Ministry of Education, Youth and Sport

The University of Cambodia

College of Education

EFFECTIVENESS OF MATHEMATICS TEACHING METHODOLOGY AND CLASSROOM ASSESSMENT BY PRIMARY SCHOOL TEACHERS ON STUDENT LEARNING OUTCOMES IN CAMBODIA

Dissertation

Submitted to The University of Cambodia as partial requirement

for the fulfillment of the Degree of Doctor of Philosophy

in Educational Administration

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2025

STATEMENT OF ORIGINAL AUTHORSHIP

I, Chhun Ramy, certify that the present dissertation is all my own work unless otherwise indicated in the text.

Signature	Date
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STATEMENT OF COMMITTEE APPROVAL

We declare that we have read this dissertation and that, in our opinion, it is satisfactory in scope and quality as a contribution towards the degree of Doctoral of Philosophy in Educational Administration.

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DEDICATION

I would dedicate this dissertation to my parent - Chhun Meng and Suon Kina - who believe better education can transform lives. I hope that this achievement is one of many ways I may success in my lifetime.

This study is dedicated to those serving the primary educators including the policy makers, school directors, and teachers of primary schools. I hope this work in some way contributes to their efforts.

For Chou Pholla, Chhun Phallyda (Poun), Chhun Phallyka (Mean), and Chhun Phallyta (Po). They are the source of strength that has always driven me to reach my full potential and become the best that I can be myself. Like all my great accomplishments, my doctoral dissertation is an enduring tribute to that amazing, unmatched force. The strength of my two-amazing parent who brought me up, I thank them for giving me the education and capacity to become the good one citizenship for my country.

ACKNOWLEDGEMENTS

I would like to express my high respect to H.E. Dr. Kao Kim Hourn, the Founder, Chairman of the Dissertation Committee, and the President of The University of Cambodia (UC), for providing me a doctor's degree scholarship and assuring us of the highest educational standards. I would like to express my gratitude to Dr. Y Ratana, Vice President for Academic Affairs of UC, for providing me the opportunity to conduct the research with the direction and assistance to complete.

I would like to express my gratitude to H.E. Dr. Mok Sarom, Deputy Director of Education, Ministry of Education, Youth, and Sport, as the main advisor for advising and guiding me directly to fulfill the gap and improve to complete the research, especially spent times to give many ideas relate to the research. I would also like to express my gratitude to Dr. Phon Sophal, as the co-advisor for providing me with the direction and assistance I needed to complete the research. Furthermore, he spent his personal time reviewing the research and offering sound expert advises that was really beneficial in completing the research.

I would like to express my gratitude to Mrs. Pamela Hughes, a teacher in England, for providing proofread includes all aspect of English structure such wordings and grammars, spent many times going through my hold research. In addition, I would like to express my heartfelt gratitude to all of my professors and lecturers at the College of Education of UC, as well as my classmates, for their time and effort in sharing information and skills both during and after the learning period.

Last but not least, I express my heartfelt thanks and affection for my family, particularly my parent and my wife, who never fails to encourage and support me in any situation. I would never be able to complete my comprehensive research without their evocations.

មូលន័យសង្ខេប

គ្រូបង្រៀននិងថ្នាក់ដឹកនាំនៅកម្ពុជា បានធ្វើការជាច្រើនទស្សវត្សរ៍ ដើម្បីរកវិធីសាស្ត្រដែលល្អបំផុតក្នុងការជំរុញការចូលរួមរបស់សិស្សក្នុងការសិក្សា។ សិស្សានុសិស្សកម្ពុជា មានតម្រូវការសិក្សាចម្រុះ និងទទួលបានកម្រិតជំនាញគណិតវិទ្យាខុសគ្នា។ ការស្រាវជ្រាវនេះ មានគោលបំណងចម្បង ដើម្បីរកឱ្យឃើញពីប្រសិទ្ធភាពនៃវិធីសាស្ត្របង្រៀនគណិតវិទ្យានិងការវាយតម្លៃកម្រិតថ្នាក់រៀនរបស់គ្រូបឋមសិក្សាលើលទ្ធផលសិក្សារបស់សិស្សនៅកម្ពុជា។ សំណាកគោលដៅ គឺគ្រូបង្រៀនបឋមសិក្សាចំនួន២៧៨ នាក់ និងសិស្សចំនួន៣៩៥នាក់ មានទិន្នន័យប្រជាសាស្ត្រផ្សេងគ្នាក្នុងខេត្តកំពង់ឆ្នាំង ដែលត្រូវបានជ្រើសរើសតាមវិធីសាស្ត្រចៃដន្យសាមញ្ញដោយការចាប់ឆ្នោត។ ឧបករណ៍ការស្រាវជ្រាវ គឺកម្រងសំណួរនិងតេស្តសិស្ស ដែលត្រូវបានរៀបចំឡើងផ្អែកលើការរំលឹកទ្រឹស្តី។ ទិន្នន័យប្រមូលបាន ត្រូវបានយកមកវិភាគដោយប្រើស្ថិតិព័ណ៌នា (ប្រកង់ ភាគរយ តម្លៃមធ្យម និងគម្លាតស្តង់ដា)និងស្ថិតិសន្និដ្ឋាន (t-test, One-way ANOVA, Pearson Correlation and Stepwise Regression) តាមរយៈកម្មវិធីកុំព្យូទ័រ។

លទ្ធផលសំខាន់ៗនៃការសិក្សានេះ អាចសរុបបាន ដូចខាងក្រោម៖

១- គ្រូបង្រៀនបឋមសិក្សា មានទស្សនៈលើប្រសិទ្ធភាពនៃវិធីសាស្ត្របង្រៀនគណិតវិទ្យា ជារួម និងតាមផ្នែក ស្ថិតនៅកម្រិតខ្ពស់។ បើរៀងលំដាប់តម្លៃមធ្យមពីខ្ពស់បំផុតមកទាបបំផុត គឺផ្នែកភាពជឿជាក់លើការបង្រៀនគណិតវិទ្យា ផ្នែកទំនុកចិត្តលើប្រធានបទគណិតវិទ្យា ផ្នែកទំនុកចិត្តលើការបង្រៀនគណិតវិទ្យា និងផ្នែកការអនុវត្តការបង្រៀនគណិតវិទ្យា។ គ្រូបង្រៀន ដែលមានប្រជាសាស្ត្រខុសគ្នា មានទស្សនៈខុសគ្នាលើវិធីសាស្ត្របង្រៀនគណិតវិទ្យា។

២- គ្រូបង្រៀនបឋមសិក្សា មានទស្សនៈលើប្រសិទ្ធភាពនៃការវាយតម្លៃកម្រិតថ្នាក់រៀន ជារួម និងតាមផ្នែក ស្ថិតនៅកម្រិតខ្ពស់។ រៀងលំដាប់តម្លៃមធ្យម ពីខ្ពស់បំផុតមកទាបបំផុត គឺផ្នែកភាពជឿជាក់លើការវាយតម្លៃកម្រិតថ្នាក់រៀន ផ្នែកជំនាញលើការវាយតម្លៃកម្រិតថ្នាក់រៀន និងផ្នែកការអនុវត្តលើការវាយតម្លៃកម្រិតថ្នាក់រៀន។ គ្រូបង្រៀន ដែលមានប្រជាសាស្ត្រខុសគ្នា មានទស្សនៈខុសគ្នាលើការវាយតម្លៃកម្រិតថ្នាក់រៀន។

៣- វិធីសាស្ត្របង្រៀនគណិតវិទ្យានិងការវាយតម្លៃកម្រិតថ្នាក់រៀនជារួមនិងគ្រប់ផ្នែក មានទំនាក់ទំនងគ្នា ស្ថិតនៅកម្រិតខ្លាំង និងវិជ្ជមាន។

៤- ពិន្ទុលទ្ធផលសិក្សារបស់សិស្សមុខវិជ្ជាគណិតវិទ្យាថ្នាក់ទី១ ដល់ទី៣ មានកំណើនខ្លាំង បើធៀបពិន្ទុថ្នាក់ទី៤ ដល់ទី៦។ ការប្រើបធៀបកំណើនពិន្ទុក្រុមទាំងពីរ មិនមានភាពខុសគ្នា។ លទ្ធផល និងអនុសាសន៍នៃការសិក្សានេះ គឺជាផលប្រយោជន៍សម្រាប់អ្នករៀបចំគោលនយោបាយ អ្នកអប់រំ និងគ្រប់អ្នកពាក់ព័ន្ធក្នុងការអភិវឌ្ឍការអប់រំបឋមសិក្សានៅកម្ពុជា។

ពាក្យគន្លឹះ៖ គ្រូបង្រៀនបឋមសិក្សា វិធីសាស្ត្របង្រៀនគណិតវិទ្យា រង្វាយតម្លៃកម្រិតថ្នាក់រៀន លទ្ធផលសិក្សារបស់សិស្ស

ABSTRACT

Cambodian teachers and administrators have been working for decades to find the best ways to engage students. Cambodian students have diverse learning needs and achieve different levels of mathematics skill mastery. The main objective of this study is to find out the effectiveness of mathematics teaching methodology and classroom assessment by primary school teachers on student learning outcome in Kampong Chhnang Province, Cambodia. A total of 278 primary teachers and 395 students from different demographic characteristics participated in this study. They were selected by using simple random sampling by drawing lots. The research instruments consisted of the survey questionnaire and student, which were adapted based on the literature. Collected data were analyzed using descriptive (frequency, percentage, mean and standard deviation) and inferential statistics (t-test, One-way ANOVA, Pearson Correlation and Stepwise Regression) through computer program procedures.

The main research findings were summarized as follows:

1. The primary teachers perceived the effectiveness of mathematics teaching methodologies as a whole and at each aspect were at high levels. Ranks from the highest to the lowest mean scores were: TBMT, TCM-TO, TCM-TE and TPMT. Teachers had different demographic characteristics were found statistically significant difference on mathematics teaching methodology.

2. The primary teachers perceived the effectiveness of classroom assessment as a whole and at each aspect were at high levels. Ranks from the highest to the lowest mean scores were: TBCA, TSCA and TPCA. Teachers had different demographic characteristics were found statistically significant difference on classroom assessment.

3. The statistics maintained that the correlation analysis of the TMTM and TCAS showed statistically significant difference, there was strong and positive relationship both as a whole and within all dimensions.

4. The scores of the mathematics student learning outcomes in grades 1-3 were grown dramatically when comparing the students' scores in grades 4-6. The mean growth scores of the two comparison groups were not different. The results and recommendations of this study are benefits for policy makers, educators, and all stakeholders who engage in primary education development in Cambodia.

Key Words: Primary School Teacher, Mathematics Teaching Methodology, Classroom Assessment, Student Learning Outcome.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF ABBREVIATIONS

AfL	Assessment for Learning
AI	Artificial Intelligence
AoL	Assessment of Learning
CAS	Classroom Assessment
CBA	Curriculum-Based Assessment
CDRI	Cambodia Development Resource Institute
EGMA	Early Grade Mathematics Assessment
EGRA	Early Grade Reading Assessment
EQAD	Education Quality Assurance Department
ESP	Education Strategy Plan
GDP	Gross Domestic Product
MMIPC	Math Methods Instructors, Personal Communication
MoEYS	Mistry of Education, Youth and Sport
MTM	Mathematic Teaching Methodology
NCTM	National Council of Teachers of Mathematics
NSDP	National Strategy Development Plan
OECD	Organization for Economic Co-operation and Development
PBC	Practice-Based Coaching
PEIM	Programa Evolutivo Instruccional para Matemáticas
PISA	Program for International Student Assessment
SBM	School Based Management
SDG4	Sustainable Development Goals 4
TALIS	Teaching and Learning International Survey
TBCA	Teachers' Beliefs about Classroom Assessment
TBMT	Teachers' Beliefs about Mathematic Teaching
TMTM	Teachers' Mathematics Teaching Methodology
TCAS	Teachers' Classroom Assessment
TCM-TE	Teachers' Confidence in Mathematics Teaching
TCM-TO	Teachers' Confidence of Mathematics Topic
TESOL	Teaching English to Speakers of Other Language
TIMSS	Trends in International Mathematics and Science Study
TPCA	Teachers' Practice of Classroom Assessment
TPMT	Teachers' Practice of Mathematics Teaching

TSCA	Teachers’ Skills in Classroom Assessment
UC	University of Cambodia

CHAPTER 1
INTRODUCTION

1.1 Background of the Study

Improving learning outcomes for students is the aim of education. The goal of pursuing this policy is to provide opportunities for next generations to develop and compete. As one of the most significant components of life, education is essential. Education equips people with the knowledge and skills necessary to fully comprehend and utilize resources in order to exist. To help students reach their full potential, education should be a focused, well-organized endeavor that actively involves them in the learning process. In order for students to develop their unique qualities and take responsibility for the development of the country as a whole, Pancasila-based education aims to strengthen students' character, intelligence, talents, and piety toward God (Tohir & Mashari, 2020). Science, technology, and engineering advancements have substantially reduced the barriers to development around the world. Science is defined as a body of information that can be verified and used in the solution of everyday issues, and mathematics is the cornerstone of science. Mathematical proficiency is required for the development of a scientific and technologically oriented society (Veloo et al., 2015).

In essence, mathematics is a subject that encompasses and describes many aspects of life. Mathematics has a role in human activities that is derived from the thought process, rather than experimental results (Damayanti & Mawardi, 2018). Many students have difficulty learning mathematics, making it challenging to comprehend mathematical concepts. Students who are having difficulty may lack the motivation to try again and may not seek assistance from a teacher. They are afraid or humiliated to ask questions when they do not comprehend a concept, therefore their learning outcomes are poor (Fadila et al., 2014). Effective mathematics learning involves two-way communication: students ask questions of the teacher, the teacher provides guidance, and students learn from each other (peer-to-peer) (Repanta et al., 2020). Learning mathematics requires that teachers pay attention to students' emotional aspects, specifically their mathematical dispositions, in addition to increasing their mathematical thinking skills (cognitive aspects). Learning mathematics in the classroom must be designed in such way that it not only improves student learning accomplishment but also improves student mathematical dispositions (National Council of Teachers of Mathematics - NCTM, 1989; Dina et al., 2019; Haji et al., 2019). Mathematical disposition is a mental state that develops over time as a result of experiences that influence an individual's reaction to all interconnected circumstances and things. Beyers (2011), Feldhaus (2014), and Kusmaryono et al. (2019) define mathematical disposition as a connection to and appreciation for mathematics, as well as an inclination to think and behave favorably towards the subject. Students' attitudes toward mathematics are reflected in the questions they pose, the ideas they share, the ways they collaborate, react to the perspectives of others, help friends, and use problem-solving techniques.

By virtue of its importance, only when the teaching method positively adds to students' learning can it be considered truly efficient. It is believed that an instructional method that enhances students' academic performance qualifies as successful (Ma, 2009; Ali et al., 2021). Skilled mathematics teachers used a variety of teaching techniques, approaches, and instruments to meet the criteria of diverse learning needs of students in order to impart mathematical concepts to a good level of understanding. A step-by-step approach to mathematics can be used to explain the subject (Akhtar et al., 2020). Mathematic teachers all over the world use a variety of instructional methods to make the teaching-learning process more fruitful. According to Enrquez et al. (2018), teachers use a variety of instructional methods in the implementation of mathematical activities. Three different methods were employed: pre-, co-, and post-instructional. Asuncion-Atupan (2013) identified a variety of different teaching styles that were used in mathematics classes. Among these are experiential, metacognitive, integrative, interactive, innovative, inquiry-based, collaborative, and introspective. According to Baig (2015), numerous distinct instructional methods are employed in mathematics classrooms worldwide. Among these are problem-solving, deductive, inductive, lecture, and activity-based approaches. Active learning, cognitive learning, and teacher-directed methods were discovered by Le Donne et al. (2016). Students are more engaged in their own learning when they participate in active learning, which encourages discussions, group work, and cooperation. Students benefit from cognitive learning because it stimulates their minds and allows them to think critically, allowing them to identify problems. This method encourages students to express their creativity in the classroom to a large extent. This method also ensures that students are fully engaged in the teaching and learning process.

"Are my students getting what I think I'm teaching?" is a million-dollar question that crosses a teacher's mind during the teaching and learning process. The nature of the subject taught, the kind and level of students in the classroom, the learning experiences that a teacher gives in the classroom, the learning outcomes that must be attained, and so on all influence the depth of this question. In the classroom, there is always a gap between a teacher's expectations and a student's knowledge (Craig et al., 1997; Lakshmi & Majid, 2021). Teachers must identify students' learning needs in order to modify their instruction, and utilize this information to make informed decisions about instructional adaptations. One way to determine the learning needs of students is to get data from them and then assess and analyze it (Feldman & Capobianco, 2008; Gottheiner & Siegel, 2012; Gulikers & Baartman, 2017; Eysink & Schildkamp, 2021). To put it another way, formative assessment and differentiation activities are essential for teachers to carry out when utilizing data to tailor instruction to students' needs (Visscher & Ehren, 2011; Sluijsmans et al., 2013; Schildkamp et al., 2014; Gulikers & Baartman, 2017). Formative assessment provides teachers with information on their students' progress. The results of these assessments are subsequently used as the foundation for teacher accountability and control systems (Alzen et al., 2017). Formative assessment is a relatively new notion, having been defined only in the 1960s; however, teachers have long used "formative assessments" in their classrooms. According to Scriven (1967, cited in Braund & DeLuca, 2018), formative assessment is a term derived from the term "formative evaluation," which refers to the evaluation of educational programs such as curricula, teaching materials, and overall teaching methods. Consequently, formative assessment is an ongoing process whereby educators provide students with feedback based on evidence of their learning to assist them in becoming more proficient. The main purpose of presenting a feed forward is to give the student insight into what needs to be done to provide future orientation so that he or she can use it as a template in other assignments to improve their performance (Sulieman & Wannus, 2021).

Over the course of the last 30 years, Cambodia's economy has undergone continuous change, accompanied by a rapidly expanding industrial sector driven by manufacturing and construction. This has allowed the country to move beyond subsistence agriculture, which kept the economy afloat during the civil war and the rebuilding that followed. "The Cambodian economy has benefited greatly from structural reform, a strong and stable financial system, and well-timed and well-targeted policy stimuli" (Chhair & Ung, 2016, p. 231).

Cambodia aspires to achieve upper middle-income status by 2030 and industrial development by 2050. To achieve these goals, Cambodia has committed to reaching the Sustainable Development Goals (SDGs) and has participated in numerous international development programs. In this way, Cambodia prioritizes education quality as a critical step toward achieving its national objectives. Academic accomplishment of students was also one of the subjects of debate among important stakeholders. The Ministry of Education, Youth and Sport (MoEYS) has placed a greater emphasis on comprehending the obstacles and factors that influence children' academic progress at the basic education level through implementing the Education Strategic Plan (ESP) 2019-2023, which responds to the National Strategic Development Plan (NSDP) 2019-2023 (MoEYS, 2019).

Throughout the 2019–2023 ESP implementation term, the MoEYS made noteworthy advancements in enhancing educational opportunities for all children in Cambodia. It enhanced the standard of instruction and the provision of successful and efficient educational services. In order to align with SDG4 and accommodate a variety of policies, the MoEYS lowered the number of education policies from three to two after the mid-term review in 2016. This action was taken to support the Royal Government of Cambodia's (RGC) goals for employment growth, equity, and efficiency—all of which are intended to lessen poverty and improve the standard of living for its people. The two policies for medium-term education are: (1) Policy 1: Make sure that everyone has access to high-quality, inclusive education, and encourage lifelong learning opportunities for all; and (2) Policy 2: Make sure that all levels of education officials are managed and led effectively.

In the past five years, the MoEYS and development partners have accomplished a great deal, including creating favorable conditions that have improved equity of access at all levels, especially during the nine years of basic education. These conditions have made it possible for underprivileged children to go to school by encouraging the badly needed growth and expansion of public institution governance and raising the quantity of scholarships available to poor students. The MoEYS placed special emphasis on professional teacher training, capacity building, and staff motivation, as well as the implementation of measures to enhance the caliber and responsiveness of education services, specifically the reform of the secondary school certificate examination and other forms of examinations. Additionally, the management of educational services became more effective and efficient. The introduction and execution of youth, education, and sport reforms in line with the government's reforms under the fifth mandate was another significant accomplishment of the MoEYS. Five reforms were put into effect between 2015 and 2018; eight reforms were put into effect in 2014. School-related reforms were the main focus from 2018 through 2023.

Over the previous five years, there has also been an improvement in the effectiveness of primary education, as seen by the lowering of dropout and repeat rates. However, the sixth grade of primary school has a significant dropout rate. Following the successful deployment of the Early Grade Reading Assessment (EGRA), the MoEYS enhanced learning. Consequently, as part of a nationwide assessment, Cambodia implemented the Early Grade Mathematics Assessment (EGMA). In 2015, the MoEYS conducted its inaugural EGMA. The findings showed that while children in Grades 1, 2, and 3 could answer questions on solution techniques, they did not grasp mathematical ideas. Since students lacked this understanding, grade 6 learning levels were low, particularly for fractions, decimals, percentages, and geometry. For mathematics teaching to be successful generally, early grade students must possess basic math abilities. The main problems included teachers not implementing inquiry-based learning activities, teachers not adhering to lesson plans, and a lack of teaching and learning resources for both teachers and students. The main goals of the primary sub-sector are to improve education quality by means of an extensive early grade learning program, guarantee that all children, especially those from disadvantaged households, complete primary school, and increase access to education. This includes teaching math and literacy in Khmer to students in grades 1-3 as well as subject-based mentoring and teacher training in more effective teaching techniques (MoEYS, 2019).

1.2 Statement of the Problem

The grade 3 national education assessment surveys were officially conducted in the 2014-2015 school year by the Education Quality Assurance Department (EQAD) of the MoEYS. The EQAD was created in 2009 from the Education Inspectorate, and is responsible for inspection and measurement of student achievement. The grade 3 survey in 2015 was the 4^{th} national assessment completed by the EQAD, which had completed previous surveys of grade three in 2012 (MoEYS, 2015).

The MoEYS-EQAD also carried out the grade 6 national assessment surveys throughout the 2015-2016 academic year. Together with 439 of grade 6 teachers, almost 6,300 students from 228 schools across the Kingdom took part in the assessment. Student and teacher questionnaires were utilized to gather more data on the teaching and learning environment, as well as student and family background, in addition to administering examinations to students in mathematics and Khmer language (MoEYS, 2016).

The results of grade 3 and grade 6 student achievement from the National Assessment in 2015 and 2016 on mathematics showed the following levels:

Table 1.1: National Assessment Results of Grade 3 and 6 on Mathematics

	Numeracy	Measurement	Geometry	Statistic	Algebra
Grade 3	37.7%	42.1%	54.6%	37.7%	30.8%
Grade 6	47.6%	47.1%	46.5%	60.3%	56%

Source: MoEYS (2015; 2016)

These results indicate the primary student achievements in mathematics are below the expected levels for these grades. Based on the findings, the MoEYS proposed to improve the teaching and learning in school; especially focusing on teaching methodology and classroom assessment (MoEYS, 2018a).

The present study has its niche in investigating what features of mathematics teaching methodologies and classroom student assessments are actually being adopted in primary schools. Moreover, the teachers are the most important link their competence in teaching and learning, and how this is reflected in their lessons in school, is critical. Furthermore, it is important to explore the relation between the teaching methodologies and classroom student assessments in school.

1.3 Objectives of the Study

The fundamental objectives of the study are fourfold:

1. To explore the perceptions of the surveyed primary teachers concerning the effectiveness of mathematics teaching methodologies at primary schools in Kampong Chhnang Province, Cambodia.
2. To explore the perceptions of the surveyed primary teachers concerning the effectiveness of classroom assessments at primary schools in Kampong Chhnang Province, Cambodia.
3. To investigate the relation between mathematics teaching methodologies and classroom assessments by primary teachers in Kampong Chhnang Province, Cambodia.
4. To explore the mathematics student learning outcomes at primary schools in Kampong Chhnang Province, Cambodia.

1.4 Research Questions

The research questions are formulated as follows:

1. How do primary teachers view the effectiveness of mathematics teaching methodologies in Kampong Chhnang Province, Cambodia?
2. How do primary teachers view the effectiveness of classroom assessments in Kampong Chhnang Province, Cambodia?
3. What is the relationship between mathematics teaching methodologies and classroom assessments by primary teachers in Kampong Chhnang Province, Cambodia?
4. What are the mathematics student learning outcomes at primary schools in Kampong Chhnang Province, Cambodia?

1.5 Hypotheses of the Study

Given the objectives of the study and the research questions, the specific research hypotheses may be stated as follows:

H1: The perceived effectiveness of mathematics teaching methodologies among primary teachers in Kampong Chhnang Province as a whole and at each aspect were at high levels.

H2: The perceived effectiveness of classroom assessments among primary teachers in Kampong Chhnang Province as a whole and at each aspect were at high levels.

H3: There is a significant positive relationship between classroom assessments with mathematics teaching methodologies.

H4: There is a positive growing score of student learning outcomes by grade levels.

1.6 Scope and Limitations of the Study

This research was conducted at public primary schools in Kampong Chhnang province. The 4 targeted districts in Kampong Chhnang Province were randomly selected as the research samples. From these, the study sample comprised of 278 public primary teachers and 395 students who are teaching and studying at grade 1 through 6. No generalizations were made to other educational levels. The Mathematics Teaching Methodologies and Classroom Assessment are conceptualized as the independent variables; while, Student Learning Outcomes is conceptualized as the dependent variables. The research study was conducted over a period of June 2023.

1.7 Significance of the Study

This study gives the desire to achieve high quality teaching methodologies and classroom assessments, this study investigates the factors that underpin the mathematics curriculum implementation. In order to achieve the objectives of educational reform and provide students with the skills they need for the twenty-first century, high-quality instructional methods and classroom assessments have the ability to help students develop higher-order thinking abilities and/or lifelong learning capabilities. It is therefore essential to improve our understanding of primary teachers' mathematics teaching methodologies and their use of classroom assessment, so that appropriate action can be taken to address any issues in a timely manner, given that primary teachers are the key agents in the teaching process to improve student learning outcomes. Furthermore, the findings from the present study provide the MoEYS with information having important implications for theory, policy and practice, which leads to improvements in the design of pre-service and in-service teacher education programs.

1.8 Conceptual Framework

The current research study is focused on three existing paradigms: (1) Theory and Model of Mathematic Teaching Methodology (Vygotsky, 1978; Wolfgang & Glickman, 1980; Brousseau, 2007; Eduedify, 2022; ORIGO Education, n.d.); (2) Theory on Classroom Assessment (Earl & Cousins, 1996; Education, 2006); and (3) Student Learning Outcome (MoEYS, 2018a).

For the theory and model of mathematics teaching methodology, Brousseau's didactic theory (2007), Vygotsky's constructivism theory, and Colburn's arithmetic book are crucial in teaching mathematics. These theories focus on didactic situations, constructivism, socio-cultural theory, visual learning models, and classroom management. They aim to integrate real-world knowledge and ensure classroom discipline to enhance student learning outcomes. Wolfgang and Glickman's book offers various discipline models and techniques to help teachers handle classroom behavior problems effectively.

In term of the theory of classroom assessment, Earl and Cousins (1996) emphasize the importance of assessment and evaluation in educational reform initiatives worldwide. Their theory on classroom assessment defines its form, centrality, extent, and process, focusing on its necessity, conduct, results, and benefits.

For student learning outcomes, the latest Cambodia's national curriculum of primary education is established in 2018, that has four main subjects which include

Mathematics. This curriculum mentioned about the five dimensions of primary mathematics, teaching and learning methodology, and also the student learning outcomes. The student learning outcomes include the knowledge and skills which the teachers have prepared to implement during their teaching and learning activities (methodologies) and the classroom assessment activities to ensure the students' achievements.

In this research study, Mathematics Teaching Methodologies (MTMs) and Classroom Assessments (CLAs) are conceptualized as the independent variables; while, Student Learning Outcomes (SLO) is conceptualized as the dependent variables. The research framework is shown below:

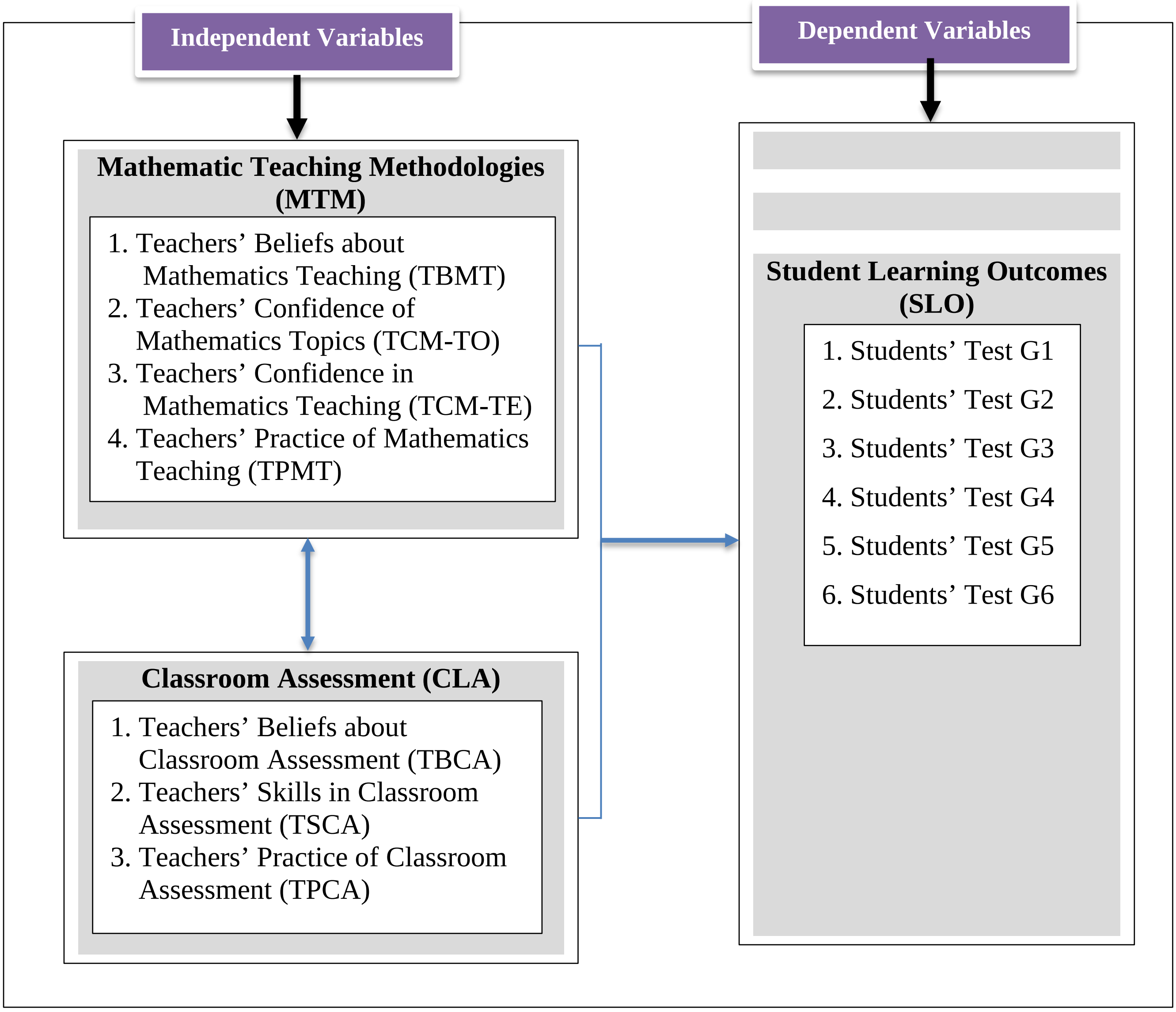

Figure 1.1: Conceptual Framework of the Study

1.9 Operational Definitions

Mathematics Teaching Methodology refers to the primary purpose of mathematics teaching to improve students' mathematical capability. The basis of mathematics is the clarity of students' thinking, the simplicity of their assumptions, and the ability to infer logical conclusions. One of the most essential purposes of mathematics teaching is to teach students how to understand abstract mathematical concepts and solve real-world situations (Atanasova & Pachemska, 2017). Several things, some of which have their roots in other disciplines, have an impact on the instruction of mathematics. Effective mathematical instruction is to teach concepts in a way that allows students to comprehend them and apply them to new situations. For a very long time, mathematics has been used to satisfy the fundamental needs of society. As mathematical knowledge increased, so did technological advancements, leading to the creation of several new scientific fields (Ünal, 2017).

Classroom Assessment refers to the process of obtaining information on what a student knows, can do, and is learning to do – is a demanding exercise in professional judgment (McMillan, 2005; Graham, 2007; Battistone et al., 2019). Teachers can "find out what we know, do not know, and might like to know about our students" through assessment. Two themes that are commonly debated in relation to assessment are the use of assessment data to determine school quality and the use of assessment to improve teaching and learning (Kulm, 1994, p. 11).

Student Learning Outcome refers to the learning outcomes method encompasses a wide range of required goals and places emphasis on how those outcomes are integrated into the teaching/learning environment, procedures, and practices. The method speaks of sophisticated skills that provide quantifiable results and can be proven. Stakeholders from all sectors are interested in the education paradigm of the twenty-first century because they want students to master academic outcomes, 21st century literacy, and competencies (Wagner, 2008; Dede, 2010; Patrick, 2013; Jang, 2016; Nir et al., 2016; Palaiologou, 2016; Sanabria & Arámburo-Lizárraga, 2017).

Primary School Teacher refers to the teachers in primary school work with students ranging in age from five to thirteen. To promote students' intellectual, physical, mental, and social growth as well as to present a predetermined curriculum, they develop learning activities and resources. They frequently oversee extracurricular activities like sports teams and field trips (Your Career, n.d.). Teaching in primary schools does not require subject-matter specialization. Different subjects bring different joys to primary school teachers as they impart knowledge in a multitude of subjects. Research indicates that science is one of the least favorite subjects to teach for primary school teachers. Consequently, it is possible that different professors exhibit varying degrees of excitement when teaching in science and technology (Denessen et al., 2015).

1.10 Structure of the Dissertation

This dissertation is organized into 6 Chapters with Chapter 1 presenting an overview of factors surrounding the topic of study and influencing the need for this research. The research questions studied, as well as limitations of the study, are presented as is a brief description of the local context and underlying conceptual framework for the study. Finally, relevant terms are defined. Chapter 2 is comprised of a literature review of research relevant to the theories and concepts of mathematics teaching methodologies, classroom assessment and student learning outcomes and summarized as is research on the additional strands of influence on this study.

The methodology utilized in this study is presented in Chapter 3. This includes an explanation of the research design, and the setting for the study. Population demographics and considerations are presented and the method of data extraction for the quantitative aspect of the study and instrumentation for the quantitative aspect are discussed. The process associated with the analysis of data, issues of validity, and the ethical considerations of the research bring the chapter to a close.

Chapter 4 is a presentation of the findings of this study. This includes a thorough description and relevant statistical analysis of the study data within the context of each research question. In Chapter 5, study findings and analyses are discussed within the context of each research question as well as in their entirety. Final chapter, Chapter 6, conclusions are drawn with a discussion of the application for future practice.

CHAPTER 2
LITERATURE REVIEW

2.1 Overviews of the Education in Cambodia

The education in Cambodia, the primary education sub-sector, curriculum implementation, teaching methodology, assessment, roles of the teacher, theories and models of mathematics teaching methodology, theories of classroom assessment, student learning outcomes, and research gaps are all covered in this chapter.

Cambodia is a small country with a turbulent recent history. In its endeavor to socially construct a classless communist society, the Khmer Rouge, led by Pol Pot, massacred nearly two million people and destroyed Cambodia's intellectual elite. Phnom Penh, the country's capital and once regarded as Asia's gem, deteriorated into a shadow of its former self. However, millions of dollars from donors have poured into Cambodia in recent decades, and via foreign investment, Cambodia has achieved the remarkable feat of having a consistently expanding Gross Domestic Product (GDP) for nearly two decades (Corrado et al., 2019).

The Ministry of Education, Youth, and Sport is in charge of overseeing the country's educational system. The bulk of Cambodia's educational system consists of primary, lower secondary, and upper secondary education (Cambodia Development Resource Institute - CDRI, 2015).

According to the World Bank, the world is currently experiencing an unprecedented global learning crisis. Despite the fact that many countries have made significant efforts to provide educational access to their citizens and encourage universal enrolment in general education, many children in developing countries reach adulthood without having acquired the necessary reading and arithmetic skills, despite spending many years in school. Enrollment in school is a necessity but attendance alone, does not allow children to reach their full learning potential; individual and household livelihoods will improve and a country's economy grow only when quality education is adequately given. The ESP 2019-2023 is a policy that reflects the following statement's objective. The government has implemented a reform agenda to improve teaching and learning quality, and the new agenda has resulted in some major changes in educational system in Cambodia (Chea & Chen, 2021).

At the start of 2019, the MoEYS approved Cambodia's 2030 Roadmap for Sustainable Development Goal #4 (SDG4), Education. This roadmap's objectives are to ensure inclusive, equitable, high-quality education and to promote chances for lifelong learning for all Cambodians. The roadmap indicated the following five policy priorities: (1) All boys and girls are entitled to free, equitable, and excellent basic education (primary and lower secondary) with meaningful and applicable learning objectives, as well as high-quality early childhood care and education; (2) A considerable proportion of young people now have more access to reasonably priced higher education, and both boys and girls complete upper-secondary education with pertinent learning outcomes; (3) Guarantee equal access to high-quality, reasonably priced technical, vocational, and postsecondary education, including university education for all individuals, irrespective of gender; (4) Promote literacy and numeracy among adults and youth, and increase opportunities for lifelong learning for students across all age groups; and (5) Enhance governance and management of education across all levels (MoEYS, 2019).

The Cambodian educational system aspires to accomplish the following goals:

1. To foster national consciousness, integrity, and a sense of pride through the promotion of shared goals, values, and aspirations in order to establish national unity and identity.
2. To develop students who are balanced holistically and integrated in all areas—physically, intellectually, emotionally, aesthetically, and spiritually.
3. To create aware, skilled, and competent human resources to meet labor market demands in a diverse, knowledge-based economy that can compete both locally and globally.
4. To provide lifelong learners with the skills necessary to function successfully and ethically in a global, regional, national, and local context in order to create a more sustainable and peaceful world (MoEYS, 2019).

2.1.1 Primary Education Sub-Sector in Cambodia

The primary education sub-sector focuses on: increasing access to primary education; ensuring that all children, particularly those from disadvantaged backgrounds, complete primary school; enhancing education quality through a comprehensive early grade learning program. Included are teaching qualifications, subject-based mentoring, literacy, and mathematics.

These are the goals of this sector:

1. Encourage more children, especially those from underprivileged backgrounds, to enroll in and complete their primary education through Grade 6.
2. Make higher-quality inputs more widely available in elementary schools.
3. Use School Based Management (SBM) to enhance the way primary school standards are implemented (MoEYS, 2019).

2.1.2 Curriculum Implementation

The curriculum is the set of rules that govern how education is delivered. The word "curriculum" comes from the Latin word "current," which meaning "to run" or runaway. Curriculum is an etymological term that refers to a learner's instructional course. Curriculum as a tool in the hands of artists (teachers) to mold their material (learners) according to their needs (educational goals and objectives) (Gurung & Parajuli, 2021). As a result, a curriculum is a crucial document that is designed to achieve a country's educational goals (Apriani et al., 2020).

The delivery of education and assessment by instructors through the use of particular resources and methodologies is referred to as curriculum implementation. Scripts, lesson plans, instructional recommendations, and alternate assessments are all commonly included in curriculum designs and are all connected to a certain set of objectives. In order to help teachers effectively execute and maintain the curricular framework in order to achieve various goals, consistency is emphasized in such designs (Wiles & Bondi, 2014). Curriculum implementation must be done in conjunction with proper and well-targeted communication and socializing. This is required in order to attain the educational objectives that are accomplished when the students are learning. One technique to determine the success of a curriculum implementation is to observe students and teachers while they are learning. However, many policymakers in a country still measure curriculum implementation effectiveness in terms of graduates' quality and learning achievement without considering students' and teachers' perspectives on the learning process (Prasetyono et al., 2021).

2.1.3 Teaching Methodology

A teaching method is a means by which an educator sets up and manages the teaching-learning environment. It can provide vivid explanations; assess students' comprehension through questions, responses, and reactions; offer praise and criticism; and more. A teaching method is a strategy for encouraging communication between educators and students in order to accomplish particular objectives (Atanasova-Pachemska, 2017).

Compared to a passive approach, an active teaching style structures the learning process to encourage more active engagement with the teacher. Active methods require a democratic style of interaction, while passive approaches require an authoritarian one. "When the classroom just has a standard chalkboard and chalk," the teacher says, they "must update traditional teaching methods at the same time." With the interactive method, having a particular level of expertise in one's profession and being able to impart it to students is no longer sufficient. Presently, the teacher has to organize the process in such a way that the pupils actively participate in learning, which is made possible by active, and even more so, interactive instructional methods. It is often known that students who actively engage in the learning process are better able to assimilate and retain the material they have studied. This interactive approach has students “closing in” on themselves. Interaction among students is one of the most crucial elements of the learning process. In order to achieve the goals of the lesson, the teacher's role in interactive classrooms is to guide and assist students' activities. What is referred to as “interactive learning” is learning that is mostly interactive (Rustamov, 2021).

The following are examples of dynamic and interactive learning: creative assignments, case studies, brainstorming sessions, conferences with report presentations and discussions, teaching with computer programs, and demonstrations of right and bad methods are all examples of educational activities. One way to visualize the case method is as a complex system with smaller cognition methods inside of it. Among the elements of the case method are modeling, systems analysis, problem solving techniques, thought experiments, simulation, classification techniques, and gaming techniques. The method of developing competencies is performance-based. This implies that students’ activity level has a direct impact on their capacity to internalize knowledge, skills, and capacities. The teacher at a higher education establishment is in charge of setting up this kind of activity appropriately (Rustamov, 2021).

2.1.4 Assessment

The process of determining what students can perform and where they may have issues is known as assessment. It gives unambiguous information for teaching and learning planning. The information can be used for a more targeted evaluation and support given where necessary. At its worst, the assessment produces a large amount of data that is not used to inform individual or collective requirements.

The following aspects of children's learning are assessed regardless of the methods used to assess them:

1. Factual data, notions, names and labels, theories, applications, links, parallels, interactions, and structures comprise knowledge and understanding;
2. Techniques, physical and mental agility, specialized proficiency in particular domains, craft mastery, and interpersonal abilities;
3. Attitudes and values - actions, convictions, subject matter expertise, individuals, and community;

4. Behavior: interpersonal connections, character attributes, execution skill, and possibility of fulfillment.

The reasons assessment matters are as follows:

1. Data to inform future instruction and learning activities;
2. Student feedback to inspire them;
3. Data to support teacher evaluation; knowledge that can be imparted to professions and parents;
4. Data that should be used to evaluate the efficacy of schools (Mary et al., 2008).

2.1.5 The Roles of Teacher

A teacher is a person who passes on knowledge to others. Teaching, educating, directing, training, assessing, and evaluating their students are just a few of the specialized tasks or roles that a teacher performs on a daily basis. As a result of these responsibilities, teachers are expected to improve their own professional development in groups or individually. Depending on their resources and abilities, teachers may utilize a variety of approaches to carry out the tasks or functions. Teachers must play these roles, for example, in coastal areas where students might learn a school subject while helping their parents' fish on a boat. Teachers have an important role in enhancing the quality of human resources in a country, which is why when a teacher has a problem, education in that country is also in jeopardy. The problem of education, particularly the problem of teachers, must be acknowledged as an unresolved occurrence in the country (Torro et al., 2021).

2.2 Overviews of the Mathematics Teaching Methodology

Mathematical methods are widely used in fields such as economics, informatics, and marketing. As a result, the most pressing methodological challenge is to bring the subject of "Mathematics" closer to the methods utilized in reality. It is vital to establish the actual relationship of mathematical material with the outside world in a language accessible to students in mathematics sessions, as well as to recommend the use of certain topics in systems sciences, in professional activity. It is critical to help students build strong and useful mathematical skills, both for further mathematics study and for solving real-world challenges. It is vital to demonstrate the relationship between the subject and their future specialty in order to increase their activity. The following approaches can be used to accomplish this: (1) incorporating information from another subject into the lesson; (2) using visual aids; and (3) posing questions based on content from related subjects (Kuziboyevna, 2020).

2.2.1 Didactic Theory

It is critical to understand the differences between the medium and the instructional approach. The technique does not exist in a vacuum and is intrinsically tied to activities. Textbooks, books, reference books, manuals, technical tools, dictionaries, and visual aides are examples of teaching aids. There are numerous applications for them. When they are included appropriately into an action, they make it possible to accomplish its goal. The basic nature of the activity is altered when different methods are employed in the learning process. The structure of the teaching method changes when different approaches are used. For instance, including clips from movies into a teacher’s lesson modifies the activities that both the teacher and the students engage in. The subtleties and component parts of a method are known as methodological methods. If a methodological approach is employed to master the primary substance of the educational material, then specific queries within the subject or topic can be thoroughly assimilated. In practice, there are many different methodological techniques to choose from. Some are applicable to a variety of subjects, while others are just relevant when teaching one subject. The teacher selects work methods and techniques that will deliver the necessary knowledge to the students, stimulate their mental activity, and build and retain their interest in learning (Kuziboyevna, 2020).

The objective and subjective aspects of teaching methods are distinguished first in their structure. The method's objective is due to the constant, unshakeable provisions that must be included in any method, regardless of how it is used by different teachers. It reflects universal didactic provisions, law and regulatory requirements, principles and rules, as well as constant components of educational goals, content, and forms. The subjective aspect of the method is attributable to the teacher’s personality, the characteristics of the students and the specific conditions. The link between objective and subjective in the method is a complex one that has yet to be fully resolved. On this topic, there is a wide range of viewpoints, from adoption of the method as totally objective education, to complete rejection of objective principles and acceptance of the method as a personal, and thus unique, work of a teacher. As is always the case, the truth lies somewhere in the middle. It is the presence of a constant, common to all objective parts in a method that allows for the development of a method theory, the suggestion of the best paths to follow in most circumstances, and the effective resolution of problems of logical choice and method optimization. It is also true that in the realm of methods, teachers' personal inventiveness, individual skill, and thus teaching methods have always been and will always be a sphere of high pedagogical art (Kuziboyevna, 2020).

In contrast to a rigidly developed mathematical theory, pre-mathematical conceptions are not split into initial and defined concepts. Concept prototypes are directly real objects and situations at the pre-mathematical level. The main difference between pre-mathematics and mathematics is that pre-mathematics utilizes only one-stage abstraction, whereas mathematics uses multiple stages (Kuziboyevna, 2020).

Didactic principles are the foundations of learning theory, expressing the fundamental laws of learning. They are determined by educational and upbringing goals, social development needs, and the features of educational activities of students of various ages (Kuziboyevna, 2020).

The system of didactic principles (teaching principles) is interconnected. There are different variations of the system of didactic principles in the pedagogical literature, with differences in the consolidation or unification of individual principles or conversely, in the detailing of individual principles and dividing one principle into several (Kuziboyevna, 2020).

The principle of active learning is defined by Polya, a well-known mathematician and teacher: the best method to learn anything is to find it for yourself. Despite the fact that a third-grade student “discovers” what has already been known, he thinks like a discoverer. The stimulation of student discovery is an important goal of teaching methodology (Kuziboyevna, 2020).

Ushinsky defines visual teaching as “instruction based on specific images directly observed by the child rather than abstract ideas and words.” Because of the peculiarity of younger students’ concrete-figurative thinking, visibility is critical in the earliest teaching of mathematics. Symbolic activity is widely used in middle and high school (drawings, graphs, graphs, diagrams, tables, etc.). All sorts of visualization are used in the initial teaching of mathematics: natural, symbolic, and especially pictorial. For example, starting with numerals and number 5, the teacher shows various pictures, each of which depicts a set of any objects, and the only thing that all of these sets have in common is that they all have five elements (pencils, birds, fish, boys, cars, etc.). Because mathematical concepts are abstracted from everyday life, pictorial representation is widely used when teaching early grades mathematics. Symbolic clarity is also used, initially in combination with pictorial elements. To demonstrate that there are as many girls in one picture as there are balls in the other, the child draws arrows from each girl to one of the balls, making sure that no two arrows finish at the same ball. Naturally, these arrows can be regarded as the child’s selection of a ball. When thinking about relationships, situations such as when all the girls don't have enough balls (“Helen is crying. She didn’t get a ball.”) and when there are extra balls are considered. From pictorial and symbolic clarity to purely symbolic clarity, there is just one step. You can use some figures to designate both the girls and the ball, such as triangles, circles, or just dots (Kuziboyevna, 2020).

