of an item in working world applications via collaborative work	

CONTINUOUS EVALUATION (HOMEWORK):

Students will be required to visit the teacher made website www.stfgcmathminds.weebly.com and complete the following tasks:

1. View and make small notes on the videos related to the computation of the cost price of an item given the profit and loss percentage in preparation for the next class session
2. Participate in online quiz # 5: Profit & Loss Percentage quiz.
3. Comment on the Blog Spot (on the website platform) where they will state the definitions of profit and loss percentage and the steps involved in computing the profit and loss percentage given the cost price and profit and loss amounts. They are also required to give two examples of how these concepts can be applied in the working world.
4. Write a journal (40 - 50 words) about today's Mathematics class describing their: enthusiasm and enjoyment in class, excitement and feelings with the class activities, thoughts and views about the website and this "new" teaching and learning style, ideas (if any) into how the website and/or teaching can be improved or adjusted, and anything else (school related) they wish to express. These journals are to be emailed to the teacher: stfgcemrith@gmail.com

TEACHER EVALUATION OF THE LESSON:

TUTOR'S COMMENTS:



FLIPPING THE CLASSROOM FOR IMPROVING STUDENTS' ENGAGEMENT IN
LEARNING AND ACADEMIC ACHIEVEMENT IN SECONDARY SCHOOL
MATHEMATICS AT THE RAGNAROK GIRLS SECONDARY SCHOOL

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SCHOOL OF EDUCATION, UNIVERSITY OF THE WEST INDIES, ST. AUGUSTINE
MATHEMATICS LESSON PLAN

Teacher: Mr. K Emrith

Date: 21-03-19	Class: 2F	Time: 90 Minutes
Unit: Consumer Arithmetic		
Topic: Computing Cost Price given Selling Price and Profit or Loss Percentage		
Pre-knowledge: Evaluate arithmetic operations involving directed numbers; identify face value; place value and value of numbers; long division on numbers; concept of indices, calculating percentages, simplifying simple algebraic expressions, solving simple algebraic equations, finding simple interest, principal, rate and time, concept of cost price, selling price, profit and loss, formulas for computing profit and loss amount, computing profit or loss amounts and profit or loss percentages, given cost price and selling price.		

OBJECTIVES: Pupils will:	Classification
1. State the formulae for computing cost price of an item given the profit percentage and selling price of an item based on the video presentation on the website.	K
2. Work collaboratively with peers or individually to compute cost price of an item given the profit percentage and selling price of an item	AT
3. State the formulae for computing cost price of an item given the loss percentage and selling price of an item based on the video presentation on the website	

4. Work collaboratively with peers or individually to compute cost price of an item given the loss percentage and selling price of an item	K
5. Begin to appreciate the important and purpose of computing cost price of an item given loss, profit percentage and selling price of an item in working world applications via collaboration	AT
	Aff.

SET INDUCTION: *(Time: 2 minutes)*

Teacher recaps the concepts from the previous classes to clarify any previous misconceptions about the computation of profit and loss percentages given the cost price and selling price of items.

Resources required: Laptop, Speakers, Projector, Necessary Cables

SECTION 1 *(Time: 7 minutes)*

Content: Formulas for Computing cost price given Profit Percentage and Selling price of an item

Teaching Points:

$$\diamond C.P = \left(\frac{100}{100 + P \%} \right) \times S.P$$

OR

$$\diamond C.P = \left(\frac{S.P}{100 + P \%} \right) \times 100$$

OR

$$\diamond C.P = \left(\frac{S.P \times 100}{100 + P \%} \right)$$

Method:		
Teaching Strategy:	Student Activity	Resources
Direct Instructions: Teacher allows students to work in pairs to discuss and compare notes based the online videos related to the formula to compute the cost price of an item given the profit percentage, and the selling price of an item Questioning: The teacher questions the students about the formula for computing the cost price of an item given the profit	Pair-Pair Discussion: Students will be working in pairs to discuss the online videos related to the formulas for computing the cost price of an item given the profit percentage and selling price. Whole Class Discussion: The class will be involved in a whole group discussion with the teacher concerning the formulas for computing the cost price of an	Teacher: white board, white board markers and duster. Student: note book, writing materials (pens, pencils etc.)

percentage and selling price of an item based on the video presentations on the website. These questioning techniques is mainly twofold: to clarify any misconceptions about the concepts presented in the videos and, to ensure and monitor if students are viewing the videos for homework. Whole Class Discussions: This leads to an interactive discussion with the teacher and students to enhance their understandings of the formulae for of the cost price of an item given the profit percentage and selling price.	item given the profit percentage and selling price.	
Sectional Review: <i>(Time: 1 minute)</i>		

What are the formulas to compute the cost price of an item given the Profit Percentage and the Selling Price of the item?

Questions & Answers :

1. What does a percentage represent? – An amount out of 100
2. How much percentage does the cost price represent? – 100%
3. During a transaction, if a profit is gained will the percentage increase or decrease? – Increase
4. During a transaction, if a loss is incurred will the percentage increase or decrease? – Decrease

SECTION 2 (*Time: 15 minutes*)

Content: Computing the Cost price of an item given Profit Percentage and the Selling Price of the item

Teaching Points: Steps in computing the Cost price of an item given Profit Percentage and the Selling Price of the item

1. Read the question until understanding is achieved
2. Determine if a loss or a profit occurs
3. If a profit is gained, use any of the formulae to compute the cost price given the profit percentage and the selling price.

Method:

Teaching Strategy:

Student Activity

Resources

Questioning: The teacher questions the students about computing the cost price of an item given the profit percentage and selling price of an item based on the video presentations on the website. These questioning techniques is mainly twofold: to clarify any misconceptions about the concepts presented in the videos and, to ensure and monitor if students are viewing the videos for homework. Whole Class Discussions: This leads to an interactive discussion with the teacher and students to enhance their understandings of the computation of the cost price of an item given the profit percentage and selling price. Guided Instructions:	Pair-Pair Discussion: Students will be working in pairs to discuss the online videos related to the computation of the cost price of an item given the profit percentage and selling price. Whole Class Discussion: The class will be involved in a whole group discussion with the teacher concerning the computation of the cost price of an item given the profit percentage and selling price. Observations: During the teacher's demonstration of how to compute the cost price of an item given the profit percentage and selling price, the students will be observing and taking notes of the important information such as the	Teacher: Markers, Duster, Laptop, Projector, Necessary Connection Cables Student: note book, writing materials (pens, pencils etc.)
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The teacher displays on the projector screen a question related to the computation of the cost price of an item given the profit percentage and selling price. He then guides the students how to perform the computation using the necessary steps and formulas. Question # 1: (Related to Profit): By selling an article for \$9200, a man gain 15%. Find the cost price of the article. Direct Instructions: Teacher allows students to work individually to solve a worded problems related to computing the cost price of an item given the profit percentage and selling price of an item.	steps and application of the formulas involved in the computation. Individual Work Student will be working individually to apply their knowledge to solve a worded problems related to computing the cost price of an item given the profit percentage and selling price of an item Question # 1 (Given Profit %): A store owner buys a television from the manufacture and sells it for \$ 2400 at a profit of 20%. Calculate the cost price of the television.	
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Sectional Review: <i>(Time: 1 minute)</i> What are the steps involved in computing the cost price of an item given the profit percentage and the selling price of the item?		
SECTION 3 <i>(Time: 7 minutes)</i>		
Content: Formulas for Computing Cost price given Loss Percentage and Selling price of an item Teaching Points: ❖ $C.P = \left(\frac{100}{100 - L\%} \right) \times S.P$ OR ❖ $C.P = \left(\frac{S.P}{100 - L\%} \right) \times 100$ OR ❖ $C.P = \left(\frac{S.P \times 100}{100 - L\%} \right)$		
Method: Teaching Strategy:	Student Activity	Resources

Direct Instructions: Teacher allows students to work in pairs to discuss and compare notes based the online videos related to the formula to compute the cost price of an item given the loss percentage, and the selling price of an item Questioning: The teacher questions the students about the formula for computing the cost price of an item given the loss percentage and selling price of an item based on the video presentations on the website. These questioning techniques is mainly twofold: to clarify any misconceptions about the concepts presented in the videos and, to ensure and monitor if students are viewing the videos for homework.	Pair-Pair Discussion: Students will be working in pairs to discuss the online videos related to the formulas for computing the cost price of an item given the loss percentage and selling price. Whole Class Discussion: The class will be involved in a whole group discussion with the teacher concerning the formulas for computing the cost price of an item given the loss percentage and selling price.	Teacher: white board, white board markers and duster. Student: note book, writing materials (pens, pencils etc.)
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Whole Class Discussions: This leads to an interactive discussion with the teacher and students to enhance their understandings of the formulae for of the cost price of an item given the loss percentage and selling price.		
Sectional Review: <i>(Time: 1 minute)</i> What are the formulas to compute the cost price of an item given the loss percentage and the selling price of the item?		
SECTION 4 <i>(Time: 15 minutes)</i>		

Content: Computing the Cost price of an item given Loss Percentage and the Selling Price of the item Teaching Points: Steps in computing the Cost price of an item given Loss Percentage and the Selling Price of the item 1. Read the question until understanding is achieved 2. Determine if a loss or a profit occurs 3. If a loss is incurred, use any of the formulae to compute the cost price given the loss percentage and the selling price.		
Method: Teaching Strategy:	Student Activity	Resources
Questioning: The teacher questions the students about computing the cost price of an item given the loss percentage and selling price of an item based on the video presentations on the website. These questioning techniques is mainly twofold: to clarify any misconceptions about the concepts presented in the videos and, to ensure and	Pair-Pair Discussion: Students will be working in pairs to discuss the online videos related to the computation of the cost price of an item given the loss percentage and selling price. Whole Class Discussion: The class will be involved in a whole group discussion with the teacher concerning the computation of the	Teacher: Markers, Duster, Laptop, Projector, Necessary Connection Cables Student: note book, writing materials (pens, pencils etc.)

monitor if students are viewing the videos for homework. Whole Class Discussions: This leads to an interactive discussion with the teacher and students to enhance their understandings of the computation of the cost price of an item given the loss percentage and selling price. Guided Instructions: The teacher displays on the projector screen a question related to the computation of the cost price of an item given the loss percentage and selling price. He then guides the students how to perform the computation using the necessary steps and formulas. Question # 2 (Related to Loss): A laptop is sold for \$6800 at a loss of 15%. Find the cost price of the laptop.	cost price of an item given the loss percentage and selling price. Observations: During the teacher's demonstration of how to compute the cost price of an item given the loss percentage and selling price, the students will be observing and taking notes of the important information such as the steps and application of the formulas involved in the computation. Individual Work Student will be working individually to apply their knowledge to solve a worded problems related to computing the cost price of an item given the loss percentage and selling price of an item	
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Direct Instructions: Teacher allows students to work individually to solve a worded problems related to computing the cost price of an item given the loss percentage and selling price of an item.	Question # 2 (Given Loss %): At a beauty salon, the owner sells long wigs for \$210, incurring a 25% loss. Calculate the cost price of the wigs.	
Sectional Review: <i>(Time: 1 minute)</i> What are the steps involved in computing the cost price of an item given the loss percentage and the selling price of the item?		

CLOSURE: <i>(Time: 3 minutes)</i> 1. What are the formulas to compute the cost price of an item given the Profit Percentage and the Selling Price of the item? 2. What are the steps involved in computing the Cost price of an item given the Profit percentage and the selling price of the item?
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3. What are the formulas to compute the cost price of an item given the Loss Percentage and the Selling Price of the item?
4. What are the steps involved in computing the Cost price of an item given the Loss percentage and the selling price of the item?

FINAL EVALUATION: *(Time: 37 minutes)*

Student will work in groups of 4's or individually to apply their knowledge to solve a series of worded problems related to computing the cost price of an item given the profit or loss percentage and selling price of an item

Each group and each student who are working individually, will present one of the worded problem at the front of the class for the other students to verify the answers and clarify any misconceptions.

1. By selling an article for \$810, a loss of 10 percent is suffered. Find its cost price.
2. By selling two each for \$600 each; a shopkeeper gains 20 percent on one watch and loses 20 percent on the other. Find Cost Price of each watch
3. At a gift shop, the owner sells 10 GB flash drives for \$210, incurring a 30% loss. Calculate the cost price of the flash drive
4. Articles bought at 5 for \$4 are sold at 4 for \$5; find
 - i. the cost-price of one article
 - ii. the cost price of 20 articles

- | Reasonable level of Achievement: | Objective |
|---|-----------|
| 1. 40/43 Students will be able to state the formulae for computing cost price of an item given the profit percentage and selling price of an item based on the video presentation on the website. | 1 |
| 2. 38/43 Students will be able to work collaboratively with peers or individually to compute cost price of an item given the profit percentage and selling price of an item | 2 |

3. 40/43 Students will be able to state the formulae for computing cost price of an item given the loss percentage and selling price of an item based on the video presentation on the website	3
4. 38/41 Students will be able to work collaboratively with peers or individually to compute cost price of an item given the loss percentage and selling price of an item	
5. 40/43 Students will be able to Begin to appreciate the important and purpose of computing cost price of an item given loss, profit percentage and selling price of an item in working world applications via collaboration	4
	5

CONTINUOUS EVALUATION (HOMEWORK):

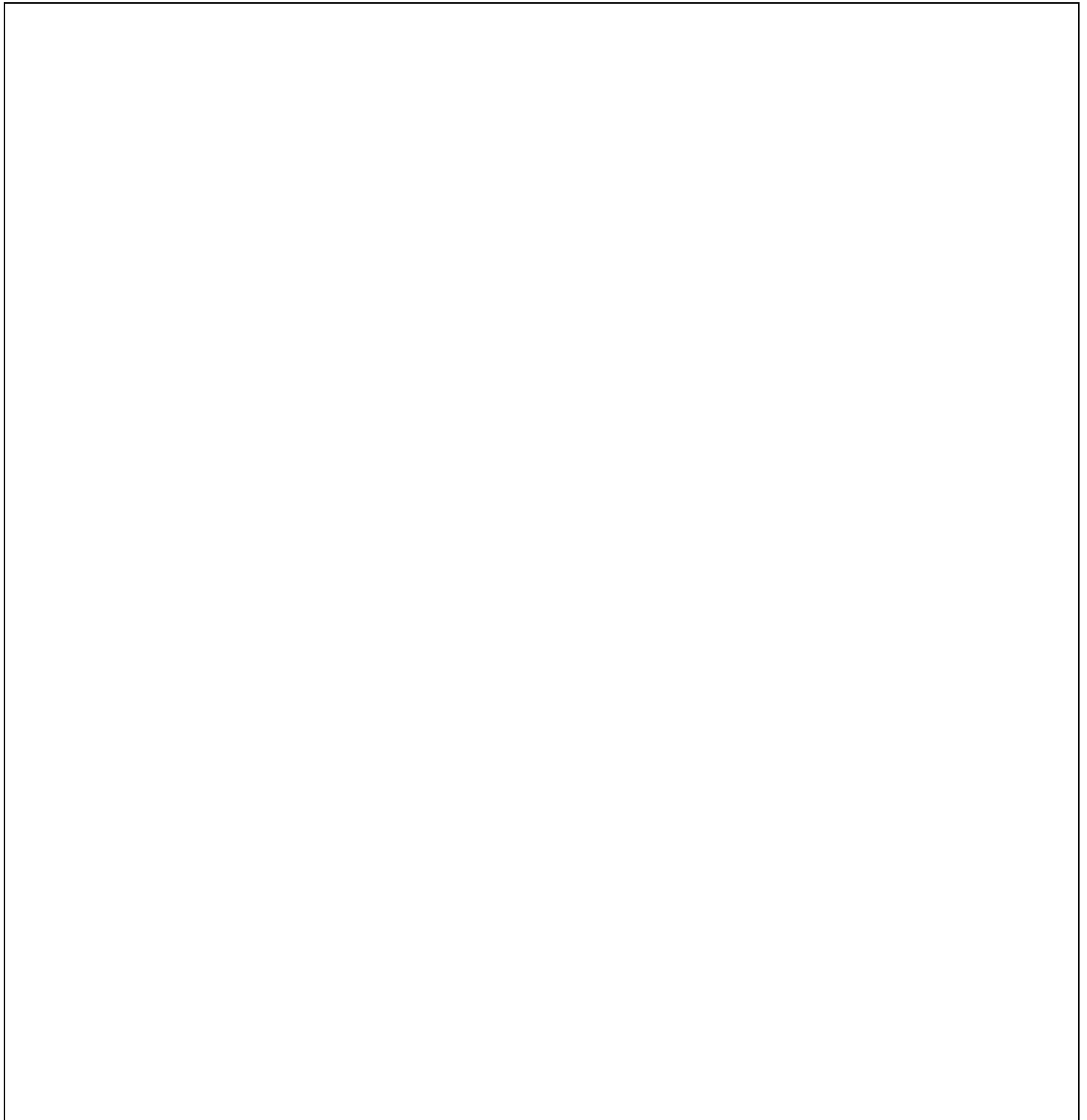
Students will be required to visit the teacher made website www.stfgcmathminds.weebly.com and complete the following tasks:

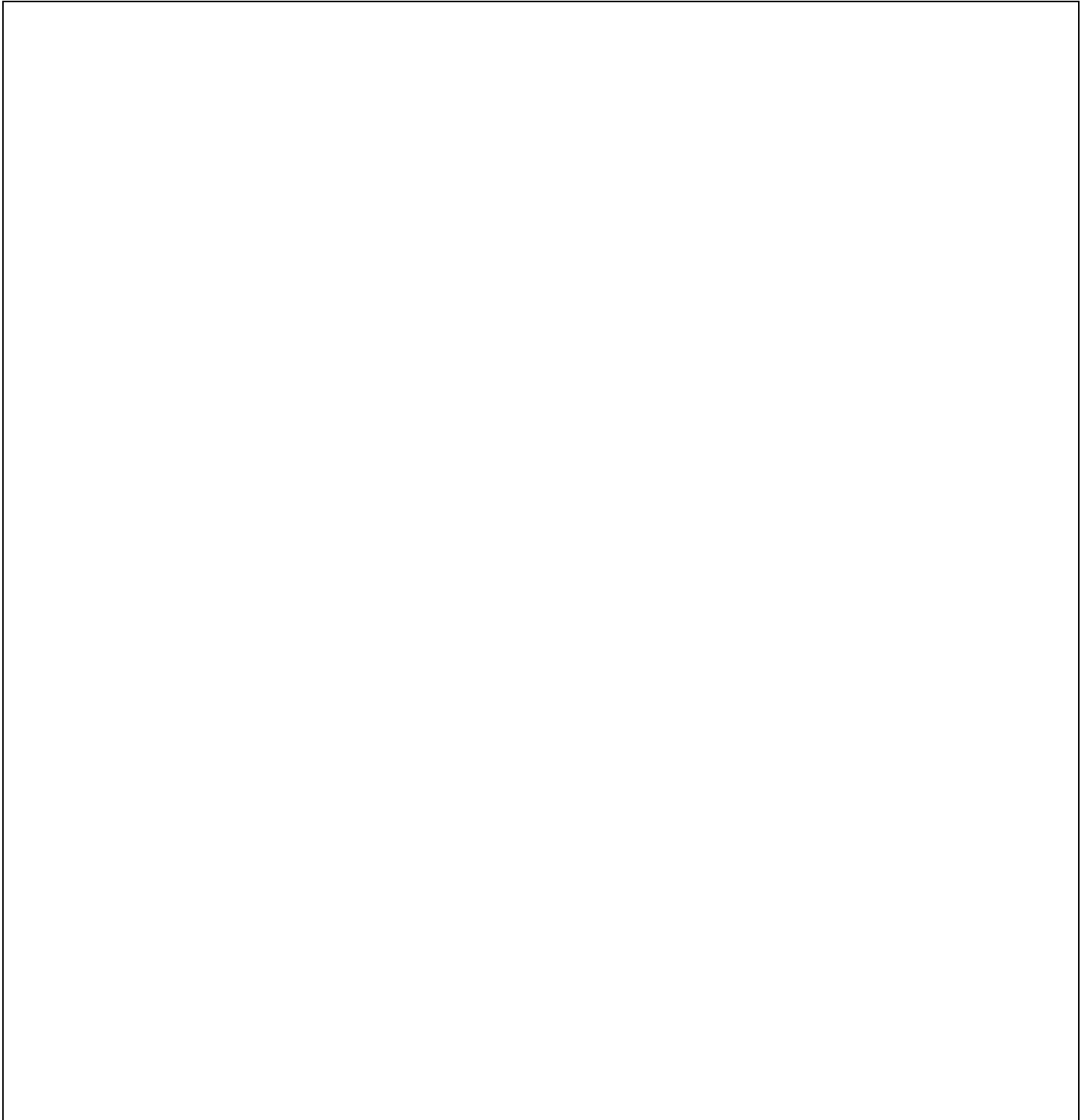
1. View and make small notes on the videos related to the computation of the selling price of an item given the profit and loss percentage in preparation for the next class session
2. Participate in online quiz # 6: Computing Cost Price, Selling Price, Profit & Loss Percentage # 1 quiz.
3. Comment on the Blog Spot (on the website platform) where they will state the formulas and steps involved in computing the cost price of an item given the selling price and profit or loss percentage
They are also required to give two examples of how these concepts can be applied in the working world.

4. Write a journal (40 - 50 words) about today's Mathematics class describing their: enthusiasm and enjoyment in class, excitement and feelings with the class activities, thoughts and views about the website and this "new" teaching and learning style, ideas (if any) into how the website and/or teaching can be improved or adjusted, and anything else (school related) they wish to express. These journals are to be emailed to the teacher: stfgcemrith@gmail.com

TEACHER EVALUATION OF THE LESSON:

TUTOR'S COMMENTS:





MATHEMATICS LESSON PLAN

Teacher: Mr. K Emrith

Date: 25-03-19	Class: 2F	Time: 90 Minutes
Unit: Consumer Arithmetic		
Topic: Computing Selling Price given Cost Price and Profit or Loss Percentage		
Pre-knowledge: Evaluate arithmetic operations involving directed numbers; identify face value; place value and value of numbers; long division on numbers; concept of indices, calculating percentages, simplifying simple algebraic expressions, solving simple algebraic equations, finding simple interest, principal, rate and time, concept of cost price, selling price, profit and loss, formulas for computing profit and loss amount, computing profit or loss amounts and profit or loss percentages, given cost price and selling price, computation of cost price given selling price and profit or loss percentage		

OBJECTIVES: Pupils will:	Classification
1. State the formulae for computing selling price of an item given the profit percentage and cost price of an item based on the video presentation on the website.	K
2. Work collaboratively with peers or individually to compute selling price of an item given the profit percentage and cost price of an item	AT
3. State the formulae for computing selling price of an item given the loss percentage and cost price of an item based on the video presentation on the website	

4. Work collaboratively with peers or individually to compute selling price of an item given the loss percentage and cost price of an item	K
5. Begin to appreciate the important and purpose of computing selling price of an item given loss, profit percentage and cost price of an item in working world applications via collaboration	AT
	Aff.

