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Enhance an Ability for Solving Word-problems in Social Arithmetic in Grade 9 Mathematics through Code-Switching: The Perspectives of Secondary School Students in Bhutan

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Abstract

Word problems are the most important thing in application of mathematical concept in daily life. Most of the students met the problems. This research aims to analyze learners' difficulties in solving word problems in social arithmetic and use of Code-Switching as a technique in enhancing the students' ability in the difficulties of students in solving word problems in social arithmetic in grade 9 mathematics. Code-Switching also known as 'language mixing' is a linguistic feature of Multi-lingual societies. Bhutan is the region of multicultural and multilingual society. Code-Switching is prevalent in offices, schools, institutes and market places, formally or informally, knowingly or unknowingly. The study highlights on the Learners' attitude towards the pedagogic relevance of code-switching in the classroom and how its use facilitates pupils' text comprehension and enhance classroom participation. The data for the study comprises the responses from survey and open-ended questionnaires of 70 respondents of grade 9 students of two different geographical located secondary schools in Bhutan. The findings indicate the factors which causes students difficulties are their lazy to read too long questions, lack of interest in learning mathematics, difficult to digest words in a problem, inability to comprehend the problems, lack of practice, and learning strategies. It also reveals that learners have positive attitude towards use of Code-Switching as a technique in the classroom to interpret complex ideas, translate questions, and check students understanding. Therefore, to motivate students in learning mathematics, a code -switching could be one of the effective teaching strategies in the classroom learning especially in comprehending word-problems in teaching and learning of mathematics in the classroom in Bhutan.

Keywords: Word-problems, Arithmetic, Code-switching, Strategy, Learners' perspectives

1. Introduction

Many students in the world have difficulty in solving word problems, including students in Bhutan. One of the factors that cause students' errors in solving word problems is mathematical resilience. Teachers continue to deal with mathematics curriculum reform in order to make mathematics more relevant and meaningful for students, encourage students to think critically, and make the process of learning mathematics more student centred and interactive. They have been trying to include a number of references for the need for learner centred approaches to have effective classroom teaching and learning in mathematics education. The curriculum framework, however, does not prescribe specific methods for implementation of any such teaching and learning strategies. Word problems are considered one of the most challenging mathematics topics, so they are commonly used as educational literature. According to Seifi, Haghrerdi and Azizmohamadi (2012), the mathematics word problem is known as an instrument of development students' abilities and talents in solving math problems. Most of the mathematics word problem relates to real life situations with mathematical concepts. In fact, such problems assist students in using their mathematical knowledge to solve their everyday problems.

Bates and Wiest (2004) stated that the word problems have several important functions in mathematics, namely providing questions that challenge students to be applied to various mathematical thinking situations, besides that word problems can also be an efficient means of connecting mathematical thinking to the real-life solving word problems is a significant difficulty for many students. Difficulties in solving word problems resulted in increased stress and anxiety in students so that they became phobia of word problems (Khoshaim, 2020). One of the sources of difficulty in solving word problems in reading comprehension and the meaning of the keywords used in math word problems (Vula, Avdyli, Berisha, Saqipi, & Elezi, 2017). As per Pearce, Bruun, Skinner and Lopez (2013), the ability of students to understand problems is the factor most reported by the teacher as the cause of student difficulty in solving word problems. Similarly, in the findings of study by Tuohimaa, Aunola, and Nurmi (2008), mathematics word problem-solving performance and reading comprehension ability are related to overall reasoning skills. Riastuti, Mardiyana, and Pramudya (2017) mentioned that students' most errors include comprehension, transformation, and students' tendency to make carelessness. Identification of student errors is needed to determine the obstacles that cause students to be unable to solve problems. There are five obstacles that a person needs to overcome in solving math problems, namely reading, comprehension, transformation, process skills, and encoding (Jha, 2012). Abdullah, Abidin, and Ali (2015) revealed that the errors occur because the students fail to understand and explain what is required by the question. Students frequently make errors in comprehension, transformation, process skills and encoding. According to Veloo, Krishnasamy and Wan Abdullah (2015) negligence in writing down information from questions, carelessness and guesswork. Apart from cognitive factors, affective factors also influence learning achievement. Based on this background, this study aims to analyse students' errors in solving word problems in terms of mathematical resilience. This research is very important to do as a first step to determine the extent to which the student's ability to solve the problems of Mathematics with correct mathematical context. Thus, this study aims to analyse students' misconceptions in solving word problems (students' errors in solving word problems including comprehension, transformation, and process skill errors) viewed by their mathematical strength and identify effective strategy in enhancing learners' ability in solving word-problems.

1.1 Rationale

It has been observed that students' performance in mathematics subject in secondary school mathematics has never been better rather declining successively over past years. This has raised concern amongst school academics and management as it has increased number of academic failures within mathematics. So, there is need to investigate the major difficulties understanding mathematics and also evaluate appropriate teaching and learning strategies that would overcome the aforementioned problem on time. Many principals and educators claim that English be the sole medium of instruction apart from Dzongkha subject taught in the class. Researchers have indicated that learners' native language promote language two acquisition (Cummins, 1981); fulfils pedagogical functions and has socio-psychological benefit (Atkinson, 1987); facilitates teaching and influences learner behavior (Kharma & Hajjaj, 1989); and serves as a communicative strategy in English classroom (Scheweers, 1999). Thus, discouraging the use of native language in the context of English as second language instruction impedes the comprehension of meaningful insights of literary works resulting in poor academic performance. Therefore, motivate students in learning mathematics, a code -switching could be one of the effective teaching strategies in the classroom learning especially in comprehending word-problems in teaching and learning of mathematics.

1.2 Situational Analysis

Modern education in Bhutan was introduced in 1960 in which 3R were important indicators of education being delivered as well as acquired. Overtime the notion of education has changed wherein the idea of wholesome education was brought in. In tryst with development of students in all spheres of life, the academic standard was weakened without being realized. The subjects like mathematics and sciences were most affected that need more interactive and collaborative learning. Although many factors could be contributing to this fact, very less research is available. Presently, this is a global phenomenon; student in different countries exhibit the same symptoms of being weak or not interested in mathematics.

Learning Mathematics does not only associate with the context of mathematical concepts but also use the concept in solving the problems that exist in the life. Associating with a mathematical concept in the context of life is not easy for students. According to there are several obstacles faced by students. First, most students in the school cannot make the connection between what they learn and how this knowledge will be applied. Second, the students have difficulty understanding the academic concept (such as mathematical concepts) when they are taught with traditional methods, but they are very necessary to understand the concepts as they relate to the world of work in which they will live. Learning Mathematics, students have been expected to make their own these relationships, outside the classroom activities. Besides students should be motivated to or learn to study mathematics and mathematical modelling in particular Math problems associated with a context is usually in word problem form.