2.2.1.1 Upbringing Teaching

Any instruction must include upbringing, which means that in addition to certain teaching functions, upbringing functions must be performed. This does not, however, imply that all education is reduced to teaching. On the contrary, it appears that considering instruction as an essential part of the upbringing system is more accurate (Kuziboyevna, 2020).

The formation of a schoolchild's worldview and morals is the main goal of education in the learning process in general, and mathematics in particular. How is this problem solved in the initial stages of teaching mathematics? It is necessary to demonstrate that all of the studied concepts and facts match to real objects, properties, and relationships between them at this stage of teaching. Countless examples in early school demonstrate F. Engels' famous remark that natural numbers and geometric figures are drawn from the real world and did not arise from pure intellect. We make various references to real prototypes of quantitative relations and spatial forms. That is, we begin, in essence, the creation of correct beliefs about the subject of mathematics, which, like other sciences, studies the real world around us. The teacher has numerous opportunities in math lessons to teach students about being honest, hardworking, and persisting in the face of hardship, among other things. The most effective way of imparting these attributes is through arithmetic problems, the text of which acts as an instructional function. The nature of upbringing is influenced by teaching methods as well (Kuziboyevna, 2020).

2.2.1.2 Scientific Approach

This concept states that instructional materials should be presented in such a way that linkages between concepts, topics and sections within a single subject, as well as interdisciplinary connections, are preserved. As a result, the term of scientific character in education also includes the concepts of consistency and systematic teaching (sometimes in pedagogical literature this principle is called the principle of scientific character, systematic and consistency in teaching) (Kuziboyevna, 2020).

Scientifics in mathematics instruction does not imply that the system of mathematical knowledge is incorporated in the curriculum in the form that it exists in mathematics science. In terms of early teaching mathematics, the scientific character principle should be interpreted as a reflection of specific mathematical principles in it, allowing them to carry out their early preparation. Number, functional dependence, geometric figures, quantity measurement and algorithm are examples of fundamental mathematical ideas (Kuziboyevna, 2020).

The properties of the natural series – “every number has a single neighbor on the right,” “every number except 1 has a single neighbor on the left,” “the neighbor on the right is obtained by adding 1,” “the neighbor on the left is obtained by subtracting 1” - reflect the ideas of the ordinal theory of the natural series and the value of the addition function 1 to form this series (Kuziboyevna, 2020).

It is critical to develop a concept of the closeness of the set of natural numbers with respect to individual operations in primary school: for any two natural numbers, their sum and product can be found, but their difference or their quotient may not be able to be found (Kuziboyevna, 2020).

Students’ familiarity with the process for measuring segments serves as preparation for their assimilation of more general questions about quantity measurement theory (Kuziboyevna, 2020).

2.2.1.3 Student Activity

Assimilation consciousness refers to students' participation in the learning process. Conscious integration of knowledge is impossible without active mental activity. It is necessary to distinguish between broad and narrow concepts of activity. In a broad sense, activity in teaching mathematics is not considerably different from student activity in the process of teaching other subjects, i.e., it has no bearing on the academic subject’s characteristics. In the narrow sense, activity can be thought of as a manifestation of a specific mental activity that is characteristic of a scientist - a mathematician, and is hence referred to as “mathematical” activity (Kuziboyevna, 2020).

The very description of the challenge of teaching mathematical activity may appear impossible at first glance. Is it true that a student in primary school is capable of mathematical activity? Obviously, neither a third-grade student nor a tenth-grade student is capable of graduate-level logical mathematical activity. A first-grader, on the other hand, is capable of some kind of mathematics activity that is appropriate for his or her level of thinking. It all depends on how “mathematical activity” is defined (Kuziboyevna, 2020).

When a first grader (or preschooler) creates pairs of elements from two sets and concludes that one set has more objects than the other, they are already engaging in some basic mathematical activity. While abstracting from the nature of objects, the learner assimilates the concept of an arithmetic operation, moving from operations on sets of specific objects to operations on the corresponding numbers (by the numbers of elements of these sets). This is a mathematics activity as well, but on a higher level. The student carries out mathematical activity at a higher level by discovering the laws of action over numbers, abstracting from specific numbers, and replacing them with letters (or empty windows of various shapes) (Kuziboyevna, 2020).

Teaching mathematics may and should be designed so that students' progress from one level of mathematical activity to another, higher level, beginning in first grade (Kuziboyevna, 2020).

Any symbolic visualization method is a standard symbolic system for separating the researched properties of objects, phenomena and processes from other qualities. As a result, symbolic visualization can be thought of as a form of communication. To make the arrows indicated above understandable, for example, it is required to explain what they mean. The records 5 + 3 = 8, 5 x 3 = 15, and so on are in the same category. Each of them is only clear when it has been exhibited with the help of a real-life circumstance that it depicts, that is, after its semantics have been explained (the meaning expressed by this entry) (Kuziboyevna, 2020).

A geometric model, such as a rectangle drawn on paper with a length of 5 and a width of 3 cells, can often be used to explain a symbolic notation, such as 5 x 3 = 15. It is simple to figure out the product - the number of cells in the shown rectangle - and to "prove" the commutability (reliability) of multiplication by counting the number of cells in the rows and columns (the word "prove" is in quotes, since this is a pre-mathematical proof in a particular case, model) (Kuziboyevna, 2020).

Clarity has an important role in the formation of mathematical concepts. Typically, this process is divided into two stages: sensory, which involves the formation of sensations and perception, and logical representation, which involves the transition from representation to concept using generalization and abstraction (Kuziboyevna, 2020).

2.2.1.4 Strength of Knowledge

Only conscious assimilation of knowledge allows for the long-term preservation of systematized knowledge, skills and abilities among students. Assimilation consciousness is provided by active mental activity; thus, active knowledge acquisition is a necessary condition for knowledge strength. However, in addition to awareness and activity, a proper teaching structure is required, taking into consideration the peculiarities of the memorization mechanism. The following are some general didactic guidelines: (a) memorization is in direct proportion to repetition; (b) memory has a selective character - we remember mainly what is important and interesting for us; (c) the material is remembered better when the possibilities of using it in practice are revealed; (d) memorization is facilitated by the division of the studied material into small portions according to the semantic content with the allocation of reference points in the form of headings, questions, mathematical relationships; and (e) emotionally colored material is remembered better (Kuziboyevna, 2020).

The process of determining what a student should remember from the material being studied is far more difficult than it appears at first. If we mean the entire school course of mathematics, it is self-evident that remembering everything is both impossible and unnecessary. Almost everything in primary school mathematics must be memorized: tables of single-digit addition and multiplication, algorithms for performing four arithmetic operations on multi-digit numbers, and so on (Kuziboyevna, 2020).

One of the most significant types of repetition in teaching mathematics in general, and in primary grades in particular, is the repetition of previously studied content before moving on to a new topic. It promotes better memorization of both old and new knowledge (Kuziboyevna, 2020).

2.2.1.5 Individual Approach

When teaching, it's important to consider each student's individual thinking style, memory characteristics and individual analyzers (vision, hearing, etc.). Even among students of the same age group, differences exist, and as a result, some students learn the same subject faster than others. All this determines the need for an individual approach to teaching (Kuziboyevna, 2020).

If the rate of assimilation of mathematical content by different students could be “measured,” the difference would be far greater than in other subjects. Negative consequences result from focusing on the “average” student. Weak students who fall below the “average” level fail, whereas “above average” students become bored in class and lose interest in the subject. As a result, in the classroom-lesson system, where 30-40 people are studying at the same time, the principle of individual approach must be implemented, and various techniques must be used to account for the differences in content assimilation by diverse learners (differentiated tasks, advanced, leveling classes, additional individual lessons, circle classes, etc. etc.). The use of personal computers in the classroom is one of the possible answers to the problem of an individual approach (Kuziboyevna, 2020).

2.2.2 Constructivism Concept and Theory

2.2.2.1 Constructivism Originality

A visual arts and architectural aesthetic style known as “constructivism” got its start in modern-day Russia circa 1920. But the history of this approach as an epistemological argument goes much beyond Plato's natural conceptions of knowing justification. In actuality, the Greek sophists and Gorgias (c. 380 BC) maintained that humans are limited to opinions (doxa) and are unable to know reality. More recently, the idea that "cogito ergo sum" is the only attainable certainty has been upheld by Descartes' systematic skepticism. In his well-known "esseest percipi," Berkeley (1685–1723) makes the case that we are solely aware of our own thoughts. Giambattista Vico (1668–1744) makes the identical claim that man can only understand what he creates or performs. The well-known aphorism "nihil est in intellectuquodprius non-fuerit in senso, nisi ipse intellectus," attributed to Leibnitz (1646-1716), operates similarly. Lastly, Kant (1724-1804) argues that experience is shaped by the active mind (Bermejo & Nieto, 2012).

Nevertheless, with his work "La construction du reel chez l'enfant," which was published in Piaget (1937/1967), the second volume of his renowned trilogy, Jean Piaget is regarded as the founder of cognitive constructivism. From different stages of a child's development, accommodation and assimilation eventually become more complimentary to each other: "True experience and deductive creation so become both separate and correlative," he writes (p. 338). Therefore, in an effort to understand development as the product of an internal dimension shaped by schemes and an interactional dimension shaped by adaptation - the outcome of the two functions mentioned above - constructivism resides in a space between empiricism and innatism or reformisms. In the first, the subject will help his mental structures adjust to reality; in the second, reality will adapt to the structures. Development is primarily caused by this process" equilibration (equilibrium-disequilibrium-equilibrium), with maturation, the physical environment, and the social environment acting as facilitators (Piaget, 1937/1967). In this sense, the environment can disrupt or create disequilibrium, but it does not directly cause development. Equilibration would therefore enable development to take place via a positive process. Equilibration is a dynamic process rather than a static one, as Fosnot (1996a, 1996b) notes: "Equilibration is not a sequential process of assimilation, conflict, and accommodation." Rather, it is a dynamic "dance" of increasing development and change, adaptation and structure, and equilibration (p. 14).

If the mature learner depends on innate biological programming, and the empiric learner is passive and depends on effort and external incentive, then the constructivist learner will adapt and develop through modifications, equilibration, and active creations.

Constructivist methods frequently come in a variety of forms. Bermejo and Nieto (2012) discuss the theories of biological constructivism (Maturana), radical constructivism (Von Glaserfeld), socio-cognitive constructivism (Vygotsky), and cognitive constructivism (Piaget). To pursue the primary objective of the paper, which is teaching and learning in mathematics classrooms, Cobb’s proposal, however, seems accurate for us in analyzing and coordinating them: “As was the case with the discussion of Rogoff's and Glasersfeld’s analyses, this coordination of perspectives leads to the view that learning is both a process and a product” (Cobb, 1996, p. 45).

According to Piaget, “you only understand what you invent,” and “you only learn what you understand.” This brings to mind the theories of Giambattista Vico, which we have already looked at. In contrast, Vygotsky highlights the role of adults in facilitating learning by highlighting the zone of proximal growth and the two stages of development - current and potential.

2.2.2.2 Constructivist Intervention Program

Numerous disciplines, including cognitive psychology, neuroscience, biology, genetics, and so forth, have been applied to mathematics education; however, a few, like educational psychology, science education, and mathematics education, establish stronger connections between their research and the actual classroom. It’s critical to keep in mind that every discipline concentrates on different facets of the teaching-learning process, including the instructor, the learner, and the situation. Owing to the intricacy of the educational process, intervention programs need to make an effort to address every variable involved. At the same time, they need to be cognizant of the possibility that changes will arise during classroom implementation as a result of variables introduced by the agents involved; these latter variables will serve as the basis for future research (Simplicio et al., 2020).

Cobb (1998) argues that constructivism can be a good substitute for more conventional methods for two reasons. The first claim is that pupils can solve a greater variety of mathematical problems because they are able to construct more intricate and abstract frameworks. In the second argument, students’ motivation is increased because they can generate and direct mathematics, which allows them to change their perspectives through the development of their own knowledge.

The interaction between the two approaches is what enables a balanced learning process when mathematics is the focus. This is because, as explained by Bermejo et al. (2002, 2021), the socio-cultural component will emphasize individual participation to explain how students take ownership of the teacher’s contributions as well as teacher-student and student-student interactions. Conversely, cognitive theorists would concentrate on how students adjust to the actions of others and how well each person’s interpretation is carried out. This implies that the development of specific mathematical concepts is influenced by the individual's interpretations of both their own and other people's actions.

In order to improve students' performance in mathematics, the intervention program Programa Evolutivo Instruccional para Matemáticas (PEIM) aims to increase students' understanding of mathematical concepts, particularly in problem-solving exercises. In order to do this, it will directly affect four factors: curriculum content, teachers, students, and the social climate in the classroom.

Constructivist methods are used in the program to give students the opportunity to actively create their own mathematical knowledge as opposed to only being taught it. students bring knowledge from their everyday lives to class; hence, it is imperative to assess knowledge before engaging in classroom-based learning as suggested by Resnick (1992) and Bermejo et al. (2021). Children grow up in an atmosphere full of stimuli that impact their mathematics learning, regardless of their cultural background (Ginsburg & Seo, 1999; Bermejo et al., 2021). For learning to be more meaningful and for the kid to become an active participant in the classroom, it is imperative that they make the connection between what they are being asked to do in class and what they already know. Accepting this idea would enable us to depart from more prescriptive courses where procedures are heavily involved and to avoid contextualized and rote learning.

When children are put in strange situations, they have to adapt by rearranging the surroundings to make it easier for them to get around. Students will typically need to employ creative or unconventional thinking to those situations by using their imagination (Bagassi et al., 2020). By using a constructivist intervention, the student generates significant learning that enables them to regularly become more mathematically proficient. Regarding this, longitudinal research carried out in England shows that, even with the same teachers and content, students who studied using rather different approaches learned differently and developed distinct attitudes about mathematics (Boaler, 2002a, 2015).

Not all authors use the same terminology to convey the same ideas when discussing learning as a constructive process (Bermejo et al., 2000b, 2021). For instance, Lampert (1989) and Bermejo et al. (2021) assert that students acquire information in the same manner that they build knowledge in mathematics. Carpenter et al. (1996, 2014); on the other hand, view the process as a unique invention made by the learner. According to the NCTM (2000, p. 20), students should acquire mathematics by comprehending and actively constructing new information from experience and prior knowledge.

The NCTM (2000) states that a valid constructivist intervention would enable the student to engage with the instructor and other students while always using a variety of tools to reason, relate, solve problems, and communicate. Additionally, it would give the learner the ability to forecast, solve problems, and formulate hypotheses that are supported by mathematical reasoning. It will also help the learner concentrate on issues that permit the investigation of instances and counterexamples. After accounting for these variables, the study comes to the conclusion that students may formulate hypotheses and provide reasoning-based solutions, a process that integrates prior knowledge with the idea that they will build new knowledge structures with one another in the classroom.

The PEIM suggests that the teacher use one-on-one interviews to define the student's mathematical profile. This will help to ascertain the student's developmental stage, the informal knowledge they have acquired, and the kinds of proposals that will help them advance at a pace that is appropriate for them.

An essential component of the teaching-learning process are the teachers. In order for them to better understand the mathematical material and to anticipate each student's activity, potential strategies, and mistakes made while learning each topic, it is imperative that they undergo extensive psycho-pedagogical training that enables them to get to know their students. Therefore, it is important to recognize the value of mistakes as a source of knowledge. Teachers that possess a solid understanding of the fundamentals of mathematics will be able to provide students with challenges that will push them to create increasingly complex and abstract schemes through meaningful learning, so advancing their mathematical competence. Therefore, "it is critical to create learning settings in which the game rules used to solve problems and the approach and resolution of issues containing major mathematical ideas and those from other disciplines make sense" (Albarracn et al., 2018, p. 15).

In light of this, early childhood education teachers must stay up to date on the latest research results in order to create links between the classroom and research and modify their own pedagogy based on tried-and-true methods. Koponen et al. (2016) propose three key areas for the development of mathematical knowledge necessary for its education in this regard. Gaining a deeper comprehension of mathematics and its proper teaching methods is the first area of focus. Methodological reflection and creativity are required in the second category. In order to deliver more equitable training, the third component, which involves doing a study on teaching, is concerned with the nature of mathematical knowledge.

Regarding effective mathematics instruction, the NCTM (2000) advises teachers to take into account the following guidelines: (a) provide meaningful tasks that enable students to apply their knowledge in real-world situations; (b) use tools to analyze the roles of the teacher and the student in the classroom and to build mathematical relationships; and (c) provide a suitable environment for the previously examined adaptation of the teaching-learning process.

Cobb (1988, 1995) and Bermejo et al. (2021) emphasize the idea that students construct their knowledge by reorganizing their cognitive schemas, and recommend that the teacher's role shifts from assisting students in receiving and acquiring mathematical knowledge to organizing and directing the student's actions. In this approach, the teacher's position has shifted significantly from the 'old school' concept. The teacher no longer acts as an instructor, but rather as a guide to assist students in figuring out how to complete the various activities. This entails putting students in circumstances where they can examine various resolution tactics, conduct critical analyses and defend how and why they accomplished things the way they did. In the absence of adult teaching, children can invent their own addition procedures as Groen and Resnick (1977) and Bermejo et al. (2021) put it. This compels us to think about the kind, scope, and delivery of instruction. Any connections between ideas and any applications provide a solid basis for understanding mathematics.

To further differentiate themselves from models where good answers are rewarded and errors are fixed, teachers also modify their mathematical vocabulary to better align with the explanations provided by students.

Jacobson (2017) claims that teachers deal with a variety of issues in the classroom, which helps them advance in creating new materials and methods. But since it requires accepting the two constructivist tenets, which must be implicit and evident in the classroom, we cannot ignore the necessity of ongoing training in this area. Children acquire knowledge on their own, but instruction also needs to be delivered in a way that ensures and facilitates this knowledge generation in the most efficient way possible.

As a result, this training must be a top priority in educational institutions, and organizing seminars on a regular basis will assist and enhance instructors' attitudes about mathematics and, as a result, positively influence the instructional process. Carpenter et al. (1998) found a link between changes in teachers' views and the manner they educate, as well as student performance (Yurekli et al., 2020). Valentine and Bolyard (2019, p. 437) state that "negative attitudes regarding mathematics are frequent among the overall adult community, including prospective elementary teachers." Some research indicates that there is a moderate to weak correlation between mathematical anxiety and performance (a range of 0.11 to 0.36), and individuals with higher math proficiency typically have less anxiety related to their mathematical performance (Primi et al., 2020). These elements don't facilitate the process of teaching and learning.

We might then say that learning is a communicative process, in which students are listened to, and their aims are understood and their logical thinking assumed. In their function as a guide, the teacher must urge students to clarify and justify their ideas both orally and in writing, allowing them to influence and go deeper into those areas that they deem more important, selecting when to use language to represent mathematical notation. To accomplish this, they will have to pose questions and offer assignments, as well as provoke compromise and test each student's thinking. “In order for the teacher to properly and efficiently manage the discussion in class, they must have not only extensive knowledge of the topic under discussion, but also, and above all, they must understand how the child learns that specific topic, that is, the levels of development in understanding the topic or content, the difficulties and errors that typically arise” (Bermejo et al., 2002, p. 40, 2021). Consequently, the program emphasizes teacher preparation before the instructor enters the classroom since, among other reasons, this will ensure the program’s success. The program’s educational curriculum is another essential component. Numerous studies have found that government-mandated curricula, parental involvement, and the amount of time spent on a subject all influence educational practice (Anderson et al., 2005; Cross Francis, 2015; Yurekli et al., 2020). The material must therefore be carefully chosen and organized. Such a decision has a significant influence on what each teacher teaches on a daily basis, as opposed to the curriculum that the government has created. Less time should be spent on repetitive and mechanical chores and more time should be spent on tasks that promote comprehension, reasoning, verbal problem solving, mental representation preparation, decision making, and other related skills. The material being produced ought to have relevance for students and be applicable to their daily lives. Bermejo et al. (2002, 2021) assert that studying in a real-world environment is crucial for students because it enhances their self-worth and gives their education greater significance. The material must be presented in a way that satisfies the difficulty requirement (Bermejo et al., 1998, 2021). In this approach, the PEIM suggests micro-genetic study, which enables the teacher to comprehend the child’s progression through the learning of each mathematical concept. Put another way, it makes a compelling case for individualized instruction.

Finally, another fundamental pillar of the PEIM is the classroom setting. In this regard, we recognize that the context refers to the dynamics of the classroom as well as a variety of other aspects that aid and support learning. Some authors, e.g., Saxe (1991), Saxe and Guberman (1998), and Bermejo et al. (2021) define learning as the attainment of individual goals through the development of group activities. As a result, Hatano and Inagaki (1991) and Bermejo (2021) argue that increasing student discussion will provide strong opportunities for knowledge production due to socio-motivational aspects. Similarly, cooperative labor appears to have a good impact on learning in general. Students can assume many roles in cooperative learning, including tutoring and being tutored, and vice versa (Youde, 2020). Johnson et al. (1983), Slavin (1983a, b), Kagan (1988), Johnson and Johnson (1989), Shara (1990), Nelson-Le Gall (1995), and Bermejo et al. (2021) are just a few of the researchers who demonstrate the three benefits of student collaboration during the learning process: academic, social, and personal. Students with learning difficulties as well as those with profiles resembling those of excellent students can take advantage of these benefits (Huber & Carter, 2019; Moliner & Alegre, 2020; Sarid et al., 2020).

Scholars like Webb et al. (1994) and Bermejo (2021) have examined various approaches to mathematical problem solving; nonetheless, it is important to acknowledge that pinpointing the learning elements that impact cognitive and affective processes can be challenging. According to several experts, peer interaction promotes learning since children are frequently more aware of their classmates' problems than their teachers are. Collaboration facilitates the sharing of beliefs, enabling individuals to act as intermediaries in the perceptions of others (Presseisen, 1992; Bermejo et al., 2021). Palincsar and Brown (1998) and Bermejo (2021), for example, claim that student conversation helps them understand the strategic components of learning by allowing them to appreciate their own views as instruments for solving issues. As a result, they discover powerful qualities of thought through such a dynamic interaction.

2.2.3 Socio-cultural Learning Theory

The benefits of socio-cultural learning theory are numerous and well-known. It emphasizes, first and foremost, the larger social, cultural, and historical background of all human endeavors. People are no longer viewed as distinct entities; instead, a more nuanced viewpoint is presented, emphasizing the pliable line that separates oneself from other people. It illustrates how a learner absorbs information and skills from society before making an impact on their environment (Miller, 2011). Second, socio-cultural theory considers both cultural and individual characteristics. Socio-cultural theory, in contrast to many other Universalist ideas, acknowledges individual diversity both inside and between cultures. It recognizes that “different historical and cultural contexts may support distinct growth trajectories to any given developmental endpoint” (Miller, 2011, p. 198) depending on particular social or physical situations and resources available. Lastly, socio-cultural theory significantly advances our theoretical knowledge of cognitive development by fusing the ideas of learning and development. Our perspective of the learning process is drastically altered when we learn to drive growth instead of being driven by a learner's developmental stage. This has important consequences for instruction and education (Miller, 2011; Polly et al., 2017).

Socio-cultural learning approaches describe ‘social learning’ in a more radical way; they regard learning as strengthening students’ engagement in social activities rather than just acquiring knowledge and skills (Van Oers, 1998; Polman et al., 2020). Participation in real or simulated “social practices” should be emphasized in meaningful learning situations rather than concentrating on particular problem-solving activities (Volman & Ten Dam, 2015). While acknowledging that knowledge acquisition may cause a change in this perception, socio-cultural methods also stress the importance of learning being relevant to students’ perceptions of their own past, present, and future selves (Wardekker et al., 2012). Students obtain information and abilities that allow them to engage in (and modify) socially relevant activities, resulting in personal growth (Van Oers, 2009; Vianna & Stetsenko, 2011). Mathematics is woven into meaningful activities rather than being taught as a distinct subject in a socio-cultural approach to mathematics (Van Oers, 2013).

2.2.4 Visual Learning Model

One of the most pressing issues has always been the development of school children's educational ability. The more a student's potential skills are realized, the more success he or she will have in life. The approach of visualizing instructional information is one of the most effective tools for improving learning. Global changes have occurred in the field of visual information transmission in recent decades: the volume of communicated information has expanded; new types of visual information, as well as transmission mechanisms, have emerged. Teachers face particular challenges as a result of technological advancements and the emergence of a new visual culture. Visualization assists students in accurately organizing and analyzing information, in developing critical thinking, in integrating new knowledge, and in linking the information gained into a holistic image of a phenomena or item. Diagrams, charts, images, memory cards, key notes, presentations, films, mind maps, mental maps, and other visual aids make it easier to remember and trace the relationships between blocks of information. It should be emphasized that visual perception is the most common type of information perception, which necessitates the development of both traditional and new visual means and ways for activating the work of vision in the learning process (Urban et al., 2021). According to Vasilevska and Rivza (2016), a person absorbs up to 90% of information through the visual channel of perception. In this context, the importance of visual models for the presentation of educational material grows, allowing students to overcome the challenges of learning based on abstract logical reasoning.

The integration of abstract and tangible ideas in education is achieved through the use of visualization, which enables teachers to help students understand the purpose of educational tasks and reflects the transmission of theory through visual approaches (Shatri & Buza, 2017). Visual literacy development is recognized as one of the most important learning objectives as early as primary school, and visualization is valued as both an independent study topic and a teaching tool (Alper et al., 2017; Lee et al., 2017).

In today’s instructional discourse, visualization of the studied topics is seen as a critical aspect in students’ understanding of mathematical concepts (Yilmaz & Argun, 2018; Kuleshova et al., 2019). Because of the peculiarities of younger students’ thinking, representation of mathematical ideas is especially important in basic education. A child’s thinking during the age of 7-12 is at the stage of developing intelligence, according to Piaget's theory of intelligence development. This stage is characterized by the fact that while thinking becomes increasingly logical, it remains specific, relying on the perception of external features of real objects. Piaget’s insights about the idiosyncrasies of this age group's thinking and speech are supported by modern research (Kurt, 2020).

However, not all visualization aids students’ comprehension of mathematical theory, and in certain situations, the use of specific educational materials obstructs the development of full-fledged mathematical representations (McLellan, 1997; Urban et al., 2021; Vasilevska & Abchynets, 2021). As a result, the importance of visual representations of the important components of the studied topics is highlighted in studies of the problem of visualization in mathematics education. In the direct sight of physical and mathematical things, these key elements are frequently not visible to the child. These visual representations are called visual models, and unlike “non-model” pictures, they teach students the intrinsic qualities of objects rather than the external ones (Urban et al., 2017).

Scientific evidence backs up the usefulness of utilizing visual models in elementary mathematics instruction, and teachers’ experience backs it up (Lehrer &

Schauble, 2019). Visual learning modeling helps elementary school students solve math and practical problems by providing a thorough and conscious understanding of computational concepts (Bartolini & Mariotti, 2008; Haylock & Cockburn, 2017).

The problem of visual educational modeling is now being researched using various approaches. First, the usefulness of adopting interactive computer visualization in primary mathematics education is justified in scientific publications. You can use visual computer models to demonstrate the dynamics of real-world or mathematical item changes. Modern high-tech computer tools are increasingly serving as a platform for educational research and experimentation, rather than just a way of mastering mathematical knowledge (Sergeev & Urban, 2012). They are becoming a component of artificial intelligence (AI) trends in education when combined with the ability to instantaneously analyze students' performance and personalize their educational paths. Despite academics' equivocal attitudes on education technologization, it should be understood that AI-trends have an impact on education at all levels, including primary school (Chassignol et al., 2018). Second, the efficiency of conventional didactic methods for creating visual models from real materials or depicting them on the blackboard (sheet of paper) is investigated in scientific research. The world-famous "Bar Model Visualization Technique" in Singapore schools was founded on the generalization and systematization of employing traditional visual tools in mathematics education (Osman et al., 2018). The usage of visual models, often known as bar modeling, is a key determinant in Singapore students' success in the Program for International Student Assessment (PISA) and the Trends in International Mathematics and Science Study (TIMSS) international educational achievement examinations (PISA, 2018; TIMSS, 2019).

Despite the fact that visual models have been proved to be effective in the practice of primary school teachers, their adoption faces many barriers. The purpose of this research is to identify and characterize primary school teachers' use of visual models in mathematics classes, as well as to identify and describe the challenges of preparing students for the use of visual teaching models and to propose a strategy for improving it.

2.2.5 Classroom Management

Classroom management is important for administrators, teachers, and students. Nonetheless, in this crucial field, there is a lack of comprehensive study on the contextual abilities of instructors (Evertson & Weinstein, 2006; Stahnke, 2021). Conversely, it is widely acknowledged that good classroom management is both an essential element of high-quality instruction (Kunter et al., 2013; Charalambous & Praetorius, 2018) and a significant cause of anxiety and stress, especially for new and pre-service teachers (Chaplain, 2008; Kaufman & Moss, 2010; Schmidt et al., 2017). Because of this, classroom management criteria are included in the majority of teacher assessment rubrics and teacher education programs worldwide (Wubbels, 2011; Gilmour et al., 2018). The influence of classroom management on student motivation, achievement, and emotion is one factor contributing to its significance (Wang et al., 1993; Seidel & Shavelson, 2007; Korpershoek et al., 2016).

As stated by Wubbels (2011, p. 114) - “use terms that illuminate the goals that classroom management seeks rather than its procedures” in their explanations of the subject, it is not surprising that they are often vague. For example, classroom management is described as “the ability to build, maintain, and (when necessary) restore the classroom as an effective setting for teaching and learning” by Brophy (1986, p. 182) and Stahnke (2021). Classroom management is similarly defined as “the process of establishing and maintaining order in a classroom setting” by Doyle (1986, p. 99) and Stahnke (2021). These goals of establishing and maintaining order are based on specific classroom characteristics (Doyle, 1986, 2006; Stahnke, 2021). In the classroom, a wide variety of activities occur, and there are numerous actors with similar goals in attendance (multidimensionality). Since a lot of things happen quickly and simultaneously, teachers need to respond quickly as well (immediacy). In addition, a lot of students usually witness the activities of professors (publicity), and the results are often unanticipated (unpredictability). On the other hand, because of past experience (history), classes have set standards and practices. The multidimensionality, simultaneity, immediacy, publicness, unpredictability, and history of classrooms make classroom management a challenging undertaking for educators (Doyle, 2006; Stahnke, 2021).

“The actions teachers do to create an environment that promotes and encourages both academic and social-emotional learning” is how Evertson and Weinstein (2006) and Stahnke (2021) define classroom management. “It strives to improve students’ social and moral growth as well as establish and maintain an orderly environment in which they can engage in meaningful academic learning” (p. 4).

2.2.5.1 Classroom Management Strategy

To effectively influence student outcomes, teachers must possess a wide range of classroom management techniques, which they should employ in an adaptive manner to “support and assist effective teaching and learning” (Kounin, 1970; Simonsen et al., 2008; Korpershoek et al., 2016; Stahnke, 2021). Many considerations determine which strategies are truly adaptive in a given situation. For instance, different teaching formats place varying demands on the classroom management of teachers (Emmer & Stough, 2001; Doyle, 2006; Stahnke, 2021). Group work formats require the teacher to keep an eye on the progress of different student groups in addition to being accessible for individual questions, whereas whole-group instruction requires the teacher to keep an eye on the behavior and learning of the students as well as the flow of the lesson (Doyle, 2006; Stahnke, 2021).

Preventive and reactive classroom management tactics are commonly used (Clunies-Ross et al., 2008; Piwowar et al., 2013; Bear, 2015). Reactive classroom management strategies are the ways in which teachers respond to disruptions, misbehavior, or disengagement in the classroom. These methods include verbal warnings, citing the rules, or even putting students in detention (Clunies-Ross et al., 2008; Glock & Kleen, 2019). Norms and routines, monitoring student engagement and learning, motivating students, and fostering a good rapport between teachers and students are examples of preventative tactics (Bear, 2015). When compared to in-service teachers, pre-service teachers, on the other hand, seem to have more difficulty applying these classroom management strategies adaptively, resorting to harsher reactionary strategies to address minor student misbehavior (Woodcock & Reupert, 2013; Glock & Kleen, 2019). Pre-service teachers prefer reactive tactics because they are more accustomed to them, even if both types of strategies are effective (Reupert & Woodcock, 2010; Stahnke, 2021). This focus on reactive approaches is reflected in pre-service teachers' perception of classroom management, which predominantly consists on upholding discipline and behavioral control (Kaufman & Moss, 2010; Stahnke, 2021). The emphasis on reactive behavior control is undesirable since it shortens students' attention spans and causes stress in teachers (Clunies-Ross et al., 2008; Stahnke, 2021).

To become effective classroom managers, new instructors need to acquire the necessary knowledge and abilities about classroom management, including methods. Contextual classroom management skills are even more predictive than declarative and procedural general pedagogical knowledge in terms of predicting effective classroom management and other measures of instructional quality (König & Kramer, 2016; König & Pflanzl, 2016). While classroom management information is already acquired at university, these abilities, on the other hand, seem to only be developed following teacher induction (König & Kramer, 2016). This has led to the creation and evaluation of a number of strategies for promoting knowledge and skills across university-level teacher education (Piwowar et al., 2013; Dicke et al., 2015; Kramer et al., 2017; Weber et al., 2018; Gold et al., 2013, 2020). It is great that a lot of these methods have helped teachers gain more understanding and proficiency in classroom management and related techniques. We do not know what features of these interventions contribute to expertise or competence growth, or what procedures are crucial in this process, without further research into what precisely makes expert classroom managers professionals.

2.2.5.2 Classroom Management Dimensions

Notwithstanding the wide range of study on the subject, a variety of distinct aspects of classroom management can be identified using research findings and conceptualizations of the topic. Behavioral management is the concept that dominates and is most closely associated with scholars' understanding of classroom management (Bullough & Richardson, 2015). Preventing or addressing student misconduct and disengagement is the aim of behavioral management (Kounin, 1970; Martin & Sass, 2010; Stahnke, 2021). Examples include keeping an eye on pupils and creating guidelines and procedures (Kounin, 1970; Gold & Holodynski, 2015). Building on the behavioral focus, instructional management describes the methods and strategies that teachers employ to accomplish their content-related objectives. Examples of these include seatwork, structure, and clarity, as well as the instructional formats they employ (Froyen & Iverson, 1999; Martin & Sass, 2010; Martin et al., 2016). Another crucial aspect of instructional management is creating seamless transitions between activities (Kounin, 1970; Gold & Holodynski, 2015).

According to Wubbels et al. (2015, p. 363), "all teacher actions and associated cognitions and attitudes involved in creating the social emotional aspect of the learning environment" are included in the affective-motivational dimension of classroom management, which is another facet of classroom management. Examples include the growth of positive teacher-student relationships and the admiration and motivation of the students (Froyen & Iverson, 1999; Piwowar et al., 2013; Schwab & Elias, 2015; Martin et al., 2016). A few conceptualizations (Martin et al., 1998; Froyen & Iverson, 1999; Piwowar et al., 2013) of classroom management make a systematic distinction between these attributes. According to Piwowar et al. (2013), there are three types of behavior management: procedures, group mobilization, time management, and clarity of the action plan); behavior management of teachers; and behavior management of students, which includes rules, monitoring, and dealing with disruptions. A final aspect of classroom management that is frequently disregarded in conceptions of classroom management is teachers' self-management, which includes their self-regulation, self-control, and especially their self-presentation (attitude, presence, gesture, or facial expression) (Fenwick, 1998; Sutton et al., 2009; Martin et al., 2016).

2.2.6 Teachers' Beliefs and Practices towards Mathematics Teaching

Philipp (2007) defined beliefs as psychologically held but false worldviews. Beliefs are seen as private, enduring, but significantly outside of an individual's awareness (Cross, 2009). It is important to investigate instructors' views because studies have shown that they have a big impact on how well their students perform (Staub & Stern, 2002; Cross, 2009; Turner et al., 2009; Behrmann & Souvignier, 2013). In contrast to a direct transmission method, a study by Staub and Stern (2002) showed that a cognitive constructivist attitude was related to increased proficiency in mathematics word problems. However, transmissive attitudes were found to positively influence students' achievement, according to Behrmann & Souvignier (2013). However, the majority of studies show that the constructivist belief approach is favorably associated with learning success (Organization for Economic Cooperation and Development - OECD, 2009; Schunk, 2012; Behrmann & Souvignier, 2015). Adopting the appropriate interventions can thereby affect teachers' perceptions of effective teaching methods.

Those who advocate learner- and teacher-centered approaches make up the majority of academics who have researched people's perceptions of the nature of teaching and learning (Stipek et al., 2001; OECD, 2009). Constructivist beliefs are those that are based on learner-centered methods, as opposed to transmission beliefs, which are those that are based on teacher-centered methods (OECD, 2009). The direct transmission theory contends that teachers are the owners of knowledge and that students are only passive recipients. As a result, it is the instructor's duty to disseminate information to the class in a clear and concise manner. Contrarily, a constructivist requires that students take an active role in their education. Constructivist educators prioritize understanding and problem-solving as the foundation for acquiring information (Schunk, 2012).

Beliefs can be constructive or unproductive, according to the NCTM (2015). While the productive beliefs are related to the constructivist viewpoint of learning the unproductive beliefs are related to the direct transmission method to learning. As per the Teaching and Learning International Survey (TALIS) report from the Organization for Economic Co-operation and Development, different nations have varying levels of teacher support for the two approaches (OECD, 2009). The TALIS report claims that constructivism and direct transmission theories of learning and instruction have been widely applied in western nations.

Additionally, studies have shown that teachers' backgrounds, including their gender, their teaching experience, and their professional development, have an impact on how they view the teaching and learning of mathematics (OECD, 2009; Devine et al., 2013). The OECD (2013) also mentioned that different nations and schools have different views on teachers. Studies by OECD (2009) revealed that female instructors are more likely than male teachers to adopt student-centered learning strategies and are less likely to consider teaching as the straight transmission of knowledge. A report by TALIS also postulated that teachers who participate in professional development adopt a variety of pedagogical stances. Studies also support the idea that in order to create conducive learning environment, schools should offer specific training programs that aim to change instructors' ideas (OECD, 2013).

2.3 Overviews of Classroom Assessment

Classroom assessments are the most common assessments conducted throughout the school year. As a result, classroom tests have the best chance of giving "diagnostic" information about what students can and cannot do. Teachers utilize classroom assessments to determine what students know and can do in relation to the standards. However, they may gather and use evidence of student learning for a variety of reasons at different times. Teachers utilize classroom assessments to examine students' knowledge and understanding of the learning objectives which were established for the year. Teachers can design their own assessment items, use published items such as those found in their textbooks or other external sources, or use a combination of methods (Schneider et al., 2013).

Classroom assessment, according to Buhagiar (2007), is a procedure that takes place within the classroom. It includes data and information about student learning to assist classroom instruction and give students pertinent feedback to help them learn better (Shepard, 1989; Kulm, 1994). Students get information through the assessment process, which involves making a variety of decisions in the classroom under different conditions (Stiggins, 1992). Teachers can monitor and assess classroom instruction, gain insight into their students' learning, and give feedback to students that can help them learn more effectively. All of these benefits come from assessment. Through classroom assessment, teachers can keep track of their students' learning progress and comprehension of many subjects in connection to the learning objectives within the classroom setting (Brookhart, 2008). The majority of teachers are faced with the task of developing and administering assessments that provide meaningful and helpful feedback on their students' progress (Butler & McMunn, 2006).

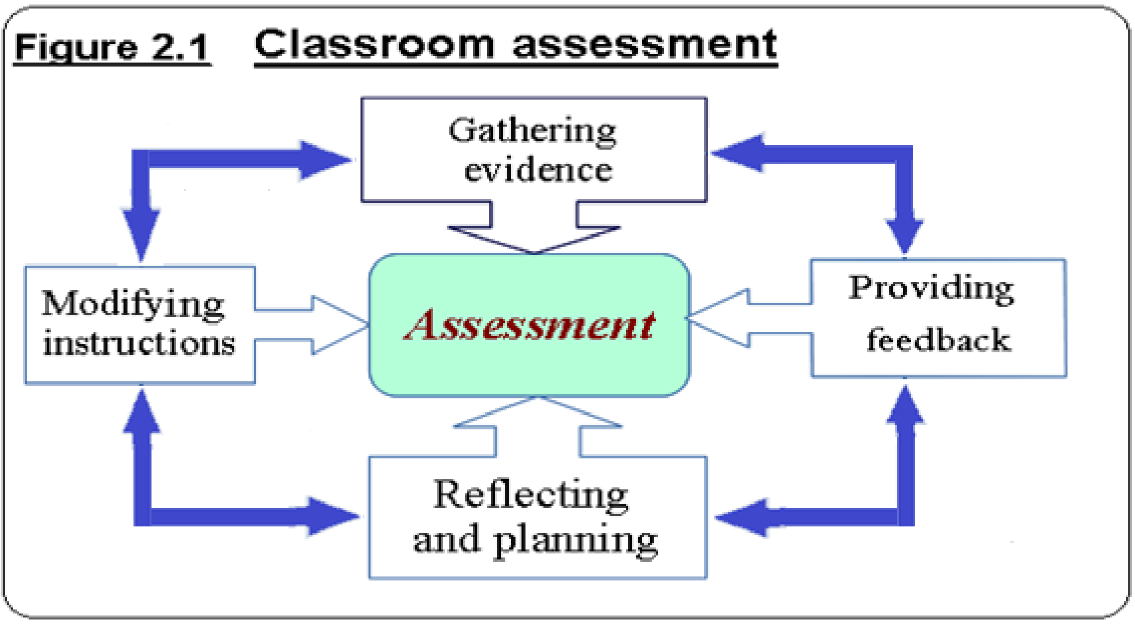

Figure 2.1: Classroom Assessment (KERMA, 2019)

2.3.1 Forms of Classroom Assessment

Assessment is the term used to describe all methods and activities that teachers employ to support students' learning and evaluate their progress. Regarding assessment-related issues and concerns, these methodologies offer advantages as well as disadvantages. One could argue that no one evaluation technique is able to account for every potential goal and reaction. According to William and Thompson (2007), teachers choose the tasks and forms for assessments, but how they are carried out depends on the assessment's purpose. As a result, the interplay between assessment formats has a significant impact on students' learning.

Assessment activities are commonly woven into classroom instruction, requiring teachers to make judgments regarding their students' progress. These assessment procedures have a significant impact on determining whether assessments should be used in and after class, as well as how they should be used. Planning assessment, according to Rea-Dickins (1993) and Hill and McNamara (2012), consists of three main elements: (1) determining the assessment goal; (2) deciding on the assessment's main topic; and (3) choosing the assessment's activities based on curriculum-specific goals.

Students' study habits and subject matter are greatly influenced by assessment. Depending on how teachers feel about assessment in the classroom, this influence could be good or unpleasant. As a result, effective evaluation in elementary school aids in both tracking pupils' learning progress and identifying their ideas. "The insights we gain by making evaluation a regular part of education enables us to meet the requirements of students who are hungry for new challenges while also intervening for those who are failing" (Burns, 2000, p. 31). It comes in a number of shapes and sizes, and it helps students learn and improves instruction. The three sorts of assessments utilized in the classroom are diagnostic, formative and summative. The link between diagnostic, formative and summative assessments is depicted in Figure 2.2. (Redrawn from Crisp, 2009). This picture shows workable methods for setting up an assessment environment in the classroom that will help children succeed in school by inspiring them to acquire the fundamental skills needed to meet the Learning Standards.

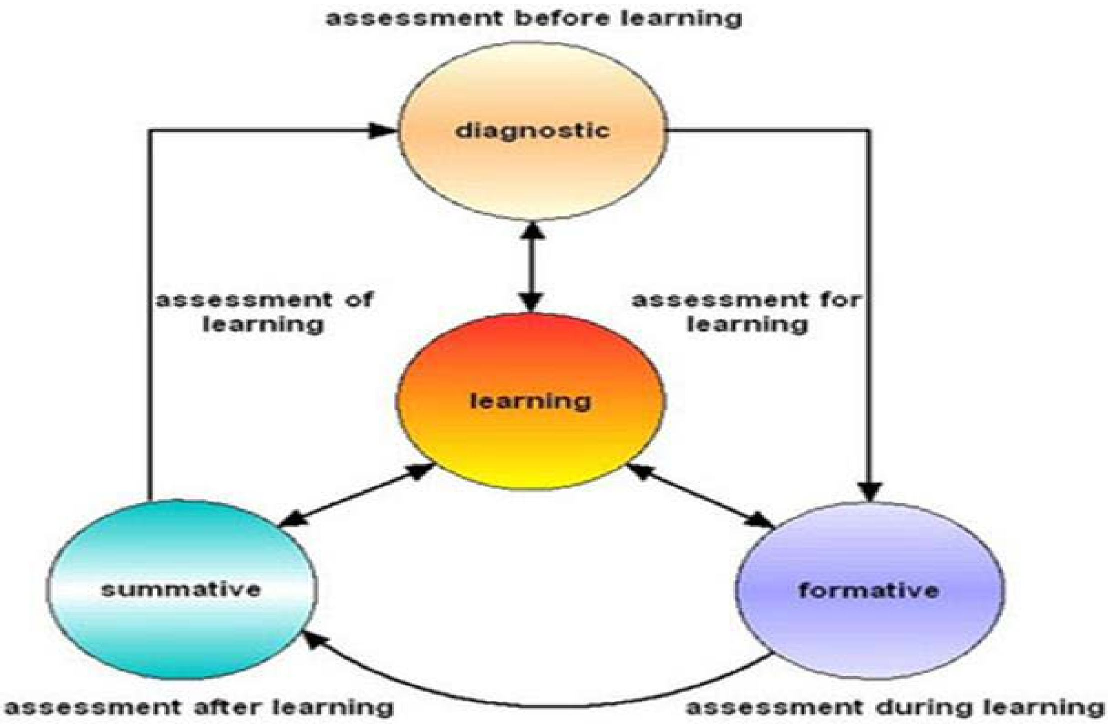

Figure 2.2: Assessment before Learning (KERMA, 2019)

Because of their crucial function in reporting and promoting student learning, numerous forms of assessments have been developed and investigated, and numerous labels have been applied to characterize their varied orientations or responsibilities. Classroom assessment is divided into two forms by assessment experts: formative and summative. Formative assessment is usually related with improving education and learning, whereas summative assessment is concerned with summing up learning outcomes and communicating them to administrators and/or other relevant stakeholders (Bloom et al., 1971; Harlen & James, 1997; Harlen, 2005; Wiliam, 2010; Brookhart, 2011; Chappuis et al., 2012; McMillan, 2014).

Gipps (1994) and Black et al. (2003) make a distinction between two categories of assessments: summative assessment and formative assessment for learning. Therefore, it is anticipated that assessments will have two functions: 1) informational, which will help to enhance instruction, and 2) summative, which will measure students' progress. The phrases "formative" and "summative" assessment were introduced by Scriven (1967) and Bloom (1969) as two separate types of assessment. Boud (2000) asserts that assessment plays a multifaceted role that encompasses assessment of learning (AoL) and assessment for learning (AfL), emphasizing the significance of learning outcomes and current activities. Formative assessment is a continuum that evaluates students' learning outcomes and provides feedback to modify training and learning. On the other side, the summative assessment is restricted to test grade assignment and administrative decisions. It achieves accountability, grading, and competency approval goals (Black et al., 2003).

The phrases "assessment" and "testing" are often used synonymously in modern literature (Clapham, 2000). Testing is a systematic method for gathering a sample of a learner's activities at one particular moment in time, according to Gottlieb (2006). It establishes the extent of a learner's mastery over time. Assessment, on the other hand, entails considerably more than just testing. It is a continuous process that includes a variety of official and informal activities aimed at monitoring and improving the quality of teaching and learning.

Many different sorts of assessments may take place at various times, at various levels and with varied methodologies to achieve a variety of goals. While the assessment kinds described below are categorized as opposites, the majority of teachers employ hybrid forms that fall somewhere in the middle of Wragg's classification, as well as a combination of both types (2003). The issues raised under each of the themes are not separate, but rather closely related: Two types of assessments are summative and formative; the third is assessment vs testing and evaluation.