SET INDUCTION: *(Time: 2 minutes)*

Teacher recaps the concepts from the previous classes to clarify any previous misconceptions about the computation of cost price given the selling price of items and profit or loss percentage

Resources required: Laptop, Speakers, Projector, Necessary Cables

SECTION 1 *(Time: 7 minutes)*

Content: Formulas for Computing selling price given profit percentage and cost price of an item

Teaching Points:

$$\diamond S.P = (100\% + P\%) \times C.P$$

OR

$$\diamond S.P = \left(\frac{100 + P\%}{100} \right) \times C.P$$

OR

$$\diamond S.P = (100 + P\%) \times \left(\frac{C.P}{100} \right)$$

Method:		
Teaching Strategy:	Student Activity	Resources
Direct Instructions: Teacher allows students to work in pairs to discuss and compare notes based the online videos related to the formula to compute the selling price of an item given the profit percentage, and the cost price of an item Questioning: The teacher questions the students about the formula for computing the selling price of an item given the profit percentage and cost price of an item	Pair-Pair Discussion: Students will be working in pairs to discuss the online videos related to the formulas for computing the selling price of an item given the profit percentage and cost price. Whole Class Discussion: The class will be involved in a whole group discussion with the teacher concerning the formulas for computing the selling price of an item given the profit percentage and cost price.	Teacher: white board, white board markers and duster. Student: note book, writing materials (pens, pencils etc.)

based on the video presentations on the website. These questioning techniques is mainly twofold: to clarify any misconceptions about the concepts presented in the videos and, to ensure and monitor if students are viewing the videos for homework. Whole Class Discussions: This leads to an interactive discussion with the teacher and students to enhance their understandings of the formulae for of the selling price of an item given the profit percentage and cost price.		
Sectional Review: <i>(Time: 1 minute)</i> What are the formulas to compute the selling price of an item given the profit percentage and the cost price of the item? Questions & Answers :		

1. What are the steps involved in computing the cost price given the profit percentage and selling price? –
 - i. Read the question until understanding is achieved
 - ii. Determine if a loss or a profit occurs
 - iii. If a profit is gained, use any of the formulae to compute the cost price given the profit percentage and the selling price.

$$C.P = \left(\frac{100}{100 + P \%} \right) \times S.P$$

OR

$$C.P = \left(\frac{S.P}{100 + P \%} \right) \times 100$$

OR

$$C.P = \left(\frac{S.P \times 100}{100 + P \%} \right)$$

2. What are the steps involved in computing the cost price given the loss percentage and selling price? –
 - i. Read the question until understanding is achieved
 - ii. Determine if a loss or a profit occurs
 - iii. If a loss is incurred, use any of the formulae to compute the cost price given the loss percentage and the selling price.

$$C.P = \left(\frac{100}{100 - L \%} \right) \times S.P$$

OR

$$C.P = \left(\frac{S.P}{100 - L \%} \right) \times 100$$

OR

$$C.P = \left(\frac{S.P \times 100}{100 - L \%} \right)$$

SECTION 2 *(Time: 15 minutes)*

Content: Computing the Selling price of an item given profit percentage and the cost price of the item

Teaching Points: Steps in computing the selling price of an item given profit percentage and the cost price of the item

4. Read the question until understanding is achieved
5. Determine if a loss or a profit occurs
6. If a profit is gained, use any of the formulae to compute the selling price given the profit percentage and the cost price.

Method:

Teaching Strategy:

Student Activity

Resources

Questioning: The teacher questions the students about computing the selling price of an item given the profit percentage and cost price of an item based on the video presentations on the website. These questioning techniques is mainly twofold: to clarify any misconceptions about the concepts presented in the videos and, to ensure and monitor if students are viewing the videos for homework. Whole Class Discussions: This leads to an interactive discussion with the teacher and students to enhance their understandings of the computation of the selling price of an item given the profit percentage and cost price. Guided Instructions:	Pair-Pair Discussion: Students will be working in pairs to discuss the online videos related to the computation of the selling price of an item given the profit percentage and cost price. Whole Class Discussion: The class will be involved in a whole group discussion with the teacher concerning the computation of the selling price of an item given the profit percentage and cost price. Observations: During the teacher's demonstration of how to compute the selling price of an item given the profit percentage and cost price, the students will be observing and taking notes of the important information such as the	Teacher: Markers, Duster, Laptop, Projector, Necessary Connection Cables Student: note book, writing materials (pens, pencils etc.)
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The teacher displays on the projector screen a question related to the computation of the selling price of an item given the profit percentage and cost price. He then guides the students how to perform the computation using the necessary steps and formulas. Question # 1 (Related to Profit): A salesman buys a home theatre system from a manufacturer for \$ 2500 and sells it for a profit of 25%. How much did he sell the home theatre system for? Direct Instructions: Teacher allows students to work individually to solve a worded problems related to computing the selling price of an item given the profit percentage and cost price of an item.	steps and application of the formulas involved in the computation. Individual Work Student will be working individually to apply their knowledge to solve a worded problems related to computing the selling price of an item given the profit percentage and cost price of an item Question # 1: (Given Profit %): An entrepreneur buys a computer game from a manufacturer for \$ 500. Calculate the selling price if he makes a profit of 20%	
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Sectional Review: <i>(Time: 1 minute)</i> What are the steps involved in computing the selling price of an item given the profit percentage and the cost price of the item?		
SECTION 3 <i>(Time: 7 minutes)</i>		
Content: Formulas for computing selling price given loss percentage and cost price of an item Teaching Points: $\diamond S.P = (100\% - L\%) \times C.P$ OR $\diamond S.P = \left(\frac{100 - L\%}{100} \right) \times C.P$ OR $\diamond S.P = (100 - L\%) \times \left(\frac{C.P}{100} \right)$		
Method: Teaching Strategy:	Student Activity	Resources

Direct Instructions: Teacher allows students to work in pairs to discuss and compare notes based the online videos related to the formula to compute the selling price of an item given the loss percentage, and the cost price of an item Questioning: The teacher questions the students about the formula for computing the selling price of an item given the loss percentage and cost price of an item based on the video presentations on the website. These questioning techniques is mainly twofold: to clarify any misconceptions about the concepts presented in the videos and, to ensure and monitor if students are viewing the videos for homework.	Pair-Pair Discussion: Students will be working in pairs to discuss the online videos related to the formulas for computing the selling price of an item given the loss percentage and cost price. Whole Class Discussion: The class will be involved in a whole group discussion with the teacher concerning the formulas for computing the selling price of an item given the loss percentage and cost price.	Teacher: white board, white board markers and duster. Student: note book, writing materials (pens, pencils etc.)
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Whole Class Discussions: This leads to an interactive discussion with the teacher and students to enhance their understandings of the formulae for of the selling price of an item given the loss percentage and cost price.		
Sectional Review: <i>(Time: 1 minute)</i> What are the formulas to compute the selling price of an item given the loss percentage and the cost price of the item?		
SECTION 4 <i>(Time: 15 minutes)</i>		
Content: Computing the selling price of an item given loss percentage and the cost price of the item Teaching Points: Steps in computing the selling price of an item given loss percentage and the cost price of the item 4. Read the question until understanding is achieved 5. Determine if a loss or a profit occurs 6. If a loss is incurred, use any of the formulae to compute the selling price given the loss percentage and the cost price.		

Method:		
Teaching Strategy:	Student Activity	Resources
Questioning: The teacher questions the students about computing the selling price of an item given the loss percentage and cost price of an item based on the video presentations on the website. These questioning techniques is mainly twofold: to clarify any misconceptions about the concepts presented in the videos and, to ensure and monitor if students are viewing the videos for homework. Whole Class Discussions:	Pair-Pair Discussion: Students will be working in pairs to discuss the online videos related to the computation of the selling price of an item given the loss percentage and cost price. Whole Class Discussion: The class will be involved in a whole group discussion with the teacher concerning the computation of the selling price of an item given the loss percentage and cost price.	Teacher: Markers, Duster, Laptop, Projector, Necessary Connection Cables Student: note book, writing materials (pens, pencils etc.)

This leads to an interactive discussion with the teacher and students to enhance their understandings of the computation of the selling price of an item given the loss percentage and cost price. Guided Instructions: The teacher displays on the projector screen a question related to the computation of the selling price of an item given the loss percentage and cost price. He then guides the students how to perform the computation using the necessary steps and formulas. Question # 2 (Related to Loss %): A shopkeeper buys a vending machine for \$ 2000. He then sells it at a loss of 35% due to technical difficulties. Determine the selling price of the vending machine. Direct Instructions:	Observations: During the teacher's demonstration of how to compute the selling price of an item given the loss percentage and cost price, the students will be observing and taking notes of the important information such as the steps and application of the formulas involved in the computation. Individual Work Student will be working individually to apply their knowledge to solve a worded problems related to computing the selling price of an item given the loss percentage and cost price of an item Question # 2 (Given Loss %): A businessman bought a personal computer for \$ 8000. The computer's	
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Teacher allows students to work individually to solve a worded problems related to computing the selling price of an item given the loss percentage and cost price of an item.	case was damaged during transportation so he decided to sell it for a loss of 10%. Determine the selling price of the computer.	
Sectional Review: <i>(Time: 1 minute)</i> What are the steps involved in computing the selling price of an item given the loss percentage and the cost price of the item?		

CLOSURE: <i>(Time: 3 minutes)</i> 5. What are the formulas to compute the selling price of an item given the Profit Percentage and the cost price of the item? 6. What are the steps involved in computing the Selling price of an item given the Profit percentage and the cost price of the item? 7. What are the formulas to compute the selling price of an item given the Loss Percentage and the cost price of the item?

8. What are the steps involved in computing the Selling price of an item given the Loss percentage and the cost price of the item?

FINAL EVALUATION: *(Time: 37 minutes)*

Student will work in groups of 4's or individually to apply their knowledge to solve a series of worded problems related to computing the selling price of an item given the profit or loss percentage and cost price of an item

Each group and each student who are working individually, will present one of the worded problem at the front of the class for the other students to verify the answers and clarify any misconceptions.

1. A watch is bought for \$1400 and is sold at a loss of 15%. Find its selling price.
2. Apples are bought at 20 for \$60. If they are sold at $33\frac{1}{3}$ percent profit. Find:
 - i. selling price of each apple
 - ii. S.P. of 8 apples
3. A toy is bought for \$840. At what price must it be sold in order to lose $12\frac{1}{2}\%$?
4. An article bought for \$350 is sold at a profit of 20%. Find its selling price.
5. A fruit seller bought oranges at \$22.50 per dozen and sold them at a loss of 8 percent. How much will a customer pay for:
 - i. one orange
 - ii. 40 oranges

6. Shelly bought a dress for \$150 and sold it to Jenny there by suffering a loss of 10%. Find the selling price of the dress.
7. By selling a chair for \$372, Daisy loses 7%. At what price must she sell it to gain 10%.
8. Mike bought a laptop for \$800 and sold it to Jack there by suffering a loss of 12%. Find the selling price of the laptop.
9. A dealer bought a couch set for \$ 1500. However, the couch set was damaged in transporting it to the costumer. Determine the selling price if the dealer incurred a loss of 40%.
10. A businessman bought a dinning set for \$ 5000 and sold it for a profit of 50%. Determine the selling price of the dinning set.

Reasonable level of Achievement:	Objective
6. 40/43 Students will be able to state the formulae for computing selling price of an item given the profit percentage and cost price of an item based on the video presentation on the website.	1
7. 38/43 Students will be able to work collaboratively with peers or individually to compute selling price of an item given the profit percentage and cost price of an item	2
8. 40/43 Students will be able to state the formulae for computing selling price of an item given the loss percentage and cost price of an item based on the video presentation on the website	3

9. 38/41 Students will be able to work collaboratively with peers or individually to compute selling price of an item given the loss percentage and cost price of an item	
10. 40/43 Students will be able to Begin to appreciate the important and purpose of computing selling price of an item given loss, profit percentage and cost price of an item in working world applications via collaboration	4
	5

CONTINUOUS ASSESSMENT (HOMEWORK):

Students will be required to visit the teacher made website www.stfgcmathminds.weebly.com and complete the following tasks:

5. View and make small notes on the videos related to the concepts of discount amount and discount percentage in preparation for the next class session
6. Participate in online quiz # 7: Computing Cost Price, Selling Price, Profit & Loss Percentage # 2 quiz.
7. Comment on the Blog Spot (on the website platform) where they will state the formulas and steps involved in computing the selling price of an item given the cost price and profit or loss percentage. They are also required to give two examples of how these concepts can be applied in the working world.
8. Write a journal (40 - 50 words) about today's Mathematics class describing their: enthusiasm and enjoyment in class, excitement and feelings with the class activities, thoughts and views about the

website and this "new" teaching and learning style, ideas (if any) into how the website and/or teaching can be improved or adjusted, and anything else (school related) they wish to express. These journals are to be emailed to the teacher: stfgcemrith@gmail.com

TEACHER EVALUATION OF THE LESSON:

TUTOR'S COMMENTS:

FLIPPING THE CLASSROOM FOR IMPROVING STUDENTS' ENGAGEMENT IN
LEARNING AND ACADEMIC ACHIEVEMENT IN SECONDARY SCHOOL
MATHEMATICS AT THE RAGNAROK GIRLS SECONDARY SCHOOL

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SCHOOL OF EDUCATION, UNIVERSITY OF THE WEST INDIES, ST. AUGUSTINE
MATHEMATICS LESSON PLAN

Teacher: Mr. K Emrith

Date: 26-03-19	Class: 2F	Time: 45 Minutes
Unit: Consumer Arithmetic		
Topic: Introduction to Discount Amount, Marked Price of an item & Discount Percentage on a Transaction		
Pre-knowledge: Evaluate arithmetic operations involving directed numbers; identify face value; place value and value of numbers; long division on numbers; concept of indices, calculating percentages, simplifying simple algebraic expressions, solving simple algebraic equations, finding simple interest, principal, rate and time, concept of cost price, selling price, profit and loss, formulas for computing profit and loss amount, computing profit and loss amount, computing cost and selling price given profit and loss percentage.		

OBJECTIVES: Pupils will:	Classification
1. Define Discount Amount based on the video presentations from the website	K
2. Define Marked price of an item based on the video presentations from the website	K
3. Define Discount Percentage based on the video presentations from the website	K
4. Apply the knowledge from the website by collaborating with their peers to create working world scenarios involving the concepts of discount amount, marked price of an item, and discount percentage on transaction using drama	Integration

5. Begin to appreciate the importance and application of discount amount, marked price of an item, and discount percentage incurred on a transaction in working world applications via the dramatic presentations	Aff.
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SET INDUCTION: *(Time: 3 minutes)*

The teacher randomly selects 3 students and assigns specific roles (shopkeeper # 1, shopkeeper # 2 and customer) for them based a scenario created by the teacher. Scenario: Its Carnival time and the shopkeepers having a massive blowout sale by reducing the cost of their costumes. One shopkeeper is giving a 50% discount and the other is reducing each it by \$ 40. The teacher allows the 3 students to enact the scenario in front of the class whilst the other students look on.

Resources required: Markers, Duster, Discount Signs

FLIPPING THE CLASSROOM FOR IMPROVING STUDENTS' ENGAGEMENT IN
LEARNING AND ACADEMIC ACHIEVEMENT IN SECONDARY SCHOOL
MATHEMATICS AT THE RAGNAROK GIRLS SECONDARY SCHOOL

300

SECTION 1 (Time: 5 minutes)		
Content: Concept of Discount Amount Teaching Points: 2. It is a reduced amount of money offered to costumers 3. It is an amount of money taken off the selling price of an item 4. It is also referred to as rebate, reduction, deduction, knock off 5. It is offered to increase sales, attract customers, free up room, meet goals, increase reputation		
Method:	Student Activity	Resources
Teaching Strategy:		
Direct Instruction: The teacher randomly selects 3 students and assigns specific roles (shopkeeper # 1, shopkeeper # 2 and a customer) for them based a scenario created by the teacher. Scenario: Its Carnival time and the shopkeepers is having a massive blowout sale by reducing the cost of their costumes. One shopkeeper is giving a 50%	Observations: During the role play, students who are not participating at the time will be observing and taking notes of the important information such as the marked price of the items for each dealer and the discount amount and discount percentage offered to the customer. Whole Class Discussion:	Teacher: white board, white board markers and duster. Student: note book, writing materials (pens, pencils etc.)

discount and the other is reducing each it by \$ 40. The teacher allows the 3 students to enact the scenario in front of the class whilst the other students look on. Questioning: The teacher questions the students about the concept of discount amount, incurred on a transaction based on the video presentations on the website. These questioning techniques is mainly twofold: to clarify any misconceptions about the concepts presented in the videos and, to ensure and monitor if students are viewing the videos for homework. Whole Class Discussion: A whole class discussion with the teacher will then follow each role play	A whole class discussion with the teacher will then follow the role play from the beginning of the class session concerning the concepts of discount amount incurred during the scenarios.	
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scenarios concerning the concept of discount amount incurred during the scenarios.		
Sectional Review: <i>(Time: 2 minutes)</i> 1. What is discount amount? 2. It is a reduced amount on the cost price or selling price? 3. What are other names used to refer to discount? 4. What is the purpose of offering discount? Questions & Answers : 4. From the scenarios, what were the dealers offering? – A discount 5. What is a discount? – A reduced amount of money customers pay for items 6. Apart from an amount how else the discount can be represented? – As a percentage 7. A reduced amount or percentage of the selling price or the cost price? – Selling price 8. How to calculate the discounted amount? – Selling Price – Discount Amount offered 9. What are other words used to refer to discount? – Rebate, Reduction. Deduction, Knock off		

10. What are some of the purposes to offering a discount?- A increase sales, attract customers, free up room, meet goals, increase reputation

SECTION 2 (Time: 5 minutes)

Content: Discount Percentage

Teaching Points:

1. It is a percentage
2. It represents the discount amount with respect to the marked price of an item
3. It is also referred to as rebate, reduction, deduction, knock off
4. It is offered to increase sales, attract customers, free up room, meet goals, increase reputation
5. It is usually used to represent information on bar graphs and pie charts

Method:

Teaching Strategy:

Student Activity

Resources

Questioning:

The teacher questions the students about the concept of discount percentage, incurred on a transaction based on the video presentations on the website. These questioning techniques is mainly twofold: to clarify any misconceptions about the

Observations:

During the role play, students who are not participating at the time will be observing and taking notes of the important information such as the marked price of the items for each dealer and the discount amount and

Teacher: white board, white board markers and duster.

Student: note book, writing materials (pens, pencils etc.)

concepts presented in the videos and, to ensure and monitor if students are viewing the videos for homework. Whole Class Discussion: A whole class discussion with the teacher will then follow each role play scenarios concerning the concept of discount percentage incurred during the scenarios.	discount percentage offered to the customer. Whole Class Discussion: A whole class discussion with the teacher will then follow the role play from the beginning of the class session concerning the concepts of discount percentage incurred during the scenarios.	
Sectional Review: <i>(Time: 1 minute)</i> 1. What is discount percentage? 2. What is the purpose of representing discount amount as a percentage?		

SECTION 3 *(Time: 5 minutes)*

Content: Marked Price of an item Teaching Points: 1. It is the price on the label of an article/product 2. It is the price before any discounts offered 3. It is the price at which a product is intended to be sold 4. It is a price greater than the selling price of an item only when a discount is offered 5. It is the selling price of an item when no discount is offered 6. It is called the list price, original price or label price		
Method: Teaching Strategy:	Student Activity	Resources
Questioning: The teacher questions the students about the concept of the marked price of an item based on the video presentations on the website. These questioning techniques is mainly twofold: to clarify any misconceptions about the concepts presented in the videos	Observations: During the role play, students who are not participating at the time will be observing and taking notes of the important information such as the marked price of the items for each dealer and the discount amount and	Teacher: white board, white board markers and duster. Student: note book, writing materials (pens, pencils etc.)

and, to ensure and monitor if students are viewing the videos for homework. Whole Class Discussion: A whole class discussion with the teacher will then follow each role play scenarios concerning the concept the marked price of an item percentage during the scenarios.	discount percentage offered to the customer. Whole Class Discussion: A whole class discussion with the teacher will then follow the role play from the beginning of the class session concerning the concept of the marked price of an item during the scenarios.	
Sectional Review: <i>(Time: 1 minute)</i> 1. What is the marked price of an item? 2. What price it actually represents in a transaction? 3. Is this price greater, less or equal to the selling price of items? 4. What are other names used to refer to the marked price of item?		

CLOSURE: *(Time: 3 minutes)*

1. What is discount amount?
2. How can discount be represented?
3. What is discount percentage?
4. Why do we represent the discount as percentage?
5. What is the marked price of an item?

FINAL EVALUATION: *(Time: 15 minutes)*

The teacher groups students in fours (10 groups of 4 students and 1 group of 3 students) and ask them to create and present (each group will have 1-2 minutes to present their piece) a working world scenario similar to the one observed at the beginning of the class to highlight the following points:

1. Discount amount offered to customers
2. Discount percentage offered to customers
3. Marked price and selling price of items
4. Reasons why shop owners offer discount in their businesses
5. Different names used to represent discounts

Observing students will be allowed to constructively criticize or praise the presenting groups

Reasonable level of Achievement:

Objective

1. 40/43 Students will be able to define discount amount based on the video presentations form the website	1
2. 40/43 Students will be able to define marked price of an item based on the video presentations form the website	2
3. 40/43 Students will be able to define discount percentage based on the video presentations form the website	3
4. 39/43 Students will be able to apply the knowledge from the website by collaborating with their peers to create working world scenarios involving the concepts of discount amount, marked price of an item, and discount percentage on transaction using drama	4
5. 39/43 Students will be able to begin to appreciate the importance and application of discount amount, marked price of an item, and discount percentage incurred on a transaction in working world applications via the dramatic presentations	5
CONTINUOUS EVALUATION (HOMEWORK): Students will be required to visit the teacher made website www.stfgcmathminds.weebly.com and complete the following tasks:	

1. View and make small notes on the videos related to the computation of marked price of items given the discount percentage and the selling price, as well as the computation of the selling price of items given the discount percentage and marked price of items in preparation for the next class session
2. Participate in online quiz # 8: Discount Amount and Discount Percentage # 1 quiz.
3. Comment on the Blog Spot (on the website platform) where they will state the definitions of discount amount, marked price of an item and discount percentage on a transaction. They are also required to give two examples of how these concepts can be applied in the working world.
4. Write a journal (40 - 50 words) about today's Mathematics class describing their: enthusiasm and enjoyment in class, excitement and feelings with the class activities, thoughts and views about the website and this "new" teaching and learning style, ideas (if any) into how the website and/or teaching can be improved or adjusted, and anything else (school related) they wish to express. These journals are to be emailed to the teacher: stfgcemrith@gmail.com

TEACHER EVALUATION OF THE LESSON:

TUTOR'S COMMENTS:



FLIPPING THE CLASSROOM FOR IMPROVING STUDENTS' ENGAGEMENT IN
LEARNING AND ACADEMIC ACHIEVEMENT IN SECONDARY SCHOOL
MATHEMATICS AT THE RAGNAROK GIRLS SECONDARY SCHOOL

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SCHOOL OF EDUCATION, UNIVERSITY OF THE WEST INDIES, ST. AUGUSTINE
MATHEMATICS LESSON PLAN

Teacher: Mr. K Emrith

Date: 28-03-19	Class: 2F	Time: 90 Minutes
Unit: Consumer Arithmetic		
Topic: Computing Marked Price and Selling Price given the Discount Percentage		
Pre-knowledge: Evaluate arithmetic operations involving directed numbers; identify face value; place value and value of numbers; long division on numbers; concept of indices, calculating percentages, simplifying simple algebraic expressions, solving simple algebraic equations, finding simple interest, principal, rate and time, concept of cost price, selling price, profit and loss, formulas for computing profit and loss amount, computing profit or loss amounts and profit or loss percentages, given cost price and selling price, computation of cost price given selling price and profit or loss percentage, concepts of discount amount, discount percentage and marked price of an item		

OBJECTIVES: Pupils will:	Classification
1. State the formula for computing the marked price of an item given the selling price and discount percentage based on the video presentation from the website	K
2. Work collaboratively with peers or individually to compute the marked price of an item given the selling price and the discount percentage	AT

3. State the formula for computing the selling price of an item given the marked price and discount percentage based on the video presentation from the website	K
4. Work collaboratively with peers or individually to compute the selling price of an item given the marked price and the discount percentage.	
5. Begin to appreciate the importance and purpose of computing the marked price and selling price given the discount percentage in working world applications via collaboration.	AT
	Aff.

SET INDUCTION: *(Time: 2 minutes)*

Teacher recaps the concepts from the previous classes to clarify any previous misconceptions about the concept of discount amount, discount percentage and marked price of an item.