Word Problems in mathematics are often found in the subject matter such as social arithmetic, statistics, algebra and some subject matter in subjects, physics and economics. Word problems in social arithmetic is very interested topic because it had a directly contact with the human daily life. So, it has a great benefit if focused in the word problems in social arithmetic. To learn about word problem questions, students are not enough to just be able and relate it to daily life and do exercises in a way constantly to be able to master the material.

Bhutanese students cannot be an exception. The national education assessment was conducted in 2013 to assess standard of English and mathematics and findings show that students' ability to do well in examination paper and what was done in the class according to the marks given for it as CA (Continuous Assessment) do not match at all. It is also viewed that proficiency in the language of assessment turned out to be even more relevant for the mathematics achievement. It is underlined that students with low language proficiency have specific reading comprehension difficulties with word problems.

The focus on word problems posing specific challenges in understanding and interpreting mathematics conceptual development in learners. We need to think from different perspective such as the methods of teaching mathematics is quite often chalk and talk. Teachers should be mindful, to cater to the needs of multiple intelligences in classroom, the teachers need to convey the shortcomings of individual learner's conceptual understanding. So, there is need to rectify the ineffectiveness of strategies for learning mathematics in the classrooms that suffices all aforementioned issues for interactive learning and liking in mathematics. Thus, this would enhance performance and develop positive attitude in learning mathematics. Grade 9 school mathematics, viz. Understanding Mathematics, consists of several topics that has contents which has immense utility to offer in our lives. The curriculum has greater emphasis to conceptual understanding rather than on memorizing and applying rote procedures. Therefore, whole textbook contents are divided into 5 strands; numbers and operations, algebra, geometry, measurement, and data and probability. These materials are quite difficult form what they have learnt in grade 8 mathematics, because the questions presented are usually in the form of story questions and students find difficult to understand the intent and to translate story problems into mathematical form. Although students are able to solve problems related to general arithmetic, but their abilities to solve same arithmetic problems correctly when given in word (story) form has greater issues. In reality, many students make mistakes in completing matter of stories, this is due to students experiencing some difficulties including difficulties in understanding the meaning of the sentences in the story problem, the lack of students' skills in translating everyday sentences into mathematical sentences and which elements must be assumed by a variable.

The difficulty of students in solving social arithmetic story questions needs to get attention. Difficulties experienced by students in solving these problems need to be identified to determine the factors causing it. Analysis of student difficulties in solving social arithmetic problems can be used to improve the quality of teaching and learning activities in mathematics. Ultimately, it is expected to improve achievement in learning math. To overcome this knowledge, it is needed to know what factors become the causes of these difficulties so that efforts can be made to minimize difficulties experienced by students.

Over decades of experience as mathematic subject-teachers for secondary graders, it is often found students are not able to solve the word-problems given completely, due to the inability of students to comprehend the concepts of mathematics learned. The goal to be achieved in this study is to describe the types the difficulty of students in solving arithmetic word-problems questions in grade 9 mathematics and analyse the factors. Also, to examine code-switching as an effective technique to comprehend the context of arithmetic word-problems.

1.3 Objectives of the Study

1. Analyse students' misconceptions/difficulties in solving word-problems in learning social arithmetic concepts.
2. Determine the extent to which the learner's ability to solve the arithmetic word-problems in secondary Mathematics (9^{th} grade) with correct mathematical context using Code-Switching technique.

2. Literature Review

Teaching is not merely a matter of telling and learning is not a consequence of automatic pouring of information into the minds of students. Learning requires mental involvement and work of the students themselves, in this case, student activity is very much required.

The Literature state that students find difficult on learning and understanding science and mathematics because of their theories about how the world works - their schemes for understanding phenomena - conflict with scientific understandings (Fellows, 1994). According to Herrera, Murry and Cabral (2012), students are now being asked to use their cognitive development, academic knowledge, and language skills to read, comprehend, synthesize, analyse, compare, contrast, relate, articulate, write, evaluate and more. There is need for appropriate teaching strategy in the classrooms that enhance learning and support the shift in perception of assessment of learning to assessment as learning and the teachers/instructors can measure academic performance incremental gains distinctly. Educationists and enthusiast researchers around the globe have proposed several findings and new approaches to get rid of difficulties in teaching science and to satisfy the needs of students. Thus, help students retain and develop higher level thinking skills. Many efforts have been made to overcome and improve quality learning ranging from upgrading and educational qualifications for teachers to implement new learning methods applied by the government. But the effort is not yet achieved optimal results due to constraints that occur in the field. This can be seen from the process of learning mathematics in schools that is not able mastering the material provided by the teacher which results in students being unable to identify and solve questions in the form of stories in mathematics. Learning mathematics is the same as learning logic, because of position mathematics in science is as basic science. In the learning process Mathematics also occurs as a thought process, because someone is said to think when that person does mental activities, and people who study mathematics must-do activities mentally. In thinking, people arrange relationships between parts information that has been recorded in his mind as meanings. Word problems also have an important role in learning mathematics because students will better know the nature of a mathematical problems when students faced with a matter of story (Word) problems.

Word problems are the most important thing in learning day-to-day applications of mathematical concepts. Also, the story or word problem is very useful for developing students' thought processes because in solving problems contained in the problems the story requires completion steps that require understanding and reasoning. But, most of the students met these problems. The results showed that the difficulties in solving word problems in social arithmetic were difficulties in understanding the problems, namely the inability of students to translate the problem that is not able write down what is known and asked; difficulties in transformation, i.e. the inability of students to determine the formula for solving arithmetic problems social; difficulties in the settlement process, namely the inability of students in performing arithmetic operations to solve the social arithmetic problem. Factors which cause students difficulty that is lazy to read too long questions, difficult to digest words in a problem, lack of student interest in learning mathematics, a way of learning for students who tend to memorize the material so the concept does not clear, students rarely practice the questions, do not understand the counting operations well, motivation low learning, a less conducive classroom, and learning strategies.

2.1 Code-switching as a Purposeful Instructional Strategy in the Classroom

The term "Code-Switching" is defined as the alternate use of two languages either within a sentence or between sentences (Clyne, 2000). Code-switching plays a significant pedagogical role in the classroom. Code-switching is useful for explaining and elaborating on concepts, increasing classroom participation, establishing good classroom relationships, ensuring the smooth running of the lesson, and making connections with the local culture of learners (Clegg & Afitska, 2011). Code-switching can be good teaching and learning strategy that features the importance of bilingual pedagogy and various language practices that teachers could adopt to facilitate pupils' understanding and participation in the classroom. So, codeswitching may occur during the teaching and learning process in the classroom to ensure that students understand instructions and content. Cook (2001) explains that teachers may use the first language in order to explain activities so that the activities would be beneficial to the learners. The use of the learners' first language would allow negotiation and better understanding of the required task. Several studies have been conducted to investigate the purpose and function of code switching around the world.