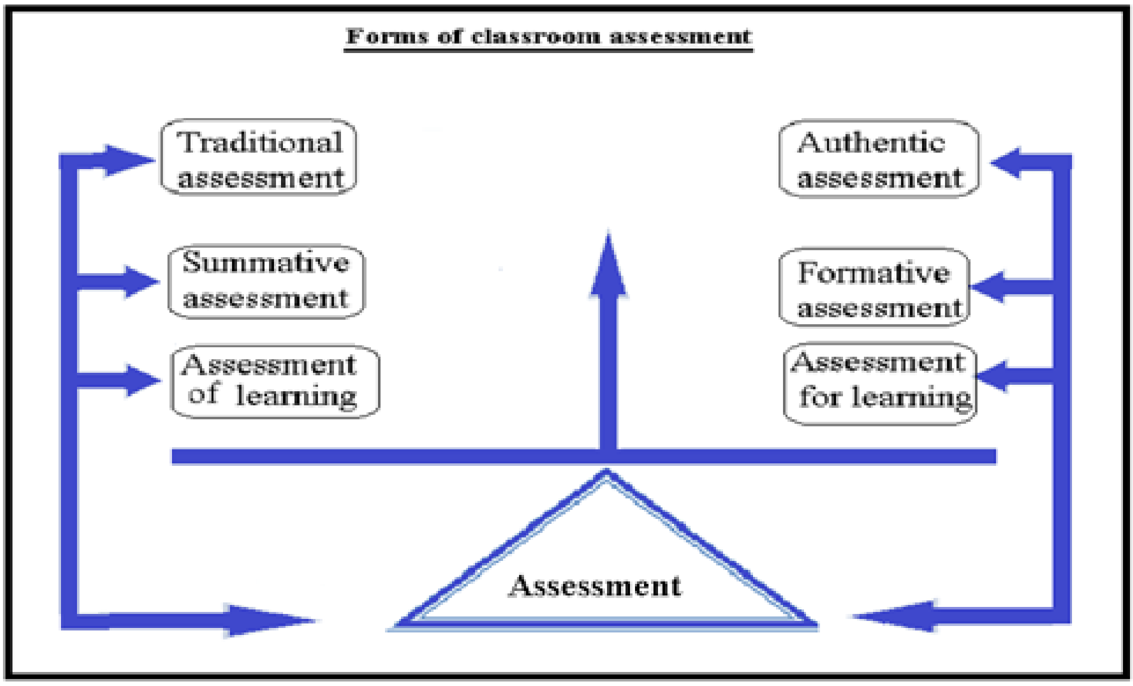

Figure 2.3: Form of Classroom Assessment (KERMA, 2019)

2.3.1.1 Summative Assessment

Summative assessments are used frequently to find out what students know and don't know throughout a predetermined period of time. It has been proposed as a means of confirming learners' proficiency levels subsequent to their acquisition of knowledge (Rudner & Schafer, 2002). The objective is to demonstrate what students have learned and understood in a little period of time, as well as to assess the effectiveness of a course or instruction. This is typically completed after the conclusion of a designated learning period, following a project, or a course. As stated by Harlen (2008, P. 139), "the objective of summative assessment is to compare achievement against broader indicators; such as level descriptors or grade level standards".

Butt (2010) investigated whether the purpose of assessment is solely to provide marks and a summary of each student's work, or if it may also be utilized to give students the confidence they need to move forward. Should assessments favor summative over formative formats, or should a more comprehensive strategy be asked for? The option could be applied to enhance teacher modifications and training in the classroom. Summative assessment is described by Black et al. as "regular, separate from instruction, conducted on formal occasions with formal rituals, and frequently administered through methods over which individual teachers have little or no influence" (2003, P. 2). Many conversations on how teachers should supervise their students' assessment techniques were sparked by this incident.

A letter or number grade is assigned to a student's learning through summative assessment, depending on how well the student performed in relation to predetermined standards. It happens at the end of a lesson plan. Schools can use summative exam results to see how their pupils compare to their peers, pinpoint areas of weakness within the school, and choose educational tools to enhance instruction. Put another way, assessment data is used summative to determine the level of learning that has occurred at a specific moment in time, enabling the marking and grading process (Brindley, 2001; Crooks, 2010). According to this point of view, summative assessments are an appropriate way to gauge a student's proficiency, which is important to know how well they have understood the curriculum's content. This type of evaluation is typically graded and takes the form of exams or tests. According to Munoz and Guskey (2015), teachers often see evaluation as separate from their regular teaching duties and with the only purpose of assigning grades.

The results of summative assessments are used to decide whether a student passed or failed the course. According to Anderson (2003), giving students a grade has traditionally been the main function of student assessment. Summative assessments are usually developed as a consequence of a unit, course, or classroom activity, according to Airasian et al. (2007). Projects, term papers, final exams, and end-of-unit exams are a few examples. According to Butt (2010, p. 53), a strong summative assessment is essential to our educational system. Using well-crafted tests that are suitable, valid, and reliable in assessing student achievement should be our main objective.

2.3.1.2 Formative Assessment

Formative assessment is most often used throughout a course or project. Its purpose is to help students in the classroom increase their learning capacities. Students receive continuous feedback on their learning progress through formative assessment, which is not necessary for grading. Examples include diagnostic testing, standardized testing, quizzes, oral questions, and draft work. At the same time, instructions and formative assessments are given. It is a step in the process of instructing and learning. Formative assessments are used to find out if students have understood the instructions as intended and to get them thinking about what they have learned so far and what they still need to learn. According to Popham (2008), "formative assessment is a planned process in which teachers use assessment-elicited evidence of students' status to adjust their ongoing instructional procedures or students use assessment-elicited evidence of students' status to adjust their current learning tactics". Formative assessment, according to Antoniou and James (2014), is a useful tool for directing students and ensuring that they are on track to learn subject-specific abilities. It helps students become more aware of their surroundings and gives them the knowledge they need to attain their goals by enhancing learning and performance.

The standards for what students should learn and how they should demonstrate that learning throughout the assessment stage is determined by formative assessment. Teachers should bring out shortcomings without being overly harsh, according to Wei (2011). Students might feel at ease and motivated to develop their skills when they receive fast and detailed feedback on their progress. Formative assessment, according to Garrison and Ehringhaus (2014), collects information on student learning through the use of outstanding teaching practices. “As well-intentioned as formative assessment is, its effectiveness is undercut if students are not fully informed of what they are required to demonstrate mastery of” Jenkins (2010, p. 567).

Formative assessment, according to practitioners, supports enhanced instructional methods, identifies curriculum gaps and adds to improved learner performance. Black and William (1998, p. 10) define: “All those actions conducted by the teacher, and or their learners, which produce information to be utilized as feedback to change teaching and learning activities in which they are engaged”. Formative assessment is described by Black and William (1998) as a regular classroom activity that calls for knowledgeable teachers who can more effectively collect and analyze data in order to enhance teaching and learning practices. It stands out for being progressive since it can happen at any moment and in many different forms, including formal and informal, proactive and reactive, and scheduled or spontaneous.

When teachers provide students enough guidance to enable them to participate in self-reflective activities that could lead to new opportunities for higher-quality learning, this is known as formative assessment. Teachers utilize formative assessments as an ongoing diagnostic tool to modify and adapt lessons to better meet the needs and advance of their students. Formative assessment, according to Sadler (1989), focuses on how assessments of a learner’s response quality can be used to shape and enhance learning capacities. Classroom-based formative assessment, according to Black et al. (2003, p. 2), “may occur many times in every lesson”. It entails a variety of techniques for motivating students to share their thoughts and approaches for responding to that feedback. Formative assessment changes are an essential and personal component of a teacher's daily work since they must be within their particular control.

For an assessment to be considered formative, it must offer insight into the discrepancy between the student’s performance and the expected standards. It must also offer recommendations for bridging the gap. According to Nyogi (1995), teachers’ conversations with pupils will highlight both their weaknesses and strengths in a way that standardized testing alone cannot. As per Heritage (2010), formative assessment utilizes data to accurately determine and track students' instructional levels of learning. It also modifies lessons to assist students in achieving particular learning objectives. Formative assessment also involves students and teachers in goal-setting, progress monitoring, and future learning planning.

Gregory and Chapman (2012) found that learner's range in ability, attitudes, learning styles and needs. As a result, instructions should be tailored to the individual's skills. Lessons related to formative assessment must be adaptable; this is not a one-size-fits-all approach (Tanner & Jones, 2003). According to Gentry et al. (2013), differentiating instruction seeks to support students in reaching their goals while optimizing their learning based on assessment data. In accordance with this logic, Popham (2008) asserts that formative assessment provides educators with the data they require to modify their teaching strategies, such as incorporating alternative learning activities and teaching methods to help students gain mastery of subject matter. "Developing exciting, engaging, and appropriate ways of teaching the curriculum to rectify inadequacies identified by the formative assessment process" is how Gregory and Chapman (2012) define this. One popular kind of formative assessment is the diagnostic assessment. The objective of a diagnostic assessment is to determine a suitable learning program for students based on their present knowledge and skills (Ronan, 2015).

Formative assessment is broadly defined by these criteria as any kind of assessment where the results are used by teachers or students to tailor instruction to the needs of the students. As a result, formative assessment is a continual, interactive and dynamic process that helps students make actual progress in their studies. It is also a continuous creative process aimed at assisting learners in confidently progressing to the next learning stage. This approach entails a number of tactics, including discussing the learning objectives and assessment criteria with the students (KERMA, 2019).

By far the most useful method of gauging students' competencies is formative assessment, which is why it is imperative that teachers employ it throughout the course to ensure they are continuously thinking about their students' development. Teachers prepare and arrange formative assessments throughout the day. As a result, teachers are continuously utilizing formative assessment to provide students with the best learning experiences possible. Teachers must use observations, checklists, talks and other forms of formative assessment to measure a student's development and provide feedback to the learner. Because of this, effective educators primarily utilize formative assessment to evaluate the growth and accomplishment of their students. For the formative assessment process to be effective, teachers must review the assessment results, make any necessary adjustments, and give students adequate feedback to allow them to monitor and adjust their learning. This process is usually a better predictor of what the student truly knows than a summative assignment, which could induce fear and consequently poor learning performance (KERMA, 2019).

Some teachers believe that when a teacher uses formative assessment, the students are generally unaware that they are being assessed, which reduces anxiety and yields a more accurate estimate of learning outcomes. As a result, students achieve better learning outcomes without the pressure of a formal test or exam. The figure below, Figure 2.4, illustrates the fundamental stages of formative assessment. It illustrates the four essential elements required for formative assessment to function well in the classroom. It outlines the elements that can help create an atmosphere conducive to brainstorming and empower all students to take an active role in their own education (KERMA, 2019).

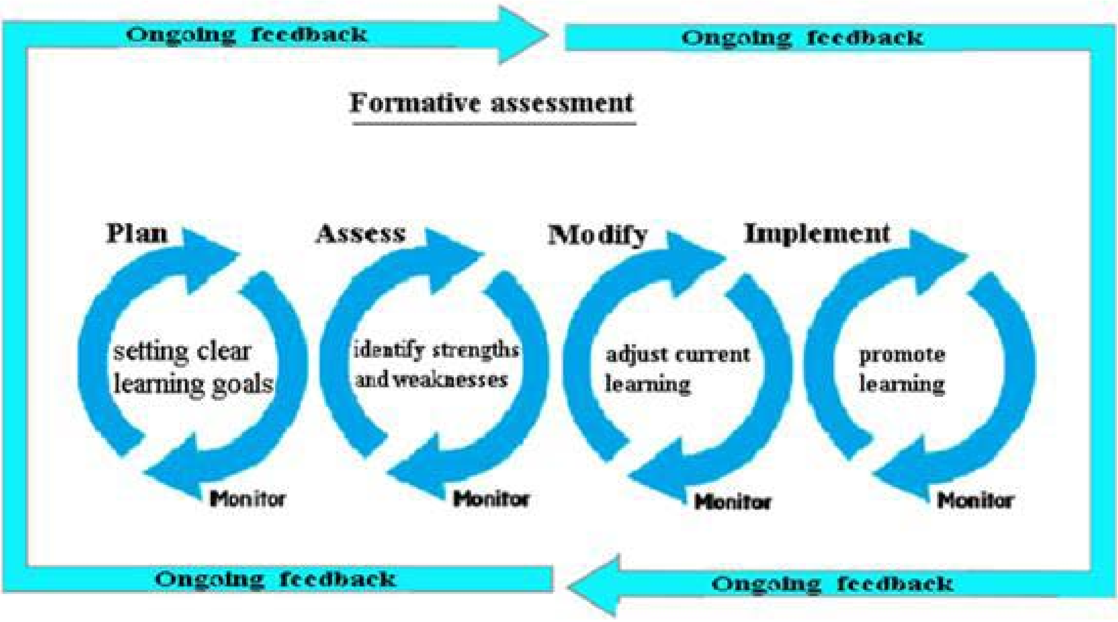

Figure 2.4: Formative Assessment (KERMA, 2019)

2.3.1.3 Formative vs. Summative Assessment

Teachers frequently encounter contrasting opinions regarding assessment challenges. A major paradigm change in educational assessment has occurred recently. One effective way to make sure that children learn is through assessment and student learning (Stiggins, 2008; Davison & Leung, 2009). The implementation of educational reforms to enhance educational planning and practices in many contexts worldwide has led to a shift in the assessment paradigm (Black & Wiliam, 1998; McMillan, 2003;

Alkharusi, 2007; Chow & Leung, 2011; Darling-Hammond & Lieberman, 2013). Assessments based on both formal and informal instructions and linked to classroom instructions are replacing traditional testing methods, which view instructions and assessments as distinct from one another, in an effort to enhance students' learning quality (Black et al., 2003; Davison & Leung, 2009).

Brill and Twist (2013) assert that teachers ought to receive training in order to guarantee a thorough comprehension of assessment, particularly in light of the current shifts in assessment policy. There is growing evidence that certain educators misconstrue formative assessment as frequent testing, indicating a lack of comprehension of the objectives of classroom assessments. According to Ussher and Earl (2010), labeling assessments as formative or summative has created confusion among teachers about what these assessments actually measure and how to administer them.

"The primary purpose of assessment in education should be to facilitate learning," stated Black and Wiliam (2005, p. 9). As to Harlen's (2005) findings, there is a misconception that summative and formative assessment are two distinct types of assessment linked to distinct data collection techniques, but in reality, they only pertain to the utilization of data. The difference between formative and summative assessments, according to Jenkins (2010), is not so much clear-cut as it is fuzzy. For data collection, a well-balanced assessment system should include both formative and summative assessments, even though there is some ambiguity surrounding the terms. It's probable that depending only on one of them won't give a true picture of what students have accomplished (Garrison & Ehringhaus, 2007). Taras (2009) asserts that there is an unbreakable bond between formative and summative assessment, with summative assessment serving as the foundation for all other assessments.

It is important to keep in mind that, although while assessment is a formative or summative product by definition, its actual value is determined by the way teachers employ it. If an assessment is just used to guide instruction, it is a formative assessment; if it is also used for assessing instruction, it is a summative assessment; and if it is used for both, it is a formative/summative assessment. According to Crooks (2001), formative assessment is meant to promote continued development, while summative assessment is meant to assess students' accomplishments at a particular moment in time.

Formative assessment is a continuum that assesses students' learning outcomes and provides feedback so that lessons can be modified and learning can continue. The formatively used assessment data supports the teaching and learning process by providing learners with regular feedback and assistance to help them minimize their shortcomings and improve on their strengths (Hill, 2000). Summative evaluation, on the other hand, is limited to administrative judgments and the assignment of test grades. It accomplishes the objectives of responsibility, grading, and approving competence (Black et al., 2003). Furthermore, according to Harlen (2006), using the terms "formative assessment" and "summative assessment" together may cause confusion as they suggest that these are two distinct types of assessments or that they are connected to various information-gathering techniques. Consequently, the phrases "assessment of learning" and "assessment for learning" are sometimes used in its place. In this study, assessments for the purposes of assessment—which are almost the same as assessment of or for learning — are referred to as formative and summative assessments. Table 2.1 provides a summary of the features of both forms of assessment.

Table 2.1: Formative Vs Summative Assessment

	Formative	**Summative**	**Similarities**
Purposes	– Assist the instructor in organizing and refining lessons. – Assist educators in adapting upcoming lessons to meet the requirements of students. – Aid students in enhancing their learning.	– Permit teachers and students to be aware of the degree of success achieved. – Scores used for accountability.	– Both are ways of assessment. – Assist in future lesson planning.
When	– Integrating into teaching and learning both before and during instruction.	– Tests mark the end of the lesson or unit and the end of instruction. – Exams at the end of the semester or term.	
Activities Practices	Class work Homework Observation	National / school formal tests.	

2.3.1.4 Assessment of Learning vs. Assessment for Learning

Summative and formative assessments are known as assessment of learning (AoL) and assessment for learning (AfL), respectively, in the field of education. The former typically measures summative learning outcomes at the conclusion of a class, course, semester, or academic year and presents the results to administrators, parents, and students. The latter is formative in most circumstances. Teachers utilize it to think about teaching strategies and the best course of action for both the class and each individual student (Earl, 2013).

AfL has been embraced in schools as an alternative to AoL because of the significance of assessment in maintaining student learning and boosting performance standards (Gipps, 1994; Black & Wiliam, 1998; Black et al., 2003; Stiggins, 2005, 2008; Wiliam & Thompson, 2007). As a result, current study has discovered that formative assessment helps students learn more effectively. The promotion of AfL has occurred despite research demonstrating the detrimental consequences of high stakes summative assessment and its distorting influence on the taught curriculum (Hattie, 2006; Gardner, 2006; Berry, 2008; Newton, 2009). AfL and AoL, which represent the “good” and “bad” aspects of assessment, respectively, had an impact on certain teachers (Wiliam, 2003; Harlen, 2013). In practice, nevertheless, it can occasionally be challenging to discern between AfL and AoL (Davies et al., 2012).

The purpose and level of formality are the only distinctions between AfL and AoL, according to Rowntree (1977), Wiliam and Black (1996), McAlpine (2002), Harlen (2007), Hodgson and Pyle (2010), and Harlen (2013). This suggests that it may be more helpful to think of these assessment processes as dimensions or a continuum rather than a binary. According to Harlen (2013), any assessment case can be used for formative or summative purposes; hence, the purpose, rather than the approach, determines the assessment name.

Diagnostic assessment and formative assessment are the two subcategories of AfL. Teachers adapt their lesson plans and methods to fit the needs of their students by using these two assessment techniques. In order to determine each student’s level of understanding about the course and to customize lessons and training to match their specific needs, it is imperative that a diagnostic assessment be carried out at the start of each unit. This gives the teacher a clear idea of the class levels in terms of what the students know in terms of subject understanding — little, some, or a lot. Knowing this, teachers can design lessons that offer reinforcement for students who need to go beyond the material covered in a unit and concentrate on important subjects for those who need to grasp the principles of a subject (KERMA, 2019).

AfL is widely used to organize future training, assess students' needs, and give them pertinent feedback to help them improve the quality of their work, according to Chappuis et al. (2012) and McMillan (2014). On the other hand, AoL is employed to gather data in order to determine the academic performance of students at a given moment in time or to inform program choices. Thus, formative and summative assessment are represented by the acronyms AfL and AoL, respectively. The key justifications for doing assessments in the classroom are outlined in Table 2.1.

2.3.1.5 Assessment Vs Testing/Evaluation

In general, the term "assessment" is used interchangeably with the term "testing". Some teachers confuse assessment with measurement and evaluation, but the concepts are not interchangeable, as will be demonstrated (Torrance & Pryor, 2001). Woods (2015) argues that while not all assessments are tests, tests are one kind of assessment. Linn & Miller (2005, p. 26) define a test as "an instrument for measuring a sample of behavior". Tests typically consist of a single piece of classroom assessment data intended to evaluate a person's or a group's abilities, performance, intelligence, or aptitude. According to McMunn (2011), specific test objectives include individual diagnostic procedures, summative assessment, and individual achievement.

Determining the quality of the assessment results is the primary goal of evaluation. Assessment and measurement are important in deciding whether a student succeeds or fails and in assigning a grade to their learning objectives. According to Linn and Miller (2005), "the process of getting a numerical description of the degree to which an individual exhibits a given attribute" (p. 26). According to Black & Wiliam (1998), classroom evaluation practices primarily prioritize surface and rote learning by placing a strong emphasis on students' ability to recall particular elements—knowledge that most students rapidly forget. They continue by stating that there is a tendency to prioritize student rivalry above individual growth when using a normative approach as opposed to one based on criteria. Such teaching methods have a negative feedback effect on lesser students by teaching them that they lack aptitude, leading to demonization and a loss of conviction in their own abilities to learn.

Traditional evaluation, also known as test, AoL, and summative assessment, and authentic assessment, also known as formative assessment or AfL, have long been divisive topics when it comes to classroom assessment and learning outcomes. Traditional evaluation proponents state that improving teaching methods and student achievement is the goal of exams. This perspective, which is based on equitable grading standards, gives preference to the cognitive side of teaching—that is, the knowledge and abilities that students should be able to pick up quickly (Linn et al., 1991; Segers & Dochy, 2001).

Authentic assessment proponents have sharply criticized traditional forms of assessment for failing to meet evolving content criteria. In order to support and motivate students to use their knowledge and skills in practical settings, alternative assessments are required. They asserted that authentic assessments, as opposed to conventional forms of assessments, are the exclusive means of gauging students' aptitudes (O'Day & Smith, 1993; Reynolds et al., 2009).

Within the field of education, assessment and evaluation are commonly used synonymously (Cooper, 1999). Making decisions on the caliber of assessment results constitutes a significant portion of evaluation. It is defined as the procedure for assessing student performance in order to grade and report on it using procedures and metrics. "The process of collecting, analyzing, and interpreting data about instruction and learning in order to make appropriate decisions that support students' performance and the advancement of educational programs" is the definition of evaluation given by Rea-Dickens and Germanie (1993), O'Mally and Valdez-Pierce (1996), Genesee and Upshur (1996), and Praslova (2010).

A collection of approaches and procedures used in the classroom to gather data on students' reactions to different teaching modalities is called assessment. Evaluation, on the other hand, is a summative outcome that is used to judgment and appraisal. Tests, papers, exams, and quizzes all reflect this. To put it briefly, assessment aids in the facilitation of learning whereas evaluation aids in its assessment.

2.3.2 Assessment Centralizing on Teaching and Learning

Formal procedures like assessment call for deliberate efforts to compile information about a learner's strengths and weaknesses. The main goal of this process, which employs a number of approaches, is to gather accurate and trustworthy data that teachers can use to inform their choices. The use of classroom assessment strategies by teachers is associated with a number of decision-making domains, such as choosing the best approach and strategy for assessing students. Assessment data can be used by teachers in a variety of ways, such as determining students' final grades at the end of the semester, guiding and improving future educational approaches, or diagnosing learning difficulties with their students (McMillan, 2005; Gronlund & Waugh, 2009; Reynolds et al., 2009; Popham, 2010; Grant & Gareis, 2015).

Research asserted that making the proper judgments can determine whether our students succeed or fail. A set of recommendations that educators should adopt and modify in the classroom was put together by Airasian (1994). Teachers were urged to think about a number of factors, including what to test, how much weight to give each instructional objective, what kind of assessment tasks (tests, projects, assignments), how much time to allot for each assessment task, how to help students prepare for the assessments, and whether or not to use textbook tests or create their own. Sadly, giving pupils a top-notch assessment is a difficult part of teaching in the classroom, and teachers usually neglect this part of the process (Hewson & Little, 1998). In order to give students outstanding feedback, it must be given on time, closely monitor the event, be encouraging, and offer specifics regarding the student's achievements. It should focus on one facet at a time. It needs to be brief and concentrate on the student's work rather than the student (Crooks, 1988; Rogers, 2001; Gibbs & Simpson, 2004).

A review of the domain's subject matter, the test's design (easiness of preparation, ease of scoring, for example), and a number of unrelated factors, such as students guessing, copying, or bluffing, which may have an impact on the test scores' psychometric qualities, should all be taken into account when organizing assessments (Zeidner1987, p. 352). Teachers will be minimally involved with the curriculum unit in which the assessments will be embedded in the classroom. They have to decide which approach to use when creating assessment goals and which key moments to include assessments in. Establishing and delivering effective and efficient guidelines for assessment development and assessment procedures is the teacher's primary duty. Teachers can promote their assessment practices by using practical test planning activities. Instructors can design a two-way planned procedure that synchronizes the learning objectives they assign with the performance goal they hope students will meet. Teachers use the instructional objectives as a reference for creating tests. They are able to connect assessment tasks — such as tests, assignments, and projects — to learning objectives (Stiggins, 1994).

The most crucial aspect of test designing that teacher need to understand is the significance of appropriate learning objectives and outcomes, which precisely identify the students' capacities at the end of a course, a unit, a topic, a term, or a class activity. All facets of education, including instructional strategies and assessment protocols, are guided by learning objectives. Teachers need to apply their intelligence to develop clear, measurable, doable, reasonable, and student-focused learning objectives (Airasian, 1994; McMillan, 2005; Popham, 2008; Gronlund & Waugh, 2009; Reynolds et al., 2009).

2.3.3 Classroom Assessment Dimensions

Rowntree (1977) provided a framework that encompasses the entire scope of assessment and is divided into five major dimensions:

1. What is the purpose of assessing? Identifying the reasons for the assessment and the outcomes that the assessment is intended to produce.
2. What ought to be assessed? Selecting, realizing, or gaining awareness of the qualities to seek for in the people who are being assessed.
3. How do you assess? Selecting from among the options offered for assessment that we think are the most fair and accurate for different kinds of important information.
4. How do you interpret this? Interpreting, and giving significance to the unprocessed "events" of assessments; interpreting the conclusions drawn from observations, measurements, or impressions we gather using whichever methods we choose.
5. What action should I take? Choosing an appropriate way to share our response to the assessment with the people who are impacted (Rowntree, 1977; P. 11)

These elements play a major role in the framework that should be used to evaluate classroom assessment practices. Their implications show how important classroom assessments are to the process of teaching and learning. Numerous methods for classroom assessment are available to teachers. Teachers can assess pupils' achievements with great ease thanks to their repercussions.

Through classroom assessments, teachers gather a variety of data that they can use to make appropriate, consistent, and well-informed decisions about the learning outcomes of their students. Most decisions on the kind of assessment items used in schools are made by teachers (Romanoski et al., 2005).

Pollard and Bourne (1994, P. 220) summarize the ideas of the assessment and suggest that:

1. Every phase of the teaching and learning process needs to include assessment, which should involve both teachers and students in choosing the best course of action.
2. Regardless of its purpose, assessment should work to enhance students' learning by influencing the curriculum in a positive way at all levels.
3. In order for parents and other learning partners to assist their children's learning, assessments must offer an efficient channel of communication.

4. The goal for which the evaluation is being conducted must be taken into account when choosing among numerous assessment methods. This could involve using multiple procedures for different types of assessments.
5. Fair use of assessment is required when gathering information to assess the efficacy of schools. This means considering factors that affect student accomplishment that are related to the environment as well as instruction.

In the classroom, teachers employ smart feedback to explore the connection between learning and skill development. “Assessment of students at the classroom level is highly crucial” as “because effective decision making is predicated to some extent on teachers’ capacity to comprehend their students and to connect actions with correct assessments” (McMillan, 2008, p. 5).

2.3.4 Student’s Learning Assessment

Assessment has long been a primary emphasis for educators all around the world in order to improve learning and guide instruction. The major purpose is to help students enhance their learning outcomes throughout their academic careers. Students and their parents have been told what skills and knowledge they need to master in order to use testing equipment. This system was followed by Canada, the United Kingdom, and sections of Europe, Asia, and Africa, particularly for compulsory education in public schools. Since then, a variety of educational innovations have been tested with the purpose of improving student performance (Marzano, 2006).

The act of finding, obtaining, assessing, and interpreting data to learn more about a student’s progress toward achieving specified learning outcomes is known as student assessment (Masters, 2013). Since supporting students' learning is the main objective of student assessment, it ought to be an integral part of the teaching and learning process (Shepard, 2000; Greaney & Kellaghan, 2004; Broadfoot, 2007; Clark, 2012).

Teachers have differing perspectives on how to assess student learning results. Some support more modern forms of evaluation such research essays, portfolios, and critical thinking. While some educators support more modern techniques like research articles, portfolios, and critical thinking, others employ more conventional types of evaluation like multiple-choice questions and other objective tests. “Test-based reforms have their origins in the middle of the 1800s, when the state superintendent of instruction in Massachusetts began using written examinations to hold public schools responsible for their performance,” writes Resnick (1982) and Miller et al. (2009, p.4). When measuring a large amount of knowledge, traditional types of assessments are crucial for assessing knowledge standards and targets. Students' knowledge, understanding and application are measured using these processes, which are important skills for students to accomplish the basic learning outcomes (McMillan, 2008).

Over the past 20 years, different assessment methods have been integrated into educational practice due to new discoveries and evolving ideas in the field of student learning. The argument in favor of these methods of assessment for students is that they help students become more engaged, intelligent, and self-aware. Such a layout and structure expressed nuanced ideas about what seemed important (Haladyna et al., 2002).

Research shows that students use their learning strategies according to expectations (Biggs, 1996, Entwistle, 2000, Rodriguez, 2004; Shepard, 2006; Harrison, 2012; Brill & Twist, 2013). A number of studies have examined this issue. Students choose study strategies that are appropriate for the knowledge and abilities being assessed. It is possible that “children do not develop the study skills required to face more complicated and higher order sorts of instructional tasks that demand problem-solving and critical thinking” (Bol & Strage, 1996, p. 159) since there is no connection between performance goals and assessment methods.

Students differ in terms of their learning methods, language, memory, attention, aptitude, skill level, and social and behavioral skills. Recognizing these variations, curriculum-based assessment (CBA) allows teachers greater flexibility in deciding when and how to teach individual students the essential material. Consequently, CBA provides students with more avenues to exhibit proficiency or expertise in their assignments. It is evident that each student has different learning styles, language, memory, attention, attitude, ability level, and social and behavioral skills. CBA takes these differences into account by offering students greater flexibility in terms of how and when they can show mastery or competence in their work. Crucially, students need to be helped to exhibit their knowledge using a range of methods for assessment. Additionally, a lot of students have trouble with timed writing assignments or exam conditions, which makes assessment flexibility necessary. With CBA, the instructor can also modify the lesson plan and, if needed, let the student go back to the lesson and complete the same or similar assessment tasks until the student satisfies the required assessment standard, competency, or criterion (Kubiszyn & Borich, 2003)

There is a link between classroom inquiry and the quality of student outcomes, as per research. They discovered that when students were assigned increasingly complex cognitive problems and given more time to react, their responses got more advanced cognitively. Changing a course’s assessment methods can be an effective strategy to influence how students learn. As a result, assessment has a considerable influence on what and how students learn (Brown et al., 1997).

Previous research into school assessment in many parts of the world found that effective schools often apply assessment key practices. Gipps (1995) and Zhang et al. (2003) states that over the past two or three decades, there has been a “paradigm shift” in the field of assessment. The way educators see student learning and assessment has changed in a variety of ways. Even the vocabulary used in assessments has changed over time; now, “outcomes,” “competences,” “criteria,” and “attainment” are the main words used. Finding out what students truly know is the aim of the current testing culture, as opposed to the previous one, which concentrated on “constructs” and “universes" of potential test items and frequently produced scores that were proxies for what students knew. As a result of the diverse competencies and attitudes that different methods of assessment give students toward successful learning, new insights may be generated. Understanding the reasoning behind each assessment method helps us build a broad framework for assessment concerns based on instructors’ present practices and a better understanding of what they are attempting to achieve.

2.3.5 Assessment Impact on Classroom Practices

There is yet to be a clear-cut compromise on the usefulness of one method of assessment over another. The dispute over various assessment methodologies is central to the goal of instruction and the desired outcomes. Also, assessment reform shifts the emphasis from using standard tests to more authentic, holistic testing methods that involve student participation and instructor instruction that is appropriate. This shift aims to replace inflexible, static testing with practical activities completed in intricate real-world situations (Tangdhanakanond, 2006).

Regardless of the educational setting, Vandeyar and Killen (2003) suggest that assessment methods of the highest caliber should satisfy crucial requirements like validity, reliability, fairness, discrimination, and meaningfulness. Teachers who fully grasp these ideas will therefore be more equipped to make decisions based on assessment findings. However, if teachers misunderstand these concepts, their assessment methods are more likely to provide useless data and cause unfavorable shifts in students' motivation. Therefore, it is critical to emphasize that in order to generate accurate descriptions of learners’ competencies in connection to the learning objectives, AoL should be carefully created. It should therefore have exacted, equitable, reliable, and meaningful measures.

2.3.6 Classroom Assessment Processes

There is consensus that the assessment process needs to incorporate validity and reliability characteristics because they are essential to guaranteeing the accuracy, equity, and suitability of assessment interpretations and applications (Cizek, 2009; Lamprianou & Athanasou, 2009; Russell & Airasian, 2012; Miller et al., 2013; McMillan, 2014; Popham, 2014). Following this trend, Shepard (2000), Roegiers (2005), and Pellegrino and Goldman (2017) offer suggestions for enhancing classroom assessment to boost learning. These include enhancing the assessment's content and quality, utilizing its results, and adding assessment as a course in teacher education programs.

To guarantee that assessment outcomes are accurate, appropriate, fair, and transparent, it has been suggested that high-quality assessment should be integrated into the educational process. Validity and reliability must therefore be taken into account throughout the entire evaluation process. Each step of the classroom assessment process will be covered, along with the concepts of validity and reliability. A number of theoretical frameworks pertaining to the validity and reliability of classroom assessment techniques are examined in the part that follows (Gipps, 2002; Gillis et al., 2009).

2.3.7 Teachers' Beliefs and Assessment Practices

Many scholars have looked at teachers' concepts and views about assessment from various angles (Cizek et al., 1995; Brown, 2004; Sikka et al., 2007; Davis & Neitzel, 2011). Researchers think it is critical to look into teachers' perceptions of assessment in order to understand how various forms of assessment are being used or misused and what can be done to improve the situation. Additionally, it is important to remember that perceptions have an impact on behavior (Richardson, 1996; Atweh et al., 1998; Patrick & Pintrich, 2001; Liaw, 2008). Research shows how ambiguity and imprecision taint teachers' perceptions (Dwyer et al., 1990; Pajares, 1992; Ertmer, 2005; Speer, 2008). Regarding the precise nature of the instructors' beliefs construct, there is no unambiguous consensus (Bernat & Gvozdenko, 2005; Toualbi-Thalibi, 2006; Bellalem, 2014).

Teachers may have differing opinions regarding assessment, which could influence their practices in the classroom when paired with other attitudes and contextual circumstances. This is because assessment procedures can have disadvantages. Teachers will surely find these ideas useful in analyzing data related to new assessment methods and in developing lesson plans and instructions (Fives & Buehl, 2012).

Most people would agree that the instructions and decisions made by teachers in their classes were informed by a particular set of beliefs that were utilized to refine these decisions prior to implementation. Therefore, a thorough grasp of the assumptions underpinning those behaviors can help us better understand how teachers behave (Pajares, 1992; Richards & Lockhart, 1996; Ballone & Czerniak, 2001; Biddle, 2006). According to Fives (2003), a teacher's level of beliefs can be seen as a factor in determining whether they are successful or unsuccessful in carrying out and doing actions to accomplish particular aims. Matese et al. (2002, p. 3) state that educators "see innovation through the lens of their previous knowledge and ideas". In addition, "teacher views are predecessors to change" and "the teacher is the crucial change agent in paving the path to educational reform" (Ballone & Czerniak, 2001, p. 7).

According to Freeman (2002), Andrews (2002), and Borg (2003), belief is viewed as a component of "cognitive research". Cognitive research is described as "the study of what teachers know, think, and believe and how these connect to what teachers do" by Borg and Burns (2008, p. 457). Teachers' opinions can be viewed as a set point of view shaped by their experiences both personally and professionally, which actively influences their decisions, practices, and guidelines. The problem of teachers' beliefs and innovation is particularly pertinent to the study because it examines Algerian teachers' ideas about curriculum innovation, also known as the second generation of school reform, and how these ideas affect classroom assessment procedures (Anderson, 1998; Farrell & Lim, 2005; Olafson & Schraw, 2006).

2.3.7.1 Realism Perspective

Teachers in the first group are practical and intentionally stress exams that are completed by writing answers on paper, with the expectation that students will recognize the answers rather than come up with their own (Windschitl, 1999; Segers & Dochy, 2001). The goal of these assessments is to improve students' cognitive learning—that is, the knowledge and skills they should pick up fast. Their theories are based on normative testing. Students' mastery of the core curriculum information and skills is evaluated through norm-referenced assessments. In order to compare students, teachers often use standardized tests that have the potential to be graded (Nitko, 2001).

2.3.7.2 Contextualism Perspective

The second group of teachers agreed with a context-based perspective. Contexts are known to be significant, and their effects are taken into consideration. In the classroom, alternate methods of assessment are employed, such as competency-based exams, group projects, and student portfolios. Therefore, in order to impact the learning environment, motivation, and abilities of students, teachers should adapt their teaching strategies to match the demands of regular instruction and evaluation. Since performance testing is adequate for assessing sophisticated mental skills like problem-solving, they advocate utilizing it more regularly (Haladyna et al., 2002). Using criterion-based testing assessment, teachers can contextualize their recommendations to find out what pupils know and do not know based on predefined criteria (Tzuriel, 2000).

2.3.7.3 Relativism Perspective

The developmental theory was embraced by teachers in the third wave. They contend that better instruction comes from more relevant learning environments. The degree of personal development experienced by each student affects how well they study. In order to choose the teaching strategy best suited to each child’s unique developmental stage, students are given the opportunity to learn, and be assessed in numerous ways (Siegeler et al., 2006; Schunk, 2008; Steinberg, 2008). To meet the different needs of the students, a variety of assessment techniques are implemented (Hargreaves et al., 2002).

2.4 Overviews of the Student Learning Outcomes

Because they demonstrate the effectiveness of learning based on teaching and learning activities, learning outcomes are essential. Learning outcomes are the outcomes that students or others achieve after engaging in learning activities. Students strive for the finest learning outcomes in order to attain success. Student outcomes can be viewed in terms of these children’s transformations as well as their academic worth in the classroom. According to students, learning is a process of transformation that takes place in them as a result of the experiences they have when engaging in teaching and learning activities (Deta et al., 2021).

2.4.1 Cambodia National Curriculum: Primary Mathematics Perspective

2.4.1.1 Numeracy

Students will be able to understand integers, fractions, decimals and percentages. This knowledge will be demonstrated through both written and mental calculation skills, and will enable students to use calculation methods for problem solving (MoEYS, 2018a, p. 2).

2.4.1.2 Measurement

The student can present on the measurement of length, weight, and capacity, perimeter of something through real practices by using some tools, standard scale, Khmer traditional scale, and international scale. The learning is on timing (year, month, week, day, hour, minute, second), calendar reading, clock using, comparing and transforming of time scale, time noting, and the problem of time scale, speed, average speed, and length. The learning is also on the value of Khmer Real currency, currency exchange, and the practice of problem of financial mathematics such as selling price, purchasing price, profit, lost, cost and interest (MoEYS, 2018a, p. 2).

2.4.1.3 Geometry

The student learns on the shape, property, and can present the geometry view that has two and three dimensions (MoEYS, 2018a, p. 3).

2.4.1.4 Statistics

The study is on data gathering, graphing, interpreting of graph, and filling the picture and color model guiding (MoEYS, 2018a, p. 3).

2.4.1.5 Algebra

The student is developed on the relationship of numeracy and the symbol using of number, algebra expression, and finding the value of algebra expression (MoEYS, 2018a, p. 3).

Summary of the Chapter

Chapter 2 discussed the conceptual framework and research framework. Under the conceptual framework ideas such as the relationship and connections between mathematics teaching methodology and classroom assessment of student learning outcomes in primary education were explored. Under the research framework the idea of all above theories and models were also discussed. Refer to the 20 previous studies in appendix D, the researcher saw that, it did not have the combination of mathematics teaching methodologies or model, such as constructivism theory, didactic theory, socio-cultural theory, and visual learning model; also, it did not include the classroom management which is the important part of effective teaching. It mentions classroom assessment, but does not link it to the teaching methodologies. The study did not reflect the effectiveness of teaching methodologies or model and classroom assessment on student learning outcomes. Thus far, larger teacher and student samples will be needed in field studies to draw a distinction between the ways in which teachers' beliefs and their classroom practices align (Cuyler, 2021; Minkkinen, 2022).

CHAPTER 3
RESEARCH METHODOLOGY

The research methodology for this study is presented in this chapter. It describes the research design, targeted population and samples, research instruments, data collection procedures, data analysis, researcher's position, and ethical consideration.

3.1 Research Design

The methodology determined to be appropriate for the study is the quantitative methodology. The quantitative research defines variables assumed to represent tangible or intangible factors and proposes relationships between the variables. The proposed relationships are then examined and tested through the statistical analysis of data collected from a sample of a given population (Powell, 2020). Relatively, the quantitative research uses instruments or tools to collect numerical data that is analyzed to test hypotheses, aiming to generalize findings (McCusker & Gunaydin, 2015). The quantitative method is most appropriate when a study utilizes validated and reliable instruments to collect numerical data, determine statistical relationships between two or more identified variables, and answer hypotheses.

Additionally, the quantitative methodology was most appropriate for this research study, as the quantitative method allows for testing the relationship between identified variables. Hence, the study best aligns with the quantitative methodology.

3.2 Targeted Population and Samples

3.2.1 Targeted Population

The targeted population for this study were teachers and students from public primary schools in Kampong Chhnang Province, Cambodia. These schools have not yet received any mathematical intervention programs from government or development partners (MoEYS, 2022a). Based on the Education Statistics and Indicators 2021/2022 (MoEYS, 2022b), Kampong Chhnang Province has 279 public primary schools in total. As a result, the target populations for this study were 1,776 teachers and 73,750 students who are teaching and studying at grade one, two, three, four, five and six in Kampong Chhnang Province, Cambodia. The eligibility criteria of the site selected for this study were carefully considered before the study's implementation. Table 3.1 below summarizes the target population arranged by district.

Table 3.1: The Population of Districts, Primary Schools, Teachers, and Students in Kampong Chhnang Province

No.	District's Name	No. of Primary School	No. of Teacher	No. of Student
1.	Baribo	33	203	8,708
2.	Chul Kiri	23	102	5,275
3.	Kampong Chhnang	8	131	4,756
4.	Kampong Leng	30	173	7,292
5.	Kampong Tralach	48	255	13,664
6.	Rolea Pa-ir	59	441	13,784
7.	SamakiMeanchey	37	250	11,219
8.	TeukPhos	41	221	9,052
	Total	**279**	**1,776**	**73,750**

3.2.2 Targeted Samples

Cohen et al. (2007) noted that probability sampling is useful as it attempts to be representative of the population; this research was based on a random "probability" sample where this researcher generalized from the results from 4 randomly selected districts in Kampong Chhnang Province.

In essence, Johnson and Rasulova (2016) mentioned that a researcher's ability to describe the participant selection process adds credibility to a study. For this study, referring to Israel (1992), practically the entire population would have to be sampled in small groups to achieve the requisite degree of precision. Based on 10% of the desired degree of precision, the samples selected were 278 public primary teachers and 395 students who are teaching and studying at grade 1 through 6 in Kampong Chhnang Province. Furthermore, Ghaljaie et al. (2017) stated that sampling was the process of choosing a part of the population to represent the whole and researchers should plan the sampling process and determine the method of study.

The details of the targeted samples' selection were as follows:

Table 3.2: The Sample Sampling and Classified by Districts

No.	District	Teachers		Students	
		P	S	P	S
1.	Baribo	203	67	8,708	99
2.	Kampong Chhnang	131	57	4,756	98
3.	Kampong Tralach	255	72	13.664	99
4.	Rolea Pa-ir	441	82	13,784	99
	Grand Total	**1,030**	**278**	**40,912**	**395**

Source: Ministry of Education, Youth and Sport: Education Statistics and Indicators 2021/2022 (2022).
Note: P=Population, S =Sample

3.3 Research Instruments

For this research study, two research instruments were selected and utilized (see Appendices A and B). The first instrument employed is the Surveyed Questionnaire. The second instrument is the Student Test.

3.3.1 The Surveyed Questionnaire

3.3.1.1 The Development of the Surveyed Questionnaire

Survey questionnaires continue to be the best approach to assess respondents' attitudes, and they are a useful method for acquiring self-reported data (Babbie, 2004). The researcher felt compelled to use a questionnaire in this study because of certain intrinsic benefits to doing so. Several questions may be included in a questionnaire that is given to a sizable sample of people in order to collect a large quantity of data (Mertens, 2015). Questionnaires can be completed quickly, readily and affordably, acquiring a substantial set of data (Burton & Bartlett, 2009; Mertens, 2015). Finally, the information gathered via questionnaires was ideal for analysis and comparison with other findings, and it is simple to use (Burton & Bartlett, 2009). The purpose of this survey was to establish baseline data regarding the attitudes of teachers toward teaching mathematics and conducting assessments in the classroom. Of course, this data may be utilized to improve teacher preparation programs, guide policy decisions, and eventually improve student learning results. The objective was to devise a methodical approach to discerning various viewpoints and their impact on the caliber of education received by students. This survey consisted of three main parts based on Byrne (2017), MoEYS (2018a), KERMA (2019), Ndlovu (2019), Cumberland (2019), Swope-Farr (2021) (see Appendix A).

3.3.1.2 The Structure of the Surveyed Questionnaire

The surveyed questionnaire was divided into three main parts.

Part I: Teachers' Demographic Profile: A demographic profile of the teachers was created by collecting basic information on teachers such as age, gender, educational background, teaching experience, area, grade, and number of students.

Part II: Teachers' Beliefs, Confidence, and Practice of Mathematics Teaching: This section used a 5-level tick-box selection key to indicate how teachers respond to statements regarding their perceptions of mathematics teaching and mathematics topics, their confidence and their practice.

Part III: Teachers' Beliefs, Skills, and Practice of Assessment: This section also used a 5-level tick-box selection key to indicate how teachers respond to statements regarding their perceptions, skill, and practice of classroom assessment. Table 3.3. below shows the detail of the surveyed questionnaire.

Table 3.3: Distribution of the Surveyed Questionnaire Items

Part	Type	Reference	No. of Items
1. Teachers' demographic profile	Background information	KERMA (2019)	7
2. Teachers' beliefs, confidence, and practice of mathematics teaching	Mathematics teaching methodology	Byrne (2017), MoEYS (2018a), Ndlovu (2019), Cumberland (2019), Swope-Farr (2021)	Section A: 10 Section B: 16 Section C: 10 Section D: 6
3. Teachers' beliefs, skills, and practice of assessment	Classroom assessment	KERMA (2019)	Section A: 10 Section B: 15 Section C: 15

A modified version of the 5-point perception level used for the various responses. Table 3.4 presented the corresponding values for criteria of scale interpretation.

Table 3.4: Criteria of Scale Interpretation Used in this Study

Perceptive Level	Score	Scale	Interpretation
5	5	4.51-5.00	Very High
4	4	3.51-4.50	High
3	3	2.51-3.50	Moderate
2	2	1.51-2.50	Low
1	1	1.00-1.50	Very Low

Note: This interpretation scale is adapted from Norman (2010)

3.3.1.3 The Translation Technique of the Surveyed Questionnaire

Four experts assessed the surveyed questionnaire after it had been translated into Khmer in order to determine its content validity. Following the recommendations of Brislin (1986), four experts were chosen, the instrument utilized in this investigation had its back translation performed.

Before the survey itself, the process of determining the instrument's content validity took place. Additionally, participants were involved in the survey's conduct. The Khmer language is their mother tongue. As a result, the instrument's translation was thoroughly carried out before the survey itself. A Ph.D. holder in the Teaching English to Speakers of Other Language (TESOL) and Applied Linguistics used the back-translation technique to guarantee the accuracy of the translation (Chang et al., 1999; Carlson, 2000). The Khmer version of the questionnaire became more accurate and appropriate as a result of this approach. Additionally, the clarity and accuracy of the phrases in the Khmer version of the questionnaire was verified by a native speaker of the language.

As was said above, a number of questionnaire-related elements were taken into account in order to attain high levels of face validity and content validity. Based on their educational backgrounds, all reviewers were proficient in both English and Khmer. Additionally, all reviewers have expertise in translating documents and articles from English to Khmer. The panel members received detailed information about the purpose and used of the instrument prior to the procedure. Panelists were asked to point out any terms and phrases that, when compared to the English version, were inappropriate or confusing in the Khmer translation. The final translation was agreed upon after discussion and agreement among the reviewers. The researcher confirmed the final instrument in light of the original translation and any necessary adjustments.