Resources required: Laptop, Speakers, Projector, Necessary Cables

SECTION 1 *(Time: 7 minutes)*

Content: Formulas for computing marked price given selling price and discount percentage

Teaching Points:

$$\diamond M.P = \left(\frac{100}{100 - D \%} \right) \times S.P$$

OR

$$\diamond S.P = \left(\frac{S.P}{100 - D \%} \right) \times 100$$

OR

$$\diamond M.P = \left(\frac{S.P \times 100}{100 - D \%} \right)$$

Method:		
Teaching Strategy:	Student Activity	Resources
Direct Instructions: Teacher allows students to work in pairs to discuss and compare notes based the online videos related to the formula to compute the marked price of an item given the discount percentage, and the selling price of an item Questioning:	Pair-Pair Discussion: Students will be working in pairs to discuss the online videos related to the formulas for computing the marked price of an item given the discount percentage and selling price. Whole Class Discussion: The class will be involved in a whole group discussion with the teacher concerning the formulas for computing the marked price of	Teacher: white board, white board markers and duster. Student: note book, writing materials (pens, pencils etc.)

The teacher questions the students about the formula for computing the marked price of an item given the discount percentage and selling price of an item based on the video presentations on the website. These questioning techniques is mainly twofold: to clarify any misconceptions about the concepts presented in the videos and, to ensure and monitor if students are viewing the videos for homework. Whole Class Discussions: This leads to an interactive discussion with the teacher and students to enhance their understandings of the formulae for of the marked price of an item given the discount percentage and selling price.	an item given the discount percentage and selling price.	
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Sectional Review: *(Time: 1 minute)*

What are the formulas to compute the marked price of an item given the discount percentage and the selling price of the item?

Questions & Answers :

1. What is meant by the discount amount?
2. What is meant by discount percentage?
3. What is the meant by the marked price of an item?

SECTION 2 *(Time: 15 minutes)*

Content: Computing the marked price of an item given discount percentage and the selling price of the item

Teaching Points: Steps in computing the marked price of an item given discount percentage and the selling price of the item

7. Read the question until understanding is achieved
8. Identify the selling price of the item and the discount percentage
9. Use any of the formulae to compute the marked price given the discount percentage and the selling price.

Method:

Teaching Strategy:

Student Activity

Resources

Questioning: The teacher questions the students about computing the marked price of an item given the discount percentage and selling price of an item based on the video presentations on the website. These questioning techniques is mainly twofold: to clarify any misconceptions about the concepts presented in the videos and, to ensure and monitor if students are viewing the videos for homework. Whole Class Discussions: This leads to an interactive discussion with the teacher and students to enhance their understandings of the computation of the marked price of an item given the discount percentage and selling price. Guided Instructions:	Pair-Pair Discussion: Students will be working in pairs to discuss the online videos related to the computation of the marked price of an item given the discount percentage and selling price. Whole Class Discussion: The class will be involved in a whole group discussion with the teacher concerning the computation of the marked price of an item given the discount percentage and selling price. Observations: During the teacher's demonstration of how to compute the marked price of an item given the discount percentage and selling price, the students will be observing and taking notes of the important information	Teacher: Markers, Duster, Laptop, Projector, Necessary Connection Cables Student: note book, writing materials (pens, pencils etc.)
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The teacher displays on the projector screen a question related to the computation of the marked price of an item given the discount percentage and selling price. He then guides the students how to perform the computation using the necessary steps and formulas. Question # 1 (Calculate the M.P): After allowing a discount of 8% on a toy, it is sold for \$ 216.20. Find the marked price of the toy. Direct Instructions: Teacher allows students to work individually to solve a worded problems related to computing the marked price of an item given the discount percentage and selling price of an item.	such as the steps and application of the formulas involved in the computation. Individual Work Student will be working individually to apply their knowledge to solve a worded problems related to computing the marked price of an item given the discount percentage and selling price of an item Question # 1(Calculating M.P): A tea set was bought for \$ 528 after getting a discount of 12% on its marked price. Find the marked price of the tea set.	
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Sectional Review: <i>(Time: 1 minute)</i> What are the steps involved in computing the marked price of an item given the discount percentage and the selling price of the item?		
SECTION 3 <i>(Time: 7 minutes)</i>		
Content: Formulas for computing selling price given discount percentage and marked price of an item Teaching Points: ❖ $S.P = (100\% - D\%) \times M.P$ OR ❖ $S.P = \left(\frac{100 - D\%}{100} \right) \times M.P$ OR ❖ $S.P = (100 - D \%) \times \left(\frac{M.P}{100} \right)$		
Method:		
Teaching Strategy:	Student Activity	Resources
Direct Instructions: Teacher allows students to work in pairs to discuss and compare notes	Pair-Pair Discussion: Students will be working in pairs to discuss the online videos related to the formulas for	Teacher: white board, white board markers and duster.

based the online videos related to the formula to compute the selling price of an item given the discount percentage, and the marked price of an item Questioning: The teacher questions the students about the formula for computing the selling price of an item given the discount percentage and marked price of an item based on the video presentations on the website. These questioning techniques is mainly twofold: to clarify any misconceptions about the concepts presented in the videos and, to ensure and monitor if students are viewing the videos for homework. Whole Class Discussions:	computing the selling price of an item given the discount percentage and marked price. Whole Class Discussion: The class will be involved in a whole group discussion with the teacher concerning the formulas for computing the selling price of an item given the discount percentage and marked price.	Student: note book, writing materials (pens, pencils etc.)
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This leads to an interactive discussion with the teacher and students to enhance their understandings of the formulae for of the selling price of an item given the discount percentage and marked price.		
Sectional Review: <i>(Time: 1 minute)</i> What are the formulas to compute the selling price of an item given the discount percentage and the marked price of the item?		
SECTION 4 <i>(Time: 15 minutes)</i>		
Content: Computing the selling price of an item given discount percentage and the marked price of the item Teaching Points: Steps in computing the selling price of an item given discount percentage and the marked price of the item 1. Read the question until understanding is achieved 2. Identify the selling price of the item and the discount percentage 3. Use any of the formulae to compute the selling price given the discount percentage and the marked price.		

Method: Teaching Strategy:	Student Activity	Resources
Questioning: The teacher questions the students about computing the selling price of an item given the discount percentage and marked price of an item based on the video presentations on the website. These questioning techniques is mainly twofold: to clarify any misconceptions about the concepts presented in the videos and, to ensure and monitor if students are viewing the videos for homework. Whole Class Discussions: This leads to an interactive discussion with the teacher and students to enhance their understandings of the computation of the selling price of an item given the discount percentage and marked price.	Pair-Pair Discussion: Students will be working in pairs to discuss the online videos related to the computation of the selling price of an item given the discount percentage and marked price. Whole Class Discussion: The class will be involved in a whole group discussion with the teacher concerning the computation of the selling price of an item given the discount percentage and marked price. Observations: During the teacher's demonstration of how to compute the selling price of an item given the discount	Teacher: Markers, Duster, Laptop, Projector, Necessary Connection Cables Student: note book, writing materials (pens, pencils etc.)

Guided Instructions: The teacher displays on the projector screen a question related to the computation of the selling price of an item given the discount percentage and marked price. He then guides the students how to perform the computation using the necessary steps and formulas. Question # 2(Calculate the S.P): The marked price of a water cooler is \$ 4650. The shopkeeper offers an off-season discount of 18% on it. Find its selling price. Direct Instructions: Teacher allows students to work individually to solve a worded problems related to computing the selling price of an item given the discount percentage and marked price of an item.	percentage and marked price, the students will be observing and taking notes of the important information such as the steps and application of the formulas involved in the computation. Individual Work Student will be working individually to apply their knowledge to solve a worded problems related to computing the selling price of an item given the discount percentage and marked price of an item Question # 2 (Calculating S.P): The marked price of a Stove is \$ 5250. The shopkeeper offers a blowout discount of 22% on it. Find its selling price.	
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Sectional Review: <i>(Time: 1 minute)</i> What are the steps involved in computing the selling price of an item given the discount percentage and the marked price of the item?		

CLOSURE: <i>(Time: 3 minutes)</i> 9. What are the formulas to compute the marked price of an item given the discount percentage and the selling price of the item? 10. What are the steps involved in computing the marked price of an item given the discount percentage and the selling price of the item? 11. What are the formulas to compute the selling price of an item given the discount percentage and the marked price of the item? 12. What are the steps involved in computing the selling price of an item given the discount percentage and the marked price of the item?
FINAL EVALUATION: <i>(Time: 37 minutes)</i>

Student will work in groups of 4's or individually to apply their knowledge to solve a series of worded problems related to computing the selling price and marked price of an item given the discount percentage or any combination of such concepts.

Each group and each student who are working individually, will present one of the worded problem at the front of the class for the other students to verify the answers and clarify any misconceptions.

1. A dinning set was bought for \$ 1520 after getting a discount of 12% on its marked price. Find the marked price of the dinning set.
2. A dealer purchased a fan for \$ 1080. After allowing a discount of 25% on its marked price, he gains 25%. Find the marked price of the fan.
3. Find the single discount which is equivalent to two successive discounts of 20% and 5%.
4. The marked price of a laptop is \$ 11500. The shopkeeper offers an off-season discount of 33.33% on it. Find its selling price. .
5. The marked price of a television is \$ 18500. A dealer allows two successive discounts of 20% and 5%. For how much is the television available?
6. How much per cent above the cost price should a shopkeeper mark his goods so that after allowing a discount of 10% on the marked price, he gains 8%?
7. A fruit seller has oranges at \$22.50 per dozen and decides to give a discount of 2% per orange before the oranges begins to rot. How much will a customer pay for:
 - i. one orange

ii. 20 oranges 8. The labelled price on an ergonomic chair is \$ 950. The store offers a 12% discount. What is the selling price of the chair? 9. A shopkeeper marked a dinner set for \$1000. He sold it at \$900. What percent discount did he give? 10. In a shop of ready-made garments, a dress is marked at \$1350 and is available for \$954. Find the discount given by the shopkeeper and express it as percent	
Reasonable level of Achievement:	Objective
11. 40/43 Students will be able to state the formulae for computing marked price of an item given the discount percentage and selling price of an item based on the video presentation on the website.	1
12. 38/43 Students will be able to work collaboratively with peers or individually to compute marked price of an item given the discount percentage and selling price of an item	2
13. 40/43 Students will be able to state the formulae for computing selling price of an item given the discount percentage and marked price of an item based on the video presentation on the website	3
14. 38/41 Students will be able to work collaboratively with peers or individually to compute selling price of an item given the discount percentage and marked price of an item	

15. 40/43 Students will be able to begin to appreciate the important and purpose of computing selling price and marked of an item given discount percentage in working world applications via collaboration	4 5
<u>CONTINUOUS ASSESSMENT (HOMEWORK):</u> Students will be required to visit the teacher made website www.stfgcmathminds.weebly.com and complete the following tasks: 9. View and make small notes on the videos related to the concepts taxations and the various types of taxes in preparation for the next class session 10. Participate in online quiz # 9: Discount Amount and Discount Percentage # 2 quiz. 11. Comment on the Blog Spot (on the website platform) where they will state the formulas and steps involved in computing the marked price selling price of an item given the discount percentage. They are also required to give two examples of how these concepts can be applied in the working world. 12. Write a journal (40 - 50 words) about today's Mathematics class describing their: enthusiasm and enjoyment in class, excitement and feelings with the class activities, thoughts and views about the website and this "new" teaching and learning style, ideas (if any) into how the website and/or teaching	

can be improved or adjusted, and anything else (school related) they wish to express. These journals are to be emailed to the teacher: stfgcemrith@gmail.com

TEACHER EVALUATION OF THE LESSON:

TUTOR'S COMMENTS:

FLIPPING THE CLASSROOM FOR IMPROVING STUDENTS' ENGAGEMENT IN
LEARNING AND ACADEMIC ACHIEVEMENT IN SECONDARY SCHOOL
MATHEMATICS AT THE RAGNAROK GIRLS SECONDARY SCHOOL

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SCHOOL OF EDUCATION, UNIVERSITY OF THE WEST INDIES, ST. AUGUSTINE
MATHEMATICS LESSON PLAN

Teacher: Mr. K Emrith

Date: 29-03-19	Class: 2F	Time: 45 Minutes
Unit: Consumer Arithmetic		
Topic: Introduction to Taxes & Sales Tax		
Pre-knowledge: Evaluate arithmetic operations involving directed numbers; identify face value; place value and value of numbers; long division on numbers; concept of indices, calculating percentages, simplifying simple algebraic expressions, solving simple algebraic equations, finding simple interest, principal, rate and time, concept of cost price, selling price, profit and loss, formulas for computing profit and loss amount, computing profit and loss amount, computing cost and selling price given profit and loss percentage, concept of discount, formulas for computing discounted price given discount as an amount and percentage, computing discounted price given discount as a percentage or an amount, solve word problems involving cost price, selling price, profit, loss and discount		

OBJECTIVES: Pupils will:	Classification
6. Define Tax based the video presentation on the website	K
7. Identify different types of taxes based on the video presentation	K
8. Define Sales Tax based on the video presentation on the website	

9. Apply the knowledge from the website by collaborating with their peers to create working world scenarios involving the concepts of Tax, various types of taxes and sales tax on transactions using drama	K Integration
10. Begin to appreciate the importance and application of Tax, various types of taxes and sales tax on a transactions in working world applications via the dramatic presentations	 Aff.

SET INDUCTION: *(Time: 2 minutes)*

The teacher walks into class and starts to collect all forms of fees from students such as bathroom fee, networking fees, and locker fees. He has a list of the students' names and he informs them who paid in full and who is outstanding. He also informs them about the consequence if these fees are not paid such as they will not have access to the lockers and internet. Also if the bathroom fee is not paid, maintenance and up keep of the bathroom cannot be done.

Resources required: Duster, Markers, Class List

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SECTION 1 (Time: 5 minutes)		
Content: Concept of Tax Teaching Points: 1. It is a monetary contribution or fee 2. It is compulsory 3. It is generally paid to the government of the country 4. It is usually a percentage 5. It varies depending on the situation 6. It is used to manage an economy 7. It is used to finance the expenses (health care, education, garbage collection repair roads) incurred by government		
Method:		
Teaching Strategy:	Student Activity	Resources
Demonstration: The teacher enacts the scenario about to highlight the concept of tax Questioning:	Observations: During the role play, students will be observing and taking notes of the important information such as the type of taxes portrayed in the	Teacher: white board, white board markers and duster.

The teacher questions the students about the concepts of taxes on transactions based on the video presentations on the website. These questioning techniques is mainly twofold: to clarify any misconceptions about the concepts presented in the videos and, to ensure and monitor if students are viewing the videos for homework. Whole Class Discussion: A whole class discussion with the teacher will then follow each role play scenarios concerning the concepts of tax incurred during the scenarios.	scenario, how it was used, and the amount that was charged. Whole Class Discussion 1: A whole class discussion with the teacher will then follow the role play from the beginning of the class session concerning the concepts of taxes incurred during transactions	Student: note book, writing materials (pens, pencils etc.)
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Sectional Review: *(Time: 1 minute)*

1. What is tax?
2. It is optional or compulsory?
3. Who it is paid to?
4. What it is charged on?
5. What is it used for?

Questions & Answers:

11. When purchasing item in a grocery, apart from the cost of the items what additional cost is charged on the bill? – Tax
12. What is tax? – Money paid to the government
13. Does it change or is it a fixed amount? – Varies depending on the situation
14. Is it a unit amount or a percentage? – Percentage
6. It is optional or compulsory?
15. Why is it necessary? – For the development of the country
16. How? – For fixing roads, hospitals, schools, school feeding program

SECTION 2 *(Time: 5 minutes)*

Content: Types of Taxes

Teaching Points:

1. Based on the economic design or situation

2. Sales tax (Tax paid on items purchased- 12.5%)
3. Income tax (Tax deducted from a person's salary- 25%)
4. Property tax (Tax paid on a particular property)
5. Land tax (Tax paid on the portion of land)
6. Business Tax or Corporation tax (Tax paid depending on the size of the profit incurred by the company)
7. Hotel Tax (Tax paid whilst staying at a hotel)
8. Vehicle Tax (Tax paid depending importation and sales of the vehicle)

Method:		
Teaching Strategy:	Student Activity	Resources
Questioning: The teacher questions the students about the various types of taxes based on the video presentations on the website. These questioning techniques is mainly twofold: to clarify any misconceptions about the concepts presented in the videos and, to ensure and monitor if students are viewing the videos for homework.	Whole Class Discussion 1: A whole class discussion with the teacher will then follow the role play from the beginning of the class session concerning the various types of taxes incurred during transactions	Teacher: white board, white board markers and duster. Student: note book, writing materials (pens, pencils etc.)

Whole Class Discussion: A whole class discussion with the teacher will then follow each role play scenarios concerning the various type of taxes incurred during the scenarios.		
Sectional Review: <i>(Time: 1 minute)</i> What are some types of taxes?		

SECTION 3 <i>(Time: 5 minutes)</i>	
Content: Concept of Sales Tax Teaching Points: 1. It is a type tax 2. It is a fixed percentage 3. It is usually referred to Value Added Tax (VAT) 4. It is based on the country or state	

5. It is a percentage of the goods and items purchased by a customer 6. It is paid to the government for economic development		
Method:		
Teaching Strategy:	Student Activity	Resources
Questioning: The teacher questions the students about the sales based on the video presentations on the website. These questioning techniques is mainly twofold: to clarify any misconceptions about the concepts presented in the videos and, to ensure and monitor if students are viewing the videos for homework. Whole Class Discussion: A whole class discussion with the teacher will then follow each role play scenarios concerning the	Whole Class Discussion 1: A whole class discussion with the teacher will then follow the role play from the beginning of the class session concerning the concept of sales tax incurred during transactions	Teacher: white board, white board markers and duster. Student: note book, writing materials (pens, pencils etc.)

concept of sales tax incurred during the scenarios.		
Sectional Review: <i>(Time: 1 minute)</i> 1. What is sales tax? 2. Is the tax the same for all countries? 3. What is it commonly referred to? 4. What types of items is it charged on? 5. What is the VAT % charged on items in Trinidad and Tobago?		
CLOSURE: <i>(Time: 2 minutes)</i> 1. What is tax? 2. It is optional or compulsory? 3. Who it is paid to? 4. What it is charged on? 5. What is it used for? 6. What are some types of taxes?		

7. What is sales tax?
8. Is the tax the same for all countries?
9. What is it commonly referred to?
10. What types of items is it charged on?
11. What is the VAT % charged on items in Trinidad and Tobago?

FINAL EVALUATION: *(Time: 23 minutes)*

The teacher groups students in fours (10 groups of 4 students and 1 group of 3 students) and ask them to create and present (each group will have 3-4 minutes to present their piece) a working world scenario similar to the one observed at the beginning of the class to highlight the following points:

5. Taxes customers must pay
6. Taxes business or store owners must pay
7. Reasons why persons must pay taxes
8. Who the taxes are paid too
9. Describing at least two other types of taxes that individuals must pay on a regular basis

Observing students will be allowed to constructively criticize or praise the presenting groups

Reasonable level of Achievement:

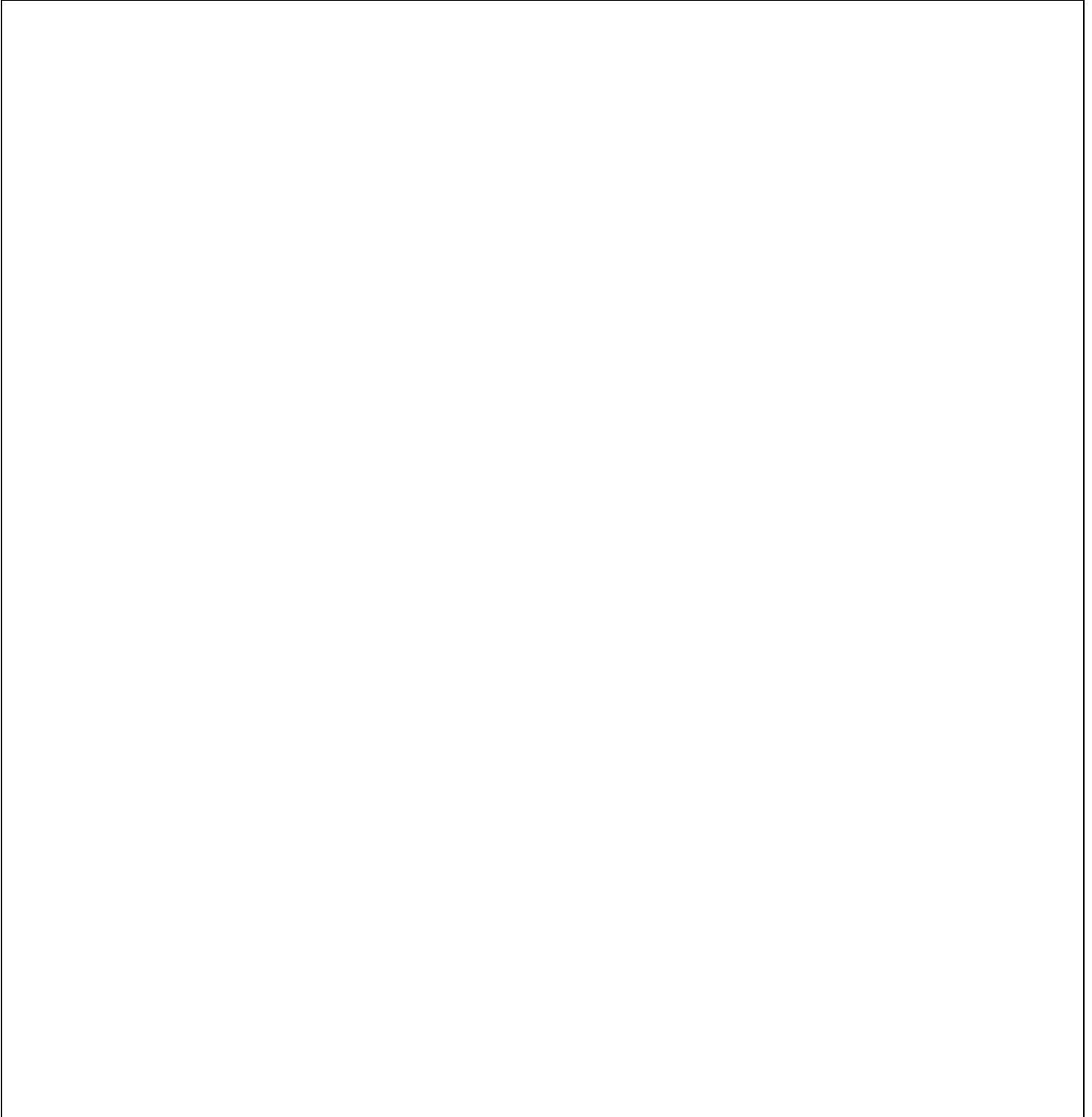
Objective

1. 40/43 Students will be able to define Tax based the video presentation on the website	1
2. 40/43 Students will be able to Identify different types of taxes based on the video presentation	2
3. 40/43 Students will be able to Define Sales Tax based on the video presentation on the website	3
4. 40/43 Students will be able to Apply the knowledge from the website by collaborating with their peers to create working world scenarios involving the concepts of Tax, various types of taxes and sales tax on transactions using drama	4
5. 38/43 Students will be able to Begin to appreciate the importance and application of Tax, various types of taxes and sales tax on a transactions in working world applications via the dramatic presentations	5
CONTINUOUS EVALUATION (HOMEWORK): Students will be required to visit the teacher made website www.stfgcmathminds.weebly.com and complete the following tasks: 5. View and make small notes on the videos related to the computation of cost price and selling price of item exclusive and inclusive of VAT in preparation for the next class session 6. Participate in online quiz # 10: Taxation quiz.	