A numerous study shows that teachers and pupils exercise code-switching during lessons to achieve learning and teaching goals in the classroom (Adjei 2010; Ezuh 2008). In a study by Arthur (1996) examines the interactions between teachers and pupils in grade six classes in two primary schools in north-eastern Botswana. The policy accentuates the use of their national language, Setswana from pre-primary to standard 3 and use of English medium from standard 4. Arthur also reveals that teachers switch code to encourage participation by pupils.

Then and Ting (2009) also concluded that both the languages are still being alternately used by English and Science teachers in Malaysia. This phenomenon has concerned the matter as English language has been implemented as the language of instruction for both the subjects in schools. The researchers suggest that teachers employ two languages in their teaching to facilitate students' comprehension of the content area. Ahmad and Jusoff (2009) revealed that nearly three quarters or 74.7% of the respondents indicated that their teachers switch code to check students' comprehension of the text. Code switching was also used to explain the meaning of new words, explain matters relating to classroom management, make students feel comfortable and to clarify the differences between Malay and English grammar. The study concluded that the low proficiency learners had a positive perception towards teachers' code-switching and these learners supported future code-switching in English classrooms. According to the study conducted by Ezuh (2008), the effectiveness of the use of code-switching as a medium of instruction in the classroom facilitates the students' academic performance. The author assumes that the students from the two schools performed better when they were taught via code-switching where as their performances declined when taught using English as the only medium of instruction. In a response to a questionnaire survey, both teachers and pupils have positive attitudes towards codeswitching in the classroom and encouraged its adoption as a medium of instruction. This conclusion reflects Arthur and Martin's (2006) argument that the use of code-switching in the classroom should be viewed as a "teachable pedagogic resource". The implication is that teachers should be introduced to the strategic use of code-switching in the classroom. Therefore, it should be incorporated into the teacher-training curriculum.

Similarly, Amekor (2009) studied the use of code-switching in the classroom in schools in the Akatsi District, Ghana. The study aimed to explore the language use patterns in classroom settings where English is the expected code choice, and the motivations behind any code choice in the classrooms. The author explains that all the classrooms were characterized by extensive use of code-switching. Code-switching was applied because teachers judged their students' command in English to be insufficient for it to be used as the sole medium of instruction. Since code-switching seems to be an inevitable code choice in the classroom, Amekor suggests that teachers should be introduced to the concept of code-switching to enable them to know the types that exist and which of them is appropriate to enhance both content and language acquisition. There is a pervasive use of code-switching inside and outside the classroom by the teachers. The teachers indicated that they switch code in the classroom to facilitate pupil's understanding and participation, and also to cover up for their inability to express themselves comprehensively in one language (Brew-Daniels, 2011). The author also concludes that code-switching in the classroom does not necessarily cause a blockage or deficiency in learning a

language, but on the contrary, it fosters pupil's performances. However, Brew-Daniels cautioned that it should be used sparingly as its pervasive use might have effect on the students' competence in the languages.

Code-switching is given considerable recognition for its effectiveness as a teaching tool. Teachers, nonetheless, are advised to adopt the technique with caution in each individual context so that improvement can be monitored. Yusuf (2009) conducted a pragmatics analysis of a teacher's code-switching in a bilingual classroom. Code-switching was less frequently elicited by the need to attain emphasis and to gain attention from the students. The findings also indicated that the language instructor most often switched codes for the purpose of accuracy, especially to explain general concepts used in the field of industrial ergonomics, and for facility of expression. Strupeck's (2006) case study on code-switching, found out that students used their first language approximately 25% and the highest number of code-switching was recorded for golfing around and for off task questions. The author suggests that students should be allowed to use their first language, not 100% of the time however, for it creates an opportunity for knowledge enhancement and promotion of confidence and cultural and social identity.

Code-switching can be used by teachers by integrating it into the teaching points. This can serve as a motivational tool by involving them in discussions so that they can relate the knowledge base in the backdrop of their own culture. Teachers can also begin a lesson in one language, then switch to another language, forcing the learners to listen carefully and comprehend the subject matter (Sultana & Gulzar, 2010).

Therefore, from the above literature on code-switching as a purposeful instructional strategy in the classroom, it can be concluded that although some research recommends that code-switching should be discouraged in the classroom, most studies suggest that it can play an important role in the teaching and learning processes as pupils' participation and understanding may increase when they are free to use the language(s) that are most familiar to them.

2.2 Pedagogic Relevancy of Code-switching in the Bhutanese Learning Environment

The types of language people prefer is greatly influenced by the environment, culture or society they live in. Language of the families would change according to the place of their living and pickup speaking or learning a language of the majority (Barron-Hauwaert, 2010). The findings from Saunder's (1983) study states that more than half of the world's population using more than one language while engaging in the activities basic to human needs. In most of the developing countries such as Africa, South America, India, and South-East Asia, bilinguals outnumber monolinguals due to intermarriage, meetings, and simply interest in acquiring new languages. Thus, bilingualism has long been considered the norm and there has always been a great deal of bilingualism.

Similarly, in Bhutan there is a multicultural and multilingual society with different ethnic groups of *Ngalop, Sharchop, Lhotshampa*, and other indigenous groups including the *Tibetans* (Driem, 1994). Likewise, majority of Bhutanese can speak at least two languages and probably understand one or two others, while some may speak five to six languages. Gyatso (2003) mentioned that Bhutan has complex linguistic situation as there are as many as nineteen different vernaculars spoken across the country. As a multilingual society, several dialects are spoken with Dzongkha as an official national language. There are good number of people who can communicate effectively in more than one or two languages. Ever since the introduction of a western-style English medium education system in Bhutan, English is taught as a subject and used as medium of instruction of school curriculum. So, code-switching between English and Dzongkha is a usual common scenario. It mostly occurs when one is at the loss of words or lack of technical terms/concept. These incur the necessity to borrow, which in turn may act as a cause for the code- switch. Singh (2005) argues that such phenomenon is considered nothing more than speakers making full use of the resources offered by a bilingual situation, and is in no way stigmatized.

Thus, this study is undertaken to contribute to the existing discussions on the relevance of the use of code-switching as a technique to enhance an ability for solving word-problems in social arithmetic in mathematics for grade 9 students of secondary school in Gelephu Higher Secondary School and Minjey

Middle Secondary School, Lhuntse District. The study attempts to find out the attitude of learners towards code-switching in learning mathematics in the classroom. The researcher will also unravel the pedagogic relevance of code-switching in the classroom and how its use facilitates pupils' text comprehension and enhance classroom participation.

3. Methodology

A research methodology is a method for conducting research that ensures that it is both successful and efficient. There are three main research approaches, according to Creswell (2003): quantitative (structured) approaches, qualitative (unstructured) approaches, and mixed methods research. To obtain the most appropriate results, all research must include an explicit, disciplined, and systematic approach.

The research adopted to use mixed methods as to achieve the highest possible levels of accuracy and reliable data but due to the pandemic, visiting research site and participants in person were restricted. So, the research method drifted towards quantitative nature. The quantitative research method was used to gather data objectively and systematically (Almeida, 2017). Survey and Open-ended Questionnaires are specifically designed as the tools to gather relevant information about the current state of practices and the challenges faced by students as learners and give a deeper understanding on the topic. Moreover, it also determines the learners' perception about use of Code-Switching technique to enhance the ability for solving word problems in social arithmetic concepts.