3.3.1.4 Piloting the Surveyed Questionnaire

A pilot research study was used to classify the instrument (tool validity and reliability) and administrate selection data, according to Arain et al. (2010), Thabane et al. (2010), Manlapaz et al. (2021) and Grosser et al. (2021). A pilot research study was a small-scale version of primary research, usually involving questionnaires, that was used to evaluate the research technique. The questionnaire was tested to see whether there were any flaws that could lead to people filling out questionnaires incorrectly, as well as poor response rates (Beach et al., 2005; Hassan et al., 2006; Ismail et al., 2018). According to Browne (1995), Reinard (2006), Johanson & Brooks (2010), and Whitehead et al. (2016), a pilot inquiry should have samples of 30 or more, which was more akin to the sample size assumption of a pilot study. As a result, the pilot project was completed by 30 primary school teachers. The surveyed questionnaires are available in English and Khmer.

For the pilot procedure, the researcher conducted a field visit at primary schools in Kampong Cham province to meet with teachers to explain the objective of the data collection and survey questionnaires, and conducted a question-and-answer session. The questionnaires then were provided to teachers to complete, and collected after 30 minutes. Some items of the survey questionnaire were revised based on the feedback analysis of this pilot study.

3.3.1.5 Validity and Reliability of the Surveyed Questionnaire

For an instrument to be deemed dependable, its results have to be consistent and steady. On the other hand, validity indicated an instrument's capacity to yield significant individual results and allow the investigator to draw relevant conclusions about the study sample (Mohamad et al., 2015). Reliability is determined using the Cronbach's alpha (α) coefficient, one of the most used reliability measures in quantitative investigations. If an instrument's dependability coefficient statistic, which is scaled from 0 to 1.0, is greater than 0.80, it is deemed to be very reliable. If $\alpha > 0.70$, the instrument is deemed very reliable; if $\alpha > 0.60$, it is considered reliable. Dependability has an impact on an instrument's validity since a reliable instrument measure only what it is supposed to measure. As a result, the results from reliable instruments were more precise and valid (Burg-Brown, 2016).

Table 3.5 below presents the reliability of piloting results of the study.

Table 3.5: Reliability Test of Instrument

IV Variables	Items	Reliability	Internal Consistency
TBMT	10	0.728	Good
TCM-TO	16	0.932	Excellence
TCM-TE	10	0.892	Excellence
TPMT	6	0.889	Excellence
TBCS	10	0.856	Excellence
TSCA	15	0.927	Excellence
TPCA	15	0.972	Excellence

3.3.2 The Student Test

The student test aimed to gather information from classroom student testing on mathematics learning. The aim was to develop a method of verification of the effectiveness of teachers' mathematics teaching through students' learning outcomes. This student test consists of a test for each of six primary grades, based on MoEYS (2018) (Appendix B). For each grade the test consists of 5 questions (exercises), with 2 marks per question, so the total scores are 10 per grade. The student tests were reviewed and accepted by Ministry of Education, youth and sport's experts and approved by the advisor.

Table 3.6: Distribution of Student Test Items

Part	Type	Reference	No. of Item
Grade 1 Test (15 mins)	Students' Test Result	MoEYS, (2018)	5
Grade 2 Test (15 mins)	Students' Test Result	MoEYS, (2018)	5
Grade 3 Test (15 mins)	Students' Test Result	MoEYS, (2018)	5
Grade 4 Test (15 mins)	Students' Test Result	MoEYS, (2018)	5
Grade 5 Test (15 mins)	Students' Test Result	MoEYS, (2018)	5
Grade 6 Test (15 mins)	Students' Test Result	MoEYS, (2018)	5

3.4 Data Collection Procedures

3.4.1 The Surveyed Questionnaire

The researcher used The University of Cambodia address to apply to the MoEYS, Cambodia, for permission to conduct the study at primary schools in Kampong Chhnang province. After receiving the letter from MoEYS giving permission, the researcher conducted the study. The researcher met with the primary education teachers from G1 to G6 and explained the objectives of the study was to introduce the survey questionnaire and answered any questions to ensure that all participants understand. The questionnaires then were provided to the teachers to complete. After a maximum of 30 minutes the questionnaires were collected and checked to ensure they have been completed. The returned questionnaire received 100%.

3.4.2 The Student Test

After the surveyed questionnaires with the teachers had been completed, the students were randomly invited for conducting the mathematics test. The students invited in each school were separated by grade (1-6) in different rooms. The researcher explained the objectives of the testing and answered any questions, and then the tests were provided to all students. During testing, the researcher read aloud the test items one by one and the students wrote their answers with total duration of 15 minutes. The tests were collected and checked for completion.

In order to respond to the research questions, this study used the survey questionnaires and student tests as the instruments for data collection. The descriptive statistics and inferential statistics were used for data analysis.

3.5 Data Analysis and Statistical Procedures

3.5.1 The Surveyed Questionnaire

The survey was created to gather information about teachers' evaluation assumptions and attitudes. In the current study, questionnaire analysis entails tabulating the survey results. This survey is designed to combine and triangulate data from several sources. As a result, the type of questions used to identify the knowledge of participants regarding competency-based evaluation was related to their background data. The survey results included information on the personal, professional, and qualification status of the participants as well as their level of familiarity with competency-based assessment syllabi, level of training, and experience with competency-based mathematics teaching and classroom assessment.

To make sure the parametric analysis was adequate, the data assumptions tests for homoscedasticity, multicollinearity, linearity, and normality were finished before the hypothesis test. For normality, linearity, and homoscedasticity, these were accessed using scatterplots and histograms; for multicollinearity, the Pearson correlation matrix was employed. A random clustering sample was the chosen sampling strategy. After determining the cluster group in the clustering stage, the researcher collected samples of individuals from those groups (Creswell, 2017). It is ensured that each member of the sample population group has equal selection probability by including a random sample. Variables were calculated using the survey item responses, and data for the survey were obtained via the researcher's own computer. Because the computer was password-protected, only the researcher could access the file. Following the completion of the study, the data was retained on the computer for three years. Once the replies were gathered, the statistical software program (SPSS 25) was used in the research. After being cleaned in Excel, the downloaded data was transferred into SPSS. In this quantitative investigation, the correlation coefficient was determined from the data gathered on the chosen research variables using the Pearson Product Moment Correlation Coefficient. In order to provide the researcher with a tried-and-tested, widely used data analysis technique to examine the relationship between the defined research variables, the Pearson Product Moment Correlation Coefficient was used (Walker, 2017; Fraenkel et al., 2019). Regression, or more precisely multiple linear regression, is the proper analysis approach when there are many predictor variables, according to Swanson and Holton (2005). By “describing what the data looks like,” descriptive statistics offer an overview of the data (Oh & Pyrczak, 2018, p. 49). Descriptive analysis was therefore computed for the sample demographics of the subjects. The survey questions themselves were preceded by these inquiries on demographic characteristics.

3.5.2 The Student Test

The student test was conducted to gather information about the result of students' learning. In the current study, testing analysis entails tabulating survey results. As a result, the type of tests used to identify the knowledgeable students regarding competency-based evaluation was related to teachers' mathematics teaching and classroom assessment and students' learning. Students' knowledge and skill status, as well as their level of acquaintance with competency-based assessment syllabi of curriculum from G1 to G6, were all included in the testing results.

SPSS version 25 was used to analyze the data collected. The frequencies and scores of each item were derived after statistical analysis. Descriptive statistics were used to assess the relevance of the distribution of responses for tests' scores. To find significant differences in students' knowledge and skill, mean and standard deviation were used. The mean tells us where the center of a value distribution is (Thompson, 2009). Mean is the most popular and widely used measure, according to Rana et al. (2012). The mean is greatly influenced by extreme data values as well as data from highly asymmetrical distributions, despite the fact that it is based on all measurements. Hoare and Hoe (2013) stated that the standard deviation of ranking ordinal data might be beneficial in some circumstances. The spread or dispersion of the scores is described by variability. At one extreme, there was no variability if all of the scores in a distribution are the same. The variability was large if the scores are all diverse and spread apart.

Table 3.7: Summary of Data Source and Data Analysis for Each Research Question

Research Question	Data Source	Data Analysis
1. How do primary teachers view the effectiveness of mathematics teaching methodologies in Kampong Chhnang Province, Cambodia?	Questionnaire	Descriptive and inferential statistical analysis of mathematics teaching methodologies.
2. How do primary teachers view the effectiveness of classroom	Questionnaire	Descriptive and inferential statistical

	assessments in Kampong Chhnang Province, Cambodia?		analysis of classroom assessments.
3.	What is the relationship between mathematics teaching methodologies and classroom assessments by primary teachers in Kampong Chhnang Province, Cambodia?	Questionnaire	Inferential statistical analysis of mathematics teaching methodologies and classroom assessments.
4.	What are the mathematics student learning outcomes at primary schools in Kampong Chhnang Province, Cambodia?	Student test	Descriptive and inferential statistical analysis of student learning outcomes.

3.6 Researcher's Position

The researchers are the independent people who conduct the study on the topic that provide the benefits for society, education, economic etc. For this study, it obtained the confidential feedback on mathematics teaching methodology and classroom assessment from Cambodia primary education teachers. Based on their perceptions of this type of teaching, researchers believe that proposing the correct quality of mathematics teaching and classroom assessment, as well as providing the appropriate professional development, is a good way to improve the student learning outcomes. Furthermore, this study is available for download without the owner's consent or authority.

3.7 Ethical Consideration

Any research study involving human subjects must take the protection of all participants including participant anonymity and the ethical use of data and information very seriously. Doing ethical research includes setting up procedures to protect the confidentiality of all data, avoid participant identification, and stop sensitive data theft. Additionally, ethical researchers work to lessen participant risks and ensure that individuals have the freedom to discontinue participation at any time.

This study followed the measures below to ensure that all participants are safe. Prior to The University of Cambodia (UC) clearance and data collection, the principals and teachers of the school sites were invited to read an overview of the project and grant final approval. Because the schools lack research study regulations, procedures, or policies, the school principals have the ability to grant permission for the study, and might have sought clearance from their school committee if they so desire. Following UC permission, each school principal will provide a list of phone numbers for participants who fit the study's requirements. Participants will be contacted by phone and asked to participate in the study. Individuals who had not responded after two weeks were contacted, asking them to accept or decline.

To protect participant privacy and confidentiality, each participant was given a participation code, and all interview transcripts would have all identifying information removed for a duration of five years, all observation logs, interview transcripts, and notes were electronically recorded and stored in a password-protected account. Only the researcher, the doctorate committee, and the UC university have access to data or procedural approaches that require validation; all other parties are subject to individual member verification. The Informed Consent Form allows participants to change their mind at any moment. If consent is withdrawn during data collection, all collected data is removed from analysis and destroyed. In the study's findings section, data will be directly provided using pseudonyms to prevent the inclusion of any personally identifiable information.

The next chapter, Chapter 4, will present the research results of these analyses quantitatively.

CHAPTER 4
DATA ANALYSES AND RESULTS

The findings of the study are presented in this chapter. This study was designed to examine the nature of the mathematics teaching methodologies, classroom assessment and student learning outcomes of the Primary Schools in Kampong Chhnang Province, Cambodia. The design of the study was an explanatory sequential design in which the quantitative data was analyzed. The quantitative data were collected using a survey instrument that was tested during a pilot step. This chapter presents the findings, relevant to the research questions, from analysis of the data. An overview of the survey respondents' demographics and findings pertaining to the independent and dependent variables are presented in the chapter's introduction. The connection between students' academic achievement and mathematics is also examined. A summary of the study results is presented as the chapter comes to a close.

4.1 Results of the Surveyed Participants' Demographic Information

As previously indicated, the survey instrument findings were the source of the data for this study, which were then analyzed using a variety of statistical techniques. This chapter is structured in accordance with the sequence in which the research questions were formulated in Chapter 1.

The following descriptive statistical summaries covered how teacher responses were distributed in several categories. The study was conducted exclusively among primary teachers in Kampong Chhnang Province, Cambodia. Data on demographic variables of primary teachers including genders (male or female), ages, educational levels, and teaching experiences, location, teaching grade and student number were collected along with data on their perceptions. The populations sampled in this study included all primary teachers during the academic year 2023-2024 and resulted in 278 (100%) having completed the surveyed questionnaire. Additional descriptive data was tabulated to help primary teachers in Kampong Chhnang Province assess the efficacy of mathematics teaching methods. Many methods were used to examine the questionnaire data. For all statistical studies, SPSS for Windows (SPSS 25.0) was used.

1) **Gender:** The surveyed primary teachers were asked to report whether they were male or female teacher.

Table 4.1: Distribution of Primary Teachers by Gender (N = 278)

Characteristics	Category	Frequency	Percentage
Gender	Male	110	39.6
	Female	168	60.4
	Total	**278**	**100**

The teacher survey participants were asked to report whether they were male or female. Table 4.1 shows the data regarding the gender of the primary teachers who completed the survey questionnaire. The larger percentage (60.4%) were female teachers. This indicated that a larger percentage of female teachers completed the survey than male teachers.

2) Age

This data shows the age of the teacher survey participants. -

Table 4.2: Distribution of Primary Teachers by Age (N=278)

Characteristics	Category	Frequency	Percentage
Age	Less than 30-Year-Old	56	20.1
	From 30–40-Year-Old	98	35.3
	Over 40-Year-Old	124	44.6
	Total	**278**	**100**

Table 4.2 shows the distribution of the teachers' age at the primary school. The surveyed teachers responded to this survey item by selecting one of three categories that corresponded to their ages: less than 30 years;30 - 40 years; more than 40 years. Using this reporting method, 44.6% of the primary teachers surveyed are over 40 years old, 35.3% are 30 - 40 years old, and 20.1% are less than 30 years old.

3) Education Level

This information represents the education of the surveyed teachers. The education is divided into 3 levels: below BA, BA and higher than BA.

Table 4.3: Distribution of Primary Teachers by Educational Level (N=278)

Characteristics	Category	Frequency	Percentage
Educational Level	Below Bachelor's Degree	157	56.5
	Bachelor's Degree	117	42.1

	Higher than Bachelor's Degree	4	1.4
	Total	**278**	**100**

Table 4.3 shows the breakdown of the surveyed teachers with: 56.5% of primary teachers having below a Bachelor's degree; 42.1% obtaining a Bachelor's degree; 1.4% obtaining higher than a Bachelor's degree.

4) Years of Teaching Experience

This information represents the teaching experience of the surveyed teachers. The experience is devised in 3 periods:1 to 10 years; 11 to 20 years; over 20 years.

Table 4.4: Distribution of Primary Teachers by Years of Teaching Experience (N=278)

Characteristics	Category	Frequency	Percentage
Years of Teaching Experience	1-10 years	66	23.7
	11-20 years	102	36.7
	Over 20 years	110	39.6
	Total	**278**	**100**

Table 4.4 shows the breakdown of the results of the surveyed teachers: 39.6% have taught more than 20 years; 36.7% from 11 to 20 years; 23.7% from 1 to 10 years.

5) Location

This information represents the school locations of the surveyed teachers. The location is devised in 2 areas, urban and rural.

Table 4.5: Distribution of Primary Teachers by Location (N=278)

Characteristics	Category	Frequency	Percentage
Location	Urban	215	77.3
	Rural	63	22.7
	Total	**278**	**100**

Referring to the table above, of the 278 respondents who completed the survey, 77.3% are teaching in an urban area.

6) Teaching Grade

This information represents the teaching grade of the surveyed teachers. The teaching grade is devised in 2 levels: early grade (G 1-3); upper grade (G 4-6).

Table 4.6: Distribution of Primary Teachers by Teaching Grade (N=278)

Characteristics	Category	Frequency	Percentage
Teaching Grade	Early	155	55.8
	Upper	123	44.2
	Total	**278**	**100**

Referring to the table above, of the 278 respondents who completed the survey, shows that more teachers, 55.8%, teach in early grades.

7) Student Number

This information presents the student numbers per class of the surveyed teachers. The student number is devised in 3 ranks: less than 31 students; from 31 to 40 students; more than 40 students.

Table 4.7: Distribution of Primary Teachers by Student Number (N=278)

Characteristics	Category	Frequency	Percentage
Student Number	Less than 31	38	13.7
	31-40	145	52.2
	More than 40	95	34.2
	Total	**278**	**100**

It is revealed in Table 4.7 that among the 278 respondents who completed the survey, most teachers, 52.2%, had classes from 31 to 40 students.

4.2 Results of the Research Question 1

The first research question was: **"How do primary teachers view the effectiveness of mathematics teaching methodologies in Kampong Chhnang Province, Cambodia?"** The first research question focused directly on finding out how the primary school teachers in Cambodia's Kampong Chhnang Province, felt about the effectiveness of mathematics teaching methodologies (MTMs). The researcher employed quantitative data from a questionnaire that assessed instructors' perceptions of the efficacy of various mathematics teaching methods in order to respond to this question.

Scale-responsive instruments were used in the study's design to enable the pairing and comparison of continuous variables. Every primary school teacher who participated in the survey was asked to answer questions on a five-point Likert scale, which goes from strongly disagree (1) to strongly agree (5). This study examined four dimensions of the questionnaire. Furthermore, teachers' beliefs about teaching mathematics (TBMT), teachers' confidence of mathematics topics (TCM-TO), teachers' confidence in mathematics teaching (TCM-TE), and teachers' practice of mathematics teaching (TPMT) were the four dimensions used in this study.

Based on the five levels of interpretation of descriptive statistic means proposed by Norman (2010), these means can be divided into five groups: very high (mean of 4.50 to 5.00), high (mean of 3.50 to 4.49), moderate (mean below 2.50 to 3.49), low (mean 1.50 to 2.49), and very low (mean 1.00 to 1.49). To provide useful information as to the frequency of views of primary school teachers towards the mathematics teaching methodology, Table 4.8 below summarizes the information contained to the interpretation key explained.

Table 4.8: The Mean, Standard Deviations for each Mathematics Teaching Methodology (N=278)

	Methodology Statement	M	S.D.	Meaning	Rank
1.	Teachers' Beliefs about Mathematics Teaching (TBMT)	4.01	0.34	High	1
2.	Teachers' Confident of Mathematics Topics (TCM-TO)	3.92	0.50	High	3
3.	Teachers' Confident in Mathematics Teaching (TCM-TE)	3.98	0.41	High	2
4.	Teachers' Practice of Mathematics Teaching (TPMT)	3.72	0.59	High	4
	Overall	**3.91**	**0.37**	**High**	

As revealed in the Table 4.8 above, the surveyed teachers reported that they rated their view the effectiveness of mathematics teaching methodologies (MTM) in Kampong Chhnang Province as a whole was at high level. When considering by each dimension, it was found that Teachers' Beliefs about Mathematics Teaching (TBMT) the most *(M=4.01, S.D.=0.34)*, Teachers' Confident in Mathematics Teaching (TCM-TE) the second most *(M=3.98, S.D.=0.41)*, followed by Teachers' Confident of Mathematics

Topics (TCM-TO) *(M=3.92, S.D.=0.50)*, and Teachers' Practice of Mathematics Teaching (TPMT) the least *(M=3.72, S.D.=0.59)*.

It should be noted that the information presented in the table above only represents the data from all surveyed teachers and all dimensions. Tables 4.9, 4.10, 4.11, and 4.12 below then display the reported primary teachers' views on the effectiveness of mathematics teaching methodologies in Kampong Chhnang Province by each dimension and item. To explore the primary teachers' views the effectiveness of mathematics teaching methodologies in greater detail, the mathematics teaching methodology (MTM) items were categorized into four separate subcategorizes: TBMT (10 items), TCM-TO (16 items), TCM-TE (10 items), and TPMT (6 items). The details of each dimension are described as follows:

Table 4.9: Reported Primary Teachers' Beliefs about Mathematics Teaching (TBMT)

	Statement	M	S.D.	Meaning	Rank
1.	I know how to teach mathematics concepts effectively.	3.89	0.54	High	9
2.	I understand mathematics concepts well enough to be effective in teaching mathematics.	3.98	0.55	High	6
3.	When a student has difficulty understanding a mathematics concept, I will usually help the student understand it better.	3.97	0.54	High	7
4.	I do know what to do to turn students on to mathematics.	3.96	0.54	High	8
5.	I control disruptive behavior in the classroom.	4.06	0.59	High	3
6.	I get student to believe they can do well in class work.	4.02	0.47	High	5
7.	I gauge student comprehension of what I have taught.	4.15	0.51	High	1
8.	I foster student creativity.	3.87	0.58	High	10
9.	I adjust my lesson to the proper level of individual students.	4.05	0.52	High	4
10.	I assist families in helping their children do well in school.	4.15	0.61	High	2
	Overall	**4.01**	**0.34**	**High**	

As shown in the table above, the 278 surveyed primary teachers' view the effectiveness of mathematics teaching methodologies in term of the teachers' beliefs about Mathematics teaching (TBMT) with varying degrees of frequency. The means of individual statement items ranged from a high of 4.15 to a low of 3.87 (with an overall mean of 4.01). The most frequently reported statement was number 7 "*I gauge student comprehension of what I have taught (M=4.15, S.D.=0.51)*". The statement with the lowest mean was number 8 "*I foster student creativity (M=3.87, S.D.=0.58)*".

Table 4.10: Reported Primary Teachers' Confident of Mathematics Topics (TCM-TO)

	Statement	M	S.D.	Meaning	Rank
1.	Whole numbers (numbers to 10 million)	4.03	0.66	High	5
2.	Addition and subtraction	4.27	0.57	High	1
3.	Word problems: addition and subtraction	4.13	0.58	High	3
4.	Multiplication and division	4.08	0.61	High	4
5.	Word problems: multiplication and division	4.01	0.62	High	6
6.	Fraction (adding, subtracting like and unlike fractions, product and dividing, word problems…)	3.85	0.69	High	9
7.	Ratio (find ratio, equivalent ratios, word problems…)	3.78	0.65	High	12
8.	Decimal numbers (the four operations of decimals, Word Problems…)	3.83	0.71	High	10
9.	Percentage (percent, percentages as fractions and decimals and reverse, percentage of quantity, solving word problems)	3.76	0.71	High	13
10.	Average and rate	3.66	0.70	High	16
11.	Measurements (length, time, weight and capacity)	3.98	0.62	High	7
12.	Currencies	4.13	0.57	High	2
13.	Statistics (picture and line graph, pie charts…)	3.81	0.67	High	11
14.	Geometry (area and perimeter, angles, triangles, quadrilaterals, volume of solids and liquids...)	3.74	0.70	High	14
15.	Speed (distance and speed, average speed)	3.74	0.76	High	15
16.	Algebra	3.90	0.64	High	8
	Overall	**3.92**	**0.50**	**High**	

As shown in the Table 4.10 above, the 278 surveyed primary teachers' view the effectiveness of mathematics teaching methodologies in term of the teachers' confident of Mathematic topics (TCM-TO) with varying degrees of frequency. The means of individual statement items ranged from a high of 4.27 to a low of 3.66 (with an overall mean of 3.92). The most frequently reported statement was number 2 "*Addition and subtraction (M=4.27, S.D.=0.57)*", followed by number 12 "Currencies *(M=4.13, S.D.=0.57)*". The statement with the lowest mean was number 10 "Average and rate *(M=3.66, S.D.=0.70)"*, followed by number 15 "*Speed (distance and speed, average speed) (M=3.74, S.D.=0.76)*".

Table 4.11: Reported Primary Teachers' Confident of Mathematics Teaching (TCM-TE)

	Statement	M	S.D.	Meaning	Rank
1.	Developing speed and accuracy of math skills improves understanding.	3.88	0.58	High	7
2.	I encourage students to use manipulation to explain their mathematical ideas to other students.	4.11	0.57	High	3
3.	I put more emphasis on getting the correct answer than on the process followed.	3.83	0.82	High	9
4.	When introducing math topics which I am confident teaching, it is important to first build understanding of a concept before focusing on algorithms.	3.97	0.67	High	6
5.	I like my students to master basic mathematical operations before they tackle complex problems.	4.16	0.54	High	2
6.	When two students solve the same problem correctly using two different strategies I have them share the steps they went through with each other.	4.21	0.61	High	1
7.	I frequently ask my students to explain why something works.	3.87	0.65	High	8
8.	Formulas and rules should be presented first when introducing new topics.	3.69	0.79	High	10

9.	A lot of things about mathematics must simply be accepted as true and remembered.	4.03	0.63	High	4
10.	With topics I am more confident teaching, I am more likely to explore alternative teaching strategies.	4.00	0.52	High	5
	Overall	**3.98**	**0.41**	**High**	

As shown in the table above, the 278 surveyed primary teachers' view the effectiveness of mathematics teaching methodologies in term of the teachers' confident of Mathematics teaching (TCM-TE) with varying degrees of frequency. The means of individual statement items ranged from a high of 4.21 to a low of 3.69 (with an overall mean of 3.98). The most frequently reported statement was number 6 "*When two students solve the same problem correctly using two different strategies I have them share the steps they went through with each other (M = 4.21, S.D. = 0.61)*". The statement with the lowest mean was number 8 "*Formulas and rules should be presented first when introducing new topics (M=3.69, S.D.=0.79)*".

Table 4.12: Reported Primary Teachers' Practice of Mathematics Teaching (TPMT)

	Statement	M	S.D.	Meaning	Rank
1.	I integrate abstract and concrete ideas in mathematics teaching.	3.72	0.72	High	4
2.	I help students see the relationship between mathematics and the real-world experience, knowledge, and event.	3.55	0.87	High	5
3.	I link the previous topic and the new topic in mathematics teaching.	3.75	0.72	High	3
4.	I promote student voice in the mathematics classroom.	4.06	0.78	High	1
5.	Students participate in choosing learning content or activities in mathematics.	3.32	0.90	Moderate	6
6.	Students collaborate and work together to actively learn in mathematics.	3.92	0.74	High	2
	Overall	**3.72**	**0.59**	**High**	

As shown in the table above, the 278 surveyed primary teachers' view the effectiveness of mathematics teaching methodologies in term of the teachers' practice of Mathematics teaching (TPMT) with varying degrees of frequency. The means of individual statement items ranged from a high of 4.06 to a low of 3.32 (with an overall mean of 3.72). The most frequently reported statement was number 4 "*I promote student voice in the mathematics classroom (M=4.06, S.D.=0.78)*". The statement with the lowest mean was number 5 "*Students participate in choosing learning content or activities in mathematics (M=3.32, S.D.=0.90)*".

Table 4.13: Frequency of Reported Statements in the Four Dimensions

Usage	Perceptions of Primary Teachers on MTM				Total
	TBMT	TCM-TO	TCM-TE	TPMT	
Very High	-	-	-	-	-
High	10	16	10	5	41
Moderate	-	-	-	1	1
Low	-	-	-	-	-
Very Low	-	-	-	-	-

As showed in Table 4.13, 41 of the 42 statements (99%) fell in the high usage group, while 1 of the remaining statement (1%) is at moderate usage.

The following section discusses the top three statements reported using by primary teachers participating in this study. Insights gained from the findings contribute to our better understanding of how the teachers selected mathematics teaching methodologies to foster their student learning achievement. In each of the following tables, TBMT, TCM-TO, TCM-TE, and TPMT are accompanied by the top three methodologies reported with the highest means. Table 4.14 contains the information as to the use of methodologies by primary teachers.

Table 4.14: Top Three Mathematics Teaching Methodologies Reported to be Perceived by Primary Teachers (N=278)

Category	Methodology	Mean	S.D.
TBMT	7. I gauge student comprehension of what I have taught.	4.15	0.51
	10. I assist families in helping their children do well in school.	4.15	0.61
	5. I control disruptive behavior in the classroom.	4.06	0.59
TCM-TO	2. Addition and subtraction.	4.27	0.57
	12. Currencies.	4.13	0.57
	3. Word problems: addition and subtraction	4.13	0.58
TCM-TE	6. When two students solve the same problem correctly using two different strategies I have them share the steps they went through with each other.	4.21	0.61
	5. I like my students to master basic mathematical operations before they tackle complex problems.	4.16	0.54
	2. I encourage students to use manipulation to explain their mathematical ideas to other students.	4.11	0.57
TPMT	4. I promote student voice in the mathematics classroom.	4.06	0.78
	6. Students collaborate and work together to actively learn in mathematics.	3.92	0.74
	3. I link the previous topic and the new topic in mathematics teaching.	3.75	0.72

As indicated in the table above, TCM-TO with the highest mean is number 2 "*Addition and subtraction (M=4.27, S.D.=0.57)*". However, of all the 42 teaching methodology items listed on the questionnaire, the teaching methodology that received the highest mean is number 6 "*When two students solve the same problem correctly using two different strategies I have them share the steps they went through with each other (M=4.21, S.D.=0.61),*" belonging to TCM-TE. The third dimension to receive a high mean is TCM-TE number 5 "*I like my students to master basic mathematical operations before they tackle complex problems (M=4.11, S.D.=0.57).*"

Table 4.15: The Lowest Three Mathematics Teaching Methodologies Reported to be Perceived by Primary Teachers (N=278)

Category	Methodology	Mean	S.D.
TBMT	8. I foster student creativity.	3.87	0.58
	1. I know how to teach mathematics concepts effectively.	3.89	0.54
	4. I do know what to do to turn students on to mathematics.	3.96	0.54
TCM-TO	10. Average and rate.	3.66	0.70
	15. Speed (distance and speed, average speed)	3.74	0.76
	14. Geometry	3.74	0.70
TCM-TE	8. Formulas and rules should be presented first when introducing new topics.	3.69	0.79
	3. I put more emphasis on getting the correct answer than on the process followed.	3.83	0.82
	7. I frequently ask my students to explain why something works.	3.87	0.65
TPMT	5. Students participate in choosing learning content or activities in mathematics.	3.32	0.90
	2. I help students see the relationship between mathematics and the real-world experience, knowledge, and event.	3.55	0.87
	1. I integrate abstract and concrete ideas in mathematic teaching.	3.72	0.72

As indicated in the Table 4.15 above, TPMT with the lowest mean is number 5 "*Students participate in choosing learning content or activities in mathematics (M=3.32, S.D.=0.65)*". However, of all the 42 teaching methodology items listed on the questionnaire, the teaching methodology that received the lowest mean is number 2 "*I help students see the relationship between mathematics and the real-world experience, knowledge, and event (M=3.55, S.D.=0.87),*" belong to TPMT. The third dimension to receive a lowest mean is TCM-TO number 10 "*Average and rate (M=3.66, S.D.=0.70)*".

As well as investigating the potential existence of differences in the surveyed teachers' perceptions of the effectiveness of mathematics teaching methodologies, their perceptions can also be analyzed using the demographic data of gender, age, educational level, years of teaching experience, location, teaching grade, and number of students from the data analyzed.

The results of separate one-way analysis of variance (ANOVA) were computed to determine significant differences among mean scores of responses from teachers based on age, educational level, years of teaching experience and number of students. For analyzing the difference in mean scores between respondents' gender, location, and teaching grade, independent samples t-test was calculated. The results are displayed in Table 4.16.

Table 4.16: Differences Concerning the Views of Primary Teachers on MTMs Based on Gender

Gender	Male (N = 110)		Female (N = 168)		t	p-value
	M	S.D.	M	S.D.		
1. TBMT	4.05	0.35	3.98	0.33	1.57	0.06
2. TCM-TO	3.98	0.49	3.87	0.49	1.92	0.28
3. TCM-TE	4.00	0.48	3.95	0.35	0.99	0.09
4. TPMT	3.83	0.53	3.64	0.61	2.67	0.23

By using the t-test, table 4.16 above reveals that there is no statistically significant difference concerning the views of the surveyed primary teachers on MTMs based on gender. When making a comparison using the mean score, it shows that the male teachers have scored higher than the female teachers in all dimensions. The highest mean score is TBMT, followed by TCM-TE, TMC-TO and TPMT respectively. Whereas, the highest mean score for the female teachers is TBMT, followed by TCM-TE, TMC-TO and TPMT, respectively.

Table 4.17: Differences Concerning the Views of Primary Teachers on MTMs Based on Location

Location	Urban (N = 215)		Rural (N = 63)		t	p-value
	M	S.D.	M	S.D.		
1. TBMT	3.99	0.34	4.06	0.34	-1.48	0.56
2. TCM-TO	3.91	0.52	3.92	0.39	-0.20	0.31
3. TCM-TE	3.95	0.42	4.04	0.35	-1.63	0.93
4. TPMT	3.68	0.61	3.84	0.52	-1.95	0.16

Table 4.17 above reveals that there is no statistically significant difference concerning the views of the surveyed primary teachers on MTMs based on location. When making a comparison using the mean score, it shows that rural surveyed teachers have scored higher than the urban surveyed teachers in all dimensions. The highest mean score for the rural surveyed teachers is TBMT, followed by TCM-TE, TMC-TO and TPMT respectively. Whereas, the highest mean score for the urban surveyed teachers is TBMT, followed by TCM-TE, TMC-TO and TPMT, respectively.

Table 4.18: Differences Concerning the Views of Primary Teachers on MTMs Based on Teaching Grade

Teaching Grade	Grades 1-3 (N = 155)		Grade 4-6 (N = 123)		t	p-value
	M	S.D.	M	S.D.		
1. TBMT	3.97	3.97	4.05	0.34	-1.96	0.62
2. TCM-TO	3.82	0.54	4.02	0.42	-3.31	0.10
3. TCM-TE	3.96	0.45	3.98	0.35	-0.48	0.79
4. TPMT	3.71	0.62	3.73	0.56	-0.22	0.81

Table 4.18 above reveals that there is no statistically significant difference concerning the views of the surveyed primary teachers on MTMs based on teaching grade. When making a comparison using the mean scores, it shows that the surveyed teachers who teach at grades 4-6 have scored higher than the surveyed teachers who teach at grades 1-3 in each dimension. The highest mean score for those teachers teaching Grades 4–6 is TBMT, followed by TCM-TO, TMC-TE and TPMT respectively. Whereas, the highest mean score for those teachers teaching grades 1-3 primary teacher is TBMT, followed by TCM-TE, TMC-TO and TPMT, respectively.

Statistical analysis was also applied to possible difference in gender. Analysis of variance (ANOVA) identifies mean scores differences among groups larger than two descriptors. Using a one-way test at the 95% confidence level, variance scores that fell below the .05 level of significance (alpha) were identified by the researcher and then paired with the age indicator by teachers. This session is presented in four major independent variables. The comparison of teachers’ variables includes: (a) age; (b) educational level; (c) years of teaching experiences; and (d) student number. The following Table 4.19 represents the reported views of the surveyed teachers on MTMs based on age difference.

Table 4.19: Differences Concerning the Views of Primary Teachers on MTMs Based on Age

Age	df	SS	MS	F	p-value
1. TBMT					
Between Group	2	0.658	0.329	2.816	0.062
Within Group	275	32.114	0.117		
Total	277	32.772			
2. TCM-TO					
Between Group	2	1.474	0.737	2.980	0.052
Within Group	275	68.023	0.247		
Total	451	69.497			
3. TCM-TE					
Between Group	2	0.066	0.033	0.193	0.824
Within Group	275	46.633	0.170		
Total	277	46.699			
4. TPMT					
Between Group	2	0.594	0.297	0.841	0.432
Within Group	275	97.217	0.354		
Total	277	97.811			

By utilizing the ANOVA, Table 4.19 shows that concerning the views of the surveyed teachers on MTMs based on age all dimensions were not different.

A series of One-way ANOVAs was conducted along with post hoc Bonferroni and Scheffé analyses. If the mean differences between the groups in the research variables are statistically significant, it can be ascertained using the ANOVA. Below are Tables 4.20, 4.21, and 4.22 which summarizes the differences concerning the views of the surveyed teachers on MTMs based upon educational level, years of teaching experiences, and number of students. Table 4.20 below represents the differences concerning the views of the surveyed teachers on MTMs based on their educational level.

Table 4.20: Differences Concerning the Views of Primary Teachers on MTMs Based on Educational Level

Educational Level	df	SS	MS	F	p-value
1. TBMT					
Between Group	2	0.786	0.393	3.377*	0.036
Within Group	275	31.986	0.116		
Total	277	32.772			
2. TCM-TO					
Between Group	2	0.976	0.488	1.959	0.143
Within Group	275	68.521	0.249		
Total	451	69.497			
3. TCM-TE					
Between Group	2	0.514	0.257	1.530	0.218
Within Group	275	46.185	0.168		
Total	277	46.699			
4. TPMT					
Between Group	2	1.433	0.717	2.045	0.131
Within Group	275	96.378	0.350		
Total	277	97.811			

** Significant difference at 0.05 level.*

Table 4.20 indicates that the results of how the surveyed teachers perceived their MTMs based on their educational background in term of TBMT has a statistically significant difference at 0.05 level, while other dimensions were not different.

Table 4.21: Differences Concerning the Views of Primary Teachers on MTMs Based on Years of Teaching Experience

Teaching Experiences	df	SS	MS	F	p-value
1. TBMT					
Between Group	2	.739	0.370	3.174*	0.043
Within Group	275	32.032	0.116		
Total	277	32.772			
2. TCM-TO					
Between Group	2	.769	0.384	1.538	0.217
Within Group	275	68.728	0.250		
Total	451	69.497			

3. TCM-TE					
Between Group	2	.328	0.164	0.972	0.379
Within Group	275	46.371	0.169		
Total	277	46.699			
4. TPMT					
Between Group	2	1.778	0.889	2.545	0.080
Within Group	275	96.034	0.349		
Total	277	97.811			

** Significant difference at 0.05 level.*

Table 4.21 shows that the surveyed teachers perceived their MTMs based on their years of teaching experiences in term of TBMT has a statistically significant difference at 0.05 level, while other dimensions were not different.

Table 4.22: Differences Concerning the Views of Primary Teachers on MTMs Based on Student Number

Student Numbers	df	SS	MS	F	p-value
1. TBMT					
Between Group	2	.739	0.073	0.613	0.542
Within Group	275	32.032	0.119		
Total	277	32.772			
2. TCM-TO					
Between Group	2	.769	0.948	3.855*	0.022
Within Group	275	68.728	0.246		
Total	451	69.497			
3. TCM-TE					
Between Group	2	.328	0.164	0.972	0.379
Within Group	275	46.371	0.169		
Total	277	46.699			
4. TPMT					
Between Group	2	1.778	0.889	2.545	0.080
Within Group	275	96.034	0.349		
Total	277	97.811			

** Significant difference at 0.05 level.*

As indicated in the Table 4.22 above, the surveyed teachers perceived their MTMs based on their student number in term of TCM-TO was statistically significant difference at 0.05 level, while other dimensions were not different.

4.3 Results of the Research Question 2

The second research question was: **"How do primary teachers view the effectiveness of classroom assessment in Kampong Chhnang Province, Cambodia?"** The aim of the second study question was to comprehend the commonalities and distinctions among the surveyed primary teachers. The researcher used the questionnaire's quantitative data to answer this question. The quantitative data came from classroom assessment on the mathematics teaching methodologies. The three dimensions used in this study were: 1) teachers' beliefs about classroom assessment (TBCA), 2) teachers' skills in classroom assessment (TSCA), and 3) teachers' practice of classroom assessment (TPCA). Details are presented as follows:

Table 4.23: The Mean, Standard Deviations for each Classroom Assessment (N=278)

Methodology Statement	M	S.D.	Meaning	Rank
1. Teachers' Beliefs about Classroom Assessment (TBCA)	4.09	0.40	High	1
2. Teachers' Skill in Classroom Assessment (TSCA)	3.65	0.62	High	2
3. Teachers' Practice of Classroom Assessment (TPCA)	3.62	0.61	High	3
Overall	**3.79**	**0.46**	**High**	

As revealed in the Table 4.23 above, the surveyed teachers reported that they rated their view of classroom assessment in Kampong Chhnang Province as a whole and each dimension at "high" levels. When comparing the results for the three dimensions, it was found that teachers' beliefs about classroom assessment (TBCA) scored the highest *(M=4.09, S.D.=0.40)"*, followed by teachers' skill in classroom assessment (TSCA) *(M=3.65, S.D.=0.62)"*, and teachers' practice of classroom assessment (TPCA) the lowest *(M=3.62, S.D.=0.61)"*.

It should be noted that the information presented in the table above only represents the data from all surveyed primary teachers across all dimensions. Tables 4.24, 4.25, and 4.26 below represent the reported surveyed teachers' view on the classroom assessment on mathematics teaching methodologies in Kampong Chhnang Province by each dimension and item. To explore the views of the classroom assessment on mathematics teaching methodologies in greater detail, the Classroom Assessment (CAS) items were categorized into 3 separate subcategorizes. The dimension of TBCA contains 10 supporting items, while the dimension of TSCA has 15 supporting items, and the dimension of TPCA has supporting 15 items.

As previously stated, the criteria for evaluating the mean score used in this study was adapted from Norman (2010). The details of each dimension are described as follows:

Table 4.24: Reported Primary Teachers' Beliefs about Classroom Assessment (TBCA) (N=278)

	Statement	M	S.D.	Meaning	Rank
1.	Assessment identify and diagnose pupils' learning needs	3.97	0.51	High	9
2.	The purpose of classroom assessments is to determine student grades.	4.14	0.58	High	5
3.	The purpose of classroom assessments is to determine the effectiveness of my instruction.	4.15	0.52	High	4
4.	Tests help me focus on the skills/knowledge needed by my students.	4.24	0.57	High	2
5.	The purpose of assessment is to make students accountable for their learning.	4.10	0.61	High	8
6.	The purpose of assessment is to monitor students' learning progress.	4.26	0.52	High	1
7.	Assessment should form a natural part of teaching activities.	4.11	0.55	High	7
8.	Assessment training, I received was adequate.	3.56	0.74	High	10
9.	Assessment provides me with valuable pieces of evidence of my students' understandings, which I use to plan subsequent lessons.	4.13	0.54	High	6
10.	I need more training in student assessment, tests, and measurement.	4.22	0.56	High	3
	Overall	**4.09**	**0.40**	**High**	

As shown in the table above, the 278 surveyed primary teachers' view the classroom assessment on mathematics teaching methodologies in term of the teachers' beliefs about classroom assessment (TBCA) with varying degrees of frequency. The means of individual statement items ranged from a high of 4.26 to a low of 3. 56 (with an overall mean of 4.09). The most frequently reported statement was number 6 "*The purpose of assessment is to monitor students' learning progress (M=4.26, S.D.=0.52)*". The statement with the lowest mean was number 8 "*Assessment training, I received was adequate (M=3.56, S.D.=0.74)*".

Table 4.25 below reports the primary teachers' skill in classroom assessment (TSCA).

Table 4.25: Reported Primary Teachers' Skill in Classroom Assessment (TSCA) (N=278)

	Statement	M	SD	Meaning	Rank
1.	Choosing appropriate assessment methods for instructional decisions.	3.38	0.79	Moderate	15
2.	Aligning test items with instructional objectives.	3.42	0.87	Moderate	14
3.	Writing essay questions and paper-pencil tests.	3.63	0.80	High	10
4.	Writing multiple-choice questions.	3.70	0.81	High	7
5.	Writing true or false questions.	3.83	0.72	High	2
6.	Assessing individual hands-on activities.	3.70	0.76	High	6
7.	Using assessment results when planning teaching.	3.59	0.77	High	11
8.	Using assessment results for decision-making about individual students.	3.57	0.80	High	12
9.	Determining why students make specific mistakes.	3.72	0.71	High	5
10.	Communicating classroom assessment results to others.	3.52	0.81	High	13
11.	Including student effort in the calculation of grades.	3.76	0.75	High	4
12.	Making sure the test adequately covers the material taught in class.	3.81	0.73	High	3

13.	Using peer assessments for student assessments.	3.64	0.85	High	9
14.	Providing oral feedback to students.	3.85	0.73	High	1
15.	Providing written feedback to students.	3.67	0.75	High	8
	Overall	**3.65**	**0.62**	**High**	

Referring to Table 4.25 above, the 278 surveyed primary teachers' view the classroom assessment on mathematics teaching methodologies in term of the teachers' skill in classroom assessment (TSCA) with varying degrees of frequency. The means of individual statement items ranged from a high of 3.85 to a low of 3.38 (with an overall mean of 3.65). The most frequently reported statement was number 14 "*Providing oral feedback to students (M=3.85, S.D.=0.73)*", followed by number 5 "*Writing true or false questions (M=3.83, S.D.=0.72)*". The statement with the lowest mean was number 1 "*Choosing appropriate assessment methods for instructional decisions (M=3.38, S.D.=0.79)*", and followed by number 2 "*Aligning test items with instructional objectives (M=3.42, S.D.=0.87)*".

Table 4.26 below reports the primary teachers' practice of classroom assessment (TPCA).

Table 4.26: Reported Primary Teachers' Practice of Classroom Assessment (TPCA) (N=278)

	Statement	M	S.D.	Meaning	Rank
1.	Choosing appropriate assessment methods for instructional decisions.	3.52	0.71	High	12
2.	Aligning test items with instructional objectives.	3.53	0.71	High	11
3.	Writing essay questions and paper-pencil tests.	3.74	0.75	High	1
4.	Writing multiple-choice questions.	3.68	0.73	High	7
5.	Writing true or false questions.	3.69	0.72	High	6
6.	Assessing individual hands-on activities.	3.70	0.76	High	4
7.	Using assessment results when planning teaching.	3.59	0.73	High	9

8.	Using assessment results for decision-making about individual students.	3.55	0.73	High	10
9.	Determining why students make specific mistakes.	3.64	0.73	High	8
10.	Communicating classroom assessment results to others.	3.51	0.80	High	14
11.	Including student effort in the calculation of grades.	3.69	0.76	High	5
12.	Making sure the test adequately covers the material taught in class.	3.70	0.71	High	3
13.	Using peer assessments for student assessments.	3.52	0.80	High	13
14.	Providing oral feedback to students.	3.72	0.68	High	2
15.	Providing written feedback to students.	3.50	0.81	High	15
	Overall	**3.62**	**0.61**	**High**	

Referring to Table 4.26 above, the 278 surveyed primary teachers' view the classroom assessment on mathematics teaching methodologies in term of the teachers' practice of classroom assessment (TPCA) with varying degrees of frequency. The means of individual statement items ranged from a high of 3.74 to a low of 3.50 (with an overall mean of 3.62). The most frequently reported statement was number 3 "*Writing essay questions and paper-pencil tests (M=3.74, S.D.=0.75)*", followed by number 14 "*Providing oral feedback to students (M=3.72, S.D.=0.68)*". The statement with the lowest mean was number 15 "*Providing written feedback to students (M=3.50, S.D.=0.81)*", and followed by number 10 "*Communicating classroom assessment results to others (M=3.51, S.D.=0.80)*".

Table 4.27: Frequency of Reported Statement in the Three Dimensions

Usage	Perceptions of Primary Teachers on CA			Total
	TBCA	TSCA	TPCA	
Very High	-	-	-	-
High	10	13	15	38
Moderate	-	2	-	2
Low	-	-	-	-
Very Low	-	-	-	-

As shown in Table 4.27, 38 of the 40 statements (98%) fell in the high usage group, while 2 of the remaining statement (2%) is at moderate usage.

The following section discusses the top three statements reported by primary teachers participating in this study. Insights gained from the findings contribute to our better understanding of how the teachers selected mathematics teaching methodologies to foster their student learning achievement. In each of the following tables, TBMT, TCM-TO, TCM-TE, and TPMT are accompanied by the top three methodologies reported with the highest means. Table 4.28 contains the information as to the use of methodologies by primary teachers.

Table 4.28: Top Three Classroom Assessments Reported to be Perceived by Primary Teachers (N=278)

Category	Classroom Assessment	Mean	S.D.
TBCA	6. The purpose of assessment is to monitor students' learning progress.	4.26	0.52
	4. Tests help me focus on the skills/knowledge needed by my students.	4.24	0.57
	10. I need more training in student assessment, tests, and measurement.	4.22	0.56
TSCA	14. Providing oral feedback to students.	3.85	0.73
	5. Writing true or false questions	3.83	0.72
	12. Making sure the test adequately covers the material taught in class.	3.81	0.73
TPCA	3. Writing essay questions and paper-pencil tests.	3.74	0.75
	14. Providing oral feedback to students.	3.72	0.68
	12. Making sure the test adequately covers the material taught in class	3.70	0.71

As indicated in the table above, TBCA with the highest mean is number 6 "*The purpose of assessment is to monitor students' learning progress (M=4.26, S.D.=0.52)*". However, of all the 40 classroom assessment items listed on the questionnaire, the classroom assessment that received the highest mean is number 4 "*Tests help me focus on the skills/knowledge needed by my students (M=4.24, S.D.=0.57),*" belonging to

TBCA. The third strategy to receive a high mean is still TBCA number 10 "*I need more training in student assessment, tests, and measurement (M=4.22, S.D.=0.56)*."