7. Comment on the Blog Spot (on the website platform) where they will state the definitions of tax, sales tax and list at least two other types of taxes individuals must pay on a regular basis. They are also required to give two examples of how these concepts can be applied in the working world.
8. Write a journal (40 - 50 words) about today's Mathematics class describing their: enthusiasm and enjoyment in class, excitement and feelings with the class activities, thoughts and views about the website and this "new" teaching and learning style, ideas (if any) into how the website and/or teaching can be improved or adjusted, and anything else (school related) they wish to express. These journals are to be emailed to the teacher: stfgcemrith@gmail.com

TEACHER EVALUATION OF THE LESSON:

TUTOR'S COMMENTS:



FLIPPING THE CLASSROOM FOR IMPROVING STUDENTS' ENGAGEMENT IN
LEARNING AND ACADEMIC ACHIEVEMENT IN SECONDARY SCHOOL
MATHEMATICS AT THE RAGNAROK GIRLS SECONDARY SCHOOL

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SCHOOL OF EDUCATION, UNIVERSITY OF THE WEST INDIES, ST. AUGUSTINE
MATHEMATICS LESSON PLAN

Teacher: Mr. K Emrith

Date: 01-04-19	Class: 2F	Time: 90 Minutes
Unit: Consumer Arithmetic		
Topic: Computing Cost Price and Selling Price given VAT		
Pre-knowledge: Evaluate arithmetic operations involving directed numbers; identify face value; place value and value of numbers; long division on numbers; concept of indices, calculating percentages, simplifying simple algebraic expressions, solving simple algebraic equations, finding simple interest, principal, rate and time, concept of cost price, selling price, profit and loss, formulas for computing profit and loss amount, computing profit or loss amounts and profit or loss percentages, given cost price and selling price, computation of cost price given selling price and profit or loss percentage, concepts of discount amount, discount percentage and marked price of an item, concepts of tax and sales tax.		

OBJECTIVES: Pupils will:	Classification
6. State the formula for computing the cost price of an item that is exclusive of VAT given the selling price and VAT based on the video presentation from the website	K
7. Work collaboratively with peers or individually to compute the cost price of an item that is exclusive of VAT given the selling price and VAT	AT

8. State the formula for computing the selling price of an item that is inclusive of VAT given the cost price and VAT based on the video presentation from the website	K
9. Work collaboratively with peers or individually to compute the selling price of an item that is inclusive of VAT given the cost price and the VAT	
10. Begin to appreciate the importance and purpose of computing the cost price and selling price given the VAT in working world applications via collaboration.	AT
	Aff.

SET INDUCTION: *(Time: 2 minutes)*

Teacher recaps the concepts from the previous classes to clarify any previous misconceptions about the concept of tax and sales tax.

Resources required: Laptop, Speakers, Projector, Necessary Cables

SECTION 1 *(Time: 7 minutes)*

Content: Formulas for computing cost price (exclusive of VAT) given selling price and VAT

Teaching Points:

$$\diamond C.P \text{ (exclusive of VAT)} = \left(\frac{100}{100 + VAT \%} \right) \times S.P$$

OR

$$\diamond C.P \text{ (exclusive of VAT)} = \left(\frac{S.P}{100 + VAT \%} \right) \times 100$$

OR

$$\diamond C.P \text{ (exclusive of VAT)} = \left(\frac{S.P \times 100}{100 + VAT \%} \right)$$

Method:		
Teaching Strategy:	Student Activity	Resources
Direct Instructions: Teacher allows students to work in pairs to discuss and compare notes based the online videos related to the formula to compute the cost price of an item given the VAT and the selling price of an item Questioning: The teacher questions the students about the formula for computing the	Pair-Pair Discussion: Students will be working in pairs to discuss the online videos related to the formulas for computing the cost price of an item given the VAT and selling price. Whole Class Discussion: The class will be involved in a whole group discussion with the teacher concerning the formulas for computing the cost price of an item given the VAT and selling price.	Teacher: white board, white board markers and duster. Student: note book, writing materials (pens, pencils etc.)

cost price of an item given the VAT and selling price of an item based on the video presentations on the website. These questioning techniques is mainly twofold: to clarify any misconceptions about the concepts presented in the videos and, to ensure and monitor if students are viewing the videos for homework. Whole Class Discussions: This leads to an interactive discussion with the teacher and students to enhance their understandings of the formulae for of the cost price of an item given the VAT and selling price.		
Sectional Review: <i>(Time: 1 minute)</i> What are the formulas to compute the cost price of an item given the VAT and the selling price of the item?		

Questions & Answers : 4. What is meant by the term Taxation? 5. What is meant by Tax? 6. What are some type of taxes? 7. What is the meant by the sales tax of an item?		
SECTION 2 (<i>Time: 15 minutes</i>)		
Content: Computing the cost price of an item given VAT and the selling price of the item Teaching Points: Steps in computing the cost price of an item given VAT and the selling price of the item 10. Read the question until understanding is achieved 11. Identify the selling price of the item and the VAT 12. Use any of the formulae to compute the cost price given the VAT and the selling price.		
Method: Teaching Strategy:	Student Activity	Resources
Questioning: The teacher questions the students about computing the cost price of an item given the VAT and selling price of an item based on the video presentations on the website.	Pair-Pair Discussion: Students will be working in pairs to discuss the online videos related to the computation of the cost price of an item given the VAT and selling price.	Teacher: Markers, Duster, Laptop, Projector, Necessary Connection Cables

These questioning techniques is mainly twofold: to clarify any misconceptions about the concepts presented in the videos and, to ensure and monitor if students are viewing the videos for homework. Whole Class Discussions: This leads to an interactive discussion with the teacher and students to enhance their understandings of the computation of the cost price of an item given the VAT and selling price. Guided Instructions: The teacher displays on the projector screen a question related to the computation of the cost price of an item given VAT and selling price. He then guides the students how to perform the computation using the necessary steps and formulas.	Whole Class Discussion: The class will be involved in a whole group discussion with the teacher concerning the computation of the cost price of an item given the VAT and selling price. Observations: During the teacher's demonstration of how to compute the cost price of an item given the VAT and selling price, the students will be observing and taking notes of the important information such as the steps and application of the formulas involved in the computation. Individual Work Student will be working individually to apply their knowledge to solve a worded problem related to computing	Student: note book, writing materials (pens, pencils etc.)
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Question # 1 (Calculate the C.P): Find the cost price of a motorbike which was bought for \$ 36300 after paying a sales tax at the rate of 10% Direct Instructions: Teacher allows students to work individually to solve a worded problem related to computing the cost price of an item given the VAT and selling price of an item.	the cost price of an item given the VAT and selling price of an item Question # 1(Calculating C.P): A refrigerator is marked for sale at \$ 17600 inclusive of sales tax at the rate of 10%. Calculate the cost price on the refrigerator.	
Sectional Review: <i>(Time: 1 minute)</i> What are the steps involved in computing the cost price of an item given the VAT and the selling price of the item?		
SECTION 3 <i>(Time: 7 minutes)</i>		
Content: Formulas for computing selling price given VAT and cost price of an item		

Teaching Points: ❖ $S.P \text{ (inclusive of VAT)} = (100 \% + \text{VAT} \%) \times C.P$ OR ❖ $S.P \text{ (inclusive of VAT)} = \left(\frac{100 + \text{VAT} \%}{100} \right) \times C.P$ OR ❖ $S.P \text{ (inclusive of VAT)} = (100 + \text{VAT} \%) \times \left(\frac{C.P}{100} \right)$		
Method:		
Teaching Strategy:	Student Activity	Resources
Direct Instructions: Teacher allows students to work in pairs to discuss and compare notes based the online videos related to the formula to compute the selling price of an item given the VAT, and the cost price of an item Questioning:	Pair-Pair Discussion: Students will be working in pairs to discuss the online videos related to the formulas for computing the selling price of an item given the VAT and marked price. Whole Class Discussion: The class will be involved in a whole group discussion with the teacher concerning the	Teacher: white board, white board markers and duster. Student: note book, writing materials (pens, pencils etc.)

The teacher questions the students about the formula for computing the selling price of an item given the VAT and cost price of an item based on the video presentations on the website. These questioning techniques is mainly twofold: to clarify any misconceptions about the concepts presented in the videos and, to ensure and monitor if students are viewing the videos for homework. Whole Class Discussions: This leads to an interactive discussion with the teacher and students to enhance their understandings of the formulae for of the selling price of an item given the VAT and cost price.	formulas for computing the selling price of an item given the VAT and cost price.	
Sectional Review: <i>(Time: 1 minute)</i>		

What are the formulas to compute the selling price of an item given the VAT and the cost price of the item?

SECTION 4 (*Time: 15 minutes*)

Content: Computing the selling price of an item given VAT and the cost price of the item

Teaching Points: Steps in computing the selling price of an item given VAT and the Cost price of the item

4. Read the question until understanding is achieved
5. Identify the cost price of the item and the VAT
6. Use any of the formulae to compute the selling price given the VAT and the cost price.

Method:

Teaching Strategy:

Student Activity

Resources

Questioning:

Pair-Pair Discussion:

Teacher: Markers,
Duster, Laptop,

The teacher questions the students about computing the selling price of an item given the VAT and cost price of an item based on the video presentations on the website. These questioning techniques is mainly twofold: to clarify any misconceptions about the concepts presented in the videos and, to ensure and monitor if students are viewing the videos for homework. Whole Class Discussions: This leads to an interactive discussion with the teacher and students to enhance their understandings of the computation of the selling price of an item given the VAT and cost price. Guided Instructions: The teacher displays on the projector screen a question related to the computation of the selling price of an item given the VAT and	Students will be working in pairs to discuss the online videos related to the computation of the selling price of an item given VAT and cost price. Whole Class Discussion: The class will be involved in a whole group discussion with the teacher concerning the computation of the selling price of an item given the VAT and cost price. Observations: During the teacher's demonstration of how to compute the selling price of an item given the VAT and cost price, the students will be observing and taking notes of the important information such as the steps and application of the formulas involved in the computation.	Projector, Necessary Connection Cables Student: note book, writing materials (pens, pencils etc.)
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cost price. He then guides the students how to perform the computation using the necessary steps and formulas. Question # 2(Calculate the S.P inclusive of VAT): The printed price of a bicycle is \$ 4200. The rate of sales tax on it is 10%. Find the price at which the cycle can be purchased inclusive of VAT Direct Instructions: Teacher allows students to work individually to solve a worded problem related to computing the selling price of an item given the VAT and cost price of an item.	Individual Work Student will be working individually to apply their knowledge to solve a worded problems related to computing the selling price of an item given the VAT and cost price of an item Question # 2 (Calculating S. P): A printing machine for is being sold for \$5136 at sales tax of 7%. Calculate the selling price of the printing machine.	
Sectional Review: <i>(Time: 1 minute)</i> What are the steps involved in computing the selling price of an item given the VAT and the cost price of the item?		

CLOSURE: *(Time: 3 minutes)*

13. What are the formulas to compute the cost price of an item given the VAT and the selling price of the item?
14. What are the steps involved in computing the cost price of an item given the VAT and the selling price of the item?
15. What are the formulas to compute the selling price of an item given the VAT and the cost price of the item?
16. What are the steps involved in computing the selling price of an item given the VAT and the cost price of the item?

FINAL EVALUATION: *(Time: 37 minutes)*

Students will work in groups of 4's or individually to apply their knowledge to solve a series of worded problems related to the computation of cost price (exclusive of VAT) and selling price (inclusive of VAT) of an item given VAT or any combination of such concepts.

Each group and each student who are working individually, will present one of the worded problems at the front of the class for the other students to verify the answers and clarify any misconceptions.

11. The printed price of a DVD player is \$ 7500. If a sales tax of 8% is realised from the buyer, find the price at which the DVD player is sold?
12. The listed price of a refrigerator is \$ 9700. If a sales tax of 6% is charged from the buyer, find the selling price of the refrigerator.
13. The price of a colour TV is \$ 13440, inclusive of sales tax. If the printed price of the colour TV be \$ 12000 then find the rate of sales tax.
14. Rahul buys a pair of shoes whose marked price is \$ 500. He has to pay a sales tax of \$ 40. Find the rate of sales tax.
15. The selling price of an article becomes $\frac{27}{25}$ times the listed price due to the inclusion of sales tax. Find the rate of sales tax.
16. The price of a camera is \$ 9810 inclusive of sales tax. If the rate of sales tax is 9%, find the printed price of the camera.
17. The rate of sales tax on trousers is 10%. One can buy a pair of trousers at \$ 660. What is the marked price?
18. The rate of sales tax on the marked price of an article is 6% and it is available at \$ 371. If the rate of sales tax increases 8%, find the price at which the article is available.
19. If the rate of sales tax reduces by 4%, the selling price of an article comes down by \$ 100. Find the marked price of the article.
20. The price of a TV set inclusive of sales tax of 9% is 17407. Find its marked price. If the sales tax is increased to 13%, how much more does the customer pay for the TV set?

21. Last year, an article was sold with a sales tax of 10% on the marked price. This year, the rate of sales tax becomes 12%. What is the percentage in the amount that a customer has to pay this year to buy it if the marked price remains the same?	
Reasonable level of Achievement:	Objective
1. 40/43 Students will be able to state the formulae for computing cost price of an item given the VAT and selling price of an item based on the video presentation on the website.	1
2. 38/43 Students will be able to work collaboratively with peers or individually to compute cost price of an item given the VAT and selling price of an item	2
3. 40/43 Students will be able to state the formulae for computing selling price of an item given the VAT and cost price of an item based on the video presentation on the website	3
4. 38/41 Students will be able to work collaboratively with peers or individually to compute selling price of an item given the VAT and cost price of an item	
5. 40/43 Students will be able to begin to appreciate the important and purpose of computing selling price and cost of an item given VAT in working world applications via collaboration	4
	5

CONTINUOUS ASSESSMENT (HOMEWORK):

Students will be required to visit the teacher made website www.stfgcmathminds.weebly.com and complete the following tasks:

1. Participate in online quiz # 10: Sales Tax quiz.
2. Comment on the Blog Spot (on the website platform) where they will state the formulas and steps involved in the computation of cost price (exclusive of VAT) and selling price of an item (inclusive of VAT) given VAT. They are also required to give two examples of how these concepts can be applied in the working world.
3. Write a journal (40 - 50 words) about today's Mathematics class describing their: enthusiasm and enjoyment in class, excitement and feelings with the class activities, thoughts and views about the website and this "new" teaching and learning style, ideas (if any) into how the website and/or teaching can be improved or adjusted, and anything else (school related) they wish to express. These journals are to be emailed to the teacher: stfgcemrith@gmail.com.
4. [Review all the topics covered in relation to consumer in preparation for the final examination.](#)

TEACHER EVALUATION OF THE LESSON:

TUTOR'S COMMENTS:

Appendix H

Concept Analysis Forms

MATHEMATICS CONCEPT ANALYSIS FORM

Teacher Name: Kiran Emrith

School Name: Ragnarok Girl's Secondary
School College

Class:
Form 2F

Concept Name: Consumer Arithmetic

Criteria attributes / Essential Characteristics:

Involves people purchasing items, making investments and taking loans. It deals with money, currency and exchange rates. It is related to other concepts such as cost price, selling price, profit, loss, discount, tax, percentages.

Non-criteria attributes / Non-Essential Characteristics:

Calculating number of angles and/or sizes of the lengths of various shapes; construction and drawings of various shapes; rotations and translations of various shapes and objects; calculating the area, perimeter and volume of various shapes.

Concept rule:

Consumer arithmetic is a field of Mathematics which involves people (consumers) utilizing and applying various arithmetic skills such as $(+, -, \times, \div)$ to working world situations. Application of consumer arithmetic may include: purchasing items, making investment, taking a loan to purchase a vehicle or a house, making down payments and so on. It can also aid in decision making when purchasing items as it relates to other concepts such as cost price, selling price, profit, loss, discount, tax, hire purchase and percentages.

Teaching Points:

1. It is a field of Mathematics
2. It involves consumer- people who purchase items for living, comfort and pleasure
3. It utilizes various arithmetic skills - basic mathematic skills $(+, -, \times, \div)$
4. It is applicable to working world scenarios; purchasing items, making investment, taking a loan, making down payments
5. It aids in decision making.

Concept examples:

1. John purchase a vehicle for \$ 10 000 and sells it for \$ 20 000, what is the cost price, selling price and profit?

2. Mariana makes a down payment for a refrigerator valued at \$ 15 000. If the interest rate is 2% what is her monthly payments?
3. Mr. Harry visits a furniture store to purchase a new couch set for his wife. He sees one that he likes but if he purchases it at cash price, he will have to pay \$ 10 000 whilst if he purchases it on hire purchase, he will have to make a down payment of \$ 1000 and 24 monthly instalments of \$ 500.
 - a. Which is the better buy for Mr. Harry to save money?
 - b. How much money will he save?

Concept non-examples:

1. Given that two sides of a right angles triangle is 25 m and 12 m respectively, calculate the length of the hypotenuse. Hence determine the magnitude of the other angles present using any of the trigonometric ratios.
2. Two points on a straight line are A (2, 3) and B (4, 5). Determine :
 - i. The gradient of AB
 - ii. Length of AB
 - iii. The mid-point of AB
3. Given that the radius of a cylindrical container is 25 cm and its height is 56cm, calculate the cylinder's :
 - i. Circumference
 - ii. Cross-Sectional Surface Area
 - iii. Volume

Relationship with another concept(s):

Cost Price, Selling Price, Profit, Loss, Discount, Taxes, Percentages, Wages, Hire Purchase, Mortgages, Depreciation, Interest

Tutor's evaluation:

MATHEMATICS CONCEPT ANALYSIS FORM

Teacher Name: Kiran Emrith

School Name: Ragnarok Girls' Secondary School C

Concept Name: Cost Price of an item

Criterial attributes / Essential Characteristics:

Initial amount of money before any deductions or additions. Money a manufacture output to produce an item.

Price given to an item when a dealer is usually buying in bulk form the manufacturer. The price from the manufacturer do not usually change.

Non-criterial attributes / Non-Essential Characteristics:

Units of the money (US, TT, Euros etc.)

Concept rule:

Cost price is the initial or original amount of money utilized by a manufacturer to produce an item. It is also referred to the manufacturers or factory price/cost. It is the price before any deductions or additions.

Teaching Points:

1. It is the initial or original amount of money
2. It is the manufacturer's cost to produce an item
3. It is also referred to the manufacturer's or factory price

Concept examples:

\$ 500, \$ 25.50,

Concept non-examples:

25% , - \$ 500,

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Relationship with another concept(s):

Profit, Loss, Discount, Taxes, Percentages

Tutor's evaluation:

MATHEMATICS CONCEPT ANALYSIS FORM

Teacher Name: Kiran Emrith

School Name: Ragnarok Girls' Secondary School Class: Form

Concept Name: Selling Price of an Item

Criteria attributes / Essential Characteristics:

Final amount of money after deductions or additions are made on the cost price; the price a consumer pays an item, the amount of money a dealer sells an item for

Non-criteria attributes / Non-Essential Characteristics:

Units of the money (US, TT, Euros etc.)

Concept rule:

Selling price is the amount of money a dealer sells an item to consumers. It can also be described as the price that a consumer pays for an item after deductions or additions are made on the cost price. It is also referred to the marked price or market value.

Teaching Points:

1. It is the amount of money a dealer sells an item to the consumers
2. It is the price a consumer pays for an item
3. It is the price after deductions or additions are made on the cost price
4. It is also referred to the marked price, market value

Concept examples:

\$ 500, \$ 25.50,

Concept non-examples:

25% , - \$ 500,

Relationship with another concept(s):

Profit, Loss, Discount, Taxes, Percentages, Hire Purchase, Mortgage

Tutor's evaluation:

MATHEMATICS CONCEPT ANALYSIS FORM

Teacher Name: Kiran Emrith

School Name: Ragnarok Girls' Secondary School Class: Form 1

Concept Name: Profit Amount incurred on a Transaction

Criteria attributes / Essential Characteristics:

Amount of money remaining when the cost price is subtracted from the selling price, surplus of money gained

Selling price is greater than cost price

Non-criteria attributes / Non-Essential Characteristics:

Units of the money (US, TT, Euros etc.), type of products sold

Concept rule:

Profit amount on a transaction is the amount of money gained when the selling price is greater than the cost price. It is calculated by subtracting the cost price from the selling price. It is also referred to financial gain, benefit, surplus, excess or interest.

Teaching Points:

1. It is the amount of money gained
2. It is gained when the selling price is greater than the cost price of an item
3. It is the difference between the cost price and selling price of an item
4. It is referred to financial gain, benefit, surplus, excess, interest

Concept examples:

\$ 500, \$ 25.50, 50%

Concept non-examples:

50° , $-\$ 500$, 500 cm

Relationship with another concept(s):

Loss, Cost Price, Selling Price Discount, Taxes, Percentages

Tutor's evaluation:

MATHEMATICS CONCEPT ANALYSIS FORM

Teacher Name: Kiran Emrith

School Name: Ragnarok Girls' Secondary Class: Form
School

Concept Name: Loss Amount incurred on a Transaction

Criterial attributes / Essential Characteristics:

Amount of money lost when the selling price is subtracted from the cost price, financial drop in money, selling price is less than cost price, decrease in money

Non-criterial attributes / Non-Essential Characteristics:

Units of the money (US, TT, Euros etc.), type of products sold,

Concept rule:

Loss amount on a transaction is the amount of money lost or not gained by a dealer when an item is sold for less money than it was bought for. A loss during a transaction occurs when the selling price is less than the cost price. It can be calculated by subtracting the selling price from the cost price. Loss referred to a financial drop or decrease

Teaching Points:

1. It is the amount of money lost by a dealer or supplier
2. It occurs when the cost price is greater than the selling price of an item
3. It is the difference between the cost price and selling price of an item
4. It is also referred to financial drop, decrease, reduction

Concept examples:

\$ 500, \$ 25.50, 50%

Concept non-examples:

Relationship with another concept(s):

Profit, Cost Price, Selling Price Discount, Taxes, Percentages

Tutor's evaluation:

MATHEMATICS CONCEPT ANALYSIS FORM

Teacher Name: Kiran Emrith

School Name: Ragnarok Girls' Secondary School Class: Form

Concept Name: Profit Percentage incurred on a Transaction

Criterial attributes / Essential Characteristics:

Percentage, relationship between profit amount and cost price, it is non-negative percentage, $\text{selling price} > \text{cost price}$

Non-criterial attributes / Non-Essential Characteristics:

Units of the money (US, TT, Euros etc.), type of products sold,

Concept rule:

Profit percentage is a percentage used to represent the profit amount in relation to the cost price. It is computed by dividing the profit amount by the cost price then it is multiplied by 100%. It is usually used to read and display the information on various charts such as a pie chart.

Teaching Points:

1. It is a percentage
2. It represents the profit amount as a percentage
3. It is the relationship between profit amount and cost price of an item
4. It is calculated by dividing the profit by the cost price then multiply by 100%
5. It is usually used to read and displayed on various charts such as a pie chart.

Concept examples:

50%, 10%

Concept non-examples:

\$ 50, - 25%, 25 cm

Relationship with another concept(s):

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Profit, Cost Price, Selling Price Discount, Taxes, Percentages

Tutor's evaluation:

MATHEMATICS CONCEPT ANALYSIS FORM

Teacher Name: K Emrith

School Name: Ragnarok Girls' Secondary School Class: Form 2F

Concept Name: Loss Percentage incurred on a Transaction

Criterial attributes / Essential Characteristics:

Percentage, relationship between loss amount and cost price, it is non-negative percentage, cost price > selling price

Non-criterial attributes / Non-Essential Characteristics:

Units of the money (US, TT, Euros etc.), type of products sold,

Concept rule:

Loss percentage is a percentage used to represent the loss amount in relation to the cost price. It is computed by dividing the loss amount by the cost price then it is multiplied by 100%. It is used to read and display the information on various charts such as a pie chart easily.

Teaching Points:

1. It is a percentage
2. It represents the loss amount
3. It is the relationship between loss amount and cost price
4. It is calculated by dividing the loss amount by the cost price then multiply by 100%
5. It is easy to read and display the information on various charts such as a pie chart.