3.1 Participants

The targeted participants for this research consisted of grade 9 students. The population of 70 heterogenous ability students (35 from each school) voluntarily participated in the research for determining difficulties/misconceptions in solving word-problems in learning social arithmetic concept in grade 9 mathematics, and also to examine the extent Code-Switching strategy in enhancing learner's ability to solve the arithmetic word-problems with correct mathematical context. The selection of the participants was based on purposive sampling as the researcher sampled with a purpose and had a specific predefined group based on the purpose of the research (Trochim, 2006). The sampling was applied to grade 9 students of two secondary schools of different geographical locations. The purpose of choosing extreme geographically located schools (urban and rural) is to determine the correlation in learners' perspective in aforementioned issues. The selected participants completed the structured survey and Open-ended questionnaires respectively to study the factors leading to difficulties in solving word-problems in learning social arithmetic concept in grade 9 mathematics and also participants' perception and attitudes towards code-switching in mathematics classroom in solving word problems.

3.2 Intervention and Data Collection Procedures

While designing the questionnaires of the survey, Likert Scale with five points or options to identify the level of opinion of the participants (Strongly agree=5, Agree=4, Neutral=3, Disagree=2, Strongly disagree=1) was included to minimize the statistical problems and to determine their level of opinions. Whereas, Open-ended questionnaire was developed to collect broad-based data on the use of code-switching technique as an effective teaching strategy in the classroom. Data from the questionnaires were used to crosscheck and triangulate quantitative findings obtained through open-ended questions. Before implementing the study, required research protocols were administered and participants were briefed on the purpose of the study. Participants were also informed regarding the confidentiality of the data provided and is administered for sole purpose of this study only.

Data collected from both questionnaires' phases were analyzed by using both descriptive and thematic analysis. Descriptive analysis was used to analyze the data collected from the survey questionnaire. With the help of five- point Likert scales the result of the survey was represented in a graphical presentation that made it easier to draw the conclusion. Thus, using both descriptive and thematic analysis approach have given an authentic and desired result of the study which was evaluated in alignment to the research objectives.

4. Results

The findings from the interviews have been collected and analyzed on the areas of students' interest and opinions about classroom code-switching. Triangulation of data analyses from survey

questionnaires and interviews have yielded valuable information about the practice of classroom code-switching and provide insights into how students' perception and beliefs affect their actual classroom teaching and learning practices.

4.1 Survey Questionnaire

Table 1. Analysis of Survey Questionnaires to Determine the Learners' Perception about Use of Code-switching (the Use of Dzongkha) While Solving Word-problems Lessons in Social Arithmetic in Grade 9 Mathematics

Statements	Mean	SD	Remarks
The use of Dzongkha language by the teacher helps me to enjoy the solving word-problems in social arithmetic lesson.	4.34	0.688	Strongly Agree
The use of Dzongkha language by the teacher helps me to understand the lesson better.	4.60	0.571	Strongly Agree
The use of Dzongkha language by the teacher makes me feel more confident and motivated in learning arithmetic lesson.	4.24	0.591	Strongly Agree
The use of Dzongkha language by the teacher enables me to focus on the lesson without worrying about unfamiliar words and sentences during the lessons.	3.61	1.037	Agree
The use of Dzongkha language by the teacher encourages me to actively participate in classroom activities.	4.32	0.713	Strongly Agree
I would prefer the teacher to use English only during mathematics lessons and not to use Dzongkha language.	2.96	0.989	Neutral
I would prefer the teacher to minimize the use of Dzongkha language while interpreting word-problems (English) lessons.	3.58	1.090	Agree
I would prefer the teacher to use both English and Dzongkha language while interpreting word-problems (English) lessons.	4.30	0.839	Strongly Agree
I don't like it when the teacher uses Dzongkha language when solving word-problems in social arithmetic lessons.	2.20	0.904	Neutral
I find it difficult to learn when the teacher does not explain concepts in Dzongkha language.	3.24	0.938	Agree
I find it difficult to concentrate when the teacher uses English only in word-problems lessons.	2.94	0.978	Agree
I switch codes when I am unable to express myself in English.	3.12	0.746	Agree
I switch codes to help myself maintain the flow of conversation.	3.20	0.606	Agree
I switch codes when I communicate with my peers who share the same language.	3.76	0.625	Agree
I switch codes when I want to comprehend difficult concepts to my peers.	3.60	0.606	Agree

I am able to learn difficult concepts easily when my teacher supplement through Dzongkha	3.74	1.175	Agree
I am able to easily grasp the instructions of my teacher when he/she teaches by using Dzongkha language	4.04	0.699	Strongly Agree
I could easily use mathematical words to solve the problems when using Dzongkha	3.40	1.107	Agree
	3.62	**0.202**	**Agree**

Analysis of survey questionnaires indicates that students "Agree" to the statement "The use of Dzongkha language by the teacher helps me to enjoy the solving word-problems in social arithmetic lesson". While switching from English to Dzongkha in social arithmetic lesson, teacher explains meaning of words and sentences in learners' preferred language that help them enjoy and understand the lesson. The result demonstrates that the students "Strongly Agree" that the use of Dzongkha language by the teacher helps me to understand the lesson better.

It is observed that students "Agree" that code-switching by teachers improve their confidence and motivate them in learning arithmetic lesson. They claim that they become more confident and motivated in learning the target concept when teachers include the use of Dzongkha language in social arithmetic lesson. They feel that they are able to comprehend concepts better in preferred language. Furthermore, majority of the respondents "Agreed" that the teachers' use of code-switching enables them to focus on the lesson without worrying about unfamiliar words and sentences. It also states that the majority of the respondents "Agreed" that teachers switching codes from English to Dzongkha encourages them to actively and confidently participate in classroom activities. The record also shows that students are skeptical ("Neutral") when teacher uses only English language during lessons. Instead, students prefer (Agree) learning social arithmetic lesson by switching languages at least for difficult words and phrases. As seen in table 1, the students have mixed response (Neutral) when their lesson is taught in both English and Dzongkha languages because they feel that the essence of English language is lost when other language is applied during short story lessons in ESL classroom. The record also indicates that students "Agree" that they find difficulty in concentrating in solving word-problems lessons in social arithmetic when the teacher does not explain new words/topics/concepts in Dzongkha language. Therefore, students "Agree" on using code-switching whenever they are unable to express themselves in English because this technique helps them maintain the flow of their conversation. The record indicates that most of the students "Agree" using code-switching to communicate with their peers who share the same language because this technique helps them explain and make their peers understand difficult words and sentences easily.