Table 4.29: The Lowest Three Classroom Assessments Reported to be Perceived by Primary Teachers (N=278)

Category	Classroom Assessment	Mean	S.D.
TBCA	8. Assessment training, I received was adequate.	3.56	0.74
	1. Assessment identify and diagnose pupils' learning needs.	3.97	0.51
	5. The purpose of assessment is to make students accountable for their learning.	4.10	0.61
TSCA	1. Choosing appropriate assessment methods for instructional decisions.	3.38	0.79
	2. Aligning test items with instructional objectives.	3.42	0.87
	10. Communicating classroom assessment results to others.	3.52	0.81
TPCA	15. Providing written feedback to students.	3.50	0.81
	10. Communicating classroom assessment results to others.	3.51	0.80
	13. Using peer assessments for student assessments.	3.52	0.80

As revealed in the table above, TSCA with the lowest mean score is number 1 "*Choosing appropriate assessment methods for instructional decisions (M=3.38, S.D.=0.79)*". However, of all the 40 classroom assessment items listed on the questionnaire, the classroom assessment that received the lowest mean score is number 2 "*Aligning test items with instructional objectives (M=3.42, S.D.=0.87),*" belonging to TSCA. The third strategy to receive a lowest mean score is TPCA number 15 "*Providing written feedback to students (M=3.50, S.D.=0.81)*".

Regarding the quantitative data, which were partially provided above, the results mainly highlighted the data on classroom assessments from every primary teacher who was surveyed. Table 4.29 opens the discussion of this element by going over variations in the reported assessments of classrooms made by the study's surveyed teachers. In addition, independent sample t-tests were used to determine whether the observed differences in the two groups' total means were statistically significant for all classroom assessment variables as reported by teachers. The significance criterion for this investigation was established at $p \leq 0.05$.

Table 4.30: Differences Concerning the Views of Primary Teachers on Classroom Assessment Based on Gender

Gender	Male (N = 110)		Female (N = 168)		t	p-value
	M	S.D.	M	S.D.		
1. TBCA	4.13	0.39	4.05	0.40	1.66	0.14
2. TSCA	3.75	0.60	3.58	0.61	2.31	0.28
3. TPCA	3.72	0.61	3.54	0.59	2.37	0.58

By using the t-test, table 4.30 above reveals that there is no statistically significant difference concerning the views of the surveyed teachers on classroom assessment based on gender. When considering and comparing by mean score, it is shown that the male surveyed teachers have higher scores than the female surveyed teacher in all dimensions. The highest mean score of the surveyed male teachers is higher than female teacher all dimensions ranking from TBCA, followed by TSCA, and TPCA, respectively. Whereas, the highest mean score of the female surveyed teachers is TBCA, followed by TSCA, and TPCA respectively.

Table 4.31: Differences Concerning the Views of Primary Teachers on Classroom Assessment Based on Location

Location	Urban (N = 215)		Rural (N = 63)		t	p-value
	M	S.D.	M	S.D.		
1. TBCA	4.07	0.40	4.12	0.36	-0.76	0.37
2. TSCA	3.60	0.65	3.79	0.43	-2.13**	0.00
3. TPCA	3.58	0.63	3.73	0.49	-1.74*	0.01

** Significant difference at 0.05 level.*

*** Significant difference at 0.01 level.*

Table 4.31 above reveals that the views of the surveyed teachers on classroom assessment based on location in terms of TSCA were statistically significant differences at 0.01 level; whereas, TPCA was at 0.05 level, and TBCA was not different. When analyzing by mean score, it shows that rural surveyed teachers have higher scores than the urban surveyed teacher in all dimensions. The highest mean score is TBCA, followed by TSCA, and TPCA, respectively. Whereas, the highest mean score for urban surveyed teacher is TBCA, followed by TSCA, and TPCA, respectively.

Table 4.32: Differences Concerning the Views of Primary Teachers on Classroom Assessment Based on Teaching Grade

Teaching Grade	Grades 1-3 (N = 155)		Grade 4-6 (N = 123)		t	p-value
	M	S.D.	M	S.D.		
1. TBCA	4.05	0.44	4.12	0.33	-1.34	0.44
2. TSCA	3.63	0.60	3.67	0.63	-0.51	0.63
3. TPCA	3.57	0.60	3.67	0.60	-1.46	0.87

Table 4.32 above reveals that there is no statistically significant difference concerning the views of surveyed primary teachers on classroom assessment based on teaching grade. When analyzing by mean score by each dimension, it is shown that the surveyed primary teachers from grades 4-6 have higher scores than the surveyed teachers who teach from grades 1-3 by each dimension. The highest mean score for grades 4-6 is TBCA, followed by TPCA, and TSCA. Whereas, the highest mean score for grades 1-3 is TBCA, followed by TSCA and TPCA, respectively.

Statistical analysis was also applied to possible difference in gender. Analysis of variance (ANOVA) identifies mean scores differences among groups larger than two descriptors. Using a one-way test at the 95% confidence level, variance scores that fell below the .05 level of significance (alpha) were identified by the researcher and then paired with the age indicator by teachers. The following Table 4.33 represents the reported classroom assessment by teachers' perception based on age difference.

Table 4.33: Differences Concerning the Views of Primary Teachers on Classroom Assessment Based on Age

Age	df	SS	MS	F	p-value
1. TBCA					
Between Group	2	0.125	0.063	0.390	0.678
Within Group	275	44.205	0.161		
Total	277	44.331			

2. TSCA					
Between Group	2	1.474	0.477	1.261	0.285
Within Group	275	68.023	0.378		
Total	451	69.497			
3. TPCA					
Between Group	2	0.594	0.488	1.337	0.264
Within Group	275	97.217	0.365		
Total	277	97.811			

By utilizing the ANOVA, Table 4.33 shows that the views of the surveyed teachers on classroom assessment based on their age in all dimensions were not different.

The series of one-way ANOVA with Bonferroni and Scheffé post hoc analysis were run. The ANOVA can determine whether the set of groups mean differences in the research variables are statistically significant. Below are Tables 4.34, 4.35, and 4.36 which summarizes the differences concerning the views of the surveyed primary teachers on classroom assessment based upon educational level, years of teaching experience, and student number.

Table 4.34: Differences Concerning the Views of Primary Teachers on Classroom Assessment Based on Educational Level

Educational Level	df	SS	MS	F	p-value
1. TBCA					
Between Group	2	0.786	0.205	1.281	0.279
Within Group	275	31.986	0.160		
Total	277	32.772			
2. TSCA					
Between Group	2	0.976	0.127	0.334	0.717
Within Group	275	68.521	0.381		
Total	451	69.497			
3. TPCA					
Between Group	2	1.433	0.475	1.301	0.274
Within Group	275	96.378	0.365		
Total	277	97.811			

** Significant difference at 0.05 level.*

Table 4.34 indicates that the results from the surveyed teachers' perception of their classroom assessment based on their educational background showed no statistically significant difference in all dimensions.

Table 4.35: Differences Concerning the Views of Primary Teachers on Classroom Assessment Based on Years of Teaching Experience

Teaching Experiences	df	SS	MS	F	p-value
1. TBCA					
Between Group	2	0.739	0.024	0.149	0.862
Within Group	275	32.032	0.161		
Total	277	32.772			
2. TSCA					
Between Group	2	0.769	0.939	2.506	0.083
Within Group	275	68.728	0.375		
Total	451	69.497			
3. TPCA					
Between Group	2	1.778	1.351	3.764*	0.024
Within Group	275	96.034	0.359		
Total	277	97.811			

** Significant difference at 0.05 level.*

It is apparent from Table 4.35 that the surveyed teachers' perception of their classroom assessment based on their years of teaching experiences in term of TPCA shows a statistically significant difference at 0.05 level, while other dimensions were not different.

Table 4.36: Differences Concerning the Views of Primary Teachers on Classroom Assessment Based on Student Number

Student Numbers	df	SS	MS	F	p-value
1. TBCA					
Between Group	2	0.739	0.171	1.071	0.344
Within Group	275	32.032	0.160		
Total	277	32.772			

2. TSCA					
Between Group	2	0.769	1.067	2.856	0.059
Within Group	275	68.728	0.374		
Total	451	69.497			
3. TPCA					
Between Group	2	1.778	0.772	2.126	0.121
Within Group	275	96.034	0.363		
Total	277	97.811			

As indicated in the Table 4.36 above, the surveyed teachers' perception of their classroom assessment based on their student numbers shows no statistically significant difference in all dimensions.

4.4 Results of the Research Question 3

The third research question was: **"What is the relationship between mathematics teaching methodologies and classroom assessments by primary teachers in Kampong Chhnang Province, Cambodia?"** This research question explored the relationship between the reports made by the surveyed primary teachers of mathematics teaching methodologies (MTM) and classroom assessments (CAS). Similar to the previous research questions, the data gathered to address this question came from the surveyed questionnaire. The researcher examined the surveyed primary teachers' responses to the questionnaire as to their perceptions of mathematics teaching methodologies and classroom assessments.

The relationship between the MTM and CAS was considered for the study. To complete the correlational analysis, the Pearson's Correlation Coefficient was conducted to measure the relationship of the MTM and CAS. The Pearson's Correlation Coefficient (Pearson r) is used as an index of the relationship between variables (Salkind, 2006). The degree of the linear relationship between the variables is shown by the Pearson r value. The central limit theory, a probability theory, which posits that repeated sampling from a population distribution will yield means that are normally distributed regardless of its form, is the foundation for the Pearson r analysis that was done for this study (Green et al., 2000).

Remarkably, Salkind (2003) provided generalizations about correlations that described the degree of correlations between variables using Pearson correlations. These generalizations served as the foundation for the analysis of the independent and dependent variables that were chosen for the study. A variable association between the variables measured is stronger when the data analysis outcome is closer to 1.00. The variable correlations are outlined in Table 4.37 below.

Table 4.37: Interpretation of Pearson Correlations (Salkind, 2003)

Correlation Between	Are said to be
0.80 and 1.00	Very strong
0.60 and 0.80	Strong
0.40 and 0.60	Moderate
0.20 and 0.40	Weak
0.00 and 0.20	Very weak

Using the variable relationships outlined in Table 4.37 as a guide for the variable relationships, the Pearson correlational analysis produced the information depicted in Table 4.39.

Table 4.38: Comparing Data among MTM and CAS

Variable	M	S.D.	n	SE	z-Skewness	z-Kurtosis
MTM	3.91	0.37	278	0.79	-0.82	-0.69
CAS	3.79	0.46	278	1.12	0.75	-1.74

For Table 4.38 above, mathematics teaching methodologies (MTM) of primary teachers (n = 278, M = 3.91, S.D. = 0.37, SE = 0.79) scored higher than the classroom assessments (CAS) (n = 278, M = 3.79, S.D. = 0.46, SE = 1.12). While a difference in the mean of each group was observed, it was necessary to utilize inferential statistics to determine the significance of the observed differences.

Table 4.39 Correlation between MTM and CAS (N=278)

	1	2	3	4	5	6	7	8	9
TMTM	-								
TCAS	0.73**	-							
TBMT	0.74**	0.55**	-						
TCM-TO	0.80**	0.55**	0.52**	-					
TCM-TE	0.81**	0.58**	0.53**	0.57**	-				
TPMT	0.80**	0.63**	0.43**	0.45**	0.51**	-			
TBCA	0.68**	0.73**	0.46**	0.49**	0.66**	0.54**	-		
TSCA	0.60**	0.89**	0.47**	0.50**	0.44**	0.50**	0.51**	-	
TPCA	0.61**	0.89**	0.46**	0.42**	0.44**	0.57**	0.49**	0.68**	-

***Correlation is significant at 0.01 (2-taled)*

As depicted in Table 4.39, correlation coefficient between MTM and CAS, the results show that there is high relationship between TMTM and TCAS (r= 0.73, p<0.01). TMTM shows relationships with all TCAS dimensions, and the highest is the strong relationship between TMTM with TBCA (r=0.68, p<0.01), the lowest is the moderate relationship between TMTM with TSCA (r=0.60, p<0,01). TCAS has only a strong relationship with TPMT at r=0.63 and moderate relationships with all dimensions of TMTM at average 0.58. All dimensions of TMTM and TCAS show positive relationships with each other.

4.5 Results of the Research Question 4

The fourth research question was: **"What are the mathematics student learning outcomes at primary schools in Kampong Chhnang Province, Cambodia?"** The fourth research question was directed to examining and analyzing the results of the students' learning outcomes from grade 1 to 6 test results. The total score is 10 and the average is 5, so the total score below 5 is false and from 5 to 10 is pass. This research question begins with a description of the process of preparing the raw data for analysis and the necessary assumption testing required for the parametric independent- samples t-testing used to determine the existence of a possible significant difference between grades. The outcomes of each assumption test are presented narratively and include applicable associated tables or figures illustrating the results of the tests. Table 4.40 shows the significance level of each comparison group by grade level.

Table 4.40: Shapiro-Wilk Significance Levels by Grade Level Comparison Group

Grade Classification	*df*	Significance level *(p)*
Grade 1	13	0.479
Grade 2	19	0.811
Grade 3	17	0.895
Grade 4	13	0.102
Grade 5	7	0.295
Grade 6	17	0.128

After visual analysis of the quantitative data for the research questions 1, 2 and 3; because each comparison group had a relatively small sample size, descriptive statistics—more specifically, the Shapiro-Wilk test for normality—were utilized to examine the growth scores of the students' learning outcomes. The significance level (p) was higher than 0.05 in each of the comparison groups ($p > 0.05$).

Table 4.41 provides a detailed breakdown on grades 1-3 growth scores for the test, from the initial learning outcomes of the mathematics test.

Table 4.41: Mean, Min and Max of the Grades 1-3 Students' Learning Outcomes

Grade Classification	*N*	Mean	Min	Max
Grade 1	66	84.1 ± 103.6	-78	294
Grade 2	68	72.1 ± 81.3	-78	211
Grade 3	63	99.6 ± 129.2	-69	294

As depicted in Table 4.41, the mean growth score of the 66 students in the first-grade class was 84.1 points, with a standard deviation of 103.6 points. The range of growth scores was 372 points, ranging from a decrease of 78 points to a gain of 294 points. The growth scores of 68 second grade research participants had an average that was 12 points lower than the first-grade class. The standard deviation for this group was lower than the first-grade class by 22.3 points. The growth scores for this comparison group spanned 289 points. The growth scores of the 63 third grade students had an average that was 15.5 points higher than the first and second grades and 27.4 points higher than the segregated comparison group by 27.5 points. The standard deviation for this group was more than the first and second grades by 25.6 points.

Table 4.42 provides a detailed breakdown on grades 4-6 growth scores for the test, from the initial learning outcomes of the mathematics test.

Table 4.42: Mean, Min and Max of the Grades 4-6 Students' Learning Outcomes

Grade Classification	*N*	Mean	Min	Max
Grade 4	66	68.6 ± 120.1	-106	330
Grade 5	66	88.4 ± 79.1	-41	183
Grade 6	66	60.5 ± 134.6	-106	330

As shown in Table 4.42, the mean growth score of the 66 students in the Grade 4 class was 68.6 points, with a standard deviation of 120.1. The range of growth scores was 436 points, ranging from a decrease of 106 points to a gain of 330 points by research participants. For Grade 5 students, the mean growth score was 88.4 points, with a standard deviation of 79.1, while for Grade 6 students, the mean growth score was 60.5 points, with a standard deviation of 134.6.

Summary of the Chapter

All data were collected, and specific patterns and conclusions were evident. In this chapter, the analysis of the results of the surveyed teachers on their perceptions of the effectiveness of mathematics teaching methodologies and classroom assessments was presented. Student learning outcomes from the result of students' tests which related to the mathematics teaching methodologies and classroom assessments was also discussed. The findings show that teachers have considerable differences when it comes to how they engage students and provide the best instruction possible in the classroom. However, there are also notable parallels in their ways of thinking. In this dynamic world of education, collaboration between teachers and administrators is essential to providing the greatest possible assistance for students.

The study provides an overview of the findings and a discussion of them in the ensuing chapter, Chapter 5.

CHAPTER 5
DISCUSSIONS

The findings of the research study are presented in this chapter. It is to be thematically discussed the results, explanations of the results, and validation of previous study findings.

5.1 Summary of the Research Findings

Though it has had a difficult past, Cambodia is a beautiful country with increasing optimism for the future. Though its history is lengthy, Cambodia has seen genocide, foreign invasion, and civil war. Regretfully, the only things many people associate with Cambodia are Pol Pot and the Khmer Rouge regime, who took over in 1975. About 1.7 million people perished from famine, torture, and execution during the four years that Pol Pot presided over the country as a communist leader. Schools and history were other targets under Pol Pot. Schools were closed and libraries were destroyed. The professors from Cambodia either died or left the nation.

Scholars often refer to the process of classifying students into groups according to their gender, race, and class as ability grouping and student monitoring. Students' engagement is important in learning. For many years, teachers and administrators in Cambodia have been trying to understand how to get students interested in their studies. Cambodian history attests to the evolution of teaching methods, tactics, and materials over time.

The purposes of this study were fourfold: (1) to explore the perceptions of the surveyed primary teachers concerning the effectiveness of mathematics teaching methodologies at primary schools in Kampong Chhnang Province, Cambodia; (2) to investigate the perceptions of the surveyed primary teachers concerning the effectiveness of classroom assessments at primary schools in Kampong Chhnang Province, Cambodia; (3) to find out the relationship between mathematics teaching methodologies and classroom assessments by primary teachers in Kampong Chhnang Province, Cambodia; and (4) to explore the mathematics student learning outcomes at primary schools in Kampong Chhnang Province, Cambodia.

In order to investigate the relationship of mathematics teaching methodologies, classroom assessments, and students' mathematics learning outcomes in Cambodia in a wide range of dimensions, the present study attempts to address four research questions which are reiterated below for convenience.

1. How do primary teachers view the effectiveness of mathematics teaching methodologies in Kampong Chhnang Province, Cambodia?
2. How do primary teachers view the effectiveness of classroom assessments in Kampong Chhnang Province, Cambodia?
3. What is the relationship between mathematics teaching methodologies and classroom assessments by primary teachers in Kampong Chhnang Province, Cambodia?
4. What are the mathematics student learning outcomes at primary schools in Kampong Chhnang Province, Cambodia?

A total of 278 primary teachers from various demographic groups took part in the survey, which was conducted using basic random sampling by drawing lots from the total number of teachers in Kampong Chhnang Province. Based on the examination of the literature, modifications were made to the survey questionnaire and student test to use them as research tools. To reduce confusion and errors, the forms were back-translated after the validity of the instruments was confirmed. Field testing was completed using the Khmer versions of the questionnaires. Through computer program methods, the collected data were evaluated using both descriptive (Frequency, Percentage, Mean, and Standard Deviation) and inferential (Independent sample *t*-test, One-way ANOVA, Pearson correlation, and Stepwise regression) statistics.

5.1.1 Mathematics Teaching Methodologies

The research findings showed that the scores for mathematics teaching methodologies were in the high category. The domains included the teachers' beliefs about mathematics teaching, teachers' confident of mathematics topics, teachers' confident in mathematics teaching, and teachers' practice of mathematics teaching. The teachers' confident in mathematic teaching is mostly related to the effectiveness of mathematics teaching methodologies, followed by the teachers' confident in mathematics topics, then is the teachers' practice of mathematics teaching, and finally the teachers' beliefs about mathematics teaching.

The result showed the high expectations of teachers' beliefs about mathematics teaching (TBMT). Most surveyed teachers assess the students' understanding of what they have taught, help the students' families support their children's academic success, manage disruptive behavior in the classroom, adapt the lesson to each student's specific level, instill confidence in the students that they can succeed in class, comprehend mathematical concepts sufficiently to be able to teach them effectively, and usually provide clarification to students who are having trouble understanding a concept.

The analysis of the data shows that the surveyed teachers' belief about mathematics teaching compared with the age of the teacher has no significant difference.

Teachers with the age below 31 years old, from 31 to 40 years old, and more than 40 years old all scored within the high range. This was also true when comparing male and female teachers; the teachers at urban and rural area; early and upper grade teachers; and the teachers who have the students less than 31, from 31 to 40, and more than 40 per class. There is, however, a significant difference between the teachers who have education under BA, BA, and above BA. It is also true that there is a significant difference between the surveyed teachers who have experience from 1 to 10 years, from 11 to 20 years, and over 20 years.

The data shows that teachers are highly confident of the knowledge and concepts of primary mathematics topics (TCM-TO). This includes addition and subtraction, currency, word problems of addition and subtraction, multiplication and division, whole numbers from 10 to million, word problems of multiplication and division, measurements (length, times, mass, and capacity), algebra, fractions (adding, subtracting, like and unlike fractions, product and dividing, word problem…), decimal numbers (the four operations of decimals, word problems…), statistics (picture and line graph, pie charts…), ratio (find ratio, equivalent ratios, word problems…), percentage (percent, percentages as fractions and decimals and reverse, percentage of quantity, solving word problem), geometry (area and perimeter, angles, triangles, quadrilaterals, volume of solids and liquids…), speed (distance and speed, average speed), and average and rate. There is no significant difference of teachers' confident on the knowledge and concepts of mathematics topics between the teachers with the age below 31 years old, from 31 to 40 years old, and more than 40 years old; male and female teachers; the teachers who have education under BA, BA, and higher than BA; the teachers who have experience from 1 to 10 years, from 11 to 20 years, and over 20 years; the teachers in urban and rural areas; and the early and upper grade teachers. There is difference between the teachers who have the students less than 31, from 31 to 40, and more than 40 per class.

The teachers are also highly confident in teaching mathematics (TCM-TE) particularly when two students correctly answer the same problem using two different approaches, they are able to discuss the methods they took. Another example shows that the surveyed teachers require their students to grasp basic mathematical operations before taking on complicated problems. They also encourage students to use manipulatives to explain mathematical concepts to other students. Put simply, a lot of information about mathematics should be accepted as true and remembered. When introducing mathematical topics, they are confident in teaching, they are likely to investigate alternative teaching strategies. When introducing concepts, they should first build understanding of the material before focusing on algorithms. Improving the speed and accuracy of math skills enhances understanding. Asking students to explain why something works is a common practice, emphasize obtaining the right response more than the procedure used, and first present of formulas and rules when introducing new topics. There is no significant difference between the surveyed teachers' confidence in mathematics teaching between the teachers with the age below 31 years old, from 31 to 40 years old, and more than 40 years old; male and female teachers; the teachers who have education under BA, BA, and higher than a BA; the teachers who have experience from 1 to 10 years, from 11 to 20 years, and over 20 years; the teachers in urban and rural areas; early and upper grade teachers; and the teachers who have the students less than 31, from 31 to 40, and more than 40 per class.

The results also show the high expectations of the surveyed teachers' practice of mathematics teaching (TPMT). The results show that the teachers: often promote the student voice in the mathematics classroom; let the students collaborate and work together to actively learn in mathematics; link between the previous topic and the new topic in mathematics teaching; integrate abstract and concrete ideas in mathematics teaching; assist students in seeing the connection between mathematics and real-life situations, knowledge, and event. However, the teachers only occasionally let the students participate in choosing learning content or activities in mathematics. There is no significant difference of the teachers' practice of mathematics topics between: the teachers with the age below 31 years old, from 31 to 40 years old, and more than 40 years old; male and female teachers; the teachers who have education under BA, BA, and higher than BA; the teachers who have experience from 1 to 10 years, from 11 to 20 years, and over 20 years; the teachers in urban and rural areas; early and upper grade teachers; the teachers who have students less than 31, from 31 to 40, and more than 40 per class. Therefore, **the hypothesis (H1) was accepted**.

5.1.2 Classroom Assessments

The classroom assessments also showed high expectation, including the surveyed teachers' beliefs about classroom assessment, teachers' skills in classroom assessment, and teachers' practice of classroom assessment. The highest score in the category for the teachers' skills in classroom assessment is related to the effectiveness of classroom assessment, followed by the teachers' practice of classroom assessment and finally the teachers' beliefs about classroom assessment. There is no significant difference of the surveyed teachers' classroom assessment between the teachers with the age below 31 years old, from 31 to 40 years old, and more than 40 years old; male and female teachers; the teachers who have education under BA, BA, and higher than BA; the teachers who have experience from 1 to 10 years, from 11 to 20 years, and over 20 years; the teachers in urban and rural areas; early and upper grade teachers; the teachers who have the students less than 31, from 31 to 40, and more than 40 per class.

The results showed the high expectations of the surveyed teachers' beliefs about classroom assessment (TBCA). The assessment in the classroom serves several purposes, including: assessing the efficacy of instruction; assigning grades to students; giving teachers useful information that can be utilized to plan lessons going forward; holding students accountable for their learning; identifying and diagnosing their own learning needs; following up with students regarding their progress in learning. The teachers think that the assessments enable them to concentrate on the abilities and information that their students require. the data shows that the surveyed teachers require further training in measuring, testing, and student assessment. There is no significant differences of teachers' beliefs about classroom assessment between the teachers: with the age below 31 years old, from 31 to 40 years old, and more than 40 years old; male and female teachers; the teachers who have education under BA, BA, and higher than a BA; the teachers have experience from 1 to 10 years, from 11 to 20 years, and over 20 years; the teachers in urban and rural areas; early and upper grade teachers; the teachers who have the students less than 31, from 31 to 40, and more than 40 per class.

The data on the teachers' skill in classroom assessment (TSCA) shows high expectation, including the skill of providing oral feedback to the students; writing true and false questions; ensuring that the test appropriately covers the subject covered in class; taking into account the effort put in by the students when determining grades; determining why students make specific mistakes; assessing individual hands-on activities; writing multiple-choice questions; providing written feedback to the students; using peer assessment for the student assessment; writing essay questions and paper-pencil tests; using assessment results when planning teaching; utilizing assessment findings to inform decisions on specific students; sharing results with others regarding classroom assessments. The teachers, however, need to improve their skills in choosing appropriate assessment methods for instructional decisions and aligning test items with instructional objectives. There is no significant difference of teachers' skills in classroom assessment between the teachers: with the age below 31 years old, from 31 to 40 years old, and more than 40 years old; male and female teachers; the teachers who have education under BA, BA, and higher than a BA; the teachers who have experience from 1 to 10 years, from 11 to 20 years, and over 20 years; early and upper grade teachers; the teachers who have the students less than 31, from 31 to 40, and more than 40 per class. There is, however, a significant difference between the teachers in urban and rural areas.

For the teachers' practice of classroom assessment (TPCA), the teachers often: write the essay questions and paper-pencil tests; provide oral feedback to the students; ensure that the test covers the subject matter that was covered in class; assess individual hands-on activities; include the student effort in the calculation of grades; write the true or false questions; write the multiple-choice questions; determine why the students make specific mistakes; utilize assessment data to inform instructional planning and to make decisions regarding specific students; align the test items with instructional objectives; select suitable methods of assessment for instructional decisions; use peer assessment for student assessment; communicate classroom assessment results to others; provide written feedback to the students. There is no significant difference of teachers' classroom assessment between the teachers: with the age below 31 years old, from 31 to 40 years old, and more than 40 years old; male and female teachers; the teachers who have education under BA, BA, and higher than a BA; early and upper grade teachers; the teachers who have the students less than 31, from 31 to 40, and more than 40 per class. There is a significant difference between the teachers who: have experience from 1 to 10 years, from 11 to 20 years, and over 20 years; teach in urban and rural areas. Therefore, **the hypothesis (H2) was accepted**.

5.1.3 The Relationship Between Mathematics Teaching Methodologies and Classroom Assessments

The surveyed primary teachers perceived the effectiveness of mathematics teaching methodologies as a whole and at each aspect at high levels. Ranks from the highest to the lowest mean scores were: TBMT, TCM-TO, TCM-TE, and TPMT, respectively. Only the statistically significant results were summarized for the independent samples t-test, and one-way ANOVA. When taking into account the educational level and years of teaching experiences of TBMT, the data showed a statistically significant difference at 0.05 level. When taking into account the student number of TCM-TO, the data showed a statistically significant difference at 0.05 level. In addition, the surveyed primary teachers perceived the effectiveness of classroom assessment as a whole and at each aspect at high levels. Ranks from the highest to the lowest mean scores were: TBCA, TSCA and TPCA, respectively. Only the statistically significant results were summarized for the independent samples t-test, and one-way ANOVA. When taking into account the location of TSCA, it was found statistically significant difference at 0.01 level and TPCA was at 0.05 level. When taking into account of years of teaching experiences of TPCA, the data showed a statistically significant difference at 0.05 level.

By virtue of its importance, the statistics maintained that the correlation analysis of the TMTM and TCAS showed statistically significant difference ($p<0.01$), there was a strong and positive relationship both as a whole and in all dimensions. The teachers' beliefs about classroom assessment are related to the effectiveness of mathematics teaching methodologies. The highest scores were related to the teachers' confidence in mathematics teaching; followed by the teachers' practice of mathematics teaching; then the teachers' confidence of mathematics topics; finally, the teachers' beliefs about mathematics teaching.

The teachers' practice of classroom assessment is related to the effectiveness of mathematics teaching methodologies. The highest scores related to the teachers' practice of mathematics teaching; followed by the teachers' beliefs about mathematic teaching; then the teachers' confidence in mathematics teaching; finally, the teachers' confidence of mathematics topics. And, the teachers' skills in classroom assessment are related to the effectiveness of mathematics teaching methodologies. The highest scores related to the teachers' confident of mathematic topics; followed by the teachers' practice of mathematic teaching; then the teachers' beliefs about mathematic teaching; finally, teachers' confidence in mathematics teaching.

Therefore, **the hypothesis (H3) was accepted**. Recommendations are made for policy makers and educators who engage in primary education in Cambodia. This study can potentially benefit the Ministry of Education, Youth and Sport, national and international education partners.

5.1.4 Student Learning Outcomes

The scores of the students' test results show that the students in Grade 1 passed. The data showed that the students have capacity in geometry - area (item 1), whole numbers (item 2), addition and subtraction (item 3), geometry-angles, triangles and quadrilaterals (item 4), whole number-comparison (item 5). The score of the students' text results shows that the students in Grade 2 failed. The data showed that the students have capacity in fractions (item 1), whole numbers (item 3), and addition and subtraction (item 4); but need to improve their learning on the whole number-comparison (item 2) and multiplication and division (item 5). The score of the students' test results shows that the students in Grade 3 failed. The data showed that the students have capacity in whole number (item 1) and addition and subtraction (item 5); but need to improve their learning on the currency - word problems (item 2) and measurement (item 3 and 4). The score of the students' test results in Grade 4, show that the students passed. It showed that the students have capacity in whole numbers (item 1), addition and subtraction (item 2), and geometry (item 4); but need to improve their learning of algebra (item 3) word problem - measurement (item 5). The results for the students in Grade 5 are pass. It showed that the students have capacity (pass) in the decimal number-addition (item 1), the fraction - subtraction (item 2), and the statistic-graph (item 4); but need to improve their learning on the fraction - like and unlike (item 3) and the word problem - percentage (item 5). The results for the students in Grade 6 show that the students have failed. It showed that the students have capacity (pass) in adding fractions (item 1), decimal numbers (item 2), and volume in geometry (item 4); but need to improve their learning on the multiplication and division of fractions (item 3) and algebra (item 5) (see Appendix K).

The growth scores of the mathematics students learning outcomes in Grades 1-3 (M= 85.2, S.D. =104.7), were compared to the growth scores of research participants in Grades 4-6 (M=72.5, S.D.=111.2). An independent sample t-test was conducted, and it was found that there was no significant statistical difference between the mean growth scores of the two comparison groups (t=0.308, p>0.05). Therefore, **the hypothesis (H4) was accepted**, and the normality of the collected data was proven.

5.2 Discussions

In this section, each of the aforementioned research questions' findings, which were introduced in the preceding chapter, are discussed. The implications for research and practice are also given, based on the findings and the discussion. Below is the discussion of the following aspects based on the findings: perceived use of mathematics teaching methodologies, perceived use of classroom assessments, and selected students' mathematics learning outcomes.

5.2.1 The Perceived Use of Mathematics Teaching Methodologies

According to the findings, the primary school teachers in this study showed shifting mathematical perceptions. The surveyed teachers had beliefs about mathematics teaching, especially they always have the strategies for: teaching mathematics; measuring the student comprehension of what they have learnt; helping the student to understand mathematics concepts; assisting families to help their children do well in school.

However, the students' results from testing show that there are still challenges in some areas. The data showed that the teachers still need assistance in improving their teaching and learning mathematics skills at primary level. Refer to researches of Bekdemir (2010), Adeyemi (2015), Unlu et al. (2017), and Gresham (2018); this discovery sheds light on people's attitudes towards mathematics. The classroom setting has the potential to stimulate students to learn mathematics. Teachers' activities, such as their choice of teaching methodology, their speech, and their demeanor, have been shown to influence how their students learn mathematics and induce mathematics anxiety in students. Based on Gresham (2018), understanding the influence that evolving mathematics perceptions can have on teachers and their students, school systems and administrators should provide support groups and external resources to help teachers talk and reflect on their ideas and feelings about mathematics and teaching arithmetic. Some teachers believe they do not get the assistance they need to deal with their mathematical beliefs and teaching experiences. As a result, there is a need for teachers to be supported.

In terms of flexible teaching methodologies, this study finds that the teachers are more likely to explore alternative teaching strategies with topics they are more confident in teaching. The teachers first build their understanding of a concept before focusing on algorithms when introducing mathematical topics which they are confident teaching. The teachers also develop speed and accuracy of mathematical skills, improving understanding and frequently asking the students to explain why something works. The teachers: put more emphasis on getting the correct answer than on the process followed; first present formulas and rules when introducing new topics; show the link between a previous topic and the new topic in mathematics teaching; adjust their lesson to the proper level of individual students. This finding is in line with Swope-Farr (2021), which uncovered turning points of teachers who initially had terrible experiences learning mathematics but later had positive experiences that improved their attitudes of mathematics and their abilities to learn and teach mathematics. Cumberland (2019), suggests that there were more demands placed on students in mathematics classes, when teachers defined a variety of methods and approaches. The teacher may offer more strategies for students to use when solving problems in some circumstances, and in other circumstances, they may choose to limit the number of methods they teach the class to prevent confusion. The teachers purposefully and flexibly used the concrete-to-abstract continuum with the students in order to understand mathematical concepts. This adaptability in teaching methods, instruments, and materials is intended to make sure that students acquire more than just the mathematical processes and procedures themselves, but also the underlying mathematical ideas.

The teachers implement strategies and activities in their classrooms that encourage students' active participation and learning. The student participation is aided by collaborative frameworks, possibilities for peer tutoring or teaching, and small group activities. Even though the students have little to no choice in content due to a prescribed curriculum, the teachers give the students opportunities to choose content, methods, and mediums during review activities, such as practicing problems on an individual whiteboard, using software, filling out a worksheet, or using manipulatives. The teachers' first priority is to foster a welcoming learning environment where students feel free to express their opinions and participate in group projects. The way that students participate is as follows: "even my quietest students are keen to contribute, and they feel comfortable sharing their thoughts on any given topic." The teachers make an effort to create a classroom environment in which students actively engage and express their ideas, accomplishments, and difficulties with studying mathematics (Cumberland, 2019). This study revealed that teachers should ask their students to explain to one another the processes they took when two students use two different ways to answer the same issue correctly. They should also encourage their students to utilize manipulatives to help other students understand mathematical concepts. It should be noted that mathematics primary teachers frequently encourage student voice in the classroom, allow students to work together to actively learn the subject, and support the use of manipulatives to help students explain mathematical concepts to one another. Before tackling more difficult problems and gaining the student's confidence that they can perform well in class, teachers prefer that their students have a firm grasp of basic mathematical operations.

This study showed that the surveyed teachers integrate the abstract and concrete ideas in mathematics teaching and assist students in seeing the connection between arithmetic and real-life situations, knowledge, and event. Additionally, the teachers assess the students' understanding of what they have taught, help the students' families support their children's academic success, and manage disruptive behavior in the classroom. The finding is similar to Cumberland (2019), by assisting the students in understanding the relationship between mathematics and the real world and the applications of mathematics in the real world for daily chores, teachers help students put mathematical concepts into context. In order to help the students to discover connections, teachers create projects that put mathematical principles into practical contexts. Real-world connections provide mathematics training with a purpose; helping students accurately retain topics because they have a meaningful relationship. Cumberland (2019) stated that “The class collaborated to determine the discounted sales prices or interest rates after the lecturers asked the students to bring in examples of percentages they had found in their community”. At certain points throughout the year, the instructor assigns students to give examples from real-world situations to the class: “I ask them to find examples of what we learned outside of school and present them in class.” To add additional interest and relevance for the students, teachers can include the students' names and items of interest into arithmetic problems.

It can have an impact on how mathematical concepts are taught when the teachers themselves are not clear of a mathematical concept. Sometimes, the teachers ignore arithmetic because they do not understand the subject matter or cannot remember how they first learned the concepts (Adeyemi, 2015). Therefore, further research is required to understand why teachers choose to focus on procedural knowledge rather than more complicated mathematical ideas that emphasize depth of understanding. It can be difficult for students to understand higher-level mathematics subjects if teachers do not teach complicated mathematical concepts, which can reduce the number of mathematical concepts that students are exposed to and understand. In essence, once someone understands the principles, teaching mathematics may be simple. Teachers’ confidence in instructing students in mathematics might rise if they received training in doing so. As a result, teacher training programs might devote more time to middle school concepts and mathematics instructional methods. For teaching mathematics topics and classes, the teachers feel that additional time is required (Math Methods Instructors, Personal Communication - MMIPC, 2021, April 1).

It is possible that mathematics teachers who keep clear of particular topics are not even aware of it. Therefore, it is essential to carry out further research on this subject to raise awareness among teachers and encourage them to engage in complex mathematics. This exposure might take place through the professional development opportunities offered by school districts to advance primary teachers’ understanding of mathematical content beyond foundational subjects. Additionally, it would be fantastic to have mentorship program where primary teachers could be connected with mathematics teachers from middle school through college, to discuss and learn techniques for better grasping difficult mathematical subjects. Given that some primary teachers may not want to take additional mathematics courses, these proposals may be more in line with activities in which primary teachers are willing to engage (Gresham, 2018).

In response to the above, the findings from this study showed that the primary teachers perceived that they have the knowledge and understanding of mathematics concepts, which includes all the dimensions of the primary mathematics curriculum which are numeracy, measurement, geometry, statistics, and algebra. For mathematics teaching, it also includes calculation (addition, subtraction, multiplication and division) and word problem. But the students' test results still showed that the students have challenges and gaps in learning of: whole number-comparison and the multiplication and division in Grade 2; currency - word problems and measurement in Grade 3; algebra and word problems - measurement in Grade 4; fraction - like and unlike and word problems - percentage in Grade 5; fractions - multiplication and division and algebra in Grade 6. This indicates that in some areas of the mathematics curriculum, the teachers have problems transferring the mathematics concepts to the students. According to the finding, the high level of effectiveness of mathematics teaching methodologies in Kampong Chhnang Province can be attributed to a combination of factors, including teacher training, the use of technology, student-centered approaches, effective assessment practices, community involvement, high-quality curriculum and instructional materials, and ongoing research and innovation. These elements work together to create a supportive and dynamic learning environment that fosters student success in mathematics. Therefore, there is a need to strengthen the teachers' skills in specific area of mathematic teaching methodologies through the training and mentoring as mentioned above.

5.2.2 The Perceived Use of Classroom Assessments

One key finding revealed by this investigation was that teachers perceived the effectiveness of classroom assessment as a whole and each aspect were at high levels. This significance of this finding is promising because it points to the fact that teachers' awareness of effective practices. There is widespread agreement regarding the value of assessment in the teaching and learning process (Brown, 2003; Remesal, 2007; Brown & Hirschfeld, 2008; Harris & Brown, 2009). The researchers began with the notion that assessments should enhance the caliber of instruction and the knowledge acquired by students (Black et al., 2003; Van de Grift, 2007; Rahim et al., 2009). The data gathered from the schools where this study was conducted, showed that the teachers' perceptions and understanding of the purpose of assessment is to track students' progress in learning through tests, which enables the teachers to concentrate on the knowledge and skills that their students need. It also serves to determine student grades, the efficacy of the teachers' instructions, and to hold students accountable for their learning. Since assessments identify and diagnose students' learning needs and provide evidence of students' understanding for lesson planning, assessment should be an integral part of teaching activities.

This is interesting because initially, this study hypothesized that Teachers require additional training in student assessment, testing, and measurement. According to Fives & Buehl (2012), all educational activities are influenced by teachers' conceptions about how to frame classroom instruction and the assessment process. Coolahan (2002), Vandeyar & Killen (2007), and Bayrakci (2009) highlighted the significance of in-service training and emphasized the necessity of providing teachers with in-depth training in assessment procedures since teachers are unable to apply assessment methods and skills that they are unfamiliar with. The surveyed teachers alleged that they lacked sufficient in-service training. The teachers appeared anxious and wanted clarification on classroom-based assessment so they would know how to support students who were experiencing learning obstacles. The research of Evans (2002), suggests that a few workshops are plainly insufficient to let participants comprehend the concepts and learn how to put them into practice for an intricate assessment policy. In addition, teachers frequently complained that the training they received was insufficient and too abstract. So ongoing training is crucial because it allows teachers the chance to think about and rearrange their perspectives as a result of altered presumptions. Consequently, teachers would have a significant and long-lasting impact on their assessment processes.

In terms of the impact of teachers' perceptions on classroom assessment use, concerns regarding the sufficiency of high-quality teaching and assessment are reflected in teachers' experiences with and comprehension of competency-based assessment. Teachers encountered the majority of the issues with instruction, learning, and assessment methods while putting the new curriculum into practice. This idea also reflects instructors' ongoing struggles to deliver high-quality instruction and useful feedback. Teachers' motivation and performance may be impacted by a lack of pertinent understanding or a misconception, which is bound to have a negative effect on the learning of the students. The degree to which competency-based assessment is used in primary schools varies depending on the instructors' attitudes and ideas regarding student-centered education. The adoption of Bloom's taxonomy, a system for grouping educational objectives into the three domains of cognitive, emotional, and psychomotor skills, was the teachers' top worry in the school. The teachers stated that they still required a lot more training and seminars on assessment. Many assessments in various institutions failed to delve into the deeper thought processes of the learners as predicted by the aforementioned taxonomy, which prevented students from developing sophisticated thinking abilities and from correctly synthesizing, analyzing, or assessing (KERMA, 2019). The teachers' perception of their classroom assessment, when analyzed based on their student numbers, reveals no statistically significant difference across all dimensions. This indicates that teachers, regardless of the number of students they teach, hold similar views on the effectiveness and implementation of classroom assessments. The findings of Mussawy (2009) and Buyukkarci (2014), discovered that instructors' attitudes toward classroom assessment had an impact on their activities in that regard.

The results of this study demonstrated how teachers' attitudes toward assessment in the classroom significantly influenced how they conducted assessments in the classroom. Researcher made a few attempts to understand how the students were learning. A teacher once said that since students are learning new material every day, it is impossible to check them every day. In teaching a class, the teachers always write essay questions and paper-pencil tests, and provide oral feedback to students. They make sure the test adequately covers the material taught in class and use the results from the students' testing to prepare their lesson plan and modify the teaching to the real situation of each student; but the teachers still need to build capacity and strengthen their skills in assessment, with especial focus on how to choose the appropriate assessment methods for instructional decisions and align the test items with instructional objectives.

5.2.3 The Students' Mathematics Learning Outcomes

The findings revealed that in the classroom, assessments are used for a variety of purposes, such as determining the effectiveness of teaching, grading students, providing teachers with useful data for future lesson planning, holding students accountable for their learning, identifying and diagnosing their own learning needs, and following up with students to inquire about their progress in learning outcomes. Teachers believe that assessments help them focus on the skills and knowledge that their students need.

One of the resources that teachers can use to enhance both their teaching and students' learning is classroom assessment. Unfortunately, some schools' approach to assessment in the classroom appear to be unclear, which prevents them from meeting the needs of their students' learning. Each teacher has a different assessment objective. The goal of assessment for learning is to provide teachers with the information they need to adapt and change various teaching and learning stimuli. It accepts that every student learns differently, but it also understands that many students follow predetermined patterns and pathways. In order to target instruction and resources, streamline education, and provide quick feedback to students in order to mold more effective learning, teachers use the information they have gathered to ascertain the requirements of their students. Assessment results are used to improve teaching and learning (KERMA, 2019).

This result underscores the importance of further studying students' mathematics learning outcomes through a conceptual framework, particularly the framework that guided this research study. The positive relationship between mathematics teaching methodologies and classroom assessments is ultimately reflected in improved student outcomes. Students in Kampong Chhnang Province consistently perform well in mathematics, demonstrating a strong understanding of mathematical concepts and the ability to apply their knowledge in various contexts. This success can be attributed to the alignment between effective teaching methodologies and comprehensive assessment practices. Since the assessment was learning-focused, students ought to generate their own knowledge (Huba & Freed, 2000). This means that before utilizing a range of assessment strategies to actively track the students' learning progress, teachers should create an engaging learning environment in the classroom. Giving students experiences and feedback that will enable them to form bonds and relationships should be the teacher's additional duty. Only by keeping an eye on the learning process and figuring out what kind of help the students need at any given moment can teachers do this. Referring to Stassen et al. (2001), Jonson (2006), and Peck and Chance (2007), teachers should use assessment data from their students' assessments as well as their own to gather information for modifications to their teaching methods and strategies that will improve students' learning. Teachers should also be able to determine which areas of their lessons are successful and pinpoint areas in which students struggle.

The information from the schools which conducted the current study indicates that the assessment is related to the effectiveness of the mathematics teaching methodologies, especially the real practice in class and makes the teachers more confident in their teaching. The teachers used the results from the assessment to prepare their lesson plan and also determine the gap or specific mistake of each student and find the ways to support individual students. The study also found that even though the teachers used the results from classroom assessment to support their teaching, the students still have gaps of learning in some areas of primary mathematics as mentioned above. these gaps might occur because the teachers have limited skills of assessment, on how to choose appropriate assessment methods for instructional decisions and align test items with instructional objectives; also, in mathematics teaching, the teachers do not let the students participate in choosing learning contents or activities.

CHAPTER 6
CONCLUSION AND RECOMMENDATIONS

This chapter concludes the dissertation and provides the conclusion of the main research findings and unexpected results. Additionally, the chapter presents the limitation of the study and the implications of the research on the theoretical and practical implications of the study and the implications on future research resulting from this study. The chapter also concludes the recommendations for change in the current educational practices for the schools from which research data was obtained, with recommendations for future study to expand on the current research findings, and the final overview.

6.1 Conclusion

Mathematics is essential to promoting economic development on a global level. Educators who provide differentiated instruction are more likely to lead diverse students toward successful learning outcomes than teachers who teach with a one-size-fits-all approach. Literature has indicated students have diverse learning needs and achieve different levels of math skill mastery. Findings for the current study with Cambodian primary teachers echo current literature in the field, affirming diverse student needs in the classroom and verifying teachers' intentions to meet students' needs adequately. In addition, the main findings of the study explore the didactic, constructivism, socio-cultural, visual learning, and classroom management approaches that teachers reported implementing in their classrooms are embodied in the primary themes of student efficacy, relationship, adaptability, and real-world context. Teachers embraced many of the ideas covered in these approaches, using them as a model for whole-class instruction and student-helping interventions. These methods follow the recommended principles outlined in the literature. Teachers reported using best practices in the areas of early intervention, foundational numeracy education, concrete to abstract instruction, chances for technology-based learning, real-world applications, and problem-solving instruction.

The didactic literature contains numerous definitions of the term "teaching method." To begin, teaching methods as coordinated sequences of interconnected behaviors between a teacher and students with the goal of achieving learning objectives as a way of education and parenting will be defined. The following details should be included in each teaching methodology description: (1) the teacher's instructional activity; (2) the substance of the students' learning (cognitive) activities; (3) the relationship between them, that is how the teacher supervises the students' cognitive activity.

However, only general teaching methods, that is, methods that do not take into account the specifics of different subjects, are considered in didactics. The subject of primary mathematics teaching methodology is the investigation of the possibilities for concrete implementation of general methods in primary mathematics teaching through their modification and adaptation, taking into account the specifics of mathematics and the mental activity of primary school students. Special teaching methods are also employed, in order to reflect the unique characteristics of mathematical knowledge. Special teaching methods, particularly modeling (creating mathematical models), have the most impact on the establishment and development of the mathematical thinking style.