Concept examples:

50%

Concept non-examples:

\$ 50, - 25%

Relationship with another concept(s):

Profit, Cost Price, Selling Price Discount, Taxes, Percentages

Tutor's evaluation:

MATHEMATICS CONCEPT ANALYSIS FORM

Teacher Name: K Emrith

School Name: Ragnarok Girls' Secondary School Class: Form 2F

Concept Name: Discount Amount on a Transaction

Criteria attributes / Essential Characteristics:

Reduced amount of money, less than the selling price, it is a non negative amount

Non-criteria attributes / Non-Essential Characteristics:

Units of the money (US, TT, Euros etc.), type of products sold,

Concept rule:

Discount is a reduced amount of money taken off the selling price in order to increase sales, attract customers, free up room, meet goals, and increase reputation of a business. It is sometimes referred to as rebate, reduction, deduction or knock off

Teaching Points:

1. It is a reduced amount of money offered to customers
2. It is an amount of money taken off the selling price of an item
3. It is also referred to as rebate, reduction, deduction, knock off
4. It is offered to increase sales, attract customers, free up room, meet goals, increase reputation

Concept examples:

\$ 500, \$ 25.50, 50%

Concept non-examples:

-\$50 , -25%

Relationship with another concept(s):

Profit, Cost Price, Selling Price, Percentages, Loss

Tutor's evaluation:

MATHEMATICS CONCEPT ANALYSIS FORM

Teacher Name: K Emrith

School Name: Ragnarok Girls' Secondary School

Class:
Form 2F

Concept Name: Discount Percentage on a Transaction

Criteria attributes / Essential Characteristics:

Reduced amount of money represented as a percentage, less than the selling price, it is a non negative percentage

Non-criteria attributes / Non-Essential Characteristics:

Units of the money (US, TT, Euros etc.), type of products sold,

Concept rule:

Discount percentage is a percentage used to represent the discount amount with respect to the marked price of an item in order to increase sales, attract customers, free up room, meet goals, and increase reputation of a business. It is sometimes referred to as rebate, reduction, deduction or knock off. It is usually used to represent information on bar graphs and pie charts

Teaching Points:

1. It is a percentage
2. It represents the discount amount with respect to the marked price of an item
3. It is also referred to as rebate, reduction, deduction, knock off
4. It is offered to increase sales, attract customers, free up room, meet goals, increase reputation
5. It is usually used to represent information on bar graphs and pie charts

Concept examples:

150%, 50%

Concept non-examples:

-\$50 , -25%

Relationship with another concept(s):

Profit, Cost Price, Selling Price, Percentages, Loss, Discount Amount

Tutor's evaluation:

MATHEMATICS CONCEPT ANALYSIS FORM

Teacher Name: K Emrith

School Name: Ragnarok Girls' Secondary School Class: Form 1

Concept Name: Marked Price of an Item

Criteria attributes / Essential Characteristics:

Selling price of an item before any discount is offered, it is a non-negative amount.

Non-criteria attributes / Non-Essential Characteristics:

Units of the money (US, TT, Euros etc.), type of products sold,

Concept rule:

This is the price on the label of an article/product before any discounts offered. This is the price at which the product is intended to be sold. However, there can be some discount given on this price and the actual selling price (price) of the product may be less than the marked price. It is generally denoted by M.P. When a discount is offered on the marked price, the selling price is less than the marked price.

the marked price of an item is greater the sale price for the item. When no discount is being offered, the marked price of an item is actually the selling price for the item. It is also called the list price, original price or label price

Teaching Points:

1. It is the price on the label of an article/product
2. It is the price before any discounts offered
3. It is the price at which a product is intended to be sold
4. It is a price greater than the selling price of an item only when a discount is offered
5. It is the selling price of an item when no discount is offered
6. It is called the list price, original price or label price

Concept examples:

\$ 150 \$ 50

Concept non-examples:

-\$50 , -25%

Relationship with another concept(s):

Profit, Cost Price, Selling Price, Percentages, Loss, Discount Amount, Discount Percentage

Tutor's evaluation:

MATHEMATICS CONCEPT ANALYSIS FORM

Teacher Name: K Emrith

School Name: Ragnarok Girls' Secondary School

Class:
Form 2F

Concept Name: Tax

Criteria attributes / Essential Characteristics:

Money paid to the government, amount depends on the country the customer lives, it is usually a percentage of money, it is a non negative amount, compulsory,

Non-criteria attributes / Non-Essential Characteristics:

Units of the money (US, TT, Euros etc.), job of an individual,

Concept rule:

Tax is a compulsory monetary contribution or fee paid to the government of a country. It is usually a percentage and it varies depending on the context or country. The money is used by the government to manage the economy by financing expenses such as health care, education, road repairs, and garbage collection.

Teaching Points:

1. It is a monetary contribution or fee
2. It is compulsory
3. It is generally paid to the government of the country
4. It is usually a percentage
5. It varies depending on the context and country
6. It is used to manage an economy
7. It is used to finance the expenses (health care, education, garbage collection repair roads) incurred by government

Concept examples:

\$ 500, \$ 25.50, 50%

Concept non-examples:

-\$50 , -25%

Relationship with another concept(s):

Profit, Cost Price, Selling Price, Percentages, Mortgage, Hire Purchase

Tutor's evaluation:

MATHEMATICS CONCEPT ANALYSIS FORM

Teacher Name: K Emrith

School Name: Ragnarok Girls' Secondary School Class: Form 10

Concept Name: Sales Tax

Criterial attributes / Essential Characteristics:

Type of tax, percentage of money, it is compulsory, amount depends on the country or state a consumer money added on to goods and items

Non-criterial attributes / Non-Essential Characteristics:

Units of the money (US, TT, Euros etc.), job of an individual, type of items

Concept rule:

Sales Tax is a type of tax commonly known as value added tax (VAT) which is a percentage of money added to goods and items purchased by a customer. The amount of VAT paid depends on the country or state the consumer lives. Similar to any other taxes it is paid to the government for economical development

Teaching Points:

1. It is a type tax
2. It is a fixed percentage
3. It is referred to Value Added Tax (VAT)
4. It is based on the country or state
5. It is a percentage of the goods and items purchased by a customer
6. It is paid to the government for economical development

Concept examples:

12.5%, 15%

Concept non-examples:

-\$50 , -25%

Relationship with another concept(s):

Profit, Loss Cost Price, Selling Price, Percentages, Mortgage, Hire Purchase

Tutor's evaluation:

Appendix I

Student Engagement Questionnaire

The purpose of the questionnaire is to help teachers determine areas of strength and growth in teaching and to enhance and create a better learning environment for students.

Instructions: Answer **ALL** the questions honestly and to the best of your ability. **Tick** the response of your choice using a **pencil only**. If you will like to change your response, erase completely and select the new response.

Number: _____

Section A: The Teacher	Very Good	Good	Acceptable	Poor	Very Poor
1. How good is the teacher at stimulating your interest in the subject?					
2. How good is the teacher at explaining the subject?					
3. How good is the teacher at organizing and preparing a variety of activities (group work, technology, and outdoor sessions) for learning?					
Section B: The Subject	Strongly Agree	Agree	Undecided	Disagree	Strongly Disagree
4. Mathematics is a very interesting and exciting subject.					

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5. Mathematics is important and applicable in the working world.					
Section C: Engagement	Always	Most Times	Neutral	Sometimes	Never
6. How often are you involved in grouped activities with your peers during class?					
7. How often do you complete your homework?					
8. How often do you look at videos and use websites to help you learn Mathematics at home?					
9. How often do you volunteer to answer questions during class?					
10. How often do you ask questions during class?					

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Appendix J

Teacher Observational Checklist

Teacher Observational Checklist

Date of Observation: _____

Session #: _____

Number of Students Present During Observation: _____

Class Being Observed: 2F

Emotional / Affective Engagement (Sense of Belonging and School Connectedness)					
Observations	Always (5 points)	Very Often (4 points)	Sometimes (3 points)	Rarely (2 points)	Never (1 point)
Positive Body Language Students exhibit body postures that indicate they are paying attention to the teacher and/or other students. These will include: eyes on the speaker, nodding of heads and sitting in an upright position during class sessions					

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Fun and Excitement Students exhibit interest and enthusiasm towards learning					
Comfort Level Students are comfortable to seek help and ask questions.					
Personal Connection Students exhibit self-assurance to the choices in how they demonstrate their learning (songs, pictures or drama)					
Sub Total (20):					
Behavioural Engagement (Compliance and Participation)					
Observations	Always (5 points)	Very Often (4 points)	Sometimes (3 points)	Rarely (2 points)	Never (1 point)
Compliance					

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Students follow directions and instructions given by the teacher on the various learning activities in a timely manner					
Verbal Participation Students contribute towards class discussions by expressing thoughtful ideas, reflective answers to questions posed, and asking questions relevant to learning in relation to the topics at hand.					
Activeness Students eagerly volunteer to display their thoughts, ideas and answers to the questions posed, at the front					

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of the class and/or on the white board.					
Collaboration Students working together in groups with minimal conflict					
Sub Total (20):					
Cognitive Engagement (meta-cognitive and self-regulation)					
Observations	Always (5 points)	Very Often (4 points)	Sometimes (3 points)	Rarely (2 points)	Never (1 point)
Individual Attention Students worked independently on various tasks and problems and ask questions to clarify any					

misconception about the content					
Critical Thinking Students create original solutions and reflect on the quality of their work					
Having an opinion and feeling like it matters Students exhibit confidence in expressing and exchanging their thoughts, ideas and personal experiences about the content materials during class discussions					
Self –Starting Students can initiate and work on complex problems and tasks with limited coaching.					

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Sub Total (20):	
Total (60):	

Appendix K

Approval from Dr. Richard Jones to adapt Teacher Observational Checklist



Appendix L

Teacher Journals

Date: 12-03-19

Journal Entry # 1

Lesson # 1: Introduction to Consumer Arithmetic

Duration: 45 minutes

Significant levels of student engagement were noted from the commencement of the lesson throughout the end. Students generally seemed **excited and enthusiastic** via their facial expressions, and use of hand gestures when describing and expressing their views on various concepts during the whole class discussions, peer-peer discussions and the role plays.

Evidence of the use of the website were noted by majority of the students. **With minimal prompts, students were able to verbally describe the concept of consumer arithmetic**, its related components and **give working world examples of its application with confidence**.

Students thoroughly **enjoyed the role plays** as they experienced an integrated approach between Mathematics and Theater Arts. Students **willingly worked together in small groups** to create very unique and creative working world scenarios portraying consumer arithmetic and its related components.

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As the lesson unfolded, the teacher gathered feedback from the students in relation to the website and its constituent components. Most students expressed positive comments towards the used of this “new” teaching and learning style. They stated that the website was very beautiful, easy to use and made Mathematics more exciting. Some students stated the background sound to some of the videos were a bit distracting and they wanted more videos for some of the topics. The noted these concerns and then addressed those concerns later that evening by replacing the distracting videos and included some additional videos.

Generally, the lesson was a success. The overall flow of the classroom activities were much smoother than the past. More time was present in the classroom for one on one discussion with students as well as a lot more opportunities for collaborative work amongst students were also noted. Less teacher and more student talk was also another benefit that emanated through the use of the flipped classroom as the lectures were already conducted via the videos presentations. Thus the classroom became the avenue where students demonstrated their knowledge and talent by bringing the content to life via the role plays.

Clearly the via the flipped classroom, the teacher operates more as a facilitator than a dictator.

Date: 14-03-19

Journal Entry # 2

Lesson # 2: Introduction to Cost Price, Selling Price, Profit and Loss Amount incurred on a transaction

Duration: 90 minutes

Once again significant levels of student engagement were noted from the commencement of the lesson throughout the end. Having been more exposed to the website than the previous session, students generally seemed more acquainted with the flipped classroom approach to learning and teaching. Their excitement and interest towards the various task were higher than the previous class.

Evidence of the use of the website were also noted by majority of the students. They initiated and took control of the class discussions whilst the teacher clarified any misconceptions and solidify their understandings of the various concepts. Students who were seen not actively involved in class activities such as the whole class discussions and peer-peer discussions prior to this intervention, were seen taking a leadership role in such activities and initiating discussions. They were willingly expressing their ideas, views and own experiences in relation to the various concepts (cost price, selling price, profit, and loss) as they felt included and related to the lessons.

As the lesson extended, the teacher once again gathered feedback from the students in relation to the website and its constituent components. Most students again expressed positive comments towards the used of this “new” teaching and learning style. However, some students stated that some of quizzes were a bit challenging. Thus after their first attempt to the quiz they would have liked to review the videos once again before the second attempt. This concern was addressed later that evening where the teacher removed the “hold” from the quiz thereby allowing students more freedom in answering the quizzes. Students also suggested that they would have liked some online game related activities after completing the videos. The

teacher then created a link to redirect students from his website to another which facilitated the use of such games. Perhaps in the next session the teacher shall attain students' feedback in relation to this.

Generally, the lesson was yet again a success whereby the overall smooth flow of the class was maintained. More time was again present in the classroom for one on one discussion with students as well as a lot more opportunities for collaborative work amongst students were also noted. Less teacher and more student talk was also another benefit that emanated through the use of the flipped classroom as the lectures were already conducted via the video presentations.

After only 2 sessions, the flipped classroom seems to have a positive impact on students' engagement in learning Mathematics

Date: 18-03-19

Journal Entry # 3

Lesson # 3: Compute Profit and Loss Amount given Cost Price and Selling Price of Items

Duration: 45 minutes

Today's session was yet another successfully one with minimal issues. For this session a think-pair-share collaborative teaching technique was deployed. Once again, students were in a constant state of engagement with each other and with the teacher through their participation in the class activities as well as initiating healthy discussions and arguments. Students generally seemed more interested, excited, acquainted and comfortable with the flipped classroom approach to learning and teaching.

Evidence of the use of the website was again also noted by majority of the students. They initiated and took control of the class discussions whilst the teacher clarified any misconceptions and solidify their understandings of the various concepts. Students were again willing to express their ideas, views and own experiences in relation to the various concepts (cost price, selling price, profit, and loss) as they felt included and related to the lessons.

Closer to the end of the session, a very unplanned, unexpected and interesting turn of events occurred. The students in the class (on their own) began a debate based on a question giving by the teacher. The question entailed a person purchasing a vehicle for \$ 50,000 then spending \$ 5,000 on repairs. He then sold the vehicle at a profit of \$ 5,000. The task was to determine the selling price of the vehicle.

One student presented her solution on the white board which triggered the debate. Some students argued that the selling price was \$ 60,000 whilst others argued that the selling price was \$ 50,000. Within the debate students asked the teacher which is the correct answer. The teacher did not disclose the answer but rather redirected the question and probed students so they can come up with the right solution for themselves. He allowed the debate to continue. Needless to say, the class became a bit noisy at times during this debate. But the teacher continuously maintained classroom management.

Also noted was the involvement of one particular student who was absent from school for quite some time due to illness. She usually do not answer nor ask any questions within the past two years of teaching her Mathematics. However, through the debate, she articulated and expressed her views on the debate question

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very comfortably and with confidence. For the researcher, this was his most fulfilling moment to witness this student partake in the discussions.

As the lesson extended, the teacher once again gathered feedback from the students in relation to the website and its constituent components. Most students again expressed positive comments towards the used of this “new” teaching and learning style. The teacher reiterated the various parts of their homework as little comments on the blog spot as well as minimal submission of students journals were seen at this point. He commended them however for their tremendous participating in the online quizzes and the various videos thus far. Perhaps the other session more journals and comments may be seen.

Generally, an overall smooth flow of the class was maintained. More time was again present in the classroom for one on one discussion with students as well as a lot more opportunities for collaborative work amongst students were also noted. Less teacher and more student talk was also another benefit that emanated though the use of the flipped classroom as the lectures were already conducted via the videos presentations.

Thus far, the flipped classroom seems to have a tremendous positive impact on students' engagement in learning Mathematics.

Date: 19-03-19

Journal Entry # 4

Lesson # 4: Concept and Computation of Profit & Loss Percentage on a Transaction

Duration: 90 minutes

Today's session was yet another successfully one with minimal issues. For this session student role plays were deployed as the main teaching and learning tool. Thus another integrated approach between Mathematics and Theater Arts was utilized. Again, students were in a constant state of engagement with each other and with the teacher through their participation in the class activities as well as initiating healthy discussions and arguments. Students generally seemed more enthusiastic and interested with the flipped classroom approach that it became a normal part of the learning and teaching process.

Evidence of the use of the website was again also noted by majority of the students. They initiated and took control of the class discussions whilst the teacher clarified any misconceptions and solidify their understandings of the various concepts. Students were again willing to express their ideas, views and own experiences in relation to the various concepts (cost price, selling price, profit, and loss) as they felt included and related to the lessons.

Also noted at this stage (5th and 6th session), more students journals as well as comments on the blog spot were seen. Students really described the various topics on the blog spot whilst simultaneously articulated their feeling, experiences and thoughts of the class activities on their blog. For every comment made by students on the blog in relation to the various content materials, the teacher added, adjusted and clarified their definition to ensure sufficient understandings are achieved.

In relation to the debate during the previous class, the teacher's set induction was actually a role play conducted by 4 randomly chosen students. The teacher instructed those students into how to enact the "debate" scenario from the previous session and allowed the play to unfold. This in itself clarified the

misconceptions some students may have encountered by the nodding of student's heads and the occasional "Ahhh" and "Oh I see" responses.

It is important to note that a continuation of last's session was conducted in order to solidify student's understanding of the content. Thus, instead of moving on to the proceeding subtopic of profit %, the teacher allowed students to fully exhaust working world problems involving Cost Price of an item, Selling Price of an item, Profit amount incurred during a transaction and Loss amount incurred during a transaction.

Moreover, based on the results from the Cost price, selling price, profit and loss online quiz, students who attempted this quiz prior to this date, did not attain passing marks of 60%. Hence this session was to ensure students fully understood this cluster of topics before moving on. This quiz in particular will be closely monitored before the next session.

In addition, students were actually suggesting to the teacher ways to make the class activates more interesting, engaging and fun. For instance after the set induction and the last scenario was clarified, the teacher instructed the students to create working world scenarios similar to the ones given during the previous class to which each group will have to present. More so one student from each group were required to join another group and fess their ideas together.

Students then suggested after a group presents, the other groups who are not presenting would be required to answer the questions described by the presenting group. The teacher adopt this within the lesson and found to be very engaging as it allowed ideas to bounce off each other.

Whilst for the most part the various activities were well executed, the teacher observed two students were not participating in the group activities after the second cycle. The teacher spoke with both students to find out what was the problem. Both stated that they preferred to work individually and not in groups due to miscommunication that sometimes occur. May be the replacement of one student with another in the second cycle made it difficult for a bond to be made before sharing ideas and thoughts. The teacher will explore more ways to assist these two students collaborate more with their colleagues or may be have mixed approach in the class with both grouped activities and individual work for students to choose.

As the lesson extended, the teacher once again gathered feedback from the students in relation to the website and its constituent components. Most students again expressed positive comments towards the used of this “new” teaching and learning style.

Generally, an overall smooth flow of the class was maintained. More time was again present in the classroom for one on one discussion with students as well as a lot more opportunities for collaborative work amongst students were also noted. Students were really afforded opportunities to help and learn from each other. Again, less teacher and more student talk was also another benefit that ema Date: 21-03-19

Journal Entry # 5

Lessons # 5: Computing Cost Price given Selling Price and Profit or Loss Percentages

Duration: 90 minutes

Another fantastic session was conducted today. For this session a multiplicity of teaching and learning techniques were deployed via the suggestions from various students which were documented on their journals. In the previous session, some students stated that they preferred to work individually as opposed to group work since they are capable of concentrating at a greater level. Thus in this session, the teacher not only had small group collaborative activities but simultaneously afforded students individual opportunities to participate. *Many students stated that they liked having options and they could have interchanged between group work and working by themselves* at any point during the lesson thus creating a *more exciting, and enjoyable* classroom.

At the initial phase of this lesson, the teacher asked the students to decide whether they would prefer to work in groups or individually. The teacher then assigned working world questions in relation to profit and loss percentages given the cost and selling price of various items to those who would *be working in groups* as well as those who are working individually. After the solutions to the questions were found, both the grouped students and individual ones were required to present (verbally, song, role play, drawing etc.) any two of the questions.

As such, the teacher integrated Mathematics with Theater Arts (role play), Visual Arts (Drawings, Memes, & Pictures), Music (Songs), and Literature (Poems). This ensured that students who worked in groups were in a constant state of engagement with each other, whilst those who worked individually, were also engaged with the problem questions and not develop a feeling of exclusion.

As the lesson unfolded an interesting turn of events occurred. Some students who stated initially they would have preferred to work independently, formed groups amongst each other leaving only a few to work by themselves. In fact of the 13 students who stated they wanted to work individually, 3 groups of varied size (4, 3, and 3) emerged, leaving only three students to work by themselves. The students who stated in the previous session that they preferred grouped work were the ones to team up with others to get the task completed.

For this lesson the teacher intended to solidify the students' understanding of the concept of profit and loss percentage. However, it seemed that using the flipped classroom approach, more content was able to be covered. After questioning students on the concepts based on the videos, he realized that the class was able to move on very quickly to the other lessons. He also reviewed the online quiz from the previous session to determine how to proceed with the content. Students generally attained high marks from the previous session which indicated that the majority were ready to apply those concepts.

The responses from students in conjunction with their confidence of speaking indicated evidence of the use of the website by majority of the students. Students were again willing to express their ideas, views and own experiences in relation to the various concepts (cost price, selling price, profit, and loss) as they felt included and related to the lessons.

More students' journals as well as comments on the blog spot were seen. Students really described the various topics on the blog spot with more accuracy than before whilst simultaneously articulated their feeling, experiences and thoughts of the class activities on their blog. For every comment made by students on the

blog in relation to the various content materials, the teacher again added, adjusted and clarified their definition to ensure sufficient understandings are achieved.

As the lesson extended, the teacher once again gathered feedback from the students in relation to the website and its constituent components. *Most students again expressed positive comments towards the used of this “new” teaching and learning style.*

Generally, an overall smooth flow of the class was maintained. More time was again present in the classroom for one on one discussion with students as well as a lot more *opportunities for collaborative work amongst students* were also noted. *Students were really afforded opportunities to help and learn from each other* as well as work by themselves if they desired. Again, less teacher and more student talk was also another benefit that emanated though the use of the flipped classroom in conjunction with moving the lessons forward.

Thus far, the flipped classroom seems to have a tremendous positive impact on students' engagement in learning Mathematics and allows more opportunities for students to improve academically.

nated though the use of the flipped classroom as the lectures were already conducted via the videos presentations.

Thus far, the flipped classroom seems to have a tremendous positive impact on students' engagement in learning Mathematics and allows more opportunities for students to improve academically.

Date: 25-03-19

Journal Entry # 6

Lessons # 6: Computing Selling price of an item given the Cost price and Profit or Loss Percentage

Duration: 90 minutes

Another great session was conducted today. Students' excitement for learning was still at a peak. For this session a think-pair-share collaborative teaching and learning technique was utilized. This thereby allowed students to work individually for a period of time, then pairing with a colleague and finally share their responses, ideas and suggestions with the class.

At the initial phase of this lesson, the teacher probe students on the content material from the website in relation computing cost price of an item given the selling price and profit or loss percentage. He was very pleased that the majority of the students knew the content to a great extent which afforded students more time to apply and clarify and misconceptions or gaps in their knowledge. The teacher then assigned working world questions in relation to computing cost price of an item given the selling price and profit or loss percentage.

Most students at this point understood the “new” structure of the class and its general flow. With minimal prompts students worked individually for 10 minutes and then collaborated with their colleague for 15 minutes. As the teacher walk around, he was amazed by the conversations that occurred between groups.

Apart from the questions given in class, students were extending these questions and creating for themselves other scenarios where an individual would compute cost price of an item given the selling price and profit or loss percentage, and very interesting reasons for attaining a loss or profit. Clearly students'

creativity, thinking and problem solving skills are some of the 21st learning skill being developed along the process which is in line with the claims on the CSEC Mathematics Syllabus 2019

The responses from students in conjunction with their confidence of speaking further indicated evidence of the use of the website by majority of the students. Students were again willing to express their ideas, views and own experiences in relation to the various concepts (cost price, selling price, profit, and loss) as they felt included and related to the lessons. Students who do not usually speak or ask any question during classes are actively participating and at times initiating class discussions.