The overall analysis from the survey questionnaires "to determine the learners' perception about use of code-switching while solving word-problems lessons in social arithmetic revealed that students "Agree" (Mean = 3.7, SD = 1.005) that code-switching is an effective strategy in teaching about solving word-problems lessons in social arithmetic in grade 9 mathematics. Majority of the students switch codes for different purposes. The results provide evidence that code-switching serves as a communicative resource for students and that it is the preferred choice of language use amongst students who share the same language. The study found that code-switching can play an important pedagogic role in the classroom. It is useful for explaining and elaborating on concepts, increasing classroom participation, establishing good classroom relationships, ensuring the smooth running of the lesson, and to contextualize.

4.2 Interview Questionnaire

To determine code-switching as an effective strategy in teaching short stories to class 9 students, students' interview questionnaire was analyzed and summarized by highlighting on the main concerns related to the practice of code-switching in learning to solve word-problems lessons during mathematics classroom.

Figure 1 presents that code-switching is a useful technique for students when they have difficulties communicating in English. A majority of the respondents (74%) reported that they switch to Dzongkha when they communicate with their friends. However, some students have expressed their preferences for use of English or Dzongkha language only in the school as they are not comfortable speaking in either of these two languages.

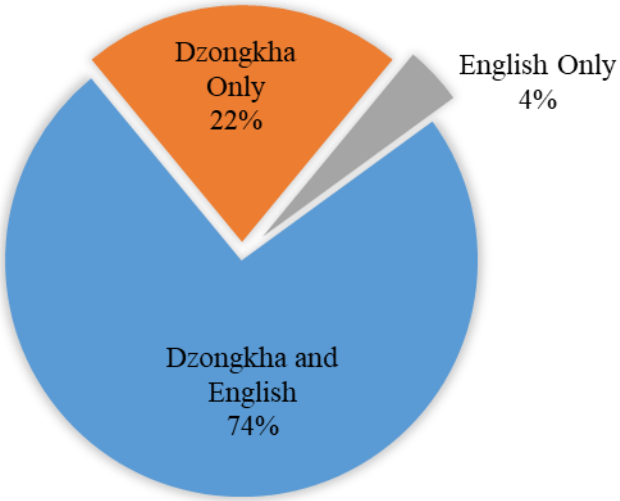

Figure 1. Common Language use as a means of communication with friends in the school

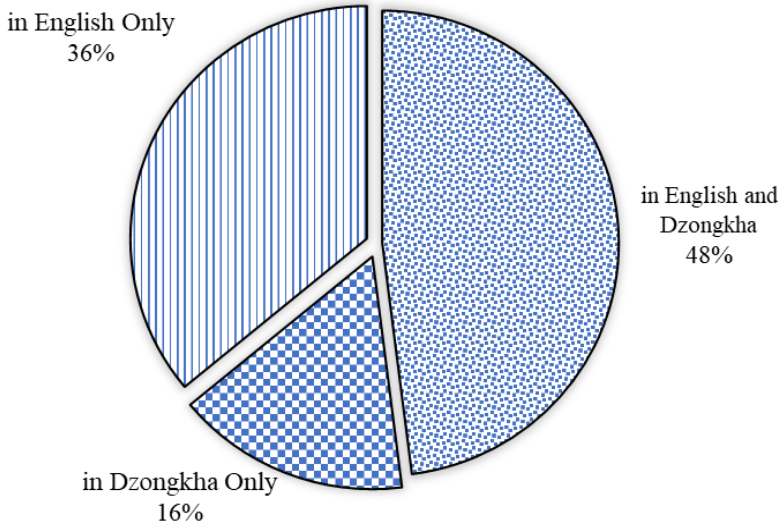

Figure 2. Language that is commonly used to Interact with their mathematics teachers in the school

Further, Figure 2, indicates that majority of students (48%) prefer using both English and Dzongkha languages while interacting with their Mathematics teachers in the school although their teachers instruct them using English language as reflected in Figure 3. because it helps them improve the standard of their English language.

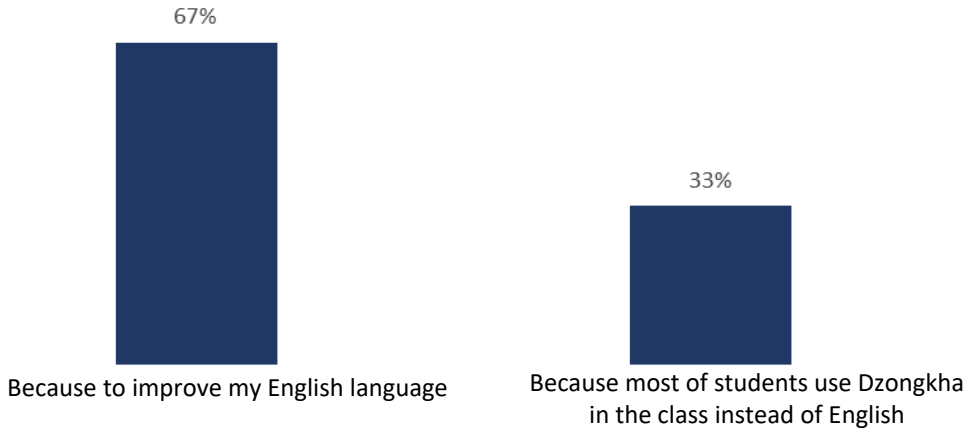

Figure 3. Reasons for mandatory use English in the classroom by teacher

Figure 3 and 4 indicates that students have a strong preference for using code-switching in classroom learning as it provides assistance in understanding lessons better. It is found that almost 70% of the respondents reported that they use code-switching as a tool to help them understand and explain difficult context and sentences in solving word-problems in social arithmetic topic. So, majority of them agree that they deliberately switch codes whenever they have difficulties in interpreting in English.

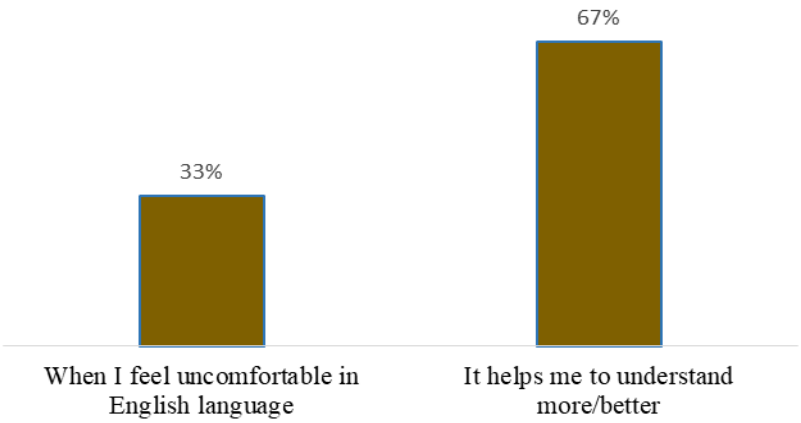

Figure 4. Students' preferences for switching from English to Dzongkha language in the classroom