A key component of constructivism learning is the use of flexibility in teaching. Teachers must be able to adapt teaching in response to student responses to ensure that teaching is relevant, meaningful, and effective in meeting the requirements of students. In order to advance, learning must begin at the student's current level and introduce new concepts that are pertinent to their everyday lives. From the literature reviewed in Chapter 2, teachers reported employing flexibility along the concrete to abstract continuum by giving students choice, providing concrete and representational tools when needed, and reinforcing concepts with concrete objects once students had proven they could use abstract symbols. So, the students can succeed in a particular lesson by receiving the necessary instruction when teaching approaches are implemented with flexibility.

The growth of student efficacy, which is a contributing factor to measures like student motivation and attitude toward learning, is another issue that teachers have brought up. In order to boost student engagement, motivation, and perseverance when presented with challenging tasks, teachers in the current study taught collaborative skills, fostered a positive learning environment, and encouraged students to take risks. Additionally, constructivism emphasizes conversation between the teacher and student. For students to take in and remember new mathematical concepts, the constructivism learning framework of give and take must make them feel safe, therefore student voice and choice are crucial. In this study, the teachers invited students to express their favorite ways to problem-solving and to indicate which tactics and methods were most helpful for them to utilize.

In order for students to understand what they are learning; mathematics instruction is contextualized through the use of real-world applications. According to the study's teachers, students' appreciation of mathematics decreased from the start of the year to the end when they entered puberty, although this decrease was lessened in classes where teachers made links between mathematical ideas and real-world situations. Given that cognitive flexibility is a major predictor of mathematical value and is higher in the lower grades, it is possible that real-world mathematics training will have the biggest impact on students in these grades. Mathematical instruction that integrates meaning into the study of mathematics may improve students' perception of the subject as well as their capacity to approach mathematical problems with flexible cognitive functioning.

The ability to create a schedule and order that facilitates learning activities while simultaneously reining in disruptive conduct and comforting and addressing troublesome students is known as classroom management.

In the classroom, the teachers utilize classroom assessments to examine students' knowledge and understanding of the learning objectives which were established for the year. Teachers can design their own assessment items, use published items such as those found in their textbooks or other external sources, or use a combination of methods.

Classroom assessment is divided into two forms by assessment experts: formative and summative. Formative assessment is usually related with improving education and learning, whereas summative assessment is concerned with summing up learning outcomes and communicating them to administrators and/or other relevant stakeholders.

Summative assessments are used frequently to find out what students know and don't know throughout a predetermined period of time. It has been proposed as a means of confirming learners' proficiency levels subsequent to their acquisition of knowledge. The objective is to demonstrate what students have learned and understood in a short period of time, as well as to assess the effectiveness of a course or instruction. This is typically completed after the conclusion of a designated learning period, following a project, or a course. The objective of summative assessment is to compare achievement against broader indicators; such as level descriptors or grade level standards.

"Formative assessment is a planned process in which teachers use assessment elicited evidence of students' status to adjust their ongoing instructional procedures or students use assessment elicited evidence of students' status to adjust their current learning tactics". Formative assessment is a useful tool for directing students and ensuring that they are on track to learn subject-specific abilities. It helps students to become more aware of their surroundings and gives them the knowledge they need to attain their goals by enhancing learning and performance.

"The primary purpose of assessment in education should be to facilitate learning,". There is a misconception that summative and formative assessment are two distinct types of evaluation linked to distinct data collection techniques, but in reality, they only pertain to the utilization of data. There is a blurry line rather than a clear distinction between summative and formative assessments. Formative and summative assessment are sometimes used interchangeably, although both should be included in a well-balanced assessment system as a means of data collection. It’s probable that depending only on one of them won’t give a true picture of what students have accomplished. There is an unbreakable bond between formative and summative assessment, with summative assessment serving as the foundation for all other assessments.

Summative and formative assessments are known as assessment of learning (AoL) and assessment for learning (AfL), respectively, in the field of education. The former typically measures summative learning outcomes at the conclusion of a class, course, semester, or academic year and presents the results to administrators, parents, and students. The latter is formative in most circumstances. Teachers utilize formative assessment to think about teaching strategies and the best course of action for each student in the class.

The terms “assessment” and “testing” are typically used interchangeably. As will be shown, there is a misconception among educators that assessment and measurement and evaluation are identical. While not all assessments are tests, tests are one kind of assessment. A test as “an instrument for measuring a sample of behavior”. Tests are often one type of classroom assessment data used to assess a person’s or a group’s abilities, performance, capabilities, intelligence, or aptitude. Individual diagnostic procedures, summative assessment and individual achievement are all examples of particular aims for tests.

Assessment is a formal procedure that requires making conscious attempts to gather data regarding a learner's talents and limitations. The main goal of this process, which employs a variety of methods, is to gather accurate and trustworthy data that teachers can use to inform their choices. The use of classroom assessment methods by teachers is associated with a number of decision-making domains, such as choosing the best approach and strategy for assessing students. Teachers can use assessment results for a variety of purposes, such as determining final grades for students at the end of the semester, diagnosing learning difficulties in their students, and guiding and improving future instructional strategies. To guarantee that assessment outcomes are accurate, relevant, fair, and transparent, it has been suggested that high-quality assessment should be integrated into the educational process.

The primary school teachers in this study showed shifting mathematical perceptions. In primary school, the teachers had beliefs about mathematics teaching, especially they always have the strategies for teaching, measure the students' comprehension of what they have learnt, help the student to understand mathematics concepts, and assist families to help their children do well in school.

When introducing mathematical topics that they feel comfortable teaching, teachers are more likely to experiment with various methods of teaching. The teachers also prioritize conceptual comprehension over algorithmic thinking when introducing mathematical concepts. Additionally, teachers help children increase their knowledge and speed and accuracy in mathematics by frequently asking them to explain why something works. When presenting new topics, the teachers place more emphasis on getting the right answer than on following the procedure. They also make connections between previous topics covered and the new topic, tailoring their lesson to each student's level. When two students use two different ways to solve the same problem correctly, the teachers ask the students to discuss the processes they used with each other. They also encourage the students to utilize manipulatives to help other students understand mathematical concepts.

In addition, teachers frequently encourage student voice in the mathematics classroom, allowing students to collaborate and actively learn the subject. The teachers also encourage students to use manipulatives to help other students understand what they are studying. Before tackling more difficult problems and encouraging their students to think that they can succeed in class, teachers prefer their students to have a firm grasp of the fundamentals of mathematics. In order to help the students to understand the connection between mathematics and real-world experience, knowledge, and events, teachers incorporate abstract and concrete ideas into their mathematical lessons. Additionally, they assess the students' understanding of what they have taught, help the students' families support their children's academic success, and manage disruptive behavior in the classroom.

The primary school teachers in this study also shared their perspectives and understanding of the purpose of assessment, which includes determining student grades, assessing the efficacy of the teachers' instruction, and holding students accountable for their learning. The purpose of assessment is to track students' learning progress through tests to help teachers concentrate on the skills and knowledge that their students need. Assessment should be a natural part of teaching activities, and teachers need more training in student assessment, testing, and measurement. The assessment diagnoses and identifies the students' learning needs and provides evidence of the students' understanding to plan for subsequent lessons. The ways in which teachers conducted assessments in the classroom were significantly influenced by their opinions of the practice. There were a few attempts made to understand how the children were learning. A teacher said that it is not feasible to assess students every day because they are learning new material. In class teaching, the teachers always write essay questions and paper-pencil tests and provide oral feedback to students. They ensure that the tests cover the content covered in the lesson, and they utilize the test results to inform their lesson plans and adjust their teaching methods and resources to fit the needs of each individual student.

Assessment is related to the effectiveness of the mathematics teaching methodologies, especially the real practice in class and enables the teachers to be more confident in their teaching. The teachers used the results from the assessment to prepare their lesson plans, to determine the gap or specific mistake of each student and find ways to support individual students.

The study also found that even though the teachers used the results from classroom assessment to support their teaching, the students still had gaps of learning. The students' results from testing, however, show that there are still challenges in some areas which including the whole number-comparison and the multiplication and division in Grade 2, the currency-word problems and measurement in Grade 3, the algebra and word problems-measurement in Grade 4, the fraction-like and unlike and word problems-percentage in Grade 5, the fractions-multiplication and division and algebra in Grade 6. This indicates that in some areas of the mathematics curriculum, the teachers have problems transferring the mathematics concepts to the students. Therefore, the teachers still need assistance to improve their teaching and learning mathematics methodology in specific area at primary level and also the skills of assessment, especially on how to choose appropriate assessment methods for instructional decisions and how to align test items with instructional objectives that is the skills in classroom assessment to support their teaching and other activities in mathematics teaching.

The study found the unexpected results that because mathematical concepts are abstracted from everyday life, pictorial representation is widely used when teaching early grades mathematics; it is necessary to match the studied concepts to real objects, properties, and relationships between them at this stage of teaching and learning development. From the beginning it is necessary to link mathematics teaching with the real world around us as in science and other subjects. The teacher has numerous opportunities in mathematics lessons to teach students about being honest, hardworking, and persisting in the face of hardship, among other things. The instructional materials should be presented in such a way that linkages between concepts, topics and sections within a single subject, as well as interdisciplinary connections, are preserved. As a result, the term of scientific character in education also includes the concepts of consistency and systematic teaching. In terms of early teaching mathematics, the scientific character principle should be interpreted as a reflection of specific mathematical principles in it, allowing them to carry out their early preparation. Number, functional dependence, geometric figures, quantity measurement and algorithm are examples of fundamental mathematical ideas. In the narrow sense, activity can be thought of as a manifestation of a specific mental activity that is characteristic of a scientist - a mathematician, and is hence referred to as “mathematical” activity. Is it true that a student in primary school is capable of mathematical activity? Obviously, neither a Grade 3 student nor a Grade 10 student is capable of graduate-level logical mathematical activity. A Grade 1 student, on the other hand, is capable of some kind of mathematics activity that is appropriate for his or her level of thinking. It all depends on how “mathematical activity” is defined. Teaching mathematics may and should be designed so that students’ progress from one level of mathematical activity to another, higher level, beginning in Grade 1. However, in addition to awareness and activity, a proper teaching structure is required, taking into consideration the peculiarities of the memorization mechanism.

The following are some general didactic guidelines: (a) memorization is in direct proportion to repetition; (b) memory has a selective character - we remember mainly what is important and interesting for us; (c) the material is remembered better when the possibilities of using it in practice are revealed; (d) memorization is facilitated by the division of the studied material into small portions according to the semantic content with the allocation of reference points in the form of headings, questions, mathematical relationships; and (e) emotionally colored material is remembered better.

Weak students who fall below the “average” level fail, whereas “above average” students become bored in class and lose interest in the subject. As a result, in the classroom-lesson system, where 30-40 people are studying at the same time, the principle of individual approach must be implemented, and various techniques must be used to account for the differences in content assimilation by diverse learners (differentiated tasks, advanced, leveling classes, additional individual lessons, circle classes, etc. etc.).

The findings of this study suggest a number of pedagogical implications, especially in primary education settings as follows:

1. Teachers need to expose to real world mathematics teaching methods that take into account students’ skill levels and learning styles. Mathematics educators could

provide techniques to help teachers enhance their student learning results when it comes to mathematics teaching and classroom assessment.

2. Teachers should be reminded that classroom assessment should enable them to adapt and use mathematics teaching methodology that will have an impact on student learning outcomes.

3. Teacher preparation programs should examine is undergraduate students' cognitive development when they enter their programs. Many of these students, ranging in age from 6 to 11, are recent primary school graduates. This group of people is still going through cognitive growth and development as children. They may need time as primary teachers to revisit mathematics core knowledge with higher levels of abstract thought than they were exposed to in primary school.

So far, the study referred to the didactic, constructivism, socio-cultural, visual learning, and classroom management approaches related to the mathematics teaching methodology. Formative and summative assessment approaches related to the classroom assessment were also explored; it also verified with the student test to find the student learning outcomes. The study showed a high relationship between classroom assessment and mathematics teaching methods, with most teachers applying this approach in their teaching methodology, challenges, however, are also evident from the analysis of the student learning outcomes in some areas of the mathematics curriculum. These challenges are especially evident in terms of teachers' competency in some mathematical content and methods and the transforming of the classroom assessment results to the actual teaching methods to respond to the students' gaps in knowledge and thus enhance the student learning outcomes that need to improve in the future.

6.2 Recommendations

6.2.1 Recommendations for Future Practice

Based on the study's findings and results, this section offers recommendations for future procedures. There are two applications for the findings. The results can be used by educational administrators to better meet teacher learning needs. In order to reduce the gap in education, school directors who are working closely with teachers can benefit from understanding the study's conclusions about teachers' perceptions of numeracy and their own learning requirements. Other educators can also benefit from the findings by better understanding some of the outcomes and the resources available to them.

Three recommendations for future practices were found in this investigation.

1. The quantitative findings of this research study suggest that teachers require practical assistance in the classroom. This suggestion for the future can assist leadership in directly witnessing how their training and mentoring affects the teachers' competency of teaching methodology in specific mathematics areas and transforming the classroom assessment results to the actual teaching and it's integrated in pre-service teacher training.

2. Considering school directors' preferences and how they determine that their mentoring is beneficial for the demands of the classroom, another useful suggestion for the future is teachers' openness to mentoring. According to this quantitative study, the teachers desire training that is appropriate for their level of teaching as well as mentoring on various methodologies. School directors can satisfy the teacher's expectations if they are aware of the mentoring supervisors provide and the necessary follow-up. One of the best tools available to school directors to assist teachers in the classroom is Practice-Based Mentoring (Wise & Hammack, 2011).

3. The final recommendation for future practices might be for educational leaders to take the initiative to proactively provide teachers with the information and assistance they require in the classroom in a useful, tangible manner. In order to assist teachers' learning needs, the holistic approach takes into account the findings of this qualitative descriptive study. It is necessary to recognize the support needs of teachers and devise better ways to enable them to be more effective teachers.

6.2.2 Recommendations for Future Research

The researcher may add recommendations for additional research in this section depending on the findings of the study. With regard to how primary teachers in Cambodia characterize their views, experiences, and practices in mathematics, as well as their classroom assessments and student learning outcomes, this quantitative study contributes to the body of knowledge in mathematics learning by addressing the four research objectives. Based on recommendations addressing teachers' instructional impressions, this quantitative study enables future research to produce additional results.

Four recommendations for future research emerged from the data collected from this study that researchers can focus on:

1. Examining each of the contextual issues that our research has shown in order to find additional contributing factors and investigate potential fixes.

2. Performing a qualitative descriptive study, but in addition to teachers, the sample might include school directors for the demographic minorities. School directors need to be able to assess student progress, in order to support teachers in increasing the

learning outcomes of their students. According to a review of the literature in Chapter Two, since a school director can have a positive or negative cascading effect, teaching administrators is just as important as training staff. While training is an essential component of a teacher's development, it can be more fruitful to listen to what it is that they need to learn. Leaders must establish an atmosphere that allows teachers to freely obtain the resources they require to complete their work efficiently.

3. Does a lack of time for assessing students lead to inaccurate assessments in the classroom in a primary school setting? Primary school teachers in Cambodia expressed that little time is allocated for assessment of students, leading to imprecise assessments. A follow-up study can concentrate on these results to learn more about the perspectives and experiences of educators, including teachers. According to Chapter 2, teachers frequently focus on the needs of their students and all of their duties as educators. Teachers utilize assessment results to develop plans of action that prioritize meeting students' learning requirements and provide them with the support they require. Classroom assessment is linked to many of the learning needs of students in primary school settings; therefore, it is important to identify these needs early on using research-based assessments and to develop interventions for both classroom assessment and academic support in the early years. To better meet the learning needs of children, teachers must be given more time and assistance in accurately understanding assessment development. The findings of this study could be useful to education leaders as they investigate whether there is a substantial relationship between the time it takes teaching to complete exams and their correctness. This research may employ mixed-methods or quantitative approaches.

4. How student assessments may be similar or different, and how communication might help teachers manage other emotions and behaviors, can be explored in a qualitative study on home ties between students, parents, and teachers. In order to assess children effectively, teachers in Cambodia must constantly practice applying different tactics and have a thorough understanding of the culture of the students they teach. Having these relationships with parents can facilitate better children management in the classroom. The teachers, however, can begin to address students' internal difficulties by taking a proactive approach. It is recommended that any future study takes into account additional factors like language, immigration status, and the relationships between teachers and students while internalizing problems. One suggestion for the future is that parents give more details regarding their child's growth and emotional maturity.

The aforementioned recommendations for more research can be attributed to the growing interest in evaluation techniques and are consistent with the processes of determining and resolving specific contextual elements that either support or hinder implementation, which is highly essential. The recommendations may also aid in the quick and long-term growth of the evaluation field. The purpose of this study was to look at potential effects on student learning outcomes from excellent practices included in mathematics teaching methodology and classroom assessment. Despite the large number of participating teachers, they did provide insightful information about the effects of classroom assessment and mathematical teaching methods on their students' learning and practice. This study's strength was in its ability to compile a number of key issues from classroom assessment and mathematical teaching methods into a single paper. As every facet of mathematical teaching methods and classroom assessment was scrutinized in relation to enhancing classroom behaviors, supplementary data in the shape of practical tactics and procedures was showcased about student engagement and achievement.

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APPENDICES

Appendix A: The Surveyed Questionnaires

កម្រងសំណួរស្រាវជ្រាវ

ប្រធានបទ

"ប្រសិទ្ធភាពនៃវិធីសាស្ត្របង្រៀនគណិតវិទ្យា និងវាយតម្លៃកម្រិតថ្នាក់រៀន របស់គ្រូបង្រៀនបឋមសិក្សា លើលទ្ធផលសិក្សារបស់សិស្សនៅកម្ពុជា"

ជូនចំពោះលោកគ្រូ អ្នកគ្រូ

ខ្ញុំបាទ **ឈុន វ៉ាមី** បច្ចុប្បន្នកំពុងសិក្សាថ្នាក់បណ្ឌិតនៅសាកលវិទ្យាល័យកម្ពុជា។ នៅពេលនេះខ្ញុំកំពុងធ្វើការសិក្សាស្រាវជ្រាវនិក្ខេបបទ លើប្រធានបទ **"ប្រសិទ្ធភាពនៃវិធីសាស្ត្របង្រៀនគណិតវិទ្យា និងវាយតម្លៃកម្រិតថ្នាក់រៀន របស់គ្រូបង្រៀនបឋមសិក្សា លើលទ្ធផលសិក្សារបស់សិស្សនៅកម្ពុជា"** ក្រោមការដឹកនាំរបស់ឯកឧត្តមបណ្ឌិត **ម៉ុក សារ៉ុម** ។

បច្ចុប្បន្នខ្ញុំកំពុងស្ថិតក្នុងដំណាក់កាលប្រមូលទិន្នន័យ។ គោលបំណងនៃលិខិតនេះ គឺដើម្បីស្នើសុំលោកគ្រូ អ្នកគ្រូ ចូលរួមក្នុងការសិក្សាស្រាវជ្រាវរបស់ខ្ញុំ ដោយឆ្លើយទៅនឹងកម្រងសំណួរស្រាវជ្រាវ។ កម្រងសំណួរនេះវាស់វែងពីរបៀបដែលលោកគ្រូ អ្នកគ្រូ គិត ជឿជាក់ និងសកម្មភាពនៃការរៀននិងបង្រៀន។ ខ្ញុំសូមថ្លែងអំណរគុណយ៉ាងជ្រាលជ្រៅដល់លោកគ្រូ អ្នកគ្រូ ក្នុងការបំពេញកម្រងសំណួរ ទោះបីមានការងារមមាញឹកក៏ដោយ។

<u>**សេចក្តីណែនាំ៖**</u>

១. កម្រងសំណួរនេះ រួមមាន ៣ផ្នែកធំៗ៖

ផ្នែកទី១៖ ព័ត៌មានទូទៅ

ផ្នែកទី២៖ ព័ត៌មាន អំពីការបង្រៀនគណិតវិទ្យា

ផ្នែកទី៣៖ ព័ត៌មាន អំពីការវាយតម្លៃកម្រិតថ្នាក់រៀន។

២. សូមបញ្ចេញមតិជាក់ស្តែងរបស់លោកគ្រូ អ្នកគ្រូ ដើម្បីឆ្លើយសំណួរទៅតាមស្ថានភាពកើតមាននៅសាលារៀន ជាពិសេសលើការរៀននិងបង្រៀន។ ការចូលរួមនេះ

ដោយស្ម័គ្រចិត្ត។ ខ្ញុំសង្ឃឹមថាលោកគ្រូ អ្នកគ្រូ នឹងផ្តល់នូវទស្សនៈផ្ទាល់ខ្លួន ដើម្បីឱ្យទិន្នន័យមានគុណភាព ឆ្លុះបញ្ចាំងពីចំណាប់អារម្មណ៍ ការយល់ឃើញ កង្វល់ និងការអនុវត្តការរៀននិងបង្រៀនរបស់លោកគ្រូ អ្នកគ្រូ។ ខ្ញុំសូមធានាថា ការឆ្លើយតបរបស់លោកគ្រូ អ្នកគ្រូ នឹងចាត់ទុកជាការសម្ងាត់ ហើយអត្តសញ្ញាណរបស់លោកគ្រូ អ្នកគ្រូ នឹងមិនត្រូវបានកត់ត្រាទុក។ ខ្ញុំចាប់អារម្មណ៍ និងប្រើប្រាស់តែព័ត៌មានក្នុងទម្រង់សរុបប៉ុណ្ណោះ។ មានតែខ្ញុំបាទតែម្នាក់គត់ ជាអ្នកសិក្សាស្រាវជ្រាវនេះ ដែលអាចចូលប្រើព័ត៌មានទាំងនេះបាន។

ខ្ញុំសូមថ្លែងអំណរគុណយ៉ាងជ្រាលជ្រៅចំពោះកិច្ចសហការរបស់លោកគ្រូ អ្នកគ្រូ ដែលបានចូលរួមក្នុងគម្រោងសិក្សាស្រាវជ្រាវនេះ។ លទ្ធផលនៃការសិក្សាស្រាវជ្រាវនេះ នឹងជួយកែលម្អការរៀននិងបង្រៀន និងលើកកម្ពស់លទ្ធផលសិក្សារបស់សិស្ស ឆ្លើយតបនឹងកំណែទម្រង់នៅកម្រិតសាលារៀន។

ឈុន រ៉ាមី

អ្នកស្រាវជ្រាវ

(បេក្ខជនបណ្ឌិត ផ្នែកគ្រប់គ្រងអប់រំ)

ផ្នែកទី១៖ ទិន្នន័យទូទៅ (**៧សំណួរ**)

ការណែនាំ៖ សូមឆ្លើយសំណួរទាំងអស់ ដោយគូស ✓ ក្នុងប្រអប់ ☐

១. អាយុ

☐ តិចជាង ៣១ឆ្នាំ ☐ ៣១ ដល់ ៤០ឆ្នាំ ☐ ច្រើនជាង ៤០ឆ្នាំ

២. ភេទ

☐ ប្រុស ☐ ស្រី

៣. ការអប់រំ

☐ ក្រោមបរិញ្ញាបត្រ ☐ បរិញ្ញាបត្រ ☐ លើបរិញ្ញាបត្រ

៤. បទពិសោធន៍នៃការបង្រៀន

☐ ១ ដល់ ១០ឆ្នាំ ☐ ១១ ដល់ ២០ឆ្នាំ ☐ ច្រើនជាង ២០ឆ្នាំ

៥. សាលារៀនរបស់អ្នកស្ថិតនៅតំបន់ណា

☐ ទីប្រជុំជន ☐ ដាច់ស្រយាល

៦. កម្រិតថ្នាក់ណាដែលអ្នកកំពុងបង្រៀន

☐ កម្រិតដំបូង (១-៣)   ☐ កម្រិតខ្ពស់ (៤-៦)

៧. ចំនួនសិស្សជាមធ្យមក្នុងថ្នាក់របស់អ្នក

☐ តិចជាង ៣១នាក់   ☐ ៣១ ដល់ ៤០នាក់   ☐ ច្រើនជាង ៤០នាក់

ផ្នែកទី២៖ ការបង្រៀនគណិតវិទ្យា

ផ្នែក ក (១០សំណួរ)

ការណែនាំ៖ សូមប្រើប្រាស់នូវសូចនាករគន្លឹះខាងក្រោម ដើម្បីបង្ហាញពីការយល់ឃើញរបស់លោកគ្រូ អ្នកគ្រូ លើភាពជឿជាក់នៃការបង្រៀនគណិតវិទ្យា។ សូមគូស ✓ ក្នុងប្រអប់ ដែលសមរម្យ៖

SD=មិនឯកភាពដាច់ខាត **D**=មិនឯកភាព **U**=មិនច្បាស់លាស់ **A**=ឯកភាព **SA**=ឯកភាពទាំងស្រុង

No.		SD	D	U	A	SA
1	ខ្ញុំដឹងពីវិធីដែលមានប្រសិទ្ធភាព នៃការបង្រៀនបញ្ញត្តិគណិតវិទ្យា					
2	ខ្ញុំយល់ច្បាស់ពីបញ្ញត្តិគណិតវិទ្យា ដើម្បីបង្រៀនឱ្យមានប្រសិទ្ធភាព					
3	នៅពេលសិស្សម្នាក់ពិបាកក្នុងការយល់បញ្ញត្តិគណិតវិទ្យាមួយ ខ្ញុំជាទូទៅជួយគាត់ឱ្យយល់បានច្បាស់					
4	ខ្ញុំដឹងថាអ្វីដែលត្រូវធ្វើ ដើម្បីនាំសិស្សឱ្យចូលចិត្តរៀនគណិតវិទ្យា					
5	ខ្ញុំអាចគ្រប់គ្រងបាន នូវឥរិយាបថមិនល្អនៅក្នុងថ្នាក់រៀន					
6	ខ្ញុំនាំសិស្សឱ្យចូលរួម និងជឿជាក់ថាពួកគេអាចធ្វើ កិច្ចការក្នុងថ្នាក់រៀនបានល្អ					
7	ខ្ញុំស្ទាបស្ទង់បានការយល់ដឹងរបស់សិស្ស ពីអ្វីដែលខ្ញុំបានបង្រៀន					
8	ខ្ញុំជំរុញសិស្សឱ្យចេះច្នៃប្រឌិត					

9	ខ្ញុំកែសម្រួលមេរៀនឱ្យសមស្របទៅតាមកម្រិតនៃការយល់ដឹងរបស់សិស្សម្នាក់ៗ					
10	ខ្ញុំគាំទ្រគ្រួសារសិស្ស ឱ្យជួយសិស្សអាចសិក្សារៀនសូត្របានល្អ					

ផ្នែក ខ (១៥សំណួរ)

ការណែនាំ៖ សូមកំណត់កម្រិតទំនុកចិត្តរបស់លោកគ្រូ អ្នកគ្រូ នៃការបង្រៀន លើប្រធានបទគណិតវិទ្យា។ សូមគូស ✓ ក្នុងប្រអប់ដែលសមរម្យ៖

NC=មិនទុកចិត្តសោះ **SNC**=មិនទុកចិត្ត **NUC**=មិនច្បាស់លាស់ **AC**=ទុកចិត្ត **CC**=ទុកចិត្តយ៉ាងប្រាកដ

No.		NC	SNC	NUC	AC	CC
1	ចំនួនគត់ (ចំនួនគត់ដល់ 10 000 000)					
2	ការបូក និងដកចំនួនគត់					
3	ចំណោទ៖ ការបូក និងដកចំនួនគត់					
4	ការគុណ និងចែកចំនួនគត់					
5	ចំណោទ៖ ការគុណ និងចែកចំនួនគត់					
6	ប្រភាគ (ការបូក និងដកប្រភាគ ដែលមានភាគ បែងដូចគ្នា និងមិនដូចគ្នា, ការគុណ និងចែក ប្រភាគ, ដោះស្រាយចំណោទបូក ដកគុណ និងចែកប្រភាគ)					
7	ផលធៀប (រកផលធៀប, ផលធៀបស្មើគ្នា, និង ចំណោទផលធៀប)					
8	ចំនួនទសភាគ (ប្រមាណវិធីទាំងបួននៃចំនួនទសភាគ និងចំណោទចំនួនទសភាគ)					
9	ភាគរយ (ភាគរយ, សរសេរភាគរយជាប្រភាគទសភាគ និងច្រាស់មកវិញ, ភាគរយនៃបរិមាណមួយ, និងដោះស្រាយចំណោទ ភាគរយ)					
10	មធ្យម និងអត្រា					

11	រង្វាស់រង្វាល់ (ប្រវែង, ពេលវេលា, ទំងន់, និង ចំណុះ)					
12	រូបីប័ណ្ណ					
13	ស្ថិតិ (ក្រាបរូបភាព, ក្រាបខ្សែរ, និងក្រាបផ្លិត)					
14	ធរណីមាត្រ (ផ្ទៃក្រឡា និងបរិមាណ, ពមុំ, ត្រីកោណ និងចតុកោណ, មាឌនៃសូលីដ និង មាឌអង្គធាតុរាវ)					
15	ល្បឿន (ចម្ងាយ និងល្បឿន, ល្បឿនមធ្យម)					
16	ពិជគណិត					

ផ្នែក គ (១០សំណួរ)

ការណែនាំ៖ សូមប្រើប្រាស់នូវសូចនាករគន្លឹះខាងក្រោម ដើម្បីបង្ហាញទំនុកចិត្តរបស់លោកគ្រូ អ្នកគ្រូ លើការបង្រៀនគណិតវិទ្យា។ សូមគូស ✓ ក្នុងប្រអប់ដែលសមរម្យ៖ **SD**=មិនឯកភាពដាច់ខាត **D**=មិនឯកភាព **U**=មិនច្បាស់លាស់ **A**=ឯកភាព **SA**=ឯកភាពទាំងស្រុង

No.		**SD**	**D**	**U**	**A**	**SA**
1	ពន្លឿនការអភិវឌ្ឍ និងកែលម្អការយល់ដឹងច្បាស់លាស់ នៃជំនាញគណិតវិទ្យា					
2	ខ្ញុំគាំទ្រសិស្ស ឱ្យពន្យល់និងបង្ហាញពីគំនិតគណិតវិទ្យារបស់ពួកគេ ទៅសិស្សដ៏ទៃទៀត					
3	ខ្ញុំផ្តោតលើចម្លើយដែលត្រឹមត្រូវ ជាជាងការអនុវត្តតាមទាំងស្រុង					
4	នៅពេលបង្ហាញប្រធានបទគណិតវិទ្យាដែលខ្ញុំទុកចិត្តថាអាចបង្រៀនបាន វាចាំបាច់ណាស់ដែលត្រូវ ផ្តល់នូវការយល់ដឹងពីបញ្ញត្តិ មុនពេលផ្តោតលើវិធីដោះស្រាយ					
5	ខ្ញុំត្រូវឱ្យសិស្សយល់ច្បាស់ពីមូលដ្ឋាននៃគណិតវិទ្យា មុនពេលពួកគេដោះស្រាយចំណោទលំបាកៗ					

6	នៅពេលសិស្សពីរនាក់ដោះស្រាយចំណោទដូចគ្នាត្រឹមត្រូវ ដោយប្រើប្រាស់វិធីពីរផ្សេងគ្នា ខ្ញុំឱ្យពួកគេ ចែករំលែកវិធីដែលប្រើជាមួយគ្នាទៅវិញទៅមក					
7	ខ្ញុំជារឿយៗ ឱ្យសិស្សពន្យល់ថាហេតុអ្វីទើបធ្វើកិច្ចការយ៉ាងដូច្នេះ					
8	ទំរង់ និងរូបមន្ត គួរបង្ហាញមុនដំបូង ពេលណែនាំប្រធានបទថ្មី					
9	អ្វីៗទាំងអស់ពីគណិតវិទ្យា ត្រូវតែសាមញ្ញ ដែលពិតប្រាកដ និងអាចចងចាំ					
10	ប្រធានបទដែលខ្ញុំមានទំនុកចិត្តក្នុងការបង្រៀន ខ្ញុំមានវិធីច្រើនក្នុងការបង្រៀន					

ផ្នែក ឃ (៦សំណួរ)

ការណែនាំ៖ សូមប្រើប្រាស់នូវសូចនាករគន្លឹះខាងក្រោម ដើម្បីបង្ហាញពីការអនុវត្តបង្រៀនគណិតវិទ្យា។ សូមគូស ✓ ក្នុងប្រអប់ដែលសមរម្យ៖

NU=មិនបានអនុវត្ត SU=កម្រអនុវត្ត UOc=បានអនុវត្ត UOf=តែងតែអនុវត្ត UVO=អនុវត្តញឹកញាប់បំផុត

No.		NU	SU	UOc	UOf	UVO
1	ខ្ញុំបានបញ្ជ្រាបគំនិតអរូបី និងរូបី ក្នុងការបង្រៀនគណិតវិទ្យា					
2	ខ្ញុំជួយសិស្ស ឱ្យមើលឃើញពីទំនាក់ទំនងរវាងគណិតវិទ្យា បទពិសោធជាក់ស្តែង និងព្រឹត្តិការណ៍ផ្សេងៗ					
3	ខ្ញុំផ្សារភ្ជាប់ទំនាក់ទំនងប្រធានបទមុន និងប្រធានបទថ្មី ក្នុងការបង្រៀនគណិតវិទ្យា					
4	ខ្ញុំជំរុញសិស្សឱ្យចូលរួសកម្មភាពក្នុងថ្នាក់រៀន					
5	សិស្សចូលរួមក្នុងការជ្រើសរើសប្រធានបទ ឬសកម្មភាពក្នុងគណិតវិទ្យា					

6	សិស្សសហការ និងធ្វើកិច្ចការទាំងអស់គ្នា ក្នុងសកម្មភាពរៀនគណិតវិទ្យា					

ផ្នែកទី៣៖ ការវាយតម្លៃកម្រិតថ្នាក់រៀន

ផ្នែក ក (១០សំណួរ)

ការណែនាំ៖ សូមប្រើប្រាស់នូវសូចនាករគន្លឹះខាងក្រោម ដើម្បីបង្ហាញពីការយល់ឃើញរបស់លោកគ្រូ អ្នកគ្រូ លើភាពជឿជាក់នៃការវាយតម្លៃកម្រិតថ្នាក់រៀន។ សូមគូស ✓ ក្នុង ប្រអប់ដែលសមរម្យ៖

SD=មិនឯកភាពដាច់ខាត **D**=មិនឯកភាព **U**=មិនច្បាស់លាស់ **A**=ឯកភាព **SA**=ឯកភាពទាំងស្រុង

No.		SD	D	U	A	SA
1	ការវាយតម្លៃកំណត់ពីតម្រូវការដំបូងនៃការសិក្សារៀនសូត្ររបស់សិស្ស					
2	គោលបំណងនៃការវាយតម្លៃកម្រិតថ្នាក់រៀន គឺដើម្បីកំណត់ចំណុចខ្វះខាតរបស់សិស្ស					
3	គោលបំណងនៃការវាយតម្លៃកម្រិតថ្នាក់រៀន គឺដើម្បីកំណត់ប្រសិទ្ធភាពនៃការបង្រៀន					
4	ការធ្វើតេស្តជួយខ្ញុំឱ្យដឹងពីតម្រូវការជំនាញ និងចំណេះដឹងរបស់សិស្ស					
5	គោលបំណងនៃការវាយតម្លៃ គឺធ្វើឱ្យសិស្សចេះទទួលខុសត្រូវលើការសិក្សារៀនសូត្ររបស់ពួកគេ					
6	គោលបំណងនៃការវាយតម្លៃ គឺដើម្បីត្រួតពិនិត្យការ រីកចំរើននៃការសិក្សារៀនសូត្ររបស់សិស្ស					
7	ការវាយតម្លៃ គួរតែជាផ្នែកមួយនៃសកម្មភាពបង្រៀន					
8	ខ្ញុំទទួលបានការបណ្តុះបណ្តាលគ្រប់គ្រាន់ អំពីការវាយតម្លៃ					

9	ការវាយតម្លៃ ផ្តល់ឱ្យខ្ញុំនូវភស្តុតាងគ្រប់គ្រាន់នៃការយល់ដឹងរបស់សិស្ស ដែលខ្ញុំអាចប្រើប្រាស់ដើម្បី រៀបចំផែនការមេរៀនបន្ទាប់ទៀត					
10	ខ្ញុំត្រូវការការបណ្តុះបណ្តាលបន្ថែមទៀតអំពីការវាយតម្លៃសិស្ស តេស្ត និងការវាស់វែង					

ផ្នែក ខ (១៥សំណួរ)

ការណែនាំ៖ សូមប្រើប្រាស់នូវសូចនាករគន្លឹះខាងក្រោម ដើម្បីបង្ហាញពីកម្រិតជំនាញនៃការវាយតម្លៃ។ សូមគូស ✓ ក្នុង ប្រអប់ដែលសមរម្យ៖

NS=មិនមានជំនាញ LS=មានជំនាញតិចតួច SK=មានជំនាញខ្លះៗ S=មានជំនាញ VS=មានជំនាញច្បាស់

No.		NS	LS	SS	S	VS
1	ជ្រើសរើសវិធីសាស្ត្រវាយតម្លៃសមស្របសម្រាប់ការសម្រេចចិត្តលើការបង្រៀន					
2	បន្សុីសំណួរតេស្តនឹងគោលបំណងនៃការបង្រៀន					
3	រៀបចំតេស្តសំណួរសរសេរ និងបំពេញលើក្រដាស់					
4	រៀបចំសំណួរពហុជ្រើសរើស					
5	រៀបចំសំណួរត្រូវ ខុស					
6	វាយតម្លៃសកម្មភាពបុគ្គល					
7	ប្រើប្រាស់លទ្ធផលនៃការវាយតម្លៃ នៅពេលរៀបចំផែនការបង្រៀន					
8	ប្រើប្រាស់លទ្ធផលនៃការវាយតម្លៃ សម្រាប់ការសម្រេចចិត្តអំពីសិស្សម្នាក់ៗ					
9	កំណត់អំពីមូលហេតុនៃកំហុសពិតប្រាកដរបស់សិស្ស					

10	ផ្សព្វផ្សាយ និងឆ្លើយតបលទ្ធផលនៃការវាយតម្លៃកម្រិតថ្នាក់រៀន ជាមួយអ្នកពាក់ព័ន្ធដទៃទៀត					
11	ការដាក់បញ្ចូលកិច្ចខិតខំប្រឹងប្រែងរបស់សិស្ស ទៅក្នុងការកំណត់កម្រិត/ចំណាត់ថ្នាក់សិស្ស					
12	ប្រាកដថាតេស្តបានគ្របដណ្តប់ទៅលើអ្វីដែល បានបង្រៀននៅក្នុងថ្នាក់					
13	ប្រើប្រាស់ការវាយតម្លៃរវាងសិស្សនិងសិស្ស					
14	ផ្តល់នូវការឆ្លើយតបដោយផ្ទាល់ចំពោះសិស្ស					
15	ផ្តល់នូវការឆ្លើយតបជាលាយលាក់អក្សរចំពោះសិស្ស					

ផ្នែក គ (១៥សំណួរ)

ការណែនាំ៖ សូមប្រើប្រាស់នូវសូចនាករគន្លឹះខាងក្រោម ដើម្បីបង្ហាញពីការអនុវត្ត នៃការវាយតម្លៃ។ សូមគូស ✓ ក្នុង ប្រអប់ដែលសមរម្យ៖

NU=មិនបានអនុវត្ត SU=កម្រអនុវត្ត UOc=បានអនុវត្ត UOf=តែងតែអនុវត្ត UVO= អនុវត្តញឹកញាប់បំផុត

No.		**NU**	**SU**	**UOc**	**UOf**	**UVO**
1	ជ្រើសរើសវិធីសាស្ត្រវាយតម្លៃសមស្រប សម្រាប់ការសម្រេចចិត្តលើការបង្រៀន					
2	បន្ស៊ីសំណួរតេស្តនឹងគោលបំណងនៃការបង្រៀន					
3	រៀបចំតេស្តសំណួរសរសេរ និងបំពេញលើក្រដាស់					
4	រៀបចំសំណួរពហុជ្រើសរើស					
5	រៀបចំសំណួរត្រូវ ខុស					
6	វាយតម្លៃសកម្មភាពបុគ្គល					

7	ប្រើប្រាស់លទ្ធផលនៃការវាយតម្លៃ នៅពេលរៀបចំផែនការបង្រៀន					
8	ប្រើប្រាស់លទ្ធផលនៃការវាយតម្លៃ សម្រាប់ការសម្រេចចិត្តអំពីសិស្សម្នាក់ៗ					
9	កំណត់អំពីមូលហេតុនៃកំហុសពិតប្រាកដរបស់សិស្ស					
10	ផ្សព្វផ្សាយ និងឆ្លើយតបលទ្ធផលនៃការវាយតម្លៃកម្រិតថ្នាក់រៀន ជាមួយអ្នកពាក់ព័ន្ធដទៃទៀត					
11	ការដាក់បញ្ចូលកិច្ចខិតខំប្រឹងប្រែងរបស់សិស្ស ទៅក្នុងការកំណត់កម្រិត/ចំណាត់ថ្នាក់សិស្ស					
12	ប្រាកដថាតេស្តបានគ្របដណ្តប់ទៅលើអ្វីដែលបានបង្រៀននៅក្នុងថ្នាក់					
13	ប្រើប្រាស់ការវាយតម្លៃរវាងសិស្សនិងសិស្ស					
14	ផ្តល់នូវការឆ្លើយតបដោយផ្ទាល់ចំពោះសិស្ស					
15	ផ្តល់នូវការឆ្លើយតបជាលាយលាក់អក្សរចំពោះសិស្ស					

Questionnaire on teachers' perceptions
of mathematics teaching methodology and classroom assessment

This questionnaire aims to gather baseline information on teachers' attitudes about mathematics teaching methodology and classroom assessment. The aim is to come up with an effective way of identifying these perceptions and their effect on students' learning quality. This survey consists of three main parts:

Part I: Background information.

Part II: Statements on mathematics teaching methodologies

Part III: Statements on classroom assessments. All answers are strictly private and will only be used with the consent of the participants.

Part I: Demographic data (7 items).

Instructions: Please answer all the items by ticking or completing accordingly.

1. Age

☐ Less than 31 ☐ 31-40 ☐ Over 40

2. Gender

Male ☐ Female ☐

3. Your educational background. Please tick one box

☐ Lower BA degree ☐ BA degree ☐ Higher BA degree

4. Your teaching experience. Please tick one box

☐ 1-10 years ☐ 11-20 years ☐ Over 20 years

5. What sort of area is your school located?

☐ Urban ☐ Rural

6. What grade are you teaching?

☐ Early grade ☐ Upper grade

7. The average number of students in your class is:

☐ Less than 31 ☐ 31-40students ☐ More than 40 students

Part II: Mathematic teaching methodology

Section A (10 items)

Instruction: For each statement below use the following key to indicate how you respond to the statement regarding your perceptions of mathematic teaching. Please check '√'in the appropriate box.

SD= Strongly Disagree **D**= Disagree **U**= Undecided **A**= Agree **SA**= Strongly Agree

No.		SD	D	U	A	SA
1	I know how to teach mathematics concepts effectively.					
2	I understand mathematics concepts well enough to be effective in teaching mathematics.					
3	When a student has difficulty understanding a mathematics concept, I will usually help the student understand it better.					
4	I do know what to do to turn students on to mathematics.					
5	I control disruptive behavior in the classroom.					
6	I get student to belief they can do well in class work.					
7	I gauge student comprehension of what I have taught.					
8	I foster student creativity.					
9	I adjust my lesson to the proper level of individual students.					
10	I assist families in helping their children do well in school.					

Section B (16 items)

Instruction: Please rate the following mathematics topics according to how confident you would be teaching primary students each topic. Please check '√'in the appropriate box.

NC= Not Confident at All **SNC**= Slightly not Confident **NUC**= Neither Unconfident or Confident **AC**= Average Confidence **CC**=Completely Confident

No.		**NC**	**SNC**	**NUC**	**AC**	**CC**
1	Whole numbers (numbers to 10 million)					
2	Addition and subtraction					
3	Word problems: addition and subtraction					
4	Multiplication and division					
5	Word problems: multiplication and division					
6	Fraction (adding, subtracting like and unlike fractions, product and dividing, word problems…)					
7	Ratio (find ratio, equivalent ratios, word problems…)					
8	Decimal numbers (the four operations of decimals, Word Problems…)					
9	Percentage (percent, percentages as fractions and decimals and reverse, percentage of quantity, solving word problems)					
10	Average and rate					
11	Measurements (length, time, weight and capacity)					
12	Currencies					
13	Statistics (picture and line graph, pie Charts…)					
14	Geometries (area and perimeter, angles, triangles, quadrilaterals, volume of solids and liquids...)					
15	Speed (distance and speed, average speed)					
16	Algebras					

Section C (10 items)

Instruction: For each statement below use the following key to indicate how you respond to the statement regarding your confident of mathematic teaching. Please check '√'in the appropriate box.

SD= Strongly Disagree **D**= Disagree **U**= Undecided **A**= Agree **SA**= Strongly Agree

No.		**SD**	**D**	**U**	**A**	**SA**
1	Developing speed and accuracy of math skills improves understanding.					
2	I encourage students to use manipulative to explain their mathematical ideas to other students.					
3	I put more emphasis on getting the correct answer than on the process followed,					
4	When introducing math topics which I am confident teaching, it is important to first build understanding of a concept before focusing on algorithms.					
5	I like my students to master basic mathematical operations before they tackle complex problems.					
6	When two students solve the same problem correctly using two different strategies I have them share the steps they went through with each other.					
7	I frequently ask my students to explain why something works.					
8	Formulas and rules should be presented first when introducing new topics.					
9	A lot of things about mathematics must simply be accepted as true and remembered.					
10	With topics I am more confident teaching, I am more likely to explore alternative teaching strategies.					

Section D (6 items)

Instruction: For each statement below please use the following scale to indicate how often you use the teaching practice described by each item. Please check '√'in the appropriate box.

NU=Not Used SU=Seldom Used UOc=Used Occasionally UOf=Used Often UVO =Used Very Often

No.		NU	SU	UOc	UOf	UVO
1	I integrate abstract and concrete ideas in mathematic teaching.					
2	I help students see the relationship between mathematics and the real-world experience, knowledge, and event.					
3	I link between previous topic and new topic in mathematic teaching.					
4	I promote student voice in the mathematics classroom.					
5	Students participate in choosing learning content or activities in mathematics.					
6	Students collaborate and work together to actively learn in mathematics.					

Part III: Classroom assessment

Section A (10 items)

Instructions: For each statement below use the following key to indicate how you respond to the statement regarding your perceptions of classroom assessment. Please check '√'in the appropriate box.

SD= Strongly Disagree **D**= Disagree **U**= Undecided **A**= Agree **SA**= Strongly Agree

No.		SD	D	U	A	SA
1	Assessment identify and diagnose pupils' learning needs					
2	The purpose of classroom assessments is to determine student grades.					
3	The purpose of classroom assessments is to determine the effectiveness of my instruction.					
4	Tests help me focus on the skills/knowledge needed by my students.					

5	The purpose of assessment is to make students accountable for their learning.					
6	The purpose of assessment is to monitor students' learning progress.					
7	Assessment should form a natural part of teaching activities.					
8	Assessment training, I received was adequate.					
9	Assessment provides me with valuable pieces of evidence of my students' understandings, which I use to plan subsequent lessons.					
10	I need more training in student assessment, tests, and measurement.					

Section B (15 items)

Instructions: For each statement below use the following key to indicate your skill level for the following assessment tasks. Please tick '√' in the appropriate box.

NS=Not Skilled LS=Little Skilled SK=Somewhat Skilled S=Skilled VS=Very Skilled

No.		**NS**	**LS**	**SS**	**S**	**VS**
1	Choosing appropriate assessment methods for instructional decisions.					
2	Aligning test items with instructional objectives.					
3	Writing essay questions and paper-pencil tests.					
4	Writing multiple-choice questions.					
5	Writing true or false questions.					
6	Assessing individual hands-on activities.					
7	Using assessment results when planning teaching.					
8	Using assessment results for decision-making about individual students.					
9	Determining why students make specific mistakes.					

10	Communicating classroom assessment results to others.					
11	Including student effort in the calculation of grades.					
12	Making sure the test adequately covers the material taught in class.					
13	Using peer assessments for student assessments.					
14	Providing oral feedback to students.					
15	Providing written feedback to students.					

Section C (15 items)

Instructions: For each statement below please use the following scale to indicate how often you use the assessment practice described by each item. Please tick '√' in the appropriate box.