It was remarkable to attain a lot more students' journals as well as comments on the blog spot than previous class. Students really described the various topics on the blog spot with more accuracy than before whilst simultaneously articulated their feeling, experiences and thoughts of the class activities on their blog. Once again for every comment made by students on the blog in relation to the various content materials, the teacher again added, adjusted and clarified their definition to ensure sufficient understandings are achieved. Students suggested to add more music to the back ground of the videos and ensure that the videos are a bit more entertaining. This was addressed by the teacher later that evening where he replaced videos and/or created hyperlinks to redirect the students to more engaging and musical material.

As the lesson extended, the teacher once again gathered feedback from the students in relation to the website and its constituent components. Most students again expressed positive comments towards the used of this "new" teaching and learning style.

Generally, an overall smooth flow of the class was maintained. More time was again present in the classroom for one on one discussion with students as well as a lot more [opportunities for collaborative work](#) amongst students were also noted. [Students were really afforded opportunities to help and learn from each other](#) as well as [work by themselves if they desired](#). Again, less teacher and more student talk was also another benefit that emanated through the use of the flipped classroom in conjunction with moving the lessons forward.

Thus far, the flipped classroom seems to have a tremendous positive impact on students' engagement in learning Mathematics and allows more opportunities for students to improve academically.

Date: 26-03-19

Journal Entry # 7

Lessons # 7: Introduction to Discount Amount, Marked Price of an item & Discount Percentage on a Transaction

Duration: 45 minutes

Another great session was conducted today. For this session similar to the previous, another think-pair-share collaborative teaching and learning technique was utilized. This thereby allowed students to work individually for a period of time, then pair with a colleague and finally share their responses, ideas and suggestions with the class. Students seemed to thoroughly [enjoyed](#) this aspect

At the initial phase of this lesson, the teacher probe students on the content material from the website in relation computing selling price of an item given the cost price and profit or loss percentage. He was very

pleased that the majority of the students knew the content to a great extent which afforded students more time to apply and clarify and misconceptions or gaps in their knowledge. Some students however, seemed unfamiliar with the formula. As a means of addressing this, *students were unfamiliar were paired with those who were as to share their knowledge and information*. The teacher then assigned working world questions in relation to computing selling price of an item given the cost price and profit or loss percentage.

In relation to the think pair share strategy, *with minimal prompts students worked individually for 10 minutes* and then *collaborated with their colleague for 15 minutes*. As the teacher walk around, he was amazed by the conversations that occurred between groups. Apart from the questions given in class, students were once again extending these questions and creating for themselves other scenarios where an individual would compute selling price of an item given the cost price and profit or loss percentage, as well as very interesting reasons for attaining a loss or profit. Clearly *students' creativity, thinking and problem solving skills* are some of the 21st learning skill being developed along the process which are in tandem with the claims on the CSEC Mathematics Syllabus 2019.

The responses from students in conjunction with their confidence of speaking further indicated evidence of the use of the website by majority of the students. Students were *again willing to express their ideas, views and own experiences in relation to the various concepts* (cost price, selling price, profit, and loss) as they *felt included and related to the lessons*. *Students who do not usually speak or ask any question during classes are actively participating* and at times *initiating class discussions*.

It was remarkable to attain a lot more students' journals as well as comments on the blog spot than previous class. Students really described the various topics on the blog spot with more accuracy than before whilst simultaneously articulated their feeling, experiences and thoughts of the class activities. Once again for every comment made by students on the blog in relation to the various content materials, the teacher added, adjusted and clarified their definition to ensure sufficient understandings were achieved. Students suggested that our next session should include some game related activities to discuss the concept of discount which is the next sub topic to be covered via this unit of work.

As the lesson extended, the teacher once again gathered feedback from the students in relation to the website and its constituent components. Most students again expressed positive comments towards the used of this "new" teaching and learning style.

Generally, an overall smooth flow of the class was maintained. More time was again present in the classroom for one on one discussion with students as well as a lot more opportunities for collaborative work amongst students were also noted. Students were really afforded opportunities to help and learn from each other as well as work by themselves if they desired. Again, less teacher and more student talk was also another benefit that emanated though the use of the flipped classroom in conjunction with moving the lessons forward.

Thus far, the flipped classroom seems to have a tremendous positive impact on students' engagement in learning Mathematics and allows more opportunities for students to improve academically.

Date: 28-03-19

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Journal Entry # 8

Lessons # 8: Computing Marked Price and Selling Price given the Discount Percentage

Duration: 90 minutes

Another great session was conducted today. For this session similar to the previous, another think-pair-share collaborative teaching and learning technique was utilized in conjunction with role playing activities. Once again students' interest and enthusiasm was maintained

For the think-pair-share, students worked individually for a period of time, then pair with a colleague and finally share their responses, ideas and suggestions with the class. With minimal prompts students worked individually for 10 minutes and then collaborated with their colleague for 15 minutes. As the teacher walked around, he was amazed by the conversations that occurred between groups. Apart from the questions given in class, students were once again extending these questions and creating for themselves other scenarios where an individual would require to compute discount given on a particular item, as well as very interesting reasons why a dealer may give a discount within his/her business. Clearly students' creativity, thinking and problem solving skills are some of the 21st learning skill being developed along the process which are in tandem with the claims on the CSEC Mathematics Syllabus 2019.

At the initial phase of this lesson, the teacher probed students on the content material from the website in relation to the concept of discount together with the associated formulas. It was remarkable to know that

majority already had a solid foundation of what discount entails and how to compute it given other variables. Clearly this was one indication that students were utilizing the website created. This thereby facilitated fast pace environment where other learning outcomes were able to be achieved. Thus instead of only conducting a lesson involving the concept of discount, students were able to compute the discounted price given discount amount and selling price (lesson # 11) and compute the discounted price given discount percentage and selling price (lesson # 12).

The teacher was not only very pleased with the ease in which [student were able to work together to accomplish the tasks involved](#), but once again more time were afforded to students to apply and clarify and misconceptions or gaps in their knowledge. Also, the responses from students in conjunction with their [confidence of speaking](#) further indicated evidence of the use of the website by majority of the students. Students were again willing to express their ideas, views and own experiences in relation to the various [concepts](#) (cost price, selling price, profit, and loss) as [they felt included and related to the lessons](#). Students who do not usually speak or ask any question during classes are actively participating and [at times initiating class discussions](#).

In the second 45 minute session, a role play activity was conducted by the students to demonstrate and apply their knowledge in relation to discount and its computation. [Students were required to work in groups](#) of 7-8 to create and present a business that offers customers a discount on items. Students were required to assign roles for each other such as a manager, cashier, workers and customers. Also whatever items being sold within their business, they had to attach a discount amount and discount percentage for each item. They were

also required to compute the sale price for their customers. The other students who were not presenting were required to verify that the sale price given the discount amount and/or percentage were accurately computed in relation to the marked price of the items. This ensured continuous participation of all students. Their facial expressions and occasional nodding of their heads signaled to the teacher that they understood the lessons.

Students were allowed to choose whether or not they wanted to work in groups or by themselves. Only 3 students chose to work individually and as seen in a previous session two students began working together and requested to join a larger group. Only one student continued to work independently on assigned questions given by the teacher. This student since the commencement of this study worked independently for all session thus far.

As the lesson extended, the teacher once again gathered feedback from the students in relation to the website and its constituent components. Most students again expressed positive comments towards the used of this “new” teaching and learning style. Only one student however (not the independent worker) stated that she missed the teacher calling and writing notes as she was accustomed to that style of teaching since primary school. The teacher took note of this and perhaps in the next session incorporate aspects of the traditional classroom as a means of addressing this comment.

Generally, an overall smooth flow of the class was maintained. More time was again present in the classroom for one on one discussion with students as well as a lot more opportunities for collaborative work amongst students were also noted. Students were really afforded opportunities to help and learn from each other as

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well as **work by themselves if they desired**. Again, less teacher and more student talk was also another benefit that emanated through the use of the flipped classroom in conjunction with moving the lessons forward.

Thus far, the flipped classroom seems to have a tremendous positive impact on students' engagement in learning Mathematics and allows more opportunities for students to improve academically.

Date: 29-03-19

Journal Entry # 9

Lessons # 9: Introduction to Taxes & Sales Tax

Duration: 45 minutes

For the researcher, today was the most significant session conducted. **The student who continuously worked individually since the commencement of this study, collaborated with other colleagues based on the related task and topics explored**. The researcher felt accomplished when he saw such interaction occurring. **The student not only collaborated with other colleagues** within her small group, but also led discussions and **was willing to share her views, ideas and thoughts about the task**. The role she took was not a dominating one to overpower the other members, but rather a **team leader role where she listened to the views of other members, shared her thoughts and pooled the ideas together**. Everyone was **laughing, smiling and having fun whilst learning**. It really was refreshing for the researcher to witness such occurrence.

For this session an extension of the think-pair-share collaborative teaching and learning technique was utilized. The session began with a whole class discussion in relation to the previous subtopics under the unit

of work being conducted. The students were eagerly with minimal prompts raising their hands to answer questions and add their own meanings and interpretations of the various concepts. The teacher then listed 5 worded questions involving cost price of an item, selling price of an item, profit & loss amount, profit and loss percentages, discount amount and discount percentages. This strategy was inspired by the comment of a student during the previous session who stated that she missed the teacher calling out questions for them to write. Also, these questions were of mixed difficulty and were in line with the content material stipulated in the CSEC Mathematics syllabus 2019.

Students were then instructed to work individually for 10 minutes to answer the question given. After the students were instructed to pair with the person next to them to share their ideas and responses to the various questions. Each pair of students were then instructed to form small groups of 5-6 students to further share their ideas and answers to the questions. Thus a large number of small groups were joined to form a small number of large groups. It was wonderful to see the entire class interacting and working together towards solutions.

At this point the teacher noticed that the student who always worked individually, joined and formed a group. After inquiring the student stated that of all the previous sessions, today she finally found a group who she understands and can work well with members. She specifically stated "I've found my group...this is my group" as she nods her head. The teacher was most pleased.

Students admitted stated that the question were a bit difficult and they cannot get the answers. The teacher encourages the students to answer the question for themselves and assisted them by writing the correct answers to each question on the white board; not all at once; but one at a time.

As the **collaboration** continued, different groups were able to answer correctly some of the questions but not all. The teacher then placed one student from the group who answered the questions correctly within the groups who were having difficulties, to assist and guide the group. Thus each student who were place within another group acted as a leader for that question thereby **building communication and leadership skills which are further 21st century skills** that are in tandem with the claims on the CSEC Mathematics Syllabus 2019. This process continued for all five questions.

The teacher was not only very pleased with the ease in which student were able to **work together to accomplish the tasks involved**, but once again more time were afforded to students to apply and clarify and misconceptions or gaps in their knowledge. Also, the responses from **students in conjunction with their confidence of speaking** further indicated evidence of the use of the website by majority of the students. Students **were again willing to express their ideas, views and own experiences in relation to the various concepts** as they **felt included and related to the lessons**.

As the lesson extended, the teacher once again gathered feedback from the students in relation to the website and its constituent components. Most students again expressed positive comments towards the used of this “new” teaching and learning style and stated that they preferred this method and hoped that the classes continues in this manner.

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Generally, an overall smooth flow of the class was maintained with a lot of dynamism. More time was again present in the classroom for one on one discussion with students as well as a lot more opportunities for collaborative work amongst students were also noted. Students were really afforded [opportunities to help and learn from each other](#) as well as [work by themselves if they desired](#). Again, less teacher and more student talk was also another benefit that emanated through the use of the flipped classroom in conjunction with moving the lessons forward.

Thus far, the flipped classroom seems to have a tremendous positive impact on students' engagement in learning Mathematics and allows more opportunities for students to improve academically.

New benefits of the flipped classroom noted in today's session was that students were able to discover the most suitable and comfortable group to work with.

Date: 01-04-19

Journal Entry # 10

Lessons # 10: Computing Cost Price and Selling Price given the VAT

Duration: 90 minutes

For this session a whole and small group discussions were the major teaching and learning technique utilized. The session began with the teacher walking around the classroom collecting bathroom fees from students and informing them that this is a compulsory fee all students must pay in order to maintain and upkeep the

cleanliness of the bathroom. He also informed them that this fee is also used to purchase various toiletries for their own use. This then led a whole class discussion in relation to the concept of taxation and taxes that exist in relation to consumer arithmetic. The students were **excited** and **eagerly raised their hands to answer, ask questions and add their own meanings and interpretations of the various concepts.**

The discussions were really refreshing as **students asked their questions and were willing to learn more about how taxes work.** Students were also seen **responding to each other with very minimal prompts from the teacher.** Once the foundation was set, students were asked to think and list various types of taxes that may exist in our country. **It was astonishing to see students working individually in few cases but mostly in pairs to compare answers.** As the teacher walked around he listen to the interesting discussions occurring.

Solid evidence of the use of the website was seen here as students easily list various taxes and knew what those taxes entailed. As the lesson extended, the teacher once again gathered feedback from the students in relation to the website and its constituent components. **Most students again expressed positive comments towards the used of this “new” teaching and learning style and stated that they preferred this method and hoped that the classes continues in this manner.**

Generally, an overall smooth flow of the class was maintained and more time was again present in the classroom for one on one discussion with students as well as a lot more opportunities for the teacher and the students to really dig deep into a discussion forum. Students were **really afforded opportunities to help and learn from each other** as well as **work by themselves if they desired.** Again, less teacher and more student

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talk was also another benefit that emanated through the use of the flipped classroom in conjunction with moving the lessons forward.

Thus far, the flipped classroom seems to have a tremendous positive impact on students' engagement in learning Mathematics and allows more opportunities for students to improve academically.

New benefits of the flipped classroom noted in today's session was that more time for in-depth discussions and ideas were viewed broadly at an international level, then regionally and finally localized to the unit of work to be covered.

Appendix M

(Full list of quotes for the Student's Online Journals)

Categories	Description	Codes	Direct Quotes
Emotional Engagement	Student's personal preferences between the flipped approach and the traditional approach Student's likes, dislikes, ease of use, interest and thought about the flipped approach	Technology Orientation. User-Friendliness	Student 36: <i>I prefer pen and paper in class work where I can sit and take the time to analyse work and understand it.</i> Student 38: <i>I personally prefer doing Home-Work like how we are doing it now.</i> Student 36: <i>I felt that acting in front of an audience has helped me in Theatre Arts class.</i> Student 14: <i>It was really fun, funny and very very informative</i> Student 23:

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			<i>I love viewing the online recordings it encourages me and I to comprehend the inquiries better.</i> <i>Student 18:</i> <i>I enjoyed working with my colleagues...how we can choose what 'presentation' of some sorts we were going to do....how the teacher didn't dictate how we were to conduct our skits etc. but rather allowed us to think for ourselves what we were going to do.</i> <i>Student 37:</i> <i>It's fun learning math in a new method...I like having a feeling of involvement....and it's much easier to recall information</i>
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			<i>I believe this method makes it easier for subjects like math to be understood</i> <i>Student 24:</i> <i>The flipped classroom is reinforcing what was learnt in primary school but I understand it much better now than before. The play clarified all the confusion and everyone understood...</i> <i>Student 39:</i> <i>..everyone wanted to go up and do the play because it was an enjoyable class. Now that we have this website it is really good and is helping us do well.</i> <i>Student 38:</i> <i>I like the classes and hope this exercise continues</i>
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	Students develop a sense of belonging and bond with each other via their interaction with the various group activities such as role plays, debates and presentations	Group Membership	<i>I prefer them now because they are very interactive and fun.</i> <i>I also like the plays that we and</i> Student 16: <i>Frankly I am overly excited for our test next week Thursday .I feel confident so far. And I hope that you upkeep with the fun activities.</i> Student 24: <i>Today's class was enjoyable and very interactive</i> <i>Everyone had their own meanings and different ways to explain certain definition</i> Student 16: <i>I love the fact that children in my class that didn't usually converse, did. And I feel that if this method is upheld mathematics sessions</i>
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			<i>would bring our class closer together without anyone's awareness.</i> <i>Student 13:</i> <i>As we got closer to the children in class it made it much more easier to communicate with others if there were problems in a question</i>
Behavioural Engagement	Working together with peers to solve various problems, create working world scenarios via role plays, debates, and pictures	Collaboration	<i>Student 33:</i> <i>...class was enjoyable working with my group was also enjoyable as we got along pretty well...</i> <i>Student 13:</i> <i>I personally don't like working in groups but these group work have shown a lot of my skills towards me. I [now] preferred to work in groups for presentations you've</i>

			<i>got to work with different people sooner or later.</i> <i>Student 27:</i> <i>...we worked in pairs and it was helpful to understand the work and have a partner to help you if you got the wrong answer they would help you.</i> <i>Student 6:</i> <i>We worked in groups to help everyone understand the topic better and it worked for me,</i> <i>Student 16:</i> <i>Teamwork was nice and productive .I hope this amount of fun continues through the week month and year.</i> <i>Student 38:</i>
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	Student's individual level of contributing from 0 (not	Participation	<i>I actually like working in groups I find it fun and like performing the plays.</i> <i>Student 37:</i> <i>Today class was extremely challenging but we worked together to help each other and it wasn't so hard after that. I truly enjoyed it</i> <i>Student 24:</i> <i>Today's class was interactive and fun because we were placed in groups but also because we had to act out our questions.</i> <i>Student 14:</i> <i>This is the first time I saw classmates debating on a maths question which is good news :) .</i> <i>Student 6</i>
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	contributing) to 5 (highly contributing) towards class activities such as group work, and individual worded problems. Disagreements, problems and issues encountered whilst students were working in groups	Conflict	<i>I participate more in class now than I did before because of the fun class activities that we have.</i> <i>Student 14:</i> <i>I answered questions, way more than I usually do and sir helped me crystallize my definitions!</i> <i>Student 33:</i> <i>I'd rather work by myself to be honest because of the lack of cooperation with the other members</i> <i>Student 27:</i> <i>I do not like to work in groups. My reason being, the attitude of some of the children in class. It is either they leave you out of the group and make it look like</i>
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			<i>you did nothing at all or their behaviour just really stinks.</i> <i>Student 39:</i> <i>I do not like to work in groups or pairs so that was the bad part of it for me. I rather do my work on my own, that way I can focus.</i> <i>When working with others I have to wait on them and that's really annoying.</i>
Cognitive Engagement	Willingness and determination to master complex task, and problems Students have control over their pace of learning to attain solid understanding	Persistence Autonomy	<i>Student 6:</i> <i>I get the whole concept of it more but I have to keep trying to get better</i> <i>Student 31:</i> <i>If you got something wrong you got another chance and saw where your mistakes were...</i> <i>Student 11:</i>

	of the content materials		<i>we made our own questions and I think this is to show if we understand the topic, instead of the usual test teachers give</i> <i>Student 38:</i> <i>Doing the plays lets everyone understand the work in their own learning style.</i> <i>e.g. VISUAL, AUDITORY AND KINESTHETIC</i>
	Students developed a depth of information that they can make recommendations to enhance the flipped technique	Critical Thinking	<i>Student 16:</i> <i>More plays and games would improve the class.</i> <i>Student 18:</i> <i>Sir needs to add games.</i>

Appendix N

Student Interviews

Semi – Structured Student Interview Protocol

Students # 27 (low engagement level), 23 (medium engagement level), 36 (high engagement level)

1. Which method between the flipped and the traditional style of teaching and learning do you prefer? Why?

Student number 27: Flipped classroom, cause it's more interesting to learn and you can get together with your class mates and do like plays and stuff and do something fun together. Yes it's more fun.

Student number 23: The Flipped. Because we dealing with technology and to get like my attention more I rather do it by the technology way than you know writing all the time and going through the note book or text.

Student number 36: I like the traditional style of teaching because the more questions I get, its better, it helps me because practice helps me. No I don't think the flipped technique doesn't have enough questions it's just we use to get more Home-work and all of that. I won't say I love Home-Work but it helps and I enjoy doing Maths.

The flipped method is ok for doing Home-work because the quizzes are easy, they are not so hard. The time is ok but I don't really run out of time but when I started doing it, I ran out of time but now that I'm doing it, I did over some of them and it was easier to do.

2. What are your thoughts about the website?

Student number 27: It's interesting, very interesting! Am the videos you get to learn the different methods of how to work out a sum, then you have the quiz to do after to make sure you understand it, so it's interesting. Yes I find it's interactive.

Student number 23: My thoughts about the website is that it easier to comprehend too and it attractive and like technology wise like the videos and stuff it easier to like understand.

Student number 36: When we were doing everything, all of the answers and every questions I had the answers were already there in the website. All the questions I had, so like if I didn't understand something, I could go in the website to understand it. I find the website was helpful.

3. What do you enjoyed most about this new teaching and learning style?

Student number 27: The presentations like the plays and different acting to show what we understand so far.

Student number 23: I enjoy working in the groups, watching the videos and like doing the quizzes online cause like it have a time and I like competition so.

Student number 36: It was very interactive in class. We get to go up on the board and all of that.

4. What did you enjoyed least about this new teaching and learning style?

Student number 27: When you had to change up the groups. Yea I want to stay in the same group and not move again.

Student number 23: Least about the approach is that, hmm I don't really have anything. I enjoyed every single aspect.

Student number 36: Having to write journals. No, it's ok. It's just I have to go find time to go on the computer to go and do the quizzes and all that but when I'm doing the quizzes I does enjoy it.

5. Which method between the flipped and the traditional style of doing homework do you prefer? Why?

Student number 27: Flipped, you get to go home and watch videos and understand and keep on, so you can watch it over and understand it more.

Student number 23: The flipped method, because like the flipped method you can do it like any time, any time. Even if you stay home, you can still do it.

Student number 36:

6. Describe your level of participation in class activities since we started this unit of work

Student number 27: Three, Cause I participated in the first group activity that we did but I think the third one I didn't, well the second group activity we did, I didn't do anything cause well they started getting on and I couldn't handle them cause remember we switched the groups. I couldn't handle the students that I switched with...Not sure why not a five.

Student number 23: My level of participation is like 4 because the last quizzes I didn't get to do like two, so it's like it is a fault cause I did all, and I didn't hand in some journals so yea. Not a five because I didn't get time to hand in the journals.

Student number 36: Four, not a five. When we were doing the topic Friday I was not really enjoying class, because I was going through it and when I got the answer it

was right on and when I was working it out, it made sense to when I was working it out but like I just got the answer and like I didn't know how to do it. I didn't know the explanation behind it at the moment.

7. What were your experiences working and collaborating in class activities with other colleagues?

Student number 27: Some interesting, enjoyable. Well they creating the scenario for us to act out but they wasn't bringing me to the part of it to help out with the scenario. They tell me, I have to make my own scenario, they don't want me to come and join them, they turning away, they talking to each other instead of talking to me.

Student number 23: Their way of thinking and like I didn't use to socialize with other students as much and like it have very intelligent students in class so now I realize that and yea they really helpful. Yes, working with others helped me and it helped the class also because a lot of us didn't use to you know sit down and chat with each other and that brought the class closer.

Student number 36: It was a good experience because everybody was creative in how we did each scenario, that's the acting in front of the class. Yes it was helpful working with other colleagues because sometimes, it have people in class that doesn't talk too much but when you get to know them you realize they is ah good person.

8. Do you recommend this style of teaching and learning to continue in Mathematics?

Why or why not?

Student number 27: Definitely yes! It's interesting, it makes it fun and as you say the more you enjoy it the better you'll learn.

Student number 23: Yes, because it kinder builds a bond and it easier to learn. I recommend it for like all schools.

Student number 36: Yes, because so like if some classes, you just sit down and take notes but you get to interact with people, you get to do different activities and things like that.