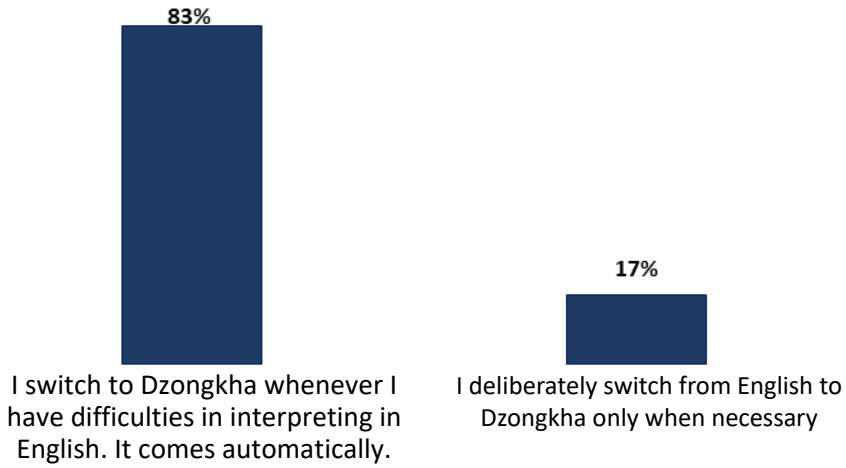

Figure 5. Conditions for switching language from English to Dzongkha

The results in Figure 6 and 7 provide evidences that students feel comfortable to switch from one language to another to comprehend the context of the word-problems, then convert the problem into mathematical format and solve correctly. Thus, provides better understanding when they come across such word-problems in social arithmetic concept. However, some students expressed that they feel awkward to switch language as the medium of instruction is English. Nevertheless, majority of the respondents indicated that code-switching helps them to understand and learn concepts and difficult words meaning from social arithmetic context better. Students use code-switching in the classroom basically to accomplish different tasks and to serve specific goals. Furthermore, code-switching is used to better communicate with other students. So, Figure 8 demonstrates that participants strongly recommend (67%) code-switching from English to Dzongkhag language during social arithmetic lessons because it helps them understand the concept better.

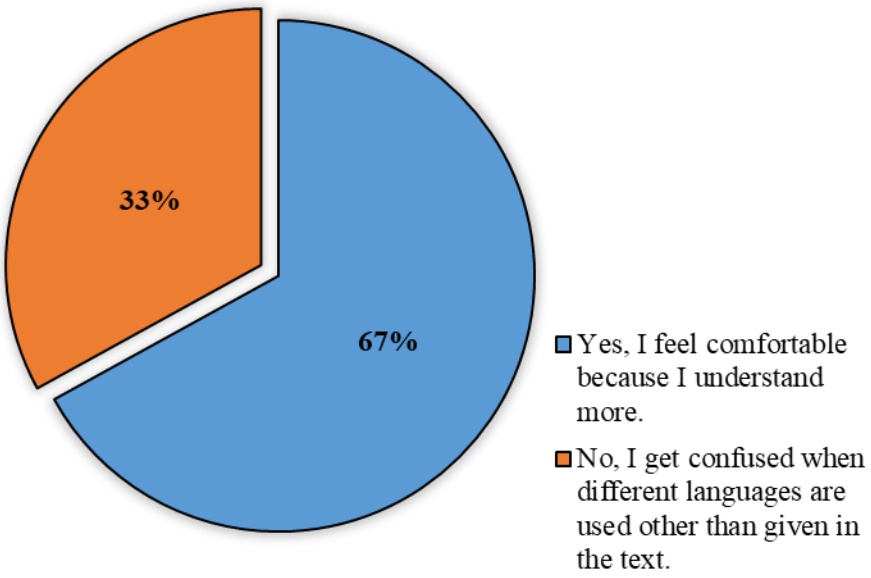

Figure 6. Students' opinions on switching languages while solving word-problem in Social Arithmetic lessons

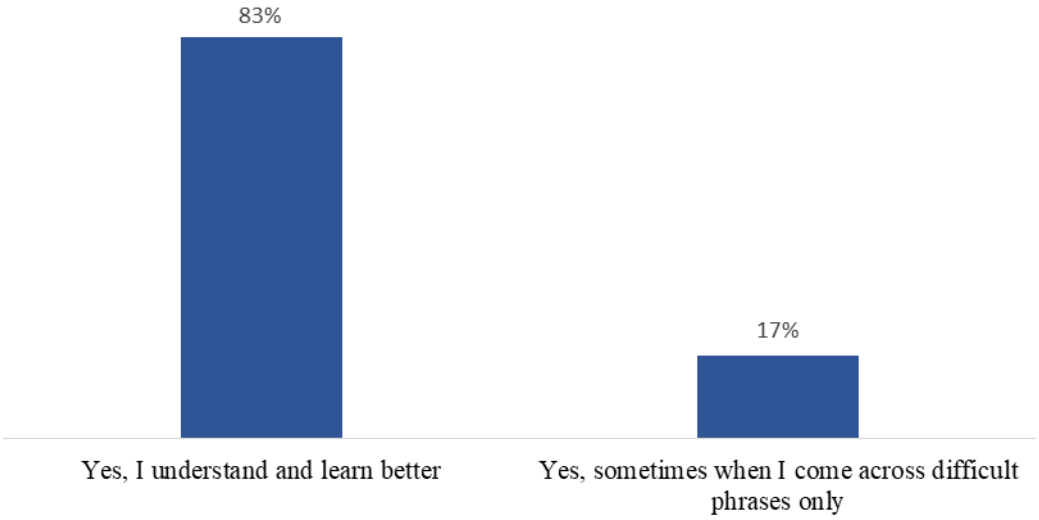

Figure 7. Students' perception on their learning level when solving word-problem lessons are taught through code-switching

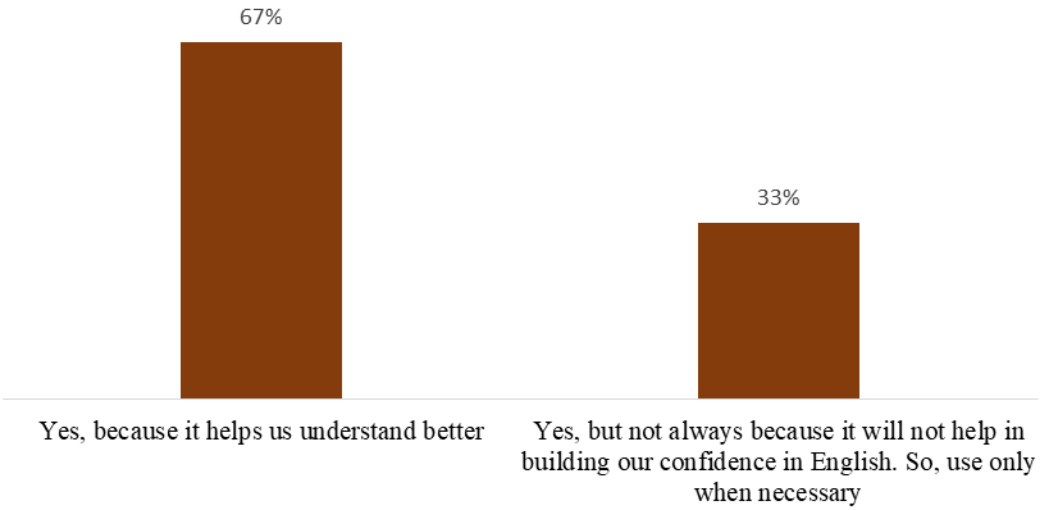

Figure 8. Students' recommendation on code-switching while solving word-problem in Social Arithmetic lessons