NU=Not Used SU=Seldom Used UOc=Used Occasionally UOf=Used Often UVO =Used Very Often

No.		NU	SU	UOc	UOf	UVO
1	Choosing appropriate assessment methods for instructional decisions.					
2	Aligning test items with instructional objectives.					
3	Writing essay questions and paper-pencil tests.					
4	Writing multiple-choice questions.					
5	Writing true or false questions.					
6	Assessing individual hands-on activities.					
7	Using assessment results when planning teaching.					
8	Using assessment results for decision-making about individual students.					
9	Determining why students make specific mistakes.					

10	Communicating classroom assessment results to others.					
11	Including student effort in the calculation of grades.					
12	Making sure the test adequately covers the material taught in class.					
13	Using peer assessments for student assessments.					
14	Providing oral feedback to students.					
15	Providing written feedback to students.					

Appendix B: Students' Test

គណិតវិទ្យា ថ្នាក់ទី១

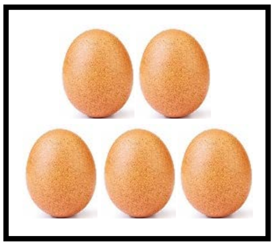
រយៈពេល ១៥នាទី

១. ចូរគូស✓ក្នុង ☐នៃរូបដែលនៅកណ្ដាល (២ពិន្ទុ)

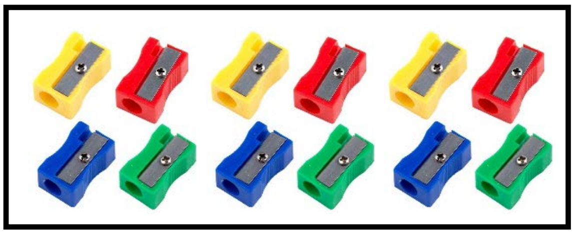
☐ក. ☐ខ. ☐គ.

២. ចូរសរសេរលេខតាងចំនួន (២ពិន្ទុ)

ក.



ខ.



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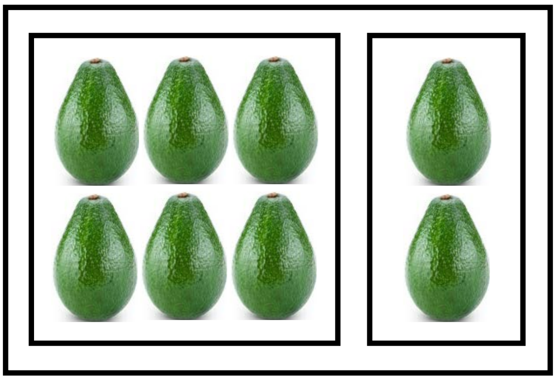
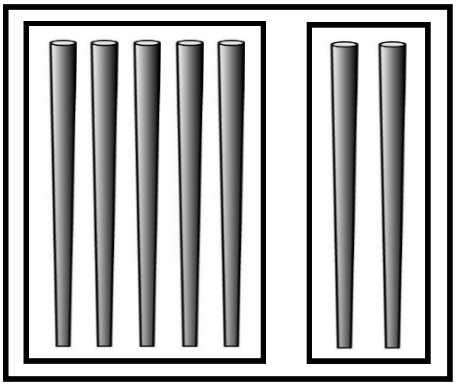
៣. ចូររកផលបូកខាងក្រោម (២ពិន្ទុ)

ក.



ខ.



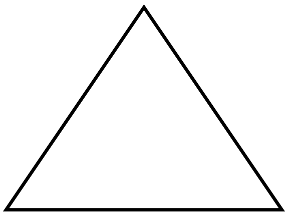
៦ + ២ = ... ៥ + ២ = ...

៤. ចូរសរសេរឈ្មោះរាងធរណីមាត្រខាងក្រោម   (២ពិន្ទុ)

ក.

....

ខ.



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៥.ចូរប្រៀបធៀបចំនួនខាងក្រោមដោយប្រើសញ្ញា<> =   (២ពិន្ទុ)

ក. ១៥ ☐ ១៩

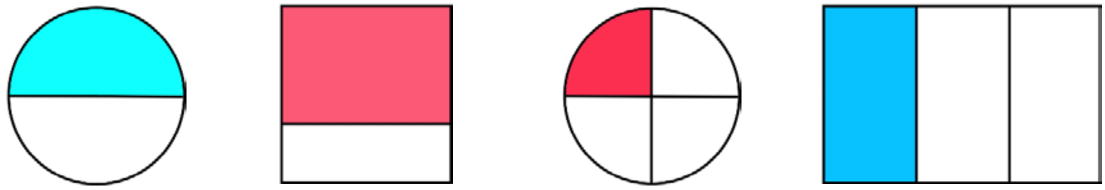
ខ. ១៨ ☐ ១៧

គ. ២០ ☐ ២០

គណិតវិទ្យា ថ្នាក់ទី២

រយៈពេល ១៥នាទី

១. ចូរគូស ✓ ក្នុង ☐ដែលផាត់ពណ៌បង្ហាញមួយភាគបី (២ពិន្ទុ)



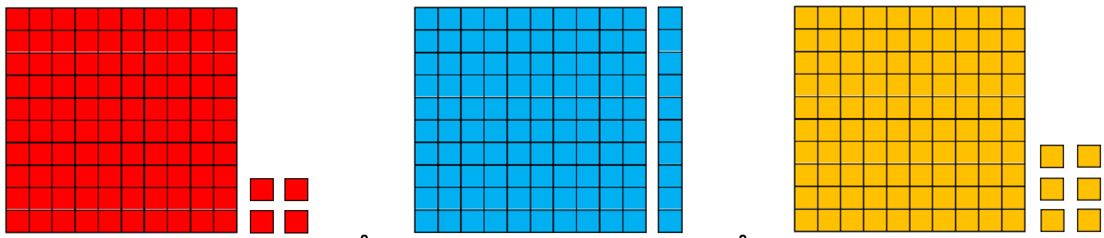
☐ក. ☐ខ. ☐គ. ☐ឃ.

២. ចូរប្រៀបធៀបចំនួនដោយប្រើសញ្ញា <> = ក្នុង ☐(២ពិន្ទុ)

ក. 89☐89 ខ. 710☐170 គ. 212☐221

៣. ចូរបំពេញចំនួន និងសរសេរជាពាក្យអានចំនួន (២ពិន្ទុ)

ក. ខ. គ.



ក. ចំនួន .....១០៤......
អានថា ...មួយរយបួន...

ខ. ចំនួន ....
អានថា ....

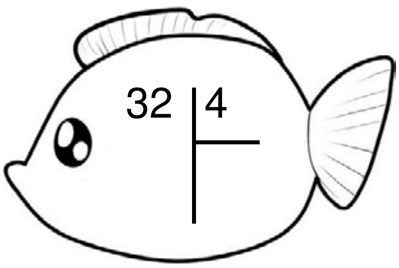
គ. ចំនួន ....
អានថា ....

៤. ចូររកផលបូកខាងក្រោម (២ពិន្ទុ)

ក. 57 + 30 = ... ខ. 33 + 25 = ... គ. 33 + 29 = ...

៥. ចូរធ្វើប្រមាណវិធីចែកខាងក្រោម (២ពិន្ទុ)

ក.



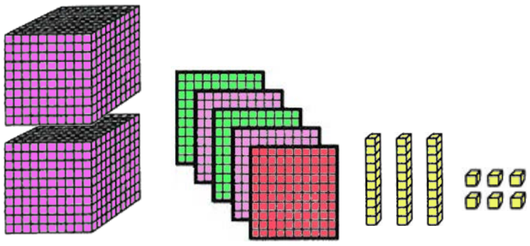
32 | 4

ខ.

65 | 5

គណិតវិទ្យា ថ្នាក់ទី៣
រយៈពេល ១៥នាទី

១. ចូរបំពេញចំនួន និងសរសេរពាក្យអានចំនួនក្នុងចន្លោះ(២ពិន្ទុ)



ចំនួនទាំងអស់មានចំនួន...

អានថា...

២. ចូរបំពេញតារាងខាងក្រោម(២ពិន្ទុ)

ល.រ	វត្ថុ និង តម្លៃ	ប្រាក់ដែលទទួលបាន	ប្រាក់ដែលត្រូវអាប់
1	 15 000 ៛	20 000 ៛	................៛
2	 23 000 ៛	................៛	7 000 ៛

៣. ចូរប្តូរខ្នាតទម្ងន់ខាងក្រោម(២ពិន្ទុ)

ក. 3គក= ....ក

ខ. 8 000ក= ....គក

៤. ចូរប្តូរខ្នាតប្រវែងខាងក្រោម (២ពិន្ទុ)

ក. 6ម = ...ដម

ខ. 9ដម = ...សម

៥. ចូររកផលបូកខាងក្រោម(២ពិន្ទុ)

ក. 4 365 + 2 224 = ______

ខ. 5 369 + 2 476 = ______

គណិតវិទ្យា ថ្នាក់ទី៤

រយៈពេល ១៥នាទី

ចូរគូស√ ក្នុង ☐ ខាងមុខចម្លើយត្រឹមត្រូវតែមួយគត់

១ .ចំនួនប្រាំម៉ឺនប្រាំពីររយសែសិបប្រាំបីគឺ (២ពិន្ទុ)

☐ ក. 57 048

☐ ខ. 50 758

☐ គ. 50 748

☐ ឃ. 5 748

២. ផលបូក 67 254 + 5 363 ស្មើនឹង (២ពិន្ទុ)

☐ ក. 6125117

☐ ខ. 72617

☐ គ. 62617

☐ ឃ. 62517

៣. ចូរបំពេញចន្លោះខាងក្រោម

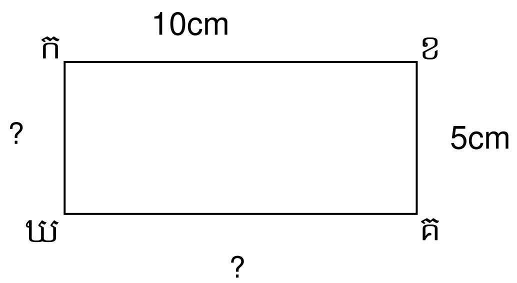
4kg600g=1000g+1000g+1000g+1000g+600g

=(4×...........................)g+600g

=.................................. +600g

=.................................. g

៤. ប្រាប់ប្រវែងជ្រុងរបស់រូបធរណីមាត្រខាងក្រោម (២ពិន្ទុ)



ជ្រុង **កឃ**=............................

ជ្រុង **ឃគ**=............................

៥. សុខមានទម្ងន់50kg200g។ បងប្រុសរបស់គាត់មានទម្ងន់លើសគាត់6kg500g។ តើបងប្រុសគាត់មានទម្ងន់ប៉ុន្មាន?(២ពិន្ទុ)

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គណិតវិទ្យា ថ្នាក់ទី៥

រយៈពេល ១៥នាទី

ចូរគូសសញ្ញា√ ក្នុង ☐ ខាងមុខចម្លើយត្រឹមត្រូវតែមួយគត់

១. ផលបូក 30.75+12.5 ស្មើនឹង (២ពិន្ទុ)

☐ក. 30.12

☐ខ. 35.75

☐គ. 43.25

☐ឃ. 75.12

២. ផលដក $\frac{12}{14}-\frac{5}{14}$ ស្មើនឹង (២ពិន្ទុ)

☐ក. $\frac{7}{28}$

☐ខ. $\frac{12}{28}$

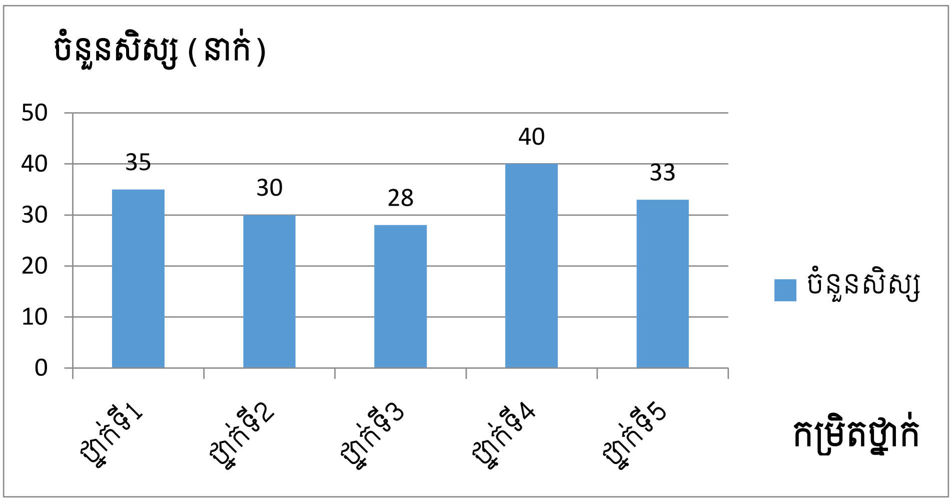
☐គ. $\frac{17}{14}$

☐ ឃ. $\frac{7}{14}$

៣. បំពេញចំនួនដើម្បីឱ្យបានផលធៀបស្មើគ្នា (២ពិន្ទុ)

$\frac{15}{37}=\frac{\ldots\ldots}{74}$

៤.ចូរសង្កេតក្រាបសសរបង្ហាញចំនួនសិស្សតាមថ្នាក់នីមួយៗខាងក្រោម(២ពិន្ទុ)



ចូរបកស្រាយទិន្នន័យតាមក្រាបសសរ ដោយបំពេញចន្លោះខាងក្រោម៖

តាមក្រាបបានបង្ហាញថា៖

- សិស្សថ្នាក់ទី2 មានចំនួន........................នាក់
- ថ្នាក់ដែលមានចំនួនសិស្សច្រើនជាងគេគឺថ្នាក់ទី........................
- សិស្សថ្នាក់ទី5 ច្រើនជាងសិស្សថ្នាក់ទី3 ចំនួន...................................នាក់។

៥.គណនាតម្លៃទំនិញក្រោយពីបញ្ចុះតម្លៃ 20%(២ពិន្ទុ)

68 000៛

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គណិតវិទ្យា ថ្នាក់ទី៦

រយៈពេល ១៥នាទី

ចូរគូសសញ្ញា√ ក្នុង □ ខាងមុខចម្លើយត្រឹមត្រូវតែមួយគត់

១. ភាគបែងរួមនៃប្រភាគ $\frac{4}{7}$ និង $\frac{3}{5}$ គឺ (២ពិន្ទុ)

□ក. 5

□ខ. 7

□គ. 12

□ឃ. 35

២. លំដាប់ចំនួនទសភាគពីធំទៅតូចគឺ (២ពិន្ទុ)

□ក. 58.368 ; 59.035 ; 59.348 ; 59.350; 59.354

□ខ. 59.350 ; 59.354 ; 59.348 ; 59.035 ; 58.368

□គ. 59.354 ; 59.350 ; 59.348 ; 59.035 ; 58.368

□ឃ. 59.354 ; 59.350 ; 59.348 ; 58.368; 59.035

ចូរបំពេញចម្លើយក្នុងប្រអប់□ ខាងក្រោម

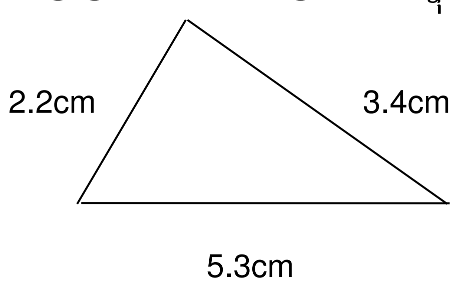
៣. គណនាផលគុណតាមទម្រង់ប្រភាគ (២ពិន្ទុ)

$$15.47 \times 3.4 = \frac{\quad}{100} \times \frac{34}{\square}$$

$$= \frac{\square}{\square} = \square$$

ចូរសរសេរចម្លើយរបស់លំហាត់នៅលើបន្ទាត់ដាច់ៗផ្នែកខាងក្រោម

៤.គណនាបរិមាត្រត្រីកោណខាងក្រោម(២ពិន្ទុ)



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៥. គេមានចំនួន N គុណនឹង 5 រួចបូកនឹង245 ស្មើនឹង1230។ ចូររកចំនួនNនោះ។ (២ពិន្ទុ)

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Appendix C: List of Experts to Approve the Surveyed Questionnaires

List of Experts

to Approve the Surveyed Questionnaires both English and Khmer

No.	Name	Sex	Role	Institution
1	Dr. Chhinh Sitha	M	Advisor	MoEYS
2	Dr. Onn Sivutha	M	Under Secretary of State	MoCS
3	Dr. Chan Sophea	M	Director	PED, MoEYS
4	Dr. Ai Songheang	M	Director	SEAMEO-TEP, MoEYS

ព្រះរាជាណាចក្រកម្ពុជា
ជាតិ សាសនា ព្រះមហាក្សត្រ

សូមគោរពជូន
លោកបណ្ឌិត ឈិញ ស៊ីថា

កម្មវត្ថុ៖ សំណើសុំជាអ្នកជំនាញ ដើម្បីពិនិត្យ កែសម្រួល និងផ្តល់សុពលភាពលើកម្រងសំណួរសិក្សាស្រាវជ្រាវនិក្ខេបបទថ្នាក់បណ្ឌិត។

យោងតាមកម្មវត្ថុខាងលើ ខ្ញុំបាទមានកិត្តិយស សូមជម្រាបលោកបណ្ឌិត ជ្រាបថា លោក **ឈុន រ៉ាមី** ជាបេក្ខជនបណ្ឌិត ជំនាញរដ្ឋបាលអប់រំ នៅសាកលវិទ្យាល័យកម្ពុជា បាននិងកំពុងធ្វើការសិក្សាស្រាវជ្រាវប្រធានបទ "**ប្រសិទ្ធភាពនៃវិធីសាស្ត្របង្រៀនគណិតវិទ្យា និងការវាយតម្លៃកម្រិតថ្នាក់រៀនរបស់គ្រូបឋមសិក្សាលើលទ្ធផលសិក្សារបស់សិស្សនៅកម្ពុជា**" ដែលខ្ញុំជាសាស្ត្រាចារ្យដឹកនាំ។

ការសិក្សាស្រាវជ្រាវនេះ និស្សិតបានរៀបចំជាកម្រងសំណួរក្នុងគោលបំណងដើម្បីប្រមូលទិន្នន័យពាក់ព័ន្ធជាមួយសំណាកស្រាវជ្រាវនិងសាលាបឋមសិក្សាគោលដៅក្នុងខេត្តកំពង់ឆ្នាំង។ ប្រការនេះ ដើម្បីធានានូវសង្គតិភាព ភាពប្រទាក់ក្រឡា និងភាពគ្រប់ជ្រុងជ្រោយនៃឧបករណ៍ស្រាវជ្រាវជ្រាវនេះ ខ្ញុំសូមគោរពស្នើសុំលោកបណ្ឌិតជាអ្នកជំនាញក្នុងការផ្តល់សុពលភាពលើកម្រងសំណួរនេះ។

អាស្រ័យដូចបានជម្រាបជូនខាងលើ សូមលោកបណ្ឌិត ទទួលពិនិត្យ កែសម្រួល និងផ្តល់សុពលភាពលើកម្រងសំណួរសិក្សាស្រាវជ្រាវនេះដោយក្តីអនុគ្រោះ។

សូមលោកបណ្ឌិត មេត្តាទទួលនូវការគោរពរាប់អានដ៏ស្មោះអំពីខ្ញុំ។

ថ្ងៃព្រហស្បតិ៍ ៨កើត ខែពិសាខ ឆ្នាំថោះ បញ្ចស័ក ព.ស.២៥៦៦
រាជធានីភ្នំពេញ ថ្ងៃទី២៧ ខែមេសា ឆ្នាំ២០២៣

ហត្ថលេខា

បណ្ឌិត **ម៉ុក សារ៉ុម**
(សាស្ត្រាចារ្យដឹកនាំនិក្ខេបបទ)

ជូនភ្ជាប់៖ កម្រងសំណួរស្រាវជ្រាវ
លេខទំនាក់ទំនង៖ 099376663

ព្រះរាជាណាចក្រកម្ពុជា
ជាតិ សាសនា ព្រះមហាក្សត្រ

សូមគោរពជូន
លោកបណ្ឌិត អុន ស៊ីខុធថា

កម្មវត្ថុ៖ សំណើសុំជាអ្នកជំនាញ ដើម្បីពិនិត្យ កែសម្រួល និងផ្តល់សុពលភាពលើកម្រងសំណួរសិក្សាស្រាវជ្រាវនិក្ខេបបទថ្នាក់បណ្ឌិត។

យោងតាមកម្មវត្ថុខាងលើ ខ្ញុំបាទមានកិត្តិយស សូមជម្រាបលោកបណ្ឌិត ជ្រាបថា លោក **ឈុន វ៉ាមី** ជាបេក្ខជនបណ្ឌិត ជំនាញរដ្ឋបាលអប់រំ នៅសាកលវិទ្យាល័យកម្ពុជា បាននិងកំពុងធ្វើការសិក្សាស្រាវជ្រាវប្រធានបទ "**ប្រសិទ្ធភាពនៃវិធីសាស្ត្របង្រៀនគណិតវិទ្យា និងការវាយតម្លៃកម្រិតថ្នាក់រៀនរបស់គ្រូបឋមសិក្សាលើលទ្ធផលសិក្សារបស់សិស្សនៅកម្ពុជា**" ដែលខ្ញុំជាសាស្ត្រាចារ្យដឹកនាំ។

ការសិក្សាស្រាវជ្រាវនេះ និស្សិតបានរៀបចំជាកម្រងសំណួរក្នុងគោលបំណងដើម្បីប្រមូលទិន្នន័យពាក់ព័ន្ធជាមួយសំណាកស្រាវជ្រាវនិងសាលាបឋមសិក្សាគោលដៅក្នុងខេត្តកំពង់ឆ្នាំង។ ប្រការនេះ ដើម្បីធានានូវសង្គតិភាព ភាពប្រទាក់ក្រឡា និងភាពគ្រប់ជ្រុងជ្រោយនៃឧបករណ៍ស្រាវជ្រាវជ្រាវនេះ ខ្ញុំសូមគោរពស្នើសុំលោកបណ្ឌិតជាអ្នកជំនាញក្នុងការផ្តល់សុពលភាពលើកម្រងសំណួរនេះ។

អាស្រ័យដូចបានជម្រាបជូនខាងលើ សូមលោកបណ្ឌិត ទទួលពិនិត្យ កែសម្រួល និងផ្តល់សុពលភាពលើកម្រងសំណួរសិក្សាស្រាវជ្រាវនេះដោយក្តីអនុគ្រោះ។

សូមលោកបណ្ឌិត មេត្តាទទួលនូវការគោរពរាប់អានដ៏ស្មោះអំពីខ្ញុំ។

ថ្ងៃព្រហស្បតិ៍ ៨កើត ខែពិសាខ ឆ្នាំថោះ បញ្ចស័ក ព.ស.២៥៦៦
រាជធានីភ្នំពេញ ថ្ងៃទី២៧ ខែមេសា ឆ្នាំ២០២៣
ហត្ថលេខា

បណ្ឌិត **ម៉ុក សារ៉ុម**
(សាស្ត្រាចារ្យដឹកនាំនិក្ខេបបទ)

ជូនភ្ជាប់៖ កម្រងសំណួរស្រាវជ្រាវ
លេខទំនាក់ទំនង៖ 099376663

ព្រះរាជាណាចក្រកម្ពុជា
ជាតិ សាសនា ព្រះមហាក្សត្រ

សូមគោរពជូន
លោកបណ្ឌិត ចាន់ សុភា

កម្មវត្ថុះ សំណើសុំជាអ្នកជំនាញ ដើម្បីពិនិត្យ កែសម្រួល និងផ្ដល់សុពលភាពលើកម្រងសំណួរសិក្សាស្រាវជ្រាវនិក្ខេបបទថ្នាក់បណ្ឌិត។

យោងតាមកម្មវត្ថុខាងលើ ខ្ញុំបាទមានកិត្តិយស សូមជម្រាបលោកបណ្ឌិត ជ្រាបថា លោក **ឈុន រ៉ាមី** ជាបេក្ខជនបណ្ឌិត ជំនាញរដ្ឋបាលអប់រំ នៅសាកលវិទ្យាល័យកម្ពុជា បាននិងកំពុងធ្វើការសិក្សាស្រាវជ្រាវប្រធានបទ **"ប្រសិទ្ធភាពនៃវិធីសាស្ត្របង្រៀនគណិតវិទ្យា និងការវាយតម្លៃកម្រិតថ្នាក់រៀនរបស់គ្រូបឋមសិក្សាលើលទ្ធផលសិក្សារបស់សិស្សនៅកម្ពុជា"** ដែលខ្ញុំជាសាស្ត្រាចារ្យដឹកនាំ។

ការសិក្សាស្រាវជ្រាវនេះ និស្សិតបានរៀបចំជាកម្រងសំណួរក្នុងគោលបំណងដើម្បីប្រមូលទិន្នន័យពាក់ព័ន្ធជាមួយសំណាកស្រាវជ្រាវនិងសាលាបឋមសិក្សាគោលដៅក្នុងខេត្តកំពង់ឆ្នាំង។ ប្រការនេះ ដើម្បីធានានូវសង្គតិភាព ភាពប្រទាក់ក្រឡា និងភាពគ្រប់ជ្រុងជ្រោយនៃឧបករណ៍ស្រាវជ្រាវជ្រាវនេះ ខ្ញុំសូមគោរពស្នើសុំលោកបណ្ឌិតជាអ្នកជំនាញក្នុងការផ្ដល់សុពលភាពលើកម្រងសំណួរនេះ។

អាស្រ័យដូចបានជម្រាបជូនខាងលើ សូមលោកបណ្ឌិត ទទួលពិនិត្យ កែសម្រួល និងផ្ដល់សុពលភាពលើកម្រងសំណួរសិក្សាស្រាវជ្រាវនេះដោយក្ដីអនុគ្រោះ។

សូមលោកបណ្ឌិត មេត្តាទទួលនូវការគោរពរាប់អានដ៏ស្មោះអំពីខ្ញុំ។

ថ្ងៃព្រហស្បតិ៍ ៨កើត ខែពិសាខ ឆ្នាំថោះ បញ្ចស័ក ព.ស.២៥៦៦
រាជធានីភ្នំពេញ ថ្ងៃទី២៧ ខែមេសា ឆ្នាំ២០២៣
ហត្ថលេខា

បណ្ឌិត **ម៉ុក សារ៉ុម**
(សាស្ត្រាចារ្យដឹកនាំនិក្ខេបបទ)

ជូនភ្ជាប់៖ កម្រងសំណួរស្រាវជ្រាវ
លេខទំនាក់ទំនង៖ 099376663

ព្រះរាជាណាចក្រកម្ពុជា
ជាតិ សាសនា ព្រះមហាក្សត្រ

សូមគោរពជូន
លោកបណ្ឌិត អែ សុខហ៊ាង

កម្មវត្ថុ៖ សំណើសុំជាអ្នកជំនាញ ដើម្បីពិនិត្យ កែសម្រួល និងផ្តល់សុពលភាពលើកម្រងសំណួរសិក្សាស្រាវជ្រាវនិក្ខេបបទថ្នាក់បណ្ឌិត។

យោងតាមកម្មវត្ថុខាងលើ ខ្ញុំបាទមានកិត្តិយស សូមជម្រាបលោកបណ្ឌិត ជ្រាបថា លោក **ឈុន រ៉ាមី** ជាបេក្ខជនបណ្ឌិត ជំនាញរដ្ឋបាលអប់រំ នៅសាកលវិទ្យាល័យកម្ពុជា បាននិងកំពុងធ្វើការសិក្សាស្រាវជ្រាវប្រធានបទ "**ប្រសិទ្ធភាពនៃវិធីសាស្ត្របង្រៀនគណិតវិទ្យា និងការវាយតម្លៃកម្រិតថ្នាក់រៀនរបស់គ្រូបឋមសិក្សាលើលទ្ធផលសិក្សារបស់សិស្សនៅកម្ពុជា**" ដែលខ្ញុំជាសាស្ត្រាចារ្យដឹកនាំ។

ការសិក្សាស្រាវជ្រាវនេះ និស្សិតបានរៀបចំជាកម្រងសំណួរក្នុងគោលបំណងដើម្បីប្រមូលទិន្នន័យពាក់ព័ន្ធជាមួយសំណាកស្រាវជ្រាវនិងសាលាបឋមសិក្សាគោលដៅក្នុងខេត្តកំពង់ឆ្នាំង។ ប្រការនេះ ដើម្បីជានានូវសង្គតិភាព ភាពប្រទាក់ក្រឡា និងភាពគ្រប់ជ្រុងជ្រោយនៃឧបករណ៍ស្រាវជ្រាវនេះ ខ្ញុំសូមគោរពស្នើសុំលោកបណ្ឌិតជាអ្នកជំនាញក្នុងការផ្តល់សុពលភាពលើកម្រងសំណួរនេះ។

អាស្រ័យដូចបានជម្រាបជូនខាងលើ សូមលោកបណ្ឌិត ទទួលពិនិត្យ កែសម្រួល និងផ្តល់សុពលភាពលើកម្រងសំណួរសិក្សាស្រាវជ្រាវនេះដោយក្តីអនុគ្រោះ។

សូមលោកបណ្ឌិត មេត្តាទទួលនូវការគោរពរាប់អានដ៏ស្មោះអំពីខ្ញុំ។

ថ្ងៃព្រហស្បតិ៍ ៨កើត ខែពិសាខ ឆ្នាំថោះ បញ្ចស័ក ព.ស.២៥៦៦
រាជធានីភ្នំពេញ ថ្ងៃទី២៧ ខែមេសា ឆ្នាំ២០២៣

ហត្ថលេខា

បណ្ឌិត **ម៉ុក សារ៉ុម**
(សាស្ត្រាចារ្យដឹកនាំនិក្ខេបបទ)

ជូនភ្ជាប់៖ កម្រងសំណួរស្រាវជ្រាវ
លេខទំនាក់ទំនង៖ 099376663

Appendix D: List of Experts to Approve the Students' Tests

List of Experts

to Approve the Student Tests

No.	Name	Sex	Role	Institution
01	Kuy Chanmongkul	M	Chief Officer	PED, MoEYS
02	Hang Piseth	M	Chief Officer	PED, MoEYS
03	Bou San	M	Chef Officer	DCD, MoEYS
04	Prum Nguon	M	Vice-Chief Officer	DCD, MoEYS

ព្រះរាជាណាចក្រកម្ពុជា
ជាតិ សាសនា ព្រះមហាក្សត្រ

សូមគោរពជូន
លោក គុយ ច័ន្ទមង្គល

កម្មវត្ថុ៖ សំណើសុំជាអ្នកជំនាញ ដើម្បីពិនិត្យ កែសម្រួល និងផ្តល់សុពលភាពលើកម្រងតេស្តសិស្ស សម្រាប់ការសិក្សាស្រាវជ្រាវនិក្ខេបបទថ្នាក់បណ្ឌិត។

យោងតាមកម្មវត្ថុខាងលើ ខ្ញុំបាទមានកិត្តិយស សូមជម្រាបលោកជ្រាបថា លោក **ឈុន រ៉ាមី** ជាបេក្ខជនបណ្ឌិត ជំនាញរដ្ឋបាលអប់រំ នៅសាកលវិទ្យាល័យកម្ពុជា បាននិងកំពុងធ្វើការសិក្សាស្រាវជ្រាវប្រធានបទ "**ប្រសិទ្ធភាពនៃវិធីសាស្ត្របង្រៀនគណិតវិទ្យា និងការវាយតម្លៃកម្រិតថ្នាក់រៀនរបស់គ្រូបឋមសិក្សាលើលទ្ធផលសិក្សារបស់សិស្សនៅកម្ពុជា**" ដែលខ្ញុំជាសាស្ត្រាចារ្យដឹកនាំ។

ការសិក្សាស្រាវជ្រាវនេះ និស្សិត បានរៀបចំជាកម្រងតេស្តសិស្ស មុខវិជ្ជាគណិតវិទ្យាថ្នាក់ទី១ ដល់ទី៦ ក្នុងគោលបំណងដើម្បីប្រមូលទិន្នន័យពាក់ព័ន្ធជាមួយសំណាកស្រាវជ្រាវ និងសាលាបឋមសិក្សាគោលដៅក្នុងខេត្តកំពង់ឆ្នាំង។ ប្រការនេះ ដើម្បីធានានូវសង្គតិភាព ភាពប្រទាក់ក្រឡា និងភាពគ្រប់ជ្រុងជ្រោយនៃឧបករណ៍ស្រាវជ្រាវជ្រាវនេះ ខ្ញុំសូមគោរពស្នើសុំលោក ជាអ្នកជំនាញក្នុងការផ្តល់សុពលភាពលើកម្រងតេស្តសិស្សនេះ។

អាស្រ័យដូចបានជម្រាបជូនខាងលើ សូមលោកទទួលពិនិត្យ កែសម្រួល និងផ្តល់សុពលភាពលើកម្រងតេស្តសិស្ស សម្រាប់ការសិក្សាស្រាវជ្រាវនេះដោយក្តីអនុគ្រោះ។

សូមលោក មេត្តាទទួលនូវការគោរពរាប់អានដ៏ស្មោះអំពីខ្ញុំ។

ថ្ងៃព្រហស្បតិ៍ ៨កើត ខែពិសាខ ឆ្នាំថោះ បញ្ចស័ក ព.ស.២៥៦៦
រាជធានីភ្នំពេញ ថ្ងៃទី២៧ ខែមេសា ឆ្នាំ២០២៣
ហត្ថលេខា

បណ្ឌិត **ម៉ុក សារ៉ុម**
(សាស្ត្រាចារ្យដឹកនាំនិក្ខេបបទ)

ជូនភ្ជាប់៖ កម្រងតេស្តសិស្ស
លេខទំនាក់ទំនង៖ 099376663

ព្រះរាជាណាចក្រកម្ពុជា
ជាតិ សាសនា ព្រះមហាក្សត្រ

សូមគោរពជូន
លោក ហាង់ ពិសិដ្ឋ

កម្មវត្ថុ៖ សំណើសុំជាអ្នកជំនាញ ដើម្បីពិនិត្យ កែសម្រួល និងផ្ដល់សុពលភាពលើកម្រងតេស្ត សិស្ស សម្រាប់ការសិក្សាស្រាវជ្រាវនិក្ខេបបទថ្នាក់បណ្ឌិត។

យោងតាមកម្មវត្ថុខាងលើ ខ្ញុំបាទមានកិត្តិយស សូមជម្រាបលោកជ្រាបថា លោក **ឈុន រ៉ាមី** ជាបេក្ខជនបណ្ឌិត ជំនាញរដ្ឋបាលអប់រំ នៅសាកលវិទ្យាល័យកម្ពុជា បាននិងកំពុងធ្វើការសិក្សាស្រាវជ្រាវប្រធានបទ "**ប្រសិទ្ធភាពនៃវិធីសាស្ត្របង្រៀនគណិតវិទ្យា និងការវាយតម្លៃកម្រិតថ្នាក់រៀនរបស់គ្រូបឋមសិក្សាលើលទ្ធផលសិក្សារបស់សិស្សនៅកម្ពុជា**" ដែលខ្ញុំជាសាស្ត្រាចារ្យដឹកនាំ។

ការសិក្សាស្រាវជ្រាវនេះ និស្សិត បានរៀបចំជាកម្រងតេស្តសិស្ស មុខវិជ្ជាគណិតវិទ្យា ថ្នាក់ទី១ ដល់ទី៦ ក្នុងគោលបំណងដើម្បីប្រមូលទិន្នន័យពាក់ព័ន្ធជាមួយសំណាកស្រាវជ្រាវ និងសាលាបឋមសិក្សាគោលដៅក្នុងខេត្តកំពង់ឆ្នាំង។ ប្រការនេះ ដើម្បីធានានូវសង្គតិភាព ភាពប្រទាក់ក្រឡា និងភាពគ្រប់ជ្រុងជ្រោយនៃឧបករណ៍ស្រាវជ្រាវជ្រាវនេះ ខ្ញុំសូមគោរពស្នើសុំលោក ជាអ្នកជំនាញក្នុងការផ្ដល់សុពលភាពលើកម្រងតេស្តសិស្សនេះ។

អាស្រ័យដូចបានជម្រាបជូនខាងលើ សូមលោកទទួលពិនិត្យ កែសម្រួល និងផ្ដល់សុពលភាពលើកម្រងតេស្តសិស្ស សម្រាប់ការសិក្សាស្រាវជ្រាវនេះដោយក្តីអនុគ្រោះ។

សូមលោក មេត្តាទទួលនូវការគោរពរាប់អានដ៏ស្មោះអំពីខ្ញុំ។

ថ្ងៃព្រហស្បតិ៍ ៨កើត ខែពិសាខ ឆ្នាំថោះ បញ្ចស័ក ព.ស.២៥៦៦
រាជធានីភ្នំពេញ ថ្ងៃទី២៧ ខែមេសា ឆ្នាំ២០២៣
ហត្ថលេខា

បណ្ឌិត **ម៉ុក សារ៉ុម**
(សាស្ត្រាចារ្យដឹកនាំនិក្ខេបបទ)

ជូនភ្ជាប់៖ កម្រងតេស្តសិស្ស
លេខទំនាក់ទំនង៖ 099376663

ព្រះរាជាណាចក្រកម្ពុជា

ជាតិ សាសនា ព្រះមហាក្សត្រ

សូមគោរពជូន

លោក ម៉ូ សន

កម្មវត្ថុ៖ សំណើសុំជាអ្នកជំនាញ ដើម្បីពិនិត្យ កែសម្រួល និងផ្តល់សុពលភាពលើកម្រងតេស្តសិស្ស សម្រាប់ការសិក្សាស្រាវជ្រាវនិក្ខេបបទថ្នាក់បណ្ឌិត។

យោងតាមកម្មវត្ថុខាងលើ ខ្ញុំបាទមានកិត្តិយស សូមជម្រាបលោកជ្រាបថា លោក **ឈុន រ៉ាមី** ជាបេក្ខជនបណ្ឌិត ជំនាញរដ្ឋបាលអប់រំ នៅសាកលវិទ្យាល័យកម្ពុជា បាននិងកំពុងធ្វើការសិក្សាស្រាវជ្រាវប្រធានបទ "**ប្រសិទ្ធភាពនៃវិធីសាស្ត្របង្រៀនគណិតវិទ្យា និងការវាយតម្លៃកម្រិតថ្នាក់រៀនរបស់គ្រូបឋមសិក្សាលើលទ្ធផលសិក្សារបស់សិស្សនៅកម្ពុជា**" ដែលខ្ញុំជាសាស្ត្រាចារ្យដឹកនាំ។

ការសិក្សាស្រាវជ្រាវនេះ និស្សិត បានរៀបចំជាកម្រងតេស្តសិស្ស មុខវិជ្ជាគណិតវិទ្យាថ្នាក់ទី១ ដល់ទី៦ ក្នុងគោលបំណងដើម្បីប្រមូលទិន្នន័យពាក់ព័ន្ធជាមួយសំណាកស្រាវជ្រាវ និងសាលាបឋមសិក្សាគោលដៅក្នុងខេត្តកំពង់ឆ្នាំង។ ប្រការនេះ ដើម្បីធានានូវសង្គតិភាព ភាពប្រទាក់ក្រឡា និងភាពគ្រប់ជ្រុងជ្រោយនៃឧបករណ៍ស្រាវជ្រាវជ្រាវនេះ ខ្ញុំសូមគោរពស្នើសុំលោក ជាអ្នកជំនាញក្នុងការផ្តល់សុពលភាពលើកម្រងតេស្តសិស្សនេះ។

អាស្រ័យដូចបានជម្រាបជូនខាងលើ សូមលោកទទួលពិនិត្យ កែសម្រួល និងផ្តល់សុពលភាពលើកម្រងតេស្តសិស្ស សម្រាប់ការសិក្សាស្រាវជ្រាវនេះដោយក្តីអនុគ្រោះ។

សូមលោក មេត្តាទទួលនូវការគោរពរាប់អានដ៏ស្មោះអំពីខ្ញុំ។

ថ្ងៃព្រហស្បតិ៍ ៨កើត ខែពិសាខ ឆ្នាំថោះ បញ្ចស័ក ព.ស.២៥៦៦

រាជធានីភ្នំពេញ ថ្ងៃទី២៧ ខែមេសា ឆ្នាំ២០២៣

ហត្ថលេខា

បណ្ឌិត **ម៉ុក សារ៉ុម**

(សាស្ត្រាចារ្យដឹកនាំនិក្ខេបបទ)

ជូនភ្ជាប់៖ កម្រងតេស្តសិស្ស

លេខទំនាក់ទំនង៖ 099376663

ព្រះរាជាណាចក្រកម្ពុជា

ជាតិ សាសនា ព្រះមហាក្សត្រ

សូមគោរពជូន

លោក ព្រុំ ខុន

កម្មវត្ថុ៖ សំណើសុំជាអ្នកជំនាញ ដើម្បីពិនិត្យ កែសម្រួល និងផ្តល់សុពលភាពលើកម្រងតេស្តសិស្ស សម្រាប់ការសិក្សាស្រាវជ្រាវនិក្ខេបបទថ្នាក់បណ្ឌិត។

យោងតាមកម្មវត្ថុខាងលើ ខ្ញុំបាទមានកិត្តិយស សូមជម្រាបលោកជ្រាបថា លោក **ឈុន រ៉ាមី** ជាបេក្ខជនបណ្ឌិត ជំនាញរដ្ឋបាលអប់រំ នៅសាកលវិទ្យាល័យកម្ពុជា បាននិងកំពុងធ្វើការសិក្សាស្រាវជ្រាវប្រធានបទ "**ប្រសិទ្ធភាពនៃវិធីសាស្ត្របង្រៀនគណិតវិទ្យា និងការវាយតម្លៃកម្រិតថ្នាក់រៀនរបស់គ្រូបឋមសិក្សាលើលទ្ធផលសិក្សារបស់សិស្សនៅកម្ពុជា**" ដែលខ្ញុំជាសាស្ត្រាចារ្យដឹកនាំ។

ការសិក្សាស្រាវជ្រាវនេះ និស្សិត បានរៀបចំជាកម្រងតេស្តសិស្ស មុខវិជ្ជាគណិតវិទ្យា ថ្នាក់ទី១ ដល់ទី៦ ក្នុងគោលបំណងដើម្បីប្រមូលទិន្នន័យពាក់ព័ន្ធជាមួយសំណាកស្រាវជ្រាវ និងសាលាបឋមសិក្សាគោលដៅក្នុងខេត្តកំពង់ឆ្នាំង។ ប្រការនេះ ដើម្បីធានានូវសង្គតិភាព ភាពប្រទាក់ក្រឡា និងភាពគ្រប់ជ្រុងជ្រោយនៃឧបករណ៍ស្រាវជ្រាវជ្រាវនេះ ខ្ញុំសូមគោរពស្នើសុំលោក ជាអ្នកជំនាញក្នុងការផ្តល់សុពលភាពលើកម្រងតេស្តសិស្សនេះ។

អាស្រ័យដូចបានជម្រាបជូនខាងលើ សូមលោកទទួលពិនិត្យ កែសម្រួល និងផ្តល់សុពលភាពលើកម្រងតេស្តសិស្ស សម្រាប់ការសិក្សាស្រាវជ្រាវនេះដោយក្តីអនុគ្រោះ។

សូមលោក មេត្តាទទួលនូវការគោរពរាប់អានដ៏ស្មោះអំពីខ្ញុំ។

ថ្ងៃព្រហស្បតិ៍ ៨កើត ខែពិសាខ ឆ្នាំថោះ បញ្ចស័ក ព.ស.២៥៦៦

រាជធានីភ្នំពេញ ថ្ងៃទី២៧ ខែមេសា ឆ្នាំ២០២៣

ហត្ថលេខា

បណ្ឌិត **ម៉ុក សារ៉ុម**

(សាស្ត្រាចារ្យដឹកនាំនិក្ខេបបទ)

ជូនភ្ជាប់៖ កម្រងតេស្តសិស្ស

លេខទំនាក់ទំនង៖ 099376663

Appendix E: MoEYS Approving Letter to Collect Data

ព្រះរាជាណាចក្រកម្ពុជា
ជាតិ សាសនា ព្រះមហាក្សត្រ

ក្រសួងអប់រំ យុវជន និងកីឡា
លេខៈ ៣២៦៧ អយក.បស

ថ្ងៃ ពុធ ៤រោច ខែជេស្ឋ ឆ្នាំថោះ បញ្ចស័ក ព.ស.២៥៦៦
រាជធានីភ្នំពេញ ថ្ងៃទី០៧ ខែមិថុនា ឆ្នាំ២០២៣

ជម្រាបជូន
លោកប្រធានមន្ទីរអប់រំ យុវជន និងកីឡាខេត្តកំពង់ឆ្នាំង

កម្មវត្ថុ៖ ការចុះប្រមូលទិន្នន័យសម្រាប់បញ្ចប់ថ្នាក់បណ្ឌិត លើប្រធានបទ "ប្រសិទ្ធភាព នៃវិធីសាស្ត្របង្រៀនគណិតវិទ្យា និងវង្វាយតម្លៃកម្រិតថ្នាក់រៀនរបស់គ្រូបង្រៀនបឋមសិក្សា លើលទ្ធផលសិក្សារបស់សិស្សនៅកម្ពុជា"។

យោង៖ លិខិតអនុញ្ញាតរបស់សាស្ត្រាចារ្យដឹកនាំ ចុះថ្ងៃទី២ ខែមិថុនា ឆ្នាំ២០២៣។

តបតាមកម្មវត្ថុ និងយោងខាងលើ ខ្ញុំសូមជម្រាបជូន **លោកប្រធាន** ជ្រាបថា៖ ក្រសួងអប់រំ យុវជន និងកីឡា បានអនុញ្ញាត **លោក ឈុន រ៉ាមី** និស្សិតថ្នាក់បណ្ឌិតផ្នែកគ្រប់គ្រងអប់រំ នៅសាកលវិទ្យាល័យកម្ពុជា ឱ្យចុះប្រមូលទិន្នន័យ សម្រាប់បញ្ចប់ថ្នាក់បណ្ឌិតលើប្រធានបទ "ប្រសិទ្ធភាពនៃវិធីសាស្ត្របង្រៀនគណិតវិទ្យា និង វង្វាយតម្លៃកម្រិតថ្នាក់រៀនរបស់គ្រូបង្រៀនបឋមសិក្សា លើលទ្ធផលសិក្សារបស់សិស្សនៅកម្ពុជា" "Effectiveness of Mathematic Teaching Methodology and Classroom Assessment by Primary School Teachers on Student Learning Outcomes in Cambodia"។ ការស្រាវជ្រាវនេះ នឹងប្រមូលទិន្នន័យពីលោកគ្រូ អ្នកគ្រូ និងសិស្សានុសិស្ស នៅតាមសាលាបឋមសិក្សាក្នុងខេត្តកំពង់ឆ្នាំង តាមពេលវេលា និងទីកន្លែងសមរម្យ ដោយមិនបង្កផលប៉ះពាល់ដល់ការបង្រៀននិងរៀនឡើយ។

អាស្រ័យហេតុនេះ សូម **លោកប្រធាន** ផ្តល់កិច្ចសហការ និងសម្របសម្រួលដល់ការប្រមូលទិន្នន័យខាងលើ តាមការគួរ។

សូម **លោកប្រធានមន្ទីរអប់រំ យុវជន និងកីឡាខេត្តកំពង់ឆ្នាំង** ទទួលនូវការរាប់អានដ៏ស្មោះពីខ្ញុំ។

រដ្ឋមន្ត្រីក្រសួងអប់រំ យុវជន និងកីឡា

បណ្ឌិតសភាចារ្យ ហង់ជួន ណារ៉ុន

ចម្លងជូន៖
- រដ្ឋបាលខេត្តកំពង់ឆ្នាំង
- អគ្គនាយកដ្ឋានអប់រំ
- ខុទ្ទកាល័យឯកឧត្តមបណ្ឌិតសភាចារ្យរដ្ឋមន្ត្រី "ដើម្បីជូនជ្រាបជាព័ត៌មាន"
- កាលប្បវត្តិ
- ឯកសារ នាយកដ្ឋានបឋមសិក្សា

អាសយដ្ឋានលេខ៨០ មហាវិថី ព្រះនរោត្តម ភ្នំពេញ កម្ពុជា ទូរស័ព្ទ: (៨៥៥-២៣) ២២០ ៦៧៣ / ២២០ ៣០៤ ទូរសារ: (៨៥៥-២៣) ២១៧ ២៥០ / ២១២ ៥១២
អ៊ីមែល: info@moeys.gov.kh / administration@moeys.gov.kh គេហទំព័រ : www.moeys.gov.kh