9. Do you recommend that this style of teaching should be implemented in other subject areas? Why or why not?

Student number 27: Yea, cause it would make it easier for children to learn and they could learn at their own pace. No particular subject it should be implemented in but generally it should be in other subjects.

Student number 23: Yes, because in other subject areas, working alone it's kinder hard, and like you see languages it would be easier to understand if this was like implemented in languages. Yes it would be feasible in Language and Geography. Maths is part of Geography and a part of Science and IT, because Consumer Arithmetic

I think, something, something and Algebra is a part of Integrated Science and you need numbers to calculate stuff in Geography and a part of IT. Yes I realize there is a kinder interconnection in this approach.

Student number 36: I recommend it but I don't see how they are going to do it. Like for English A, I don't see how they going to do that for that. Mathematics is like, so I find Mathematics is easy because every answer has a logic behind it. So for English is doesn't have a logic behind it, you just doing it because they say to do it. Yes some subjects it can be implemented and some subjects it may not be as best. Well some subjects you really need to try something different, because right now, so let's say for IT right now we just taking notes and it not really fun. Yes I am enjoying this approach.

10. What would you recommend to improve this new teaching style?

Student number 27: Probably, just am the videos could be a bit more interesting with a little cartoon or something. Like how you did the statistics video for the Frog video. Like how it was a bit funny but at the same time with a little more animations.

Student number 23: Add in? I think it's perfect just the way it is. We need more music videos, more attractive background music in just a few.

Student number 36: I would recommend games. Maths games and general games. I just didn't like the journals. Sometimes I can't remember what we actually like did, the activities cause I don't write journals like right away so I does forget stuff.

Appendix O

Focus Group Interviews

Focus Group # 1 - Student Engagement Interview Questions

(Students # 3, 6, 12, 14, 35)

1. Which method between the flipped and the traditional style of teaching and learning do you prefer? Why?

Student number 35: I find the flipped classroom is better because it's easier to remember stuff compared to like all the classrooms before because the classroom before not everyone was working together or solving the questions as easy as now, so.

Student number 12: Am when I think in the classroom when people don't understand questions that it's better for the children to come and help them by rather than trying to work it out by yourself or going by the teacher you can have other people understand it also and stuff. I prefer the flipped classroom.

2. What are your thoughts about the website?

Student number 14: Am my thoughts about the website, it is well built. Am I could see myself using it more often. I like the videos to help myself like yesterday I wasn't

here for the VAT and I watch the videos and I understood it. Am and the quizzes to help me understand and get better in certain areas of these Consumer Arithmetic.

Student number 35: I find for me for a recommendation is that like some of the videos can be very boring to people. People tend to lose their focus on the videos. Like it would have the information but how they speak it like tends to drain out your energy and it just feels like, feels like oh my goshhh.

3. What do you enjoyed most about this new teaching and learning style?

Student number 6: I enjoy am the videos the most, watching the videos because it help meh understand better. I enjoy working with people.

Student number 35: I find the presentations was most interesting because how people could come together as a group and make up ah problem or make up a skit to explain everything instead of like just writing it on the board and trying to explain cause not a lot of people want to be on the board trying to explain anything so they get to do it in the skit or presentation.

4. What did you enjoyed least about this new teaching and learning style?

Student number 35: I think that could be improved is when yuh in group work and some people like when you doing the questions that are like sometimes difficult some people tend to just give up and they don't end up helping and yuh just kinder lost. So

when yuh sitting down there doing the questions with the other group and yuh trying to get their input they not saying anything or anything like that.

5. Which method between the flipped and the traditional style of doing homework do you prefer? Why?

Student number 3: I prefer doing the traditional way. Sometimes class does be loud.

Student number 12: I prefer the flipped because for me it's easier to do the Homework and you can write your own method of how you understand it in your own ways and it's way easier than the traditional am in terms of amount of work.

6. Describe your level of participation in class activities since we started this unit of work.

Student number 35: Between the traditional way, I would say my participation for traditional is like if you had to come up on the board and write, I would say a 2 because I tend not to, cuz I don't know if my answer is correct or wrong so I tend to to like have an anxiety like do I wanna go up there and write my answer? and people would say no that wrong but when I'm doing it am the other way I would say more a 4 because it's a group working, so you could get to talk it out with your group see if ur correct or wrong and then you could get your answer. Am I think what would make my

participation a 5 is like what what usually happen to me I tend to like to do work individually so me working with other people is not as easy as working with myself cause I tend, cause I got so use to working by myself. Group work is kinder difficult for me.

7. What were your experiences working and collaborating in class activities with other colleagues?

Student number 3: It's much more easier to work with your colleagues especially your friends cause they like understand if you're having trouble. Like be shy when you don't talk to other persons and so like you can communicate more better.

8. Do you recommend this style of teaching and learning to continue in Mathematics?
Why or why not?

Student number 35: Yes because Maths suppose to be ah, its sort of a Science, yes it suppose to be more numbers and everything like that right. What before as traditional

way its, you still learn your work but its less, its less fun and its less cooperative or socializing as with the traditional but in the flipped classroom you get more participation, you get more work done its way more fun than the traditional way and it's easier to understand if you look at it.

9. Do you recommend that this style of teaching should be implemented in other subject areas? Why or why not?

Student number 14: I recommend this in other subjects because am other subjects can be difficult too and some of them you would learn your work but it just not inspire you to go further in that subject. Like for example Science, I love Science, I understand Science but sometimes you forget all the things you learn because it's just notes you taking down and your trying to memorize it. Your not trying to actually like have fun how we are doing the flipped classroom and it staying in our brains.

Student number 35: I find it should be more recommended for some subjects especially like History or sometimes even Music because those two subjects there is a lot of work in it, like a lot of work and then you tend to forget a lot of it because there is nothing really implemented in to it because and History, the teacher comes into class, you write notes, he talks a little about it and then he leaves, literally. So, and history suppose to be a fun subject for me cause I love History and I love Music but it's kinder of difficult in that case.

10. What would you recommend to improve this new teaching style?

Student number 35: I think it should have more than one websites recommended like for me I use the website you created and I use Candid Academy as another one cause that's another good website I use to learn my work. So sometimes you can use Youtube, sometimes you can use the website your teacher creates or you can use another website like your parents suggested to you cause you learn more and it's easier to remember everything and sometimes they would have like challenges or quizzes and all of those stuff and it would help you to learn your work better.

Focus Group # 2 - Student Engagement Interview Questions

(Students # 21, 22, 24, 25, 37, 38)

1. Which method between the flipped and the traditional style of teaching and learning do you prefer? Why?

Student number 38: The flipped method. I prefer that method because it more interactive, more entertaining, more enjoyable and you still getting the work done.

Student number 37: I prefer the flipped method as well. Am because even though you doing work you still being able to see other ways of doing it like without a teacher in

front of you and like that and you able to hear different things and see different practical methods without you being in a classroom setting or like when you are home.

2. What are your thoughts about the website?

Student number 21: I prefer the website than actual class am time because it have the blog spot where you could am get your definitions and if you have any issues or problems you could go there and am well the videos making yuh, yuh understanding the videos more than the actual teaching because it have am lot of am what's the name of it animations to make it feel interesting.

Student number 38: The website also includes the three learning styles, visual, auditory and kinesthetic in it so that you can also like the website.

Student number 37: Am as she mentioned that it include all three learning styles. Am For other people who mighten like the sitting down in class and doing this kinder of setting, it's nicer because on that website there is the blog spot where you can ask different things without like the teacher in front of you there and there is no other excess noises around you, no distractions and stuff like that and you know you in your own space and you could do your own work and be more focused.

3. What do you enjoyed most about this new teaching and learning style?

Student number 22: I like to do the plays because it does help you interact more with children in your class and it helping yuh understand the topics more.

Student number 37: I like, what I like most about this whole thing is the use of technology and being able to do things like, like in the arts as in like Visual arts and stuff like you can draw, you could do whatever. I like too that the videos and the website are still there even if you didn't get to do a day or something like that, it would still be available there for you to use it even though, you know.

Student number 25: I like it because you could get to see videos and stuff and it could be easier to take down notes and stuff seeing it instead of the teacher talking.

Student number 24: I like it because you get to take your own notes from however you perceive the work to be, other than the teacher writing down notes and you just taking it down you get to understand it more.

4. What did you enjoyed least about this new teaching and learning style?

Student number 38: The music and the video that have the Indian lady and the voices and the background music in the another profit and loss video. Not the one with the fairy, leave the fairy.

5. Which method between the flipped and the traditional style of doing homework do you prefer? Why?

Student number 24: I prefer the flipped method because when you get Home-work or something in class, you could go and watch the video and understand it more and you have quizzes to do after, after you watch the video than when you do it in school and you have to go home and remember everything, it right there.

Student number 38: I also prefer the flipped method to do your Home-work because like I say if you didn't come to school that day and you didn't get that note, you could always go onto the website and look at the video instead of taking down wrong notes from other people in the class.

Student number 37: I also like doing the flipped method for Home-work because like she said if you won't there on that particular day and you have Home-work to do for it, am the notes are available there for you or the videos or whatever are available there so that you can be able to do it without having to am ask anybody else for notes that

you like won't there for. So I think it's more convenient in that way and it still would be there available for and yea you can do it in your own words to, the way you write and stuff to understand it.

Student number 21: I personally prefer the traditional method but so far I mix the traditional method with the flipped method because in the traditional method you get to go and write down, in go in your note book and watch the notes and you could use the notes and the website at the same time and still get the work done. So I prefer both methods. Yea I like the combination.

6. Describe your level of participation in class activities since we started this unit of work.

Student number 21: In the participation has increased a lot because we get more interactive time with your classmates and your pairs and you get to understand different everybody's opinions and you get to put your own opinions into the play as well so.

Student number 38: Between the two methods, my participation was the same because I like to share my opinion with other people. I find some of my opinion to be valid.

Student number 37: Sir it has increased a lot more too because of the interaction with other people in the class at the same time and it helps me to understand other methods and understand other ways of doing things which other people would have been doing and to make sure that yuh have the right way of doing it or understanding the topic that yuh doing and to the am the level of understanding and cooperation with each other.

7. What were your experiences working and collaborating in class activities with other colleagues?

Student number 25: I thinks it's good to collaborate with other colleagues because it help us to work better with each other and with all of us doing it together we would get the work done faster.

Student number 22: I enjoyed working with other colleagues because I understand the work more and get more done faster.

Student number 38: I also like collaborating with other colleagues during this activity because I wouldn't have collaborated with some of the people that yuh put me in the group with. If you didn't put me there.

Student number 24: It was better collaborating with your colleagues because they have different ways of explaining things than the teacher. It may have an easier way that they learn somewhere, a method that would be easier for you to understand than what is written in the board.

Student number 37: I am really enjoyed working with colleagues because of the variety of things that could be done as ideas for plays and stuff like that and the different type of techniques that we would have used that I might not myself have not thought about. So I really like working with colleagues.

8. Do you recommend this style of teaching and learning to continue in Mathematics?

Why or why not?

Student number 37: Am personally I really didn't like Maths before cause it use to get me so board and I really never use to just (audio unclear), cause every time I do something is like ah second guess myself and then I'll just. So now the method that we use because I'm an auditory learner it easier for me now to hear what's going on around me and like ok so if I do this this this in terms of the plays I would remember so we did this to get to this way and stuff like that. So I would recommend it because it's was easy for me and probably would be for somebody else.

Student number 21: I think it should go on because, the am website itself it have some really nice funny videos that it helping you understand and it have a sense of humor in it well. It nice, it just nice overall.

Student number 38: I would recommend this website to other children because some of them might have been am facing the same problem as you before the website was in progress.

Student number 24: I like the flipped method because I really didn't like Consumer Arithmetic before, when we learn it before and now that it has different videos and different interactive ways in class to like learn the same thing that we learn before but it's more fun and easier to memorize it. So I like the flipped classroom better.

9. Do you recommend that this style of teaching should be implemented in order subject areas? Why or why not?

Student number 25: I recommend this for other subjects because it's more fun and helps you understand the subject more.

Student number 37: Am I would definitely recommend it for other subject areas because if I could like this method in Mathematics and which is not really like one of

meh real good subjects but am I would definitely enjoy it for every other subject I would have.

Student number 21: I would like it in other subjects because the same interactive way it have in Mathematics, it would be converted to the other subject areas and then am people who are weak in the different subject areas once they have that they could raise their marks and get to understand the subjects better just like in Maths.

Student number 22: I would recommend this approach to other subjects because I didn't really like or understand Maths before and this approach helped me to understand it so I would recommend it for other subjects.

10. What would you recommend to improve this new teaching style?

Student number 25: Put some Maths games and stuff for us.

Student number 37: For this method am because it is something that incorporates technology am I think that what also could enhance this is that we have some type of technology even when we in the classroom besides just that at home but in the classroom as well.

Student number 38: To enhance this method, I would really like if you put it in a different subject area and like the people that doing, that weak in that subject area could

actually get the choice if they want to do it or if they don't want to do it right, so the people who stronger can focus on a different one, another subject.

(Full list of quotes for the semi structured and focus group interviews)

Categories	Description	Codes	Direct Quotes
Emotional Engagement	Student's personal preferences between the flipped approach and the traditional approach	Technology Orientation.	<i>Student 27(Individual) :</i> <i>[I prefer] the flipped classroom, cause it's more interesting to learn...</i> <i>Student 23(Individual):</i> <i>[I prefer] the flipped classroom...</i> <i>[because] I rather do it by the technology</i> <i>I enjoyed every single aspect.</i> <i>Student 36(Individual):</i> <i>I like the traditional style of teaching because the more questions I get, its better...</i> <i>I find the website was helpful...it was very interactive in class...</i>

			<i>I am enjoying this approach.</i> <i>Student 35 (Focus Group) :</i> <i>I find the flipped classroom is better</i> ... <i>Student 12 (Focus Group):</i> <i>I prefer the flipped classroom.</i> <i>I prefer the flipped because for me</i> <i>it's easier to do the Home-work</i> <i>Student 38 (Focus Group):</i> <i>The flipped method...</i> <i>I also prefer the flipped method to</i> <i>do your Home-work...</i> <i>Student 37 (Focus Group):</i> <i>I prefer the flipped method as well...</i> <i>I also like doing the flipped method</i> <i>for Home-work...</i> <i>Student 21 (Focus Group):</i> <i>I prefer the website than actual</i> <i>class...</i>
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	Student's likes, dislikes, ease of use, interest and thought about the flipped approach	User- Friendliness	<i>I personally prefer the traditional method [for homework] ... because yuh get to go and write down, am go in your note book and watch the notes</i> <i>...I prefer both methods... I like the combination.</i> <i>Student 3 (Focus Group):</i> <i>I prefer doing [homework] the traditional way [because] sometimes class does be loud.</i> <i>Student 24 (Focus Group):</i> <i>I prefer the flipped method [when doing homework]</i> <i>Student 27(Individual):</i> <i>Yes it's more fun!</i> <i>It's interesting, very interesting!</i> <i>I find its interactive</i> <i>[I don't like] When you had to change up the groups</i>
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			[I like] <i>The presentations like the plays and different acting to show what we understand so far.</i> <i>Student 23(Individual):</i> <i>...it attractive and I like technology...</i> [I like this] <i>interconnection in this approach.</i> <i>Student 35 (Focus Group):</i> <i>...it's easier to remember stuff compared to like all the classrooms before... its way more fun than the traditional way and it's easier to understand</i> <i>Student 38 (Focus Group):</i> <i>... it more interactive and more entertaining and you still getting the work done...like the website</i> <i>Student 37 (Focus Group):</i>
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			<i>...I like most about this whole thing is the use of technology and being able to do things like, like in the arts as in like Visual arts... I like too that the videos and the website</i> <i>Student 21 (Focus Group):</i> <i>It nice, it just nice overall.</i> Student 14: <i>I like the videos...</i> <i>...how we are doing the flipped classroom [the work] staying in our brains...</i> <i>Student 6 (Focus Group):</i> <i>I enjoy am the videos the most,</i> <i>Student 22 (Focus Group):</i> <i>I like to do the plays...</i> <i>Student 25 (Focus Group):</i> <i>I like...to see videos...</i>
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	Students develop a sense of belonging and bond with each other via their interaction with the various group activities such as role plays, debates and presentations	Group Membership	<i>...I recommend this for other subjects because it's more fun and helps you understand the subject more...</i> <i>Student 24 (Focus Group):</i> <i>...it's more fun and easier to memorize [the work]</i> <i>Student 23(Individual):</i> <i>...a lot of us didn't use to you know sit down and chat with each other and that (group work) brought the class closer...it kinder builds a bond...</i> <i>Student 36(Individual):</i> <i>...it have people in class that doesn't talk too much but when you get to know them you realize they is ah good person</i> <i>Student 38 (Focus Group):</i> <i>...I wouldn't have collaborated with some of the people that yuh put me</i>
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			<i>in the group with. If you didn't put me there..</i> <i>Student 21 (Focus Group):</i> <i>....you get to understand different am everybody opinions and you get to put your own opinions into the play as well.</i>
Behavioural Engagement	Working together with peers to solve various problems, create working world scenarios via role plays, debates, and pictures	Collaboration	<i>Student 27(Individual):</i> <i>Some [groups were] interesting, enjoyableyou can get together with your class mates and do like plays and stuff and do something fun together.</i> <i>Student 23(Individual):</i> <i>I enjoy working in the groups</i> <i>...working with others helped me and it helped the class also...</i> <i>... Working alone it's kinder hard...</i> <i>Student 36(Individual):</i>

			<i>It (group work) was a good experience.... it was helpful working with other colleagues</i> <i>... you get to interact with people, you get to do different activities</i> <i>Student 35 (Focus Group):</i> <i>...the classroom before not everyone was working together or solving the questions as easy as now.... because how people could come together as a group...</i> <i>[In] group working...you could get to talk it out with your group see if ur correct or wrong and then you could get your answer...</i> Student 12: <i>[The flipped classroom is] better for the children to come and help them by rather than trying to work it out</i>
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			<i>by yourself... you can have other people understand it also and stuff</i> <i>Student 6 (Focus Group):</i> <i>I enjoy working with people.</i> <i>Student 22 (Focus Group):</i> <i>...the plays...does help you interact more with children in your class and it helping yuh understand the topics more.</i> <i>Student 21 (Focus Group):</i> <i>I enjoyed working with other colleagues because I understand the work more and get more done faster.</i> <i>Student 38 (Focus Group):</i> <i>I also like collaborating with other colleagues during this activity...</i> <i>Student 37 (Focus Group):</i> <i>[Group work] helps me to understand other methods and</i>
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			<i>understand other ways of doing things...</i> <i>I am really enjoyed working with colleagues because of the variety of things that could be done as ideas for plays... and the different type of techniques that we would have used that I might not myself have not thought about.</i> <i>Student 3 (Focus Group):</i> <i>It's much more easier to work with your colleagues especially your friends... you can communicate more better.</i> <i>Student 25 (Focus Group):</i> <i>...it's good to collaborate with other colleagues because it help us to work better with each other and with all of us doing it together we would get the work done faster.</i>
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	Student's individual level of contributing from 0 (not contributing) to 5 (highly contributing) towards class activities such as group work, and individual worded problems.	Participation	<i>Student 24 (Focus Group):</i> <i>It was better collaborating with your colleagues because they have different ways of explaining things</i> <i>Student 27(Individual):</i> [My level of participation was] <i>three, cause I participated in the first group activity.... the second group activity we did, I didn't do anything</i> <i>Student 23(Individual):</i> <i>My level of participation is like 4.... because I didn't get time to hand in the journals.</i> <i>Student 36(Individual):</i> [My level of participation was] <i>Four ... When we were doing the topic Friday I was not really enjoying class, because... I just got</i>
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			<i>the answer and like I didn't know</i> <i>how to do it... it at the moment</i> <i>Student 35 (Focus Group):</i> [My participation] <i>I would say more</i> <i>a 4...because... you could get to talk</i> <i>it out...</i> <i>...the flipped classroom you get</i> <i>more participation, you get more</i> <i>work done...</i> <i>Student 21 (Focus Group):</i> [My] <i>participation has increased a</i> <i>lot because we get more interactive</i> <i>time</i> <i>Student 38 (Focus Group):</i> <i>Between the two methods, my</i> <i>participation was the same...</i> <i>Student 37 (Focus Group):</i> [My participation] <i>has increased a</i> <i>lot more too because of the</i>
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	Disagreements, problems and issues encountered whilst students were working in groups	Conflict	<i>interaction with other people in the class at the same time...</i> <i>Student 27(Individual):</i> <i>...cause well they started getting on and I couldn't handle... the students that I switched with...</i> <i>[Some groups] ... they don't want me to come and join them, they turning away, they talking to each other instead of talking to me.</i> <i>Student 35 (Focus Group):</i> <i>...when yuh in group work... some people tend to just give up and they don't end up helping.... and yuh trying to get their input they not saying anything...</i> .
Cognitive Engagement	Willingness and determination to	Persistence	<i>Student 27(Individual):</i>

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	master complex task, and problems Students have control over their pace of learning to attain solid understanding of the content materials	Autonomy	<i>..you get to go home and watch videos and understand and keep on...</i> <i>Student 36(Individual):</i> <i>...when I started doing it (homework)</i> <i>, I ran out of time but now that I'm doing it, I did over some of them and it was easier to do.</i> <i>Student 21 (Focus Group):</i> <i>...yuh could use the notes and the website at the same time and still get the work done...</i> <i>Student 27(Individual):</i> <i>..you can watch it over and understand it more.</i> <i>...it (flipped approach) would make it easier for children to learn and they could learn at their own pace...</i> <i>Student 23(Individual):</i>
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			<i>...the flipped method you can do it like any time, any time. Even if you stay home, you can still do it and even if you still don't understand, you can look at other videos like on YouTube to help...</i> <i>Student 21 (Focus Group):</i> <i>...it have the blog spot where you could am get your definitions and if you have any issues or problems you could go there and am well the videos making yuh, yuh understanding the videos more than the actual teaching</i> <i>Student 37 (Focus Group):</i> <i>...even though you doing work you still being able to see other ways of doing it like without a teacher in front of you ...like when you are home.....you in your own space and</i>
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			<i>you could do your own work and be more focused.</i> <i>...you can be able to do [homework] without having to ask anybody else for notes... it's more convenient in that way...</i> <i>Student 14 (Focus Group):</i> <i>I like the videos to help myself... and get better in certain areas I wasn't here for the VAT and I watch the videos and I understood it.</i> <i>Student 6 (Focus Group):</i> <i>...watching the videos because it help me understand better...</i> <i>Student 25 (Focus Group):</i> <i>... [the videos makes it] easier to take down notes and stuff seeing it instead of the teacher talking.</i> <i>Student 24 (Focus Group):</i>
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	Students developed a depth of information that they can make recommendations to enhance the flipped technique	Critical Thinking	<i>...you could go and watch the video... you get to understand it (topics) more and if I still don't get it, then I ask Google...</i> <i>Student 12 (Focus Group):</i> <i>...you can write your own method of how you understand it in your own ways and it's way easier than the traditional...</i> <i>Student 38 (Focus Group):</i> <i>... say if you didn't come to school....you could always go onto the website and look at the video instead of taking down wrong notes from other people in the class.</i> <i>Student 27(Individual):</i> <i>...the videos could be a bit more interesting with a little cartoon...</i> <i>Student 23(Individual):</i>
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			<i>We need more music videos, more attractive background music</i> Student 36(Individual): <i>I would recommend games, Math games and general games...</i> Student 21 (Focus Group): <i>...I would like it in other subjects because ... people who are weak in the different subject areas once they have that they could raise their marks and get to understand the subjects better just like in Maths</i> Student 37 (Focus Group): <i>...I think that what also could enhance this is that we have some type of technology even when we in the classroom besides just that at home but in the classroom as well.</i> Student 14 (Focus Group):
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			<i>...I recommend this in other subjects because...how we are doing the flipped classroom and it staying in our brains.</i> Student 25 (Focus Group): <i>I recommend this for other subjects because it's more fun and helps you understand the subject more....</i> <i>Put some Maths games...</i> Student 38 (Focus Group): <i>To enhance this method, I would really like if you put it in a different subject area... people that weak in that subject area could actually get the choice if they want.... people who stronger can focus on a different one, another subject...</i> Student 22 (Focus Group): <i>I would recommend this approach to other subjects because I didn't</i>
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			<i>really like or understand Maths before and this approach helped me to understand it so I would recommend it for other subjects.</i> Student 35 (Focus Group): <i>I think it should have more than one websitesit would help you to learn your work better ...cause you learn more</i>
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Appendix P