The overall analysis from the interview questionnaires administered in students revealed code-switching as a valuable teaching and learning strategy to enhance an ability for solving word-problems in social arithmetic in grade 9 mathematics learners. The main reason why students switch codes in the mathematics classroom in learning to solve word-problems, is due to difficulties in contextualizing the text into numbers for mathematical computation. Moreover, the nature of code-switching dependent on the social environment. So, the amount of code-switching varies from schools in urban areas and those in rural areas. In urban schools, students are considered more proficient English speakers. It is noticed that students use less code-switching while in rural schools the use of code-switching is more. They consider code-switching to be one of the best solutions to assist them in overcoming the learning difficulties due to their lack of comprehension of the English text into mathematical numbers.

Code-switching helps less competent students to understand any concepts taught. So, to facilitate comprehension and understanding of the text, teachers use code-switching as a technique to increase students' motivation and confidence in learning mathematics. However, the use of code-switching as a technique in solving word-problem in social arithmetic lessons must be kept as the last resort, because excessive use of code-switching is believed to result in overdependence on the students' first language (Dzongkha/Mother tongue). Therefore, teachers should remind students to abide by the language policy of using English as a medium of instructions to improve their English language standard. Nevertheless, it can be concluded that students are satisfied and had positive opinions towards the use of code-switching as a technique to enhance an ability for solving word-problems in social arithmetic in grade 9 mathematics learners but not to use as frequently as they wished to. Code-switching must be practiced only at times of difficulty in convincing the concept.

5. Discussion

The findings of this research shed light on the most important factors behind students' struggle in solving word-problem mathematical tasks from learners' perspectives. Moreover, the results of this research informed the mathematics education society on the approaches that could be used to address the challenges behind implementing word-problem tasks in mathematics classrooms. The issue under study was to explore the significant factors leading to the use of Alternate Language (Dzongkha) in enhancing an ability for solving word-problems in social arithmetic in grade 9 mathematics in Bhutanese classroom. In exploring this issue, the study findings indicated that the most influential factor which resulted in using of code-switching in students is their limited proficiency or incompetency in speaking English compared to their first language (Dzongkha). This indicates that higher the speaking proficiency in English have greater ability for solving word-problems, which is consistent to the findings by Wang (2003) and Weijen, Bergh, Rijlaarsdam and Sanders's (2009), which have reported on the L2 proficiency as a defining factor in L2 text quality. The inclusion of students' preferred language in the classroom provides affective support to decrease students' learning anxiety. Therefore, students switch codes as it helps in the acquisition of the second language (English) which is evident from the learning theory stated in the literature review. Cummins (1981) stated that teaching the subject content often in learners' native language promotes the second language acquisition and results in better scholastic performance. Similarly, students responded that they are able to perform better and promote their English language. Thus, the result is consistent to Cummins' statement. Further, it was found from the survey questionnaire that students are encouraged to actively participate in classroom activities when the teachers use Dzongkha language. This finding aligns with what Arthur (1996) revealed in his study that teachers switch codes to encourage participation by pupils. Students prefer switching languages from L1 to L2 as it is easier to communicate and feel more comfortable when they use two languages within the same discourse. Therefore, they use switch codes to avoid misunderstanding, express emotions, fill in stopgaps, and actively participate in classroom discussion. Kharma and Hajjaj (1989) also supported that teachers' efficiency in using learners' native language facilitates learners' behavior in active classroom participation. Despite having to follow the school language policy, students still switch codes as it is hard to find proper equivalents when they have to contextualize the text. This practice reinforces Bista (2010) and Leyew's (1998) socio-linguistic factors that impact the behavior of code-switching such as lack of equivalent words in English and unfamiliarity with the used English words. This research aimed at investigating the perception and attitudes of students on switching codes from English to Dzongkha/ Mother tongue. It is evident from the survey questionnaire that students have positive attitudes towards code-switching in the classroom and are in favor of using it as an alternative approach to teaching and learning in the classroom. This conclusion reflects Arthur and Martin's (2006) argument that the use of code-switching in the classroom should be viewed as a "teachable pedagogic resource". As code-switching seems to be an unavoidable code choice in the classroom, Amekor (2009) suggests that teachers should be introduced to the concept of code-switching to enable them to know the types and use it appropriately to enhance both content and language acquisition. Further, code-switching is given considerable recognition for its effectiveness in facilitating the language learning process. Almost half of the student participants perceived code-switching to be particularly beneficial when explaining unfamiliar words and sentences to the students who have limited knowledge in L2. It is apparent from the entire interview questions that both teachers and students feel the necessity to switch codes when students lack proficiency in the

target language, which aligns with the findings of the study by Ariffin and Husin (2011). Teachers, nonetheless, are advised to adopt the technique with caution in each individual context so that improvement could be monitored. It is apparent from the survey questionnaire that the majority of the students are in favour of code-switching. Pupils said that switching codes by the teachers enhance their ability for solving word-problems in social arithmetic in grade 9 mathematics classes. It is also noted that most students are encouraged to participate actively in classroom activities such as question and answer session, group discussions and presentations when they are allowed to switch codes by their teachers. This statement is consistent to the claim made by Cook (2001) that teachers could use their familiar language (Dzongkha) in order to explain the activities so that the activities are beneficial to the learners' active participation in the activity. Moreover, most of the students felt that switching codes during the lesson enhances confidence and therefore they are able to enjoy learning word -problems in social arithmetic classroom. This demonstrates that code-switching could be used as an effective strategy which enhances students' learning process. Code-switching may be the preferred option of students when new materials are delivered, but it may not be the preference for other aspects of the lesson such as to exclude others, reflect social status and to seek attention. Nonetheless, it is found that students regard code-switching as a valuable classroom resource for knowledge transfer and expressive purposes. This conclusion aligns with Wells' (1982) "Reciprocal Interaction Model of Learning" which emphasizes language as a resource for the interaction purpose. Children learn the concept through interaction by using different languages. Thus, it considers language as a resource in which code-switching is perceived as a resource in the classroom.