Appendix F: Previous Related Research Studies

Previous Studies

No.	Studies	Data	Methodology	Finding
1	Sisemore (2018), United State of America	About 37 teachers and multiple teacher teams collaborate with this researcher at five nearby high schools.	The analysis in this paper is quantitative. This will look at how each class's results changed from a pre- to a post-assessment and calculate the disparity between the two. Utilizing a paired t-test, compare the scores of the first and second classes.	There has always been disagreement over how pupils should study mathematics. The two main kinds of methodologies that legislators, administrators, teachers, parents, and even students have embraced are constructivism and traditionalism. During the assessment's open-ended section, the class that received constructivist instruction showed a greater comprehension of mathematical ideas and more links to the outside world. The future study: firstly, could the multiple-choice section of the assessment yield different findings if students were exposed to constructivist approaches over a longer period of time? Secondly, would student accomplishment on long-term goals be more consistent with constructivist methods?
2	Adewoye (2018), Nigeria	13 teachers from 7 schools that volunteered for the research made up the teacher sample size, which was insufficient for inferential analysis.	The purpose of this quantitative study was to evaluate how two different teacher professional development programs affected teachers' FAQs and, in turn, students' self-regulation in primary school mathematics. The goal of the professional development was to improve formative assessment quality and to help teachers become more	levels of FAQ for teachers in the workshop-plus and workshop-only groups were gradually raised. Compared to their colleagues in the workshop only group, the teachers in the workshop plus group scored higher on the FAQ. Compared to their peers, students whose teachers participated in the workshop-plus variation demonstrated superior self-regulation. Larger instructor samples are needed for future studies. This study showed that more investigation is required to fully understand how FAQ affects students' self-regulation abilities and scores. There should be an effort to learn more about the impact

			adept at using it. The self-regulation of primary school students was the outcome of interest.	formative assessment has on student learning. Government officials and legislators should also be made aware of the value of giving students the freedom to take ownership of their education and the ways that formative assessment procedures can help achieve that goal. Therefore, it is crucial that more extensive study be conducted in the Nigerian setting to ascertain how the transformative assessment model and professional development framework could serve as a foundation for enhancing student autonomy.
3	Ulu (2017), Turkey	There were 22 students in the study group—13 girls and 9 boys. The students' range in age from 10 years and 2 months to 10 years and 9 months.	The fundamental method to qualitative analysis guided the study's design. The student offers valuable insights into their thought processes, and in order to assess cognitive ability and investigate the depth of the student's thinking, the clinical interview method—a technique that involves asking open-ended questions—must be used. Standardized tests just measure how well or poorly students answer an issue; they don't ask them why they did it that way or what they should have done to get the desired outcome.	The majority of students were unable to propose a reasonable solution, and the replies were split into two themes: unrealistic and realistic. Most students in primary schools received accurate math grades, but many were unable to understand the results in practical situations. This shows that there is a need to enhance the connection between mathematics and real life starting at a young age. The future study: the purpose of the studies should be to enhance students' abilities to validate during in-class activities. Although the primary school children were modest in number, it was evident that they could model and test that model; yet, the application classroom teacher had not been assigning modeling challenges to the class. Therefore, more research may be done to find out what teachers think about the modeling issues that give kids practical math skills, and educators can receive training in this area.
4	KERMA (2019), Algeria	The case study explores the opinions of twenty teachers from ten primary schools in the west Algiers region of Sidi Bel Abbes.	The fundamental ideas that guide the development of the qualitative framework used to explain the key ideas and problems related to the	It exposed a wide range of perspectives on competency-based assessment, including problems and limitations that keep teachers from properly implementing CBA changes. The way that teachers teach and make decisions is a reflection of their

		Because of their proximity to curriculum creation, educational reforms, and workshops on competency-based methodologies for teaching and assessment at various levels of assessment training, the target teachers were recognized as a significant case.	current study. The corpus examines how the teachers use assessment, their views toward it, and how it affects their day-to-day instructions in the classroom. It makes an effort to throw light on the various aspects of evaluation that the chosen informants employed, as well as their idea, conduct, and methods. The researcher then went on to explain and defend the case study methodology, the qualitative case study's justification, and the general and particular sample selection criteria that were employed. To give readers accurate information on the subjects discussed in the interviews, the most common ways of gathering data are discussed.	pedagogical concepts. The way that instructors conducted assessments in the classroom was greatly influenced by their views and opinions about the subject, even if they lacked the necessary skills to carry out assessments in primary schools. The deficiency in competencies was attributed to inadequate teacher training, which neglected assessment procedures. It therefore revealed that instructors' perceptions of the new curriculum and assessment guidelines seemed to be deeply ingrained in their conception of assessment. The information and expertise they had gained in assessment during their classroom activities, especially under the CBA, was also ingrained in their capacity to handle assessment-related difficulties. It suggests potential directions for future investigation that might offer more in-depth understanding of assessment-related problems that fell outside the purview of this study. To clarify the connection between teachers' beliefs and their classroom activities, more field research is also needed. Future study on teachers' opinions of formative and summative assessments, informal assessments, assessments in other learning domains, and assessments at various grade levels may be conducted using the existing technique.
5	Cuyler (2021), United State of America	Teachers of mathematics in primary school, first, and second grades at the two schools under investigation participated in the study. Teachers received emails inviting them to take part in this	Based on teachers' memories of students in their early years, qualitative study was consistent with creating a retrospective portrayal of kids who were currently having difficulty with arithmetic in the fourth and	Despite the fact that participants indicated strategies for improving math student achievement, there appears to be a gap between the strategies teachers employ and the real benefits those strategies provide for their pupils. Data analysis showed that difficulties experienced by both current and former students have remained constant over time, and that there is no change in the amount of information available about

		study. 16 teachers were projected to take part in the study. It was my hope that all teachers, or at least three or four instructors from each grade, would be willing to participate because there weren't many people there.	fifth grades. Open-ended interview questions are a common tool used in case study research designs to collect data; case studies necessitate investigations taking place in real environments. The underlying realities that surfaced from the data were then discovered through the coding of interviews.	learning mathematics, suggesting a degree of complacency in early grade instruction. A potential direction for future research could be to examine teachers' perceptions of their own efficacy in enhancing mathematics education. This shows that children's educators may be getting a little too comfortable with the lessons and learning opportunities they are giving young students.
6	Prescott (2017), United State of America	157 students who were enrolled in developmental math classes made up the study's sample size. Nine beginning or intermediate algebra classes made up the sample; five of the courses were computer-mediated, and the other four were lecture-based.	The purpose of this quantitative study was to investigate the connections between students' math achievement and math self-efficacy in computer-mediated and traditional lecture-based developmental courses that make use of Connect Math. Students answered questions about their perceptions of Connect Math and their level of math self-efficacy.	The study discovered a substantial positive link between age and math self-efficacy, but no significant difference in math self-efficacy was identified between students participating in computer-mediated math courses utilizing Connect Math and traditional lecture-based developmental math courses. Finally, it was determined that math self-efficacy grew with age and declined with age. Further study is required to examine additional contextual aspects that could impact performance, self-efficacy, and perceptions of specific technological platforms.
7	(Miah, Based on comparisons of TIMSS results from 1995-2015)	The way in which the IEA, who oversee the cycles, considered ethical considerations was examined, as was the use of the TIMSS online data that was already available. Participants cannot learn who is gathering their data	The materials used in secondary research are easily obtainable and are gathered from sources like government agencies and academic institutions.	England's low ranking in the TIMSS tables can only be attributed to their own pressure to adopt the same pedagogy as the countries with the highest scores. As a result, they have focused less on Sweden and other nations that share their values and aspirations for the general advancement of math. The modest gain in TIMSS scores over the course of each of the four years can be attributed to the delayed borrowing and implementation process. The claim that curricula are

		because this is done digitally. In this case, it may be said that the researcher should take confidentiality into account by not mentioning individual names unless they have already been recorded.		always evolving calls into question the value of competition since it forces one nation to catch up with the next accomplishment once it has achieved something else. According to the survey, teachers are becoming more and more shocked by the positive effects that efforts like mastery are having on students' academic success, even though there are cultural ramifications when adopting pedagogical approaches. Further research on this topic may raise concerns about whether policies are perceived to be equally beneficial for SEN students and whether their needs are taken into consideration when adopting them.
8	Kremer (2019), United State of America	12 learning coaches and 151 Math I students might have participated in the study, according to the request for participation.	The qualitative analysis was used for this study.	The results of this study confirm that those two elements are crucial for students to successfully complete a course in a virtual school; however, based on feedback from learning coaches and students, virtual schools can start modifying the model to make it more user-friendly for all learners. Future research will use survey results, observational data, and interviews from accessible engagement and transactional distance measurements for a mixed-methods study design in an effort to gain a more objective understanding of the behavior of students and learning coaches.
9	Ndlovu (2019), South Africa	While their teachers were teaching mathematics classes of their choosing, three Grade 6 classes from three separate schools were watched. The study involved the deliberate selection of three	To collect, document, and evaluate data for the study, qualitative research methodology was used. Teachers' interviews and observations in the classroom were used to gather data for this investigation.	Meaningful learning at the Grade 6 level in Eswatini was made possible by the ways in which math instructors constructed learner-centered practices and the degree to which they personally implemented these practices. The notion of learner-centered teaching is hazily understood by the teachers. Their design lacks a clear grasp of the theories and methods underlying learner-centered education, viewing the

		proficient and accomplished Grade 6 Mathematics instructors to take part. Regarding their proficiency in mathematics, the Grade 6 students' abilities were diverse.		teacher's role as only providing guidance. The teachers disregarded the primary purpose of learner-centered practices, which is to facilitate meaningful learning, in favor of emphasizing external forms in their implementation of what they called "learner-centered practices." Further study endeavors may investigate the nature of professional development initiatives established to assist educators in executing the curriculum. Subsequent research endeavors that center on the characteristics of mathematics education teaching methodologies at education colleges. To enable for a sound comparison of the constructs and enactments of learner-centered practices by Grade 6 Mathematics instructors, future research should concentrate on all four areas of the nation and include rural schools. Data for the current study came from urban schools in Eswatini and from a single region.
10	Akhmedina (2017), Kazakhstani	8 teachers with a range of teaching experiences—from 1 to 32 years—were chosen to teach courses like arithmetic, biology, English, Russian, and Kazakh.	This qualitative study characteristic made it possible to analyze and interpret the data gathered in order to comprehend actual problems with the formative assessment implementation. Semi-structured one-on-one interviews were selected as the method of data gathering.	They have to do with time, students (having the incorrect idea of their roles in classroom assessment), and inadequate professional training and knowledge (creating tasks and activities for classroom assessment, providing constructive feedback to students). Although formative assessment is a potent tool in education, it is not always effective. Therefore, it is crucial that legislators and administrators take into account the challenges instructors face when integrating formative assessment into their lesson plans. Gender discrepancies should be eliminated in future research by having an equal number of male and female participants, and their goal should be to

				uncover some topic-specific problems with the use of formative evaluation.
11	Reece (2021), United State of America	One of the LCPS 10 MICs provided support to 200 K–12 math teachers who made up the study's target population or sampling frame. The 60 instructors at the four middle schools, four high schools, and one alternative education center are supported by five MICs, while the 140 teachers at the eleven primary schools are supported by the remaining five.	For this study, two quantitative surveys were explicitly taken into consideration: Examining Mathematics Coaching Teacher Reflection and Impact Survey and Teachers Perceptions on Instructional Coaches to Support and Facilitate the Implementation of the Common Core Standards.	The findings showed that although relationships with teachers were not found to be statistically significant in the teacher perception of impact, two MIC roles—knowledge of curriculum resources and facilitation of pedagogy—can predict teachers' perception of the impact of mathematics instructional coaching. Convenience sampling will not be used in future research; random sampling is the preferable approach (Creswell, 2015). Rather of yielding outcomes exclusive to one school district, data from a random selection would be more broadly applicable. An alternative distribution strategy would be used in conjunction with a different sample strategy to boost response rates and produce more broadly applicable results.
12	Minkkinen (2022), United State of America	34 students in all, divided into two parts of 17 students each, took part in the study. Male students made up 35% of the student body, while female students made up 65%. All forty of the pupils were Caucasian. Furthermore, two of the 40 participants in the study—one in each class—were receiving special education services. The two classes' compositions were comparable to one another.	For the researcher, figuring out how to test the effectiveness of a particular formative assessment approach proved to be challenging. A quantitative method was found to be the most effective after much research and discussion about how to approach this.	Drawing on the findings of this investigation, non-permanent workspaces can be employed as a formative assessment technique to facilitate improved student outcomes with regard to both success and attitudes toward algebra. Notwithstanding the limitations of this specific study, the research offered and significant results nevertheless support this conclusion. In the future, researchers might think about doing this study on a bigger sample size of pupils. Another constraint on the study's findings is that it only included two subsets of kids from a single school. It's possible that pupils in one class were already better math students than those in the other, or that they had more positive attitudes toward algebra than their classmates in the other Basic Algebra portion.

				Conducting this study over a longer time period and/or with a different topic taught would be another consideration to better comprehend the study's outcomes.
13	Smith et al. (2022), South Africa	The research questionnaire was given to all math teachers in the provinces of the Northern Cape and Western Cape who took part in a CPD program. The questionnaire could be completed voluntarily. Approximately 72% of the teachers—51 out of 70—responded. With ages ranging from 21 to 61, there were 27 men and 24 women among the 51 teachers.	The research design employed for this paper is based on a quantitative research approach.	Their desire to grow as teachers and people, which includes enhancing their subject-matter expertise to eventually enhance their students' learning outcomes, is one of the motivations behind their participation in CPD events. Teachers mostly want to learn by doing experiments in their own classrooms, reflecting on their own teaching, working together with other educators at their own schools, and, to a lesser degree, taking part in other professional development activities. This suggests that they have a preference for creative, up-to-date, and innovative CPD activities that are directly related to their classroom practice and improve the design of investigations and assessments. Regarding the commencement and effectiveness of teacher-led and teacher-initiated approaches to CPD, regardless of subject area, further study is required in the South African setting. Subject advisors' developmental requirements and concurrent desires for CPD represent another gap in the literature. This could be a topic for more investigation.
14	Dagienė et al. (2022), 52 countries	We examine the state of informatics in primary education across the globe (phase I of the initial study includes 52 nations). Our quantitative results are bolstered by qualitative information gathered from nations that have either developed or implemented	This research study uses a mixed method approach, meaning that both quantitative and qualitative methodologies are employed to gather and analyze data, in order to investigate the state of informatics education in primary schools today and teachers' comprehension of	It's a tough and demanding endeavor to introduce informatics instruction in primary schools. The three most significant problems, as identified by ACM Europe and Informatics Europe, are: 1) curriculum development; 2) teacher preparation and training; and 3) research on implementation strategies and recommended curricula. The quantitative study's findings indicate that, even in the majority of the countries surveyed—including those where an informatics-related primary education curriculum has

		informatics curricula (phase II of the first study). Phase III, the second study, involved surveying 110 in-service teachers as a case study to address Research Question 2.	CT in various nations. In terms of methodology, our study was planned as a survey. In-depth questionnaires were written and used for the data collection procedures.	been implemented or is in the process of being developed—most primary teacher education programs only offer instruction in digital literacy. Further insights from experts indicated that, at the time of this research, pre-service teacher education was receiving less emphasis than in-service teacher professional development and training. Furthermore, professional development programs include training in digital literacy, CT, and informatics.
15	Kane & Saclarides (2022), Canada	12 elementary mathematics coaches and one district administrator formed our partnership. 10 of the participants in our study identified as White, and three as Black. All of them were female. Our participants had been teaching in classrooms for four to thirty years on average. Moreover, eight of the coaches were seasoned professionals because they had been with the Hamilton School District since the program's beginning, which was four years before the year our data was gathered. Three others were coaching for the first or second time. Facilitator Beth was starting her first full year in her new	This research is a qualitative discourse analysis of coaches of primary mathematics as they worked together to complete the arithmetic.	According to our analysis, the coaches' performance of the math routine provided opportunities for them to talk about students' and their own mathematical thinking, the concepts and disciplinary procedures included in the task, and how those practices and concepts related to grade level expectations. Additionally, the task demonstrated how tasks could be modified for instruction to improve mathematical access, especially for students whose performance is deemed to be below grade level. Additionally, our data revealed that solving the math problems infrequently led to direct discussions on mathematics tutoring. We suggest potential directions for further study based on the analysis's results. As previously stated, we anticipate that the math conversations might be expanded to include specific allusions to coaching by include protocol questions that specifically address the formation of a coach's professional coaching vision. We do, however, also remark that there is still a dearth of work that aims to comprehend this vision, and we hope that this will change. The usage of particular questions regarding coaching practice in the protocol, such as "Which coaching activities might

		position at the time of data collection, which took place in the spring semester.		you draw upon and use when supporting teachers to implement this mathematical task with students, and why," may also be the subject of future research. and/or "How might you engage resistant teachers and organize a professional development session for teachers that focuses on doing the math?"
16	Saeed et al. (2018), Pakistan	All 16,230 primary and secondary school teachers were the target group. A random sample of 550 instructors was selected from the general population. This involved the random selection of 220 secondary school instructors and 330 primary education teachers from the general public.	This research had a quantitative focus. This study employed a cross-sectional survey design. Teachers in public and private schools in the Lahore area were asked to complete a survey that was designed to find out what methods they used for classroom assessments at both the primary and secondary levels.	Formative and summative assessments are the most commonly utilized assessment methods, according to the study's findings. It has been shown that nearly identical methods were employed by private and public schools. The difference between male and female teachers is minuscule and nearly insignificant. While male teachers have used formative assessment, both of them have mostly relied on summative assessments in their instructional processes. Summative assessment is also used in elementary and secondary education. Future research on the higher education system could identify the methods utilized for classroom assessments. It might also compare any two cities instead of focusing on a certain topic. Analyzing classroom evaluation methods may also be done in order to analyze teachers' instruction.
17	Oden (2022), Southeastern United States	51 site-based instructional coaches who supported mathematics in the study district's primary schools were the study's participants.	The statistical method employed in this study to examine the beliefs of mathematics instructional coaches regarding the efficacy of their coaching duties and the impact of both internal and external factors was multiple regression analysis (quantitative).	The majority of the participants were Black female math instructional coaches. Even though the majority of participants had master's degrees or above, many had not taken courses covering a lot of mathematics or coaching-related material. There was no discernible correlation between these factors according to the research. The participants' self-efficacy scores were comparatively high, according to the CSI results. The results also revealed that the most significant internal and external components for effective mathematics coaching, according to the participants, were years of

				experience teaching K–5 mathematics and collaborative planning time. The research will be further by conducting additional extensive, quantitative investigations including a wide range of math instructional coaches from different school populations. Given that almost 70% of the participants in this study had less than five years of experience as math instructional coaches, the findings of a larger sample or more seasoned participants may change. Similarly, with a theoretical foundation, future researchers could construct the external and internal composites in numerous ways.
18	Sharp et al. (2019), Southern United States	The current investigation was carried out in a Southern American public school system. Approximately 70 teachers from all grade levels were being trained and receiving ongoing support using the math workshop technique by this school system at the time of the current study.	First, the quantitative data were examined. For every closed-ended question, the responses were totaled and distributions with frequencies and percentages were presented. Subsequently, descriptive analytic methods were employed to examine the qualitative data obtained from the questionnaire.	The math workshop technique was acknowledged by the study's teachers as a useful teaching strategy for enhancing math instruction. All of the teachers stated that they frequently used the math workshop method in their classes and that they saw several advantages to giving students "time to experience, not just to observe" arithmetic. The present study's instructors' classroom implementation of math workshop was in perfect alignment with the NCTM's (2014) guidelines for mathematics teaching. It is advised that more research be done to better understand the viewpoints of math workshop instructors in elementary, middle, and high schools. Teachers with varied degrees of expertise and from all grade levels should be invited to participate in this research. Future research can include school district-level initiatives of math workshop implementation in addition to a more thorough analysis with a bigger sample size.

19	Schoevers et al. (2019), Netherlands	The study's participating school was located close to Amsterdam in the Netherlands. The school's and the 12 teachers' goal in the MACE initiative was to raise the standard of mathematics instruction.	The qualitative analysis was used for this study.	According to the current study's findings, open interdisciplinary sessions with open learning objectives encouraged mathematical creativity when teachers facilitated extended class discussions and a welcoming environment. This research suggests that mathematical creativity might be easier to foster in open, multidisciplinary classrooms, which is good news for educators. During these lessons, the instructor should concentrate on using strategies such as asking thought-provoking open-ended questions that encourage students to come up with multiple answers and ideas, organizing longer class discussions where students' ideas are central, ensuring that students' responses are acknowledged and valued, and asking follow-up questions to find out more about students' ideas. Future studies could look into the number and types of students in a classroom who are creative in their mathematical expressions. It might also consider creative expressions that are nonverbal.
20	Hackenberg et al. (2021), United State of America	At the beginning of the sixth grade, thirty percent of kids are using the first and second multiplicative ideas, while forty percent are using the third. Therefore, our goal for each trial was to include three MC1, three MC2, and three MC3 students. MC1 pupils were identified throughout the screening process, but they chose not to take part.	The purpose of the worksheet and interview questions was to evaluate students' multiplicative notions (qualitative).	According to this study, the five approaches taken together could support professional development for teachers and aid in the differentiation of mathematics instruction for middle school pupils. We believe that secondary teachers shouldn't be required to produce this information in the same way that we did; instead, they should have access to research-based knowledge as a foundation upon which to develop. To be clear, we do not anticipate classroom teachers to create second order models in the same way that we did. Because of this, we defined the first practice as employing research-based information in the classroom; one example of this practice is the use of second-order models, such the ones used in this study.

	As a result, six MC2 students and three MC3 students were invited to take part in each experiment. 22 students finished the study as a result of attrition: nine, seven, and six students in Experiments 1, 2, and 3, respectively.		More research is required to fully understand the five strategies used by math teachers in the classroom, including how they help teachers diversify instruction, how they are learned, how they affect students, and what has to be added to them to overcome the study's limitations. It is particularly crucial that future research take into account the linguistic, cultural, and socioeconomic dimensions of student diversity.

Appendix G: Results of Piloting Study

Pilot Study

Case Processing Summary			
		N	%
Cases	Valid	30	100.0
	Excluded[a]	0	.0
	Total	30	100.0

a. Listwise deletion based on all variables in the procedure.

Reliability Statistics	
Cronbach's Alpha	N of Items
.728	10

Case Processing Summary			
		N	%
Cases	Valid	30	100.0
	Excluded[a]	0	.0
	Total	30	100.0

a. Listwise deletion based on all variables in the procedure.

Reliability Statistics	
Cronbach's Alpha	N of Items
.932	16

Case Processing Summary			
		N	%
Cases	Valid	30	100.0
	Excluded[a]	0	.0
	Total	30	100.0

a. Listwise deletion based on all variables in the procedure.

Reliability Statistics	
Cronbach's Alpha	N of Items
.892	10

Case Processing Summary

		N	%
Cases	Valid	30	100.0
	Excluded[a]	0	.0
	Total	30	100.0

a. Listwise deletion based on all variables in the procedure.

Reliability Statistics

Cronbach's Alpha	N of Items
.889	6

Case Processing Summary

		N	%
Cases	Valid	30	100.0
	Excluded[a]	0	.0
	Total	30	100.0

a. Listwise deletion based on all variables in the procedure.

Reliability Statistics

Cronbach's Alpha	N of Items
.856	10

Case Processing Summary

		N	%
Cases	Valid	30	100.0
	Excluded[a]	0	.0
	Total	30	100.0

a. Listwise deletion based on all variables in the procedure.

Reliability Statistics

Cronbach's Alpha	N of Items
.927	15

Case Processing Summary

		N	%
Cases	Valid	30	100.0
	Excluded[a]	0	.0
	Total	30	100.0

a. Listwise deletion based on all variables in the procedure.

Reliability Statistics

Cronbach's Alpha	N of Items
.972	15

Appendix H: Results of Independent Sample t-test

T-test

Group Statistics

	Gender	N	Mean	Std. Deviation	Std. Error Mean
TBMT	Male	110	4.0500	.35960	.03429
	Female	168	3.9839	.33181	.02560
TCMTO	Male	110	3.9881	.49289	.04700
	Female	168	3.8705	.50208	.03874
TCMTE	Male	110	4.0055	.48213	.04597
	Female	168	3.9554	.35625	.02749
TPMT	Male	110	3.8379	.53922	.05141
	Female	168	3.6448	.61733	.04763
TBCA	Male	110	4.1373	.39582	.03774
	Female	168	4.0560	.40070	.03091
TSCA	Male	110	3.7570	.60238	.05743
	Female	168	3.5837	.61598	.04752
TPCA	Male	110	3.7236	.61100	.05826
	Female	168	3.5488	.59284	.04574

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
									95% Confidence Interval of the Difference	
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
TBMT	Equal variances assumed	3.522	.062	1.570	276	.117	.06607	.04208	-.01676	.14890
	Equal variances not assumed			1.544	219.817	.124	.06607	.04279	-.01826	.15040
TCMTO	Equal variances assumed	1.167	.281	1.922	276	.056	.11753	.06114	-.00282	.23789
	Equal variances not assumed			1.930	236.248	.055	.11753	.06090	-.00245	.23751
TCMTE	Equal variances assumed	2.897	.090	.995	276	.321	.05010	.05036	-.04904	.14924
	Equal variances not assumed			.935	185.401	.351	.05010	.05356	-.05557	.15576
TPMT	Equal variances assumed	1.390	.239	2.678	276	.008	.19304	.07208	.05113	.33494
	Equal variances not assumed			2.754	254.179	.006	.19304	.07008	.05502	.33105
TBCA	Equal variances assumed	2.098	.149	1.663	276	.098	.08132	.04891	-.01497	.17761
	Equal variances not assumed			1.667	235.231	.097	.08132	.04879	-.01479	.17743
TSCA	Equal variances assumed	1.139	.287	2.313	276	.021	.17324	.07490	.02580	.32068
	Equal variances not assumed			2.324	236.876	.021	.17324	.07455	.02638	.32010
TPCA	Equal variances assumed	.304	.582	2.375	276	.018	.17483	.07360	.02994	.31972

	Equal variances not assumed			2.360	228.200	.019	.17483	.07407	.02889	.32077

Group Statistics

	Location	N	Mean	Std. Deviation	Std. Error Mean
TBMT	Urban	215	3.9935	.34364	.02344
	Rural	63	4.0667	.34172	.04305
TCMTO	Urban	215	3.9137	.52769	.03599
	Rural	63	3.9286	.39954	.05034
TCMTE	Urban	215	3.9535	.42490	.02898
	Rural	63	4.0492	.35052	.04416
TPMT	Urban	215	3.6837	.61012	.04161
	Rural	63	3.8492	.52082	.06562
TBCA	Urban	215	4.0781	.40928	.02791
	Rural	63	4.1222	.36784	.04634
TSCA	Urban	215	3.6099	.65293	.04453
	Rural	63	3.7968	.43952	.05537
TPCA	Urban	215	3.5839	.63070	.04301
	Rural	63	3.7344	.49492	.06235

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
									95% Confidence Interval of the Difference	
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
TBMT	Equal variances assumed	.327	.568	-1.488	276	.138	-.07318	.04917	-.16997	.02362
	Equal variances not assumed			-1.493	101.603	.139	-.07318	.04902	-.17041	.02405
TCMTO	Equal variances assumed	1.013	.315	-.207	276	.836	-.01491	.07188	-.15642	.12660
	Equal variances not assumed			-.241	131.615	.810	-.01491	.06188	-.13731	.10750
TCMTE	Equal variances assumed	.006	.939	-1.632	276	.104	-.09572	.05865	-.21117	.01973
	Equal variances not assumed			-1.812	120.418	.072	-.09572	.05282	-.20029	.00886
TPMT	Equal variances assumed	1.959	.163	-1.954	276	.052	-.16549	.08470	-.33223	.00126
	Equal variances not assumed			-2.130	116.434	.035	-.16549	.07770	-.31937	-.01160
TBCA	Equal variances assumed	.789	.375	-.769	276	.443	-.04408	.05735	-.15699	.06883
	Equal variances not assumed			-.815	110.914	.417	-.04408	.05410	-.15129	.06312
TSCA	Equal variances assumed	8.661	.004	-2.133	276	.034	-.18690	.08761	-.35937	-.01444
	Equal variances not assumed			-2.630	149.946	.009	-.18690	.07106	-.32731	-.04650
TPCA	Equal variances assumed	6.014	.015	-1.743	276	.082	-.15052	.08637	-.32054	.01951
	Equal variances not assumed			-1.987	126.733	.049	-.15052	.07575	-.30042	-.00062

Group Statistics

	TG	N	Mean	Std. Deviation	Std. Error Mean
TBMT	1-3	155	3.9742	.34185	.02746
	4-6	123	4.0553	.34265	.03090
TCMTO	1-3	155	3.8298	.54059	.04342
	4-6	123	4.0269	.42299	.03814
TCMTE	1-3	155	3.9645	.45050	.03619
	4-6	123	3.9886	.35533	.03204
TPMT	1-3	155	3.7140	.62035	.04983
	4-6	123	3.7304	.56197	.05067
TBCA	1-3	155	4.0594	.44469	.03572
	4-6	123	4.1244	.33372	.03009
TSCA	1-3	155	3.6353	.60342	.04847
	4-6	123	3.6737	.63204	.05699
TPCA	1-3	155	3.5708	.60499	.04859
	4-6	123	3.6775	.60239	.05432

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
									95% Confidence Interval of the Difference	
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
TBMT	Equal variances assumed	.227	.634	-1.962	276	.051	-.08109	.04132	-.16244	.00026
	Equal variances not assumed			-1.962	261.562	.051	-.08109	.04133	-.16248	.00030
TCMTO	Equal variances assumed	2.612	.107	-3.317	276	.001	-.19709	.05942	-.31407	-.08011
	Equal variances not assumed			-3.410	275.953	.001	-.19709	.05779	-.31086	-.08332
TCMTE	Equal variances assumed	.069	.793	-.485	276	.628	-.02410	.04965	-.12184	.07364
	Equal variances not assumed			-.499	275.993	.618	-.02410	.04833	-.11925	.07104
TPMT	Equal variances assumed	.056	.814	-.228	276	.820	-.01637	.07188	-.15788	.12513
	Equal variances not assumed			-.230	271.158	.818	-.01637	.07107	-.15628	.12354
TBCA	Equal variances assumed	.583	.446	-1.348	276	.179	-.06504	.04824	-.15999	.02992
	Equal variances not assumed			-1.393	275.191	.165	-.06504	.04670	-.15698	.02691
TSCA	Equal variances assumed	.221	.639	-.517	276	.606	-.03844	.07441	-.18493	.10805
	Equal variances not assumed			-.514	256.150	.608	-.03844	.07481	-.18577	.10888
TPCA	Equal variances assumed	.025	.875	-1.464	276	.144	-.10675	.07292	-.25030	.03679
	Equal variances not assumed			-1.465	262.323	.144	-.10675	.07288	-.25026	.03675

Appendix I: Results of One-way ANOVA

ANOVA

Descriptive

		N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean Lower Bound	95% Confidence Interval for Mean Upper Bound	Minimum	Maximum
TBMT	<31	56	3.9482	.38565	.05153	3.8449	4.0515	2.80	4.80
	31-40	98	3.9786	.31204	.03152	3.9160	4.0411	3.00	5.00
	>40	124	4.0629	.34322	.03082	4.0019	4.1239	2.00	5.00
	Total	278	4.0101	.34396	.02063	3.9695	4.0507	2.00	5.00
TCMTO	<31	56	3.8750	.49829	.06659	3.7416	4.0084	2.31	4.88
	31-40	98	3.8399	.40802	.04122	3.7581	3.9217	2.75	4.88
	>40	124	3.9970	.55742	.05006	3.8979	4.0961	1.00	5.00
	Total	278	3.9170	.50089	.03004	3.8579	3.9762	1.00	5.00
TCMTE	<31	56	3.9446	.36874	.04928	3.8459	4.0434	3.10	5.00
	31-40	98	3.9837	.36713	.03709	3.9101	4.0573	3.10	5.00
	>40	124	3.9823	.46048	.04135	3.9004	4.0641	1.00	5.00
	Total	278	3.9752	.41059	.02463	3.9267	4.0237	1.00	5.00
TPMT	<31	56	3.7202	.53852	.07196	3.5760	3.8645	2.67	5.00
	31-40	98	3.6633	.59589	.06019	3.5438	3.7827	2.67	5.00
	>40	124	3.7675	.61699	.05541	3.6578	3.8771	1.00	5.00
	Total	278	3.7212	.59423	.03564	3.6511	3.7914	1.00	5.00
TBCA	<31	56	4.0964	.35160	.04698	4.0023	4.1906	3.10	4.90
	31-40	98	4.1122	.35704	.03607	4.0407	4.1838	3.00	5.00
	>40	124	4.0653	.45120	.04052	3.9851	4.1455	1.10	5.00
	Total	278	4.0881	.40005	.02399	4.0409	4.1354	1.10	5.00
TSCA	<31	56	3.6393	.57865	.07732	3.4843	3.7942	2.07	4.73
	31-40	98	3.5823	.64951	.06561	3.4521	3.7125	1.80	4.93
	>40	124	3.7134	.60231	.05409	3.6064	3.8205	1.00	5.00
	Total	278	3.6523	.61542	.03691	3.5796	3.7249	1.00	5.00
TPCA	<31	56	3.5500	.52095	.06962	3.4105	3.6895	2.60	5.00
	31-40	98	3.5741	.65966	.06664	3.4419	3.7064	2.00	5.00
	>40	124	3.6833	.59335	.05328	3.5779	3.7888	1.00	4.93
	Total	278	3.6180	.60508	.03629	3.5465	3.6894	1.00	5.00

ANOVA

		Sum of Squares	df	Mean Square	F	Sig.
TBMT	Between Groups	.658	2	.329	2.816	.062
	Within Groups	32.114	275	.117		
	Total	32.772	277			

TCMTO	Between Groups	1.474	2	.737	2.980	.052
	Within Groups	68.023	275	.247		
	Total	69.497	277			
TCMTE	Between Groups	.066	2	.033	.193	.824
	Within Groups	46.633	275	.170		
	Total	46.699	277			
TPMT	Between Groups	.594	2	.297	.841	.432
	Within Groups	97.217	275	.354		
	Total	97.811	277			
TBCA	Between Groups	.125	2	.063	.390	.678
	Within Groups	44.205	275	.161		
	Total	44.331	277			
TSCA	Between Groups	.953	2	.477	1.261	.285
	Within Groups	103.958	275	.378		
	Total	104.911	277			
TPCA	Between Groups	.977	2	.488	1.337	.264
	Within Groups	100.440	275	.365		
	Total	101.417	277			

Descriptives

		N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean Lower Bound	95% Confidence Interval for Mean Upper Bound	Minimum	Maximum
TBMT	<BA	157	4.0045	.33975	.02711	3.9509	4.0580	2.00	4.90
	BA	117	4.0026	.33668	.03113	3.9409	4.0642	2.80	5.00
	>BA	4	4.4500	.52599	.26300	3.6130	5.2870	4.00	5.00
	Total	278	4.0101	.34396	.02063	3.9695	4.0507	2.00	5.00
TCMTO	<BA	157	3.8654	.49815	.03976	3.7869	3.9440	1.00	5.00
	BA	117	3.9861	.50617	.04680	3.8934	4.0788	2.00	5.00
	>BA	4	3.9219	.17211	.08606	3.6480	4.1957	3.75	4.13
	Total	278	3.9170	.50089	.03004	3.8579	3.9762	1.00	5.00
TCMTE	<BA	157	3.9408	.44027	.03514	3.8714	4.0102	1.00	5.00
	BA	117	4.0248	.36810	.03403	3.9574	4.0922	3.10	5.00
	>BA	4	3.8750	.27538	.13769	3.4368	4.3132	3.60	4.20
	Total	278	3.9752	.41059	.02463	3.9267	4.0237	1.00	5.00
TPMT	<BA	157	3.6783	.61819	.04934	3.5809	3.7758	1.00	5.00
	BA	117	3.7621	.54943	.05080	3.6615	3.8627	2.67	5.00
	>BA	4	4.2083	.76225	.38112	2.9954	5.4212	3.17	5.00
	Total	278	3.7212	.59423	.03564	3.6511	3.7914	1.00	5.00
TBCA	<BA	157	4.0548	.42569	.03397	3.9877	4.1219	1.10	5.00
	BA	117	4.1299	.36348	.03360	4.0634	4.1965	3.00	4.90

	>BA	4	4.1750	.33040	.16520	3.6493	4.7007	3.80	4.50
	Total	278	4.0881	.40005	.02399	4.0409	4.1354	1.10	5.00
TSCA	<BA	157	3.6450	.63507	.05068	3.5449	3.7451	1.00	5.00
	BA	117	3.6536	.59146	.05468	3.5453	3.7619	1.80	4.93
	>BA	4	3.9000	.62183	.31091	2.9105	4.8895	3.33	4.73
	Total	278	3.6523	.61542	.03691	3.5796	3.7249	1.00	5.00
TPCA	<BA	157	3.5924	.61468	.04906	3.4955	3.6893	1.00	5.00
	BA	117	3.6370	.58764	.05433	3.5294	3.7446	2.13	5.00
	>BA	4	4.0667	.69921	.34960	2.9541	5.1793	3.47	5.00
	Total	278	3.6180	.60508	.03629	3.5465	3.6894	1.00	5.00

ANOVA

		Sum of Squares	df	Mean Square	F	Sig.
TBMT	Between Groups	.786	2	.393	3.377	.036
	Within Groups	31.986	275	.116		
	Total	32.772	277			
TCMTO	Between Groups	.976	2	.488	1.959	.143
	Within Groups	68.521	275	.249		
	Total	69.497	277			
TCMTE	Between Groups	.514	2	.257	1.530	.218
	Within Groups	46.185	275	.168		
	Total	46.699	277			
TPMT	Between Groups	1.433	2	.717	2.045	.131
	Within Groups	96.378	275	.350		
	Total	97.811	277			
TBCA	Between Groups	.409	2	.205	1.281	.279
	Within Groups	43.922	275	.160		
	Total	44.331	277			
TSCA	Between Groups	.254	2	.127	.334	.717
	Within Groups	104.657	275	.381		
	Total	104.911	277			
TPCA	Between Groups	.951	2	.475	1.301	.274
	Within Groups	100.466	275	.365		
	Total	101.417	277			

Descriptives

						95% Confidence Interval for Mean			
		N	Mean	Std. Deviation	Std. Error	Lower Bound	Upper Bound	Minimum	Maximum
TBMT	1-10	66	3.9303	.38389	.04725	3.8359	4.0247	2.80	4.80
	11-20	102	4.0039	.30956	.03065	3.9431	4.0647	3.00	5.00

	>20	110	4.0636	.34234	.03264	3.9989	4.1283	2.00	5.00
	Total	278	4.0101	.34396	.02063	3.9695	4.0507	2.00	5.00
TCMTO	1-10	66	3.8475	.46849	.05767	3.7324	3.9627	2.31	4.88
	11-20	102	3.8964	.46151	.04570	3.8058	3.9871	2.63	5.00
	>20	110	3.9778	.54981	.05242	3.8739	4.0817	1.00	5.00
	Total	278	3.9170	.50089	.03004	3.8579	3.9762	1.00	5.00
TCMTE	1-10	66	3.9136	.38626	.04755	3.8187	4.0086	3.10	5.00
	11-20	102	3.9951	.33192	.03287	3.9299	4.0603	3.10	5.00
	>20	110	3.9936	.48411	.04616	3.9022	4.0851	1.00	5.00
	Total	278	3.9752	.41059	.02463	3.9267	4.0237	1.00	5.00
TPMT	1-10	66	3.7222	.54171	.06668	3.5891	3.8554	2.67	5.00
	11-20	102	3.6258	.57278	.05671	3.5133	3.7383	2.67	5.00
	>20	110	3.8091	.63408	.06046	3.6893	3.9289	1.00	5.00
	Total	278	3.7212	.59423	.03564	3.6511	3.7914	1.00	5.00
TBCA	1-10	66	4.0833	.36567	.04501	3.9934	4.1732	3.00	4.90
	11-20	102	4.1049	.32802	.03248	4.0405	4.1693	3.30	4.90
	>20	110	4.0755	.47626	.04541	3.9855	4.1655	1.10	5.00
	Total	278	4.0881	.40005	.02399	4.0409	4.1354	1.10	5.00
TSCA	1-10	66	3.6061	.60919	.07499	3.4563	3.7558	2.07	4.73
	11-20	102	3.5739	.63711	.06308	3.4487	3.6990	1.80	4.93
	>20	110	3.7527	.58978	.05623	3.6413	3.8642	1.00	5.00
	Total	278	3.6523	.61542	.03691	3.5796	3.7249	1.00	5.00
TPCA	1-10	66	3.4980	.54163	.06667	3.3648	3.6311	2.33	5.00
	11-20	102	3.5693	.63770	.06314	3.4440	3.6945	2.00	5.00
	>20	110	3.7352	.59488	.05672	3.6227	3.8476	1.00	4.93
	Total	278	3.6180	.60508	.03629	3.5465	3.6894	1.00	5.00

ANOVA

		Sum of Squares	df	Mean Square	F	Sig.
TBMT	Between Groups	.739	2	.370	3.174	.043
	Within Groups	32.032	275	.116		
	Total	32.772	277			
TCMTO	Between Groups	.769	2	.384	1.538	.217
	Within Groups	68.728	275	.250		
	Total	69.497	277			
TCMTE	Between Groups	.328	2	.164	.972	.379
	Within Groups	46.371	275	.169		
	Total	46.699	277			
TPMT	Between Groups	1.778	2	.889	2.545	.080
	Within Groups	96.034	275	.349		
	Total	97.811	277			
TBCA	Between Groups	.048	2	.024	.149	.862
	Within Groups	44.283	275	.161		

	Total	44.331	277			
TSCA	Between Groups	1.878	2	.939	2.506	.083
	Within Groups	103.033	275	.375		
	Total	104.911	277			
TPCA	Between Groups	2.703	2	1.351	3.764	.024
	Within Groups	98.714	275	.359		
	Total	101.417	277			

Descriptives

		N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean Lower Bound	95% Confidence Interval for Mean Upper Bound	Minimum	Maximum
TBMT	<31	38	3.9526	.28450	.04615	3.8591	4.0461	3.50	4.70
	31-40	145	4.0200	.32115	.02667	3.9673	4.0727	2.80	5.00
	>40	95	4.0179	.39652	.04068	3.9371	4.0987	2.00	4.90
	Total	278	4.0101	.34396	.02063	3.9695	4.0507	2.00	5.00
TCMTO	<31	38	3.7105	.59015	.09573	3.5165	3.9045	2.00	4.88
	31-40	145	3.9427	.47281	.03926	3.8651	4.0203	1.00	5.00
	>40	95	3.9605	.48951	.05022	3.8608	4.0602	2.00	5.00
	Total	278	3.9170	.50089	.03004	3.8579	3.9762	1.00	5.00
TCMTE	<31	38	3.9447	.31852	.05167	3.8400	4.0494	3.10	4.80
	31-40	145	3.9593	.41941	.03483	3.8905	4.0282	1.00	5.00
	>40	95	4.0116	.43045	.04416	3.9239	4.0993	2.00	5.00
	Total	278	3.9752	.41059	.02463	3.9267	4.0237	1.00	5.00
TPMT	<31	38	3.6053	.56476	.09162	3.4196	3.7909	2.67	4.83
	31-40	145	3.7069	.51680	.04292	3.6221	3.7917	2.67	5.00
	>40	95	3.7895	.70384	.07221	3.6461	3.9329	1.00	5.00
	Total	278	3.7212	.59423	.03564	3.6511	3.7914	1.00	5.00
TBCA	<31	38	4.0158	.36799	.05970	3.8948	4.1367	3.10	5.00
	31-40	145	4.0821	.34854	.02894	4.0249	4.1393	2.80	4.90
	>40	95	4.1263	.47807	.04905	4.0289	4.2237	1.10	5.00
	Total	278	4.0881	.40005	.02399	4.0409	4.1354	1.10	5.00
TSCA	<31	38	3.4649	.62893	.10203	3.2582	3.6716	2.00	4.60
	31-40	145	3.6418	.56743	.04712	3.5487	3.7350	1.80	4.93
	>40	95	3.7432	.66666	.06840	3.6074	3.8790	1.00	5.00
	Total	278	3.6523	.61542	.03691	3.5796	3.7249	1.00	5.00
TPCA	<31	38	3.4333	.55513	.09005	3.2509	3.6158	2.13	4.67
	31-40	145	3.6363	.55744	.04629	3.5448	3.7278	1.67	5.00
	>40	95	3.6639	.68202	.06997	3.5249	3.8028	1.00	5.00
	Total	278	3.6180	.60508	.03629	3.5465	3.6894	1.00	5.00

ANOVA

		Sum of Squares	df	Mean Square	F	Sig.
TBMT	Between Groups	.145	2	.073	.613	.542
	Within Groups	32.626	275	.119		
	Total	32.772	277			
TCMTO	Between Groups	1.896	2	.948	3.855	.022
	Within Groups	67.601	275	.246		
	Total	69.497	277			
TCMTE	Between Groups	.198	2	.099	.584	.558
	Within Groups	46.501	275	.169		
	Total	46.699	277			
TPMT	Between Groups	.983	2	.492	1.396	.249
	Within Groups	96.828	275	.352		
	Total	97.811	277			
TBCA	Between Groups	.343	2	.171	1.071	.344
	Within Groups	43.988	275	.160		
	Total	44.331	277			
TSCA	Between Groups	2.134	2	1.067	2.856	.059
	Within Groups	102.777	275	.374		
	Total	104.911	277			
TPCA	Between Groups	1.544	2	.772	2.126	.121
	Within Groups	99.872	275	.363		
	Total	101.417	277			

Appendix J: Results of Pearson Correlation

Pearson Correlation

Descriptive Statistics

	Mean	Std. Deviation	N
TMTM	3.9059	.36585	278
TCAS	3.7861	.45993	278
TBMT	4.0101	.34396	278
TCMTO	3.9170	.50089	278
TCMTE	3.9752	.41059	278
TPMT	3.7212	.59423	278
TBCA	4.0881	.40005	278
TSCA	3.6523	.61542	278
TPCA	3.6180	.60508	278

Correlations

		TMTM	TCAS	TBMT	TCMTO	TCMTE	TPMT	TBCA	TSCA	TPCA
TMTM	Pearson Correlation	1	.732**	.735**	.804**	.805**	.803**	.679**	.603**	.606**
	Sig. (2-tailed)		.000	.000	.000	.000	.000	.000	.000	.000
	N	278	278	278	278	278	278	278	278	278
TCAS	Pearson Correlation	.732**	1	.545**	.548**	.580**	.625**	.734**	.894**	.886**
	Sig. (2-tailed)	.000		.000	.000	.000	.000	.000	.000	.000
	N	278	278	278	278	278	278	278	278	278
TBMT	Pearson Correlation	.735**	.545**	1	.517**	.526**	.431**	.463**	.470**	.459**
	Sig. (2-tailed)	.000	.000		.000	.000	.000	.000	.000	.000
	N	278	278	278	278	278	278	278	278	278
TCMTO	Pearson Correlation	.804**	.548**	.517**	1	.567**	.447**	.492**	.496**	.419**
	Sig. (2-tailed)	.000	.000	.000		.000	.000	.000	.000	.000
	N	278	278	278	278	278	278	278	278	278
TCMTE	Pearson Correlation	.805**	.580**	.526**	.567**	1	.509**	.658**	.435**	.444**
	Sig. (2-tailed)	.000	.000	.000	.000		.000	.000	.000	.000
	N	278	278	278	278	278	278	278	278	278
TPMT	Pearson Correlation	.803**	.625**	.431**	.447**	.509**	1	.535**	.495**	.568**
	Sig. (2-tailed)	.000	.000	.000	.000	.000		.000	.000	.000
	N	278	278	278	278	278	278	278	278	278
TBCA	Pearson Correlation	.679**	.734**	.463**	.492**	.658**	.535**	1	.512**	.492**

	Sig. (2-tailed)	.000	.000	.000	.000	.000	.000		.000	.000
	N	278	278	278	278	278	278	278	278	278
TSCA	Pearson Correlation	.603**	.894**	.470**	.496**	.435**	.495**	.512**	1	.683**
	Sig. (2-tailed)	.000	.000	.000	.000	.000	.000	.000		.000
	N	278	278	278	278	278	278	278	278	278
TPCA	Pearson Correlation	.606**	.886**	.459**	.419**	.444**	.568**	.492**	.683**	1
	Sig. (2