Online Blogs

Student No.	Blog Comments
1	
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9	
10	1. Consumer Arithmetic deals with people using money in their everyday lives. For example, Selling/Buying an item, taking a loan. Profit and Loss Profit is when someone or a company make more money than they bought an item for. Loss is when someone or a company makes less money than they bought an item for. 2. Cost Price (C.P) is the original price an item was bought for from the manufacture. Other words for cost price is manufacturer price, factory price, original price. Selling Price (S.P) is the amount of money the company sells an item to consumer. Other words for selling price ~ retail price, marked price, store bought price.
11	
12	
13	

14	consumer arithmetic is what us consumers use on a daily basis e.g. counting, financing etc. cost price is the original price the manufacturer used to create the item; other words for it are: original price, manufacturing price, initial price selling price is the price an dealer sells after being bought from the manufacturer to us consumers; other names for it are: market value, marked price. profit is when your selling price is increased and is more than the manufacturing price. loss is when there is no gain and the cost price is higher than the selling price.
15	1) Consumer Arithmetic deals with money and how people use it in their everyday life e.g. Purchasing groceries, making a down payment on a house. 2) 2) Cost Price is the original price of an item which comes straight from the manufactured. 3) Selling Price is the price an outside dealer sells to the consumer to make a profit or a loss. 4) Profit is the increase in an investment. 5) Loss is the decrease in an investment.
16	1. so far so good. the website is actually very helpful on my end .I am actually doing good on the quizzes and getting better at

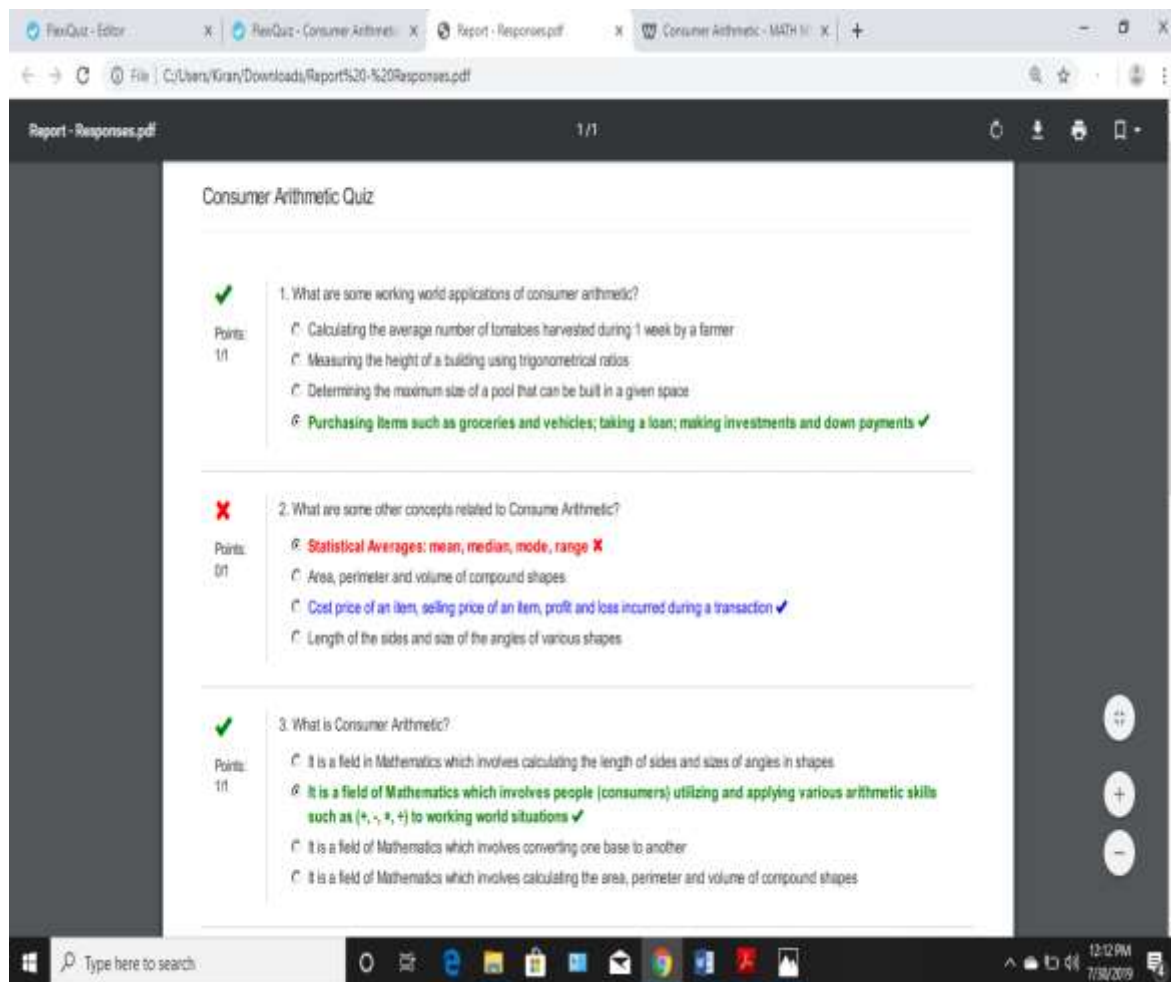
	understanding the topics than i did whiles using a textbook for homework 2. cp;the money paid to buy an item sp;the money recieved on selling an item profit; $sp > cp$ loss; $cp < sp$
17	
18	
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22	
23	
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25	
26	This website is very helpful and attractive. I have no problems with it at all. I personally prefer this over the mathematics in class
27	
28	
29	
30	
31	Consumer arithmetic is day-to-day math people(consumer) use when dealing with money. It is related to counting, buying, saving and interest. It is used when you buy something for a shop or when you invest in buying a car.

32	
33	
34	
35	The website is quite easy to follow. The videos are extremely helpful and it's definitely easier to remember and take notes. I hope we use the method of teaching more often Cost price(C.P) is the original price of an item from the manufacturers. Selling price(S.P) is the "marketed price" of an item that consumers buy to make a profit. Profit is the gain of money that is more than the cost price when subtracted from the selling price. Loss is the deduction or financial loss where the you get less money than the cost price. Profit and Loss doesn't only deal with money but many other things.
36	consumer arithmetic involves everyday people like customers using various math operations. It is related to addition subtraction multiplication and division. Two examples of this are wages and hire purchase.
37	1. The format of the page is quite simple and easy to follow and I have no problems 2. sir can you please send your email address thank you

38	1.Consumer Arithmetic is the way consumers give or take money. 2. Profit is when you gain extra money. 3. Loss is when there in is no gain.
39	I understand Consumer Arithmetic but what I'm having a hard time with is Mean, mode and those things. Can you please explain it to me. Thank You
40	
41	
42	
43	

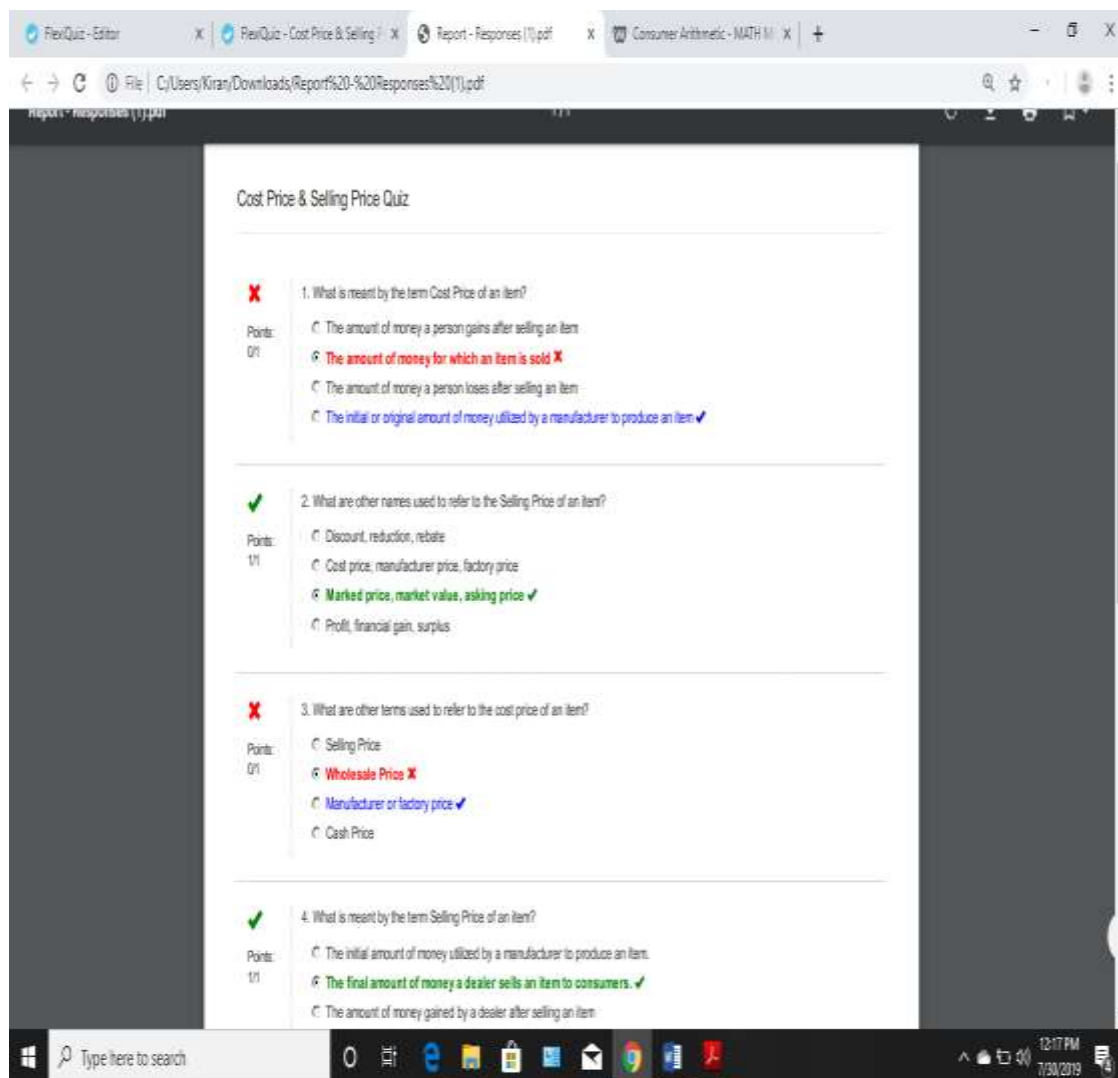
Appendix Q

Samples of Online Quizzes



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The screenshot shows a PDF document titled "Report - Responses (2).pdf" open in a web browser. The document displays the results of a "Profit & Loss Amount Quiz". It contains four questions, each with a point value and a list of multiple-choice options. The correct answer for each question is marked with a green checkmark, and incorrect answers are marked with a red X.

Profit & Loss Amount Quiz

1. What formula is used to calculate the Loss Amount incurred on a transaction?
Points: 100
Correct Answer: **Loss Amount = Cost Price - Selling Price** ✓
Incorrect Answers:
- Loss Amount = Selling Price + Cost Price
- Loss Amount = Selling Price - Cost Price
- Loss Amount = Cost Price + Selling Price

2. What is meant by the term Profit incurred on a transaction?
Points: 001
Correct Answer: **A gain on the value of an investment** ✓
Incorrect Answers:
- A reduction on the value of an investment
- An increase on the marked price of an item
- A deduction on the marked price of an item

3. What is meant by the term Loss incurred on a transaction?
Points: 100
Correct Answer: **A reduction on the value of an investment** ✓
Incorrect Answers:
- An increase on the marked price of an item
- A gain on the value of an investment
- A deduction on the marked price of an item

4. Loss incurs on a transaction when the
Points: 001
Correct Answer: **Cost Price > Selling Price** ✓
Incorrect Answers:
- Cost Price - Selling Price
- Cost Price < Selling Price
- Cost Price + Selling Price

Appendix R

Summative Achievement Test

**Form II -Term II
2018/2019
Consumer Arithmetic**

Name: _____

Number: _____

Section I (Multiple Choice)

Instructions:

Using a pencil **ONLY**, circle the response that **BEST** answers the following questions.

Questions 1 to 4 are based on the following scenario.

A shopkeeper Mr. Henry, sold a dryer for \$ 2,500 and a refrigerator for \$ 4500. However, he only made a profit of 25% on the dryer whilst incurring a loss of 30% on the refrigerator.

1. Which of the following is the correct formula for calculating the **Cost Price** for the **Dryer**?

a. $C.P = \left(\frac{100}{100 - P \%} \right) \times S.P$

b. $C.P = \left(\frac{100 + P \%}{100} \right) \times S.P$

c. $C.P = \left(\frac{100}{100 + P \%} \right) \times S.P$

d. $C.P = \left(\frac{100 - P \%}{100} \right) \times S.P$

2. Which of the following **BEST** represents the **Cost Price** for the **Dryer**?

a. \$ 1,850

b. \$ 2,000

c. \$ 3,125

d. \$ 3,333

3. Which of the following is the correct formula for calculating the **Cost Price** for the **Refrigerator**?

a. $C.P = \left(\frac{100}{100 + L \%} \right) \times S.P$

b. $C.P = \left(\frac{100}{100 - L \%} \right) \times S.P$

c. $C.P = \left(\frac{100 + L \%}{100} \right) \times S.P$

d. $C.P = \left(\frac{100 - L \%}{100} \right) \times S.P$

4. Which of the following **BEST** represents the **Cost Price** for the **Refrigerator**?

a. \$ 3,150

b. \$ 3,462

c. \$ 5,850

d. \$ 6,430

Questions 5 to 10 are based on the following scenario.

At a local gift shop, in order to increase sales, Mrs. Janky the owner of “Shop till you drop gift shop” advertised a *Blowout* sale of 25 % on the marked price of all of her items. She bought a full sized teddy bear for \$ 1,175 and sold it in her shop to making a profit of 20 %. She also bought a picture frame for \$ 1,500 but sold it in her shop at a loss of 10 % due to scratches on its edges.

5. Which of the following is the correct formula for calculating the **Selling Price** for the **Teddy Bear**?

a. $S.P = \left(\frac{100 - P\%}{100} \right) \times C.P$

b. $S.P = \left(\frac{100}{100 - P\%} \right) \times C.P$

c. $S.P = \left(\frac{100 + P\%}{100} \right) \times C.P$

d. $S.P = \left(\frac{100}{100 + P\%} \right) \times C.P$

6. Which of the following **BEST** represents the **Selling Price** for the **Teddy Bear**?

a. \$ 940

b. \$ 979

c. \$ 1,410

d. \$ 1,469

7. Which of the following is the correct formula for calculating the **Selling Price** for the **Picture Frame**?

a. $S.P = \left(\frac{100}{100 - L\%} \right) \times C.P$

b. $S.P = \left(\frac{100 - L\%}{100} \right) \times C.P$

c. $S.P = \left(\frac{100 + L\%}{100} \right) \times C.P$

d. $S.P = \left(\frac{100}{100 + L\%} \right) \times C.P$

8. Which of the following **BEST** represents the **Selling Price** for the **Picture Frame**?

a. \$ 1,350

b. \$ 1,364

c. \$ 1,650

d. \$ 1,667

9. Which of the following is the correct formula for calculating the **Marked Price** for the **Teddy Bear**?

a. $M.P = \left(\frac{100}{100 - D\%} \right) \times S.P$

b. $M.P = \left(\frac{100}{100 + D\%} \right) \times S.P$

c. $M.P = \left(\frac{100 - D\%}{100} \right) \times S.P$

d. $M.P = \left(\frac{100 + D\%}{100} \right) \times S.P$

10. Which of the following **BEST** represents the **Marked Price** for the **Teddy Bear**?

a. \$ 1,058

b. \$ 1,128

c. \$ 1,567

d. \$ 1,880

Section II (Constructed Response)

Instructions:

Show **ALL** working and state **ALL** relevant formulas for the following questions

Questions 11 to 12 are based on the following scenario.

John boy recently opened an electronics store in his community and in order to attract customers, he allowed two successive discounts of 20 % and 5 % on all of his products. The marked price on one of his surround sound systems was \$18,500.

11. Calculate the exact discounted price for the surround sound system

12. Using the answer in question 11 above, if a VAT is charged at 12.5% on all of his products, calculate the exact price in which customers must pay for the surround sound system VAT inclusive.

Appendix S

Table of Specification for Summative Achievement Test

Key: 5.1 means Lesson # 5, Objective # 1

Question #	Skills / Concept	Specific Unit Objective	Specific Lesson Objective	Profiles			Total Marks
				Knowledge (K)	Algorithmic Thinking (AT)	Problem Solving (PS)	
1	Identify the formula for computing the Cost price of an item given selling price and profit percentage	7	5.1	1			1
2	Compute the Cost price of an item given selling price and profit percentage	8	5.2		1		1
3	Identify the formula for computing the	7	5.3	1			1

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	Cost price of an item given selling price and loss percentage						
4	Compute the Cost price of an item given selling price and loss percentage	8	5.4		1		1
5	Identify the formula for computing the Selling price of an item given cost price and profit percentage	7	6.1	1			1
6	Compute the Selling price of an item given cost price and profit percentage	8	6.2		1		1

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7	Identify the formula for computing the Selling price of an item given cost price and loss percentage	7	6.3	1			1
8	Compute the Selling price of an item given cost price and loss percentage	8	6.4		1		1
9	Identify the formula to compute the Marked price of an item given selling price and discount percentage	7	8.1	1			1
10	Compute the Marked price of an item given selling	8	8.2		1		1

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	price and discount percentage						
11	Compute the Discounted price of an item given the marked price and discount percentage	8 & 10	8.3 & 8.4	2	2	2	6
12	Compute the Selling price of an item inclusive of VAT given the cost price of an item and the VAT percentage	9 & 10	10.3 & 10.4	2	1	1	4
	TOTAL			9	8	3	20

Appendix T

Mark Scheme for Summative Achievement Test

Question	Key
1	C
2	B
3	B
4	D
5	C
6	C
7	B
8	A
9	A
10	D

Question #	Solutions	Profiles			Total Marks
		Knowledge (K)	Algorithmic Thinking (AT)	Problem Solving (PS)	
1	$C.P = \left(\frac{100}{100 + P \%} \right) \times S.P$ Key: C	1			1
2	$C.P = \left(\frac{100}{100 + P \%} \right) \times S.P$ $= \left(\frac{100}{100 + 25 \%} \right) \times \$ 2,500$ $= \left(\frac{100}{125} \right) \times \$ 2,500$ $= (0.8) \times \$ 2,500$ $= \$ 2000$		1		1

	Key : B				
3	$C.P = \left(\frac{100}{100 - L \%} \right) \times S.P$	1			1
	Key : B				
4	$C.P = \left(\frac{100}{100 - L \%} \right) \times S.P$ $= \left(\frac{100}{100 - 30 \%} \right) \times \$ 4,500$ $= \left(\frac{100}{70} \right) \times \$ 4,500$ $= (1.42857) \times \$ 4,500$ $= \$ 6,428.565$ $\cong \$ 6,430$		1		1
	Key: D				
5	$S.P = \left(\frac{100 + P\%}{100} \right) \times C.P$	1			1
	Key: C				
6	$S.P = \left(\frac{100 + P\%}{100} \right) \times C.P$ $= \left(\frac{100 + 20\%}{100} \right) \times \$ 1,175$ $= \left(\frac{120}{100} \right) \times \$ 1,175$ $= (1.20) \times \$ 1,175$ $= \$ 1,410$		1		1

	Key: C				
7	$S.P = \left(\frac{100 - L\%}{100} \right) \times C.P$ Key: B	1			1
8	$S.P = \left(\frac{100 - L\%}{100} \right) \times C.P$ $= \left(\frac{100 - 10\%}{100} \right) \times \$1,500$ $= \left(\frac{90}{100} \right) \times \$1,500$ $= (0.90) \times \$1,500$ $= \$1,350$ Key: A		1		1
9	$M.P = \left(\frac{100}{100 - D\%} \right) \times S.P$ Key: A	1			1
10	$M.P = \left(\frac{100}{100 - D\%} \right) \times S.P$ $= \left(\frac{100}{100 - 25\%} \right) \times \$1,410$ $= \left(\frac{100}{75} \right) \times \$1,410$		1		1

	$= (1.3333) \times \$ 1,410$ $= \$ 1,880$ Key: D				
11	Method I: $M.P = \\$ 18,500,$ $1st\ D\% = 20\%,$ $2nd\ D\% = 5\%$ <i>1st Discount Amount</i> $= 1st\ D\% \times M.P$ $= 20\% \times \$ 18,500$ $= \left(\frac{20}{100}\right) \times \$ 18,500$ $= 0.20 \times \$ 18,500$ $= \$ 3,700$ <i>1st Sale Price</i> $= M.P - 1st\ Discount\ Amount$ $= \$ 18,500 - \$ 3,700$ $= \$ 14,800$ When applying the second discount of 5%, this Sale Price of \$ 14,800 now becomes a Marked Price.	1	1	1	6
		1			

	<i>2nd Discount Amount</i> $= 2nd\ Discount\ \% \times M.P$ $= 5\% \times \$ 14,800$ $= \left(\frac{5}{100}\right) \times \$ 14,800$ $= (0.05) \times \$ 14,800$ $= \$ 740$ <i>2nd Sale Price =</i> <i>Marked Price (1st Sale Price) –</i> <i>2nd Discount Amount</i> $= \$ 14,800 - \$ 740$ $= \text{\textcolor{red}{\$ 14,060}}$				
	Method II: $1st\ S.P = \left(\frac{100 - D\%}{100}\right) \times M.P$ $= \left(\frac{100 - 20}{100}\right) \times \$ 18,500$ $= \left(\frac{80}{100}\right) \times \$ 18,500$ $= (0.80) \times \$ 18,500$ $= \$ 14,800$	1		1	

	When applying the second discount of 5%, this Sale Price of \$ 14,800 now becomes a Marked Price. $\begin{aligned} 2^{nd} S.P &= \left(\frac{100 - D\%}{100} \right) \times M.P \\ &= \left(\frac{100 - 5}{100} \right) \times \$ 14,800 \\ &= \left(\frac{95}{100} \right) \times \$ 14,800 \\ &= (0.95) \times \$ 14,800 \\ &= \text{\textcolor{red}{\$ 14,060}} \end{aligned}$	1	1	1	
12	Method I: $S.P = \\$ 14,060$, $VAT = 12.5\%$ $VAT Amount = VAT \% \times S.P$ $\begin{aligned} &= 12.5\% \times \$ 14,060 \\ &= \left(\frac{12.5}{100} \right) \times \$ 14,060 \\ &= (0.125) \times \$ 14,060 \\ &= \$ 1,757.5 \end{aligned}$ $S.P (inclusive\ of\ VAT)$ $\begin{aligned} &= S.P + VAT\ Amount \\ &= \$ 14,060 + \$ 1,757.50 \\ &= \text{\textcolor{red}{\$ 15,817.5}} \end{aligned}$	1 1	1		4

	Method II: <i>S. P (inclusive of VAT)</i> $= \left(\frac{100 + VAT \%}{100} \right) \times C.P$ $= \left(\frac{100 + 12.5}{100} \right) \times \$ 14,060$ $= \left(\frac{112.5}{100} \right) \times \$ 14,060$ $= (1.125) \times \$ 14,060$ $= \$ 15,817.5$	2	1	1	
	TOTAL	9	8	3	20

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