The analysis of the survey and interview results also revealed few negative sentiments among the participants about using code-switching in teaching-learning short stories. Code-switching is undesirable because it leads to unacceptable language use among students, which might lead to deterioration of English standards in higher order learnings skills. It is evident that some students prefer teachers to conduct the lesson entirely in English without referring to the first language (Dzongkha). This may be because students perceive the amount of target language exposure as an important factor in determining their success in acquiring the target comprehension of the given problems in mathematics. This finding is very much similar to the findings of Selament's (2014) study on the perception of code-switching in Malaysian ESL classroom. According to Brew-Daniels (2011) code-switching in the classroom does not necessarily cause a blockage or deficiency in learning a language, on the contrary, it fosters pupil's performances. Nevertheless, he also cautioned that it should be used sparingly as its pervasive use might hamper students' language competency. Therefore, it may be concluded that the classroom reality does not encourage complete exclusion of code-switching but could be used as the most convenient and effective tool in practicality.

This research question sought to explore how the practice of code-switching enhances text comprehension foe solving word-problems in social arithmetic concept. The findings from the study demonstrates that the use of alternative language (Dzongkha) enhances learner's vocabularies, provides meaningful and significant information, ensures understanding of plot, characters and other elements of social arithmetic context and promotes learners' creativity and critical thinking. Therefore, to facilitate the interaction and collaboration amongst students for effective learning, switching codes whenever necessary have a number of positive impacts. It is also noted that code-switching might help students in lexical searches, aids in generation of newer words in English and overall synthesis of text. According to the study on teachers' code-switching in classroom instructions for low English proficient learners, explored the significance of code-switching for text comprehension in the study by (Ahmad & Jusoff, 2009). Their findings revealed that almost 70% of the respondents reported that teachers switch codes in the classroom to facilitate students' understanding of the context. So, it is evident from the current study and the earlier findings that code- switching is an effective teaching and learning strategy in facilitating students' text comprehension.

6. Conclusion

The number of previous findings that support the importance of applying word-problem tasks in mathematics classrooms is tremendous. The amount of literature that emphasized the challenge of applying such tasks is also very large. However, limited research looked at why this challenge occurs or whether some academic or non-academic factors enlarge the difficulties. Moreover, most previous

investigations addressed secondary education and did not consider higher education classrooms. The results of this study shed light on some of the factors that contribute to the challenges that are facing students when working with word-problem tasks and suggested some possible solutions that might address these challenges. The findings of this study suggest that teachers—before implementing word-problem tasks—teachers should be equipped with the appropriate pedagogical approaches that foster the process of learning—such as the implementation of word-problem tasks—and ensure that teachers are aware of and committed to the importance of such approaches. In addition, the findings recommend to have meaningful, hands-on, reader-friendly tasks that are relatable to students' lives and that are relevant to their interests. This in return will help in fostering a positive attitude towards the tasks. Therefore, such pedagogical tools must be encouraged to be implemented for effective teaching of mathematics. The finding states that use of alternative language/ Code-Switching is one of such pedagogical tools that learners prefer to be used by their teachers in enhancing their ability in solving word-problems in social arithmetic in grade 9 mathematics.

Code-switching is a natural phenomenon among bilingual speakers. Speakers switch codes for a variety of reasons, the most common of which is their lack of proficiency in the second language and the need to grasp new concepts quickly. Other factors include encouraging students' participation, strengthening interpersonal relationship, to check comprehension, and organizing classroom tasks. Bhutan is a multicultural and multilingual country of many ethnic communities, with the majority of Bhutanese speaking at least two languages and understanding at least one or two others. Most of the people in a multilingual culture can easily communicate in more than one or two languages. English is taught as a subject in Bhutanese schools and is used as the medium of instruction. However, code-switching from English to Dzongkha or any other languages is a common phenomenon in the Bhutanese classroom. Thus, the purpose of this research was to examine the students' perception on code-switching in enhancing an ability for solving word-problems in teaching and learning social arithmetic concepts in grade 9 mathematic in classroom and also to analyze code-switching as an effective strategy in enhancing an ability for solving word-problems in social arithmetic to grade 9 mathematic students.

Based on the data analysis, the study findings established that the most influential factor which resulted in using of code-switching in students is their limited proficiency or incompetency in English compared to their Dzongkha (first language). This finding has led to the conclusion that code-switching serves as an essential pedagogical function. Thus, the study found code-switching to be useful for communicating and elaborating ideas by reducing students' anxiety in comprehension of mathematical context. It also found code-switching to be useful in conveying the clear understanding of the concepts and to encourage students' active participation in the classroom. The result also shows that students strongly agree that teachers' code-switching improved their understanding and comprehension of the text. Students also reported that code-switching helps gain confidence and motivates them to participate in the class activities. Furthermore, owing to the complexity of the plot and unfamiliar materials or topics, and also the students' diverse learning background and low competency level, code-switching is considered as an effective technique in teaching short stories. Thus, this suggests that teachers' attitude is optimistic about code-switching as they perceive code-switching could improve students' comprehension of the text and learn better.

Depending on the context, a teacher may employ such repertoire however, it might have an implication such as code exchange may bring inharmonious relationship among different speakers in the classroom. Therefore, teachers' understanding of the students' native language is important in order to handle the lessons carefully without hurting anyone's sentiments when switching codes in the classroom. Similarly, code-switching might promote unacceptable language use among students, that could lead to a decline in English standards. On examining the negative impacts of code-switching, it is found that such practices might deprive students from becoming independent learners. Nevertheless, if the purpose of using code-switching is to help students understand better and make them learn as quickly as possible, code-switching might be an effective teaching and learning strategy. A teacher may allow students to switch codes in classroom learning to deliver the intended message and also to help in learning the target language.

In a nutshell, code-switching may be considered as one of the most effective teaching and learning strategies to enhance learners' ability for solving word-problems in social arithmetic in grade 9

mathematics classes. It was also found that teachers and students have positive attitudes and experiences of code-switching to help cater to the needs of students in the classroom. However, teachers also have concerns with regard to negative aspects of code-switching in the target language. Such inconsistency in their perception of code-switching could impact the way in which it is used in the classroom. Therefore, concern teachers may ensure that the practice of switching codes (switching English to Dzongkha) does not interfere with the acquisition of the target mathematical concept, instead promote students' learning abilities.

7. Recommendations

This study has yielded findings which provide a better understanding of the role of code-switching in solving word-problems in social arithmetic in grade 9 mathematics classrooms and how code-switching is perceived by learners/ students. Although the findings support existing literature and reveal several pedagogical implications of code-switching as a technique for enhancing the ability for solving word-problems in social arithmetic concept to grade 9 students in secondary schools, it is acknowledged that there are certain limitations to this study. Since, the study was conducted with small sample size of the population in just two secondary schools, the result revealed might not be applicable to the whole population. Some of the survey questionnaire items might not be that relevant to the situation where the research has been conducted. Moreover, ability to interpret and comprehend mathematical word-problems depend on learners' language acquisition, environment, demographics, the age, background of learners and psychodynamic modality of the class itself. In such cases, data interpretations could be classified differently. For generalization, there is a need to conduct the study with larger population size, students' learning process and their background in more details which is not done in this study.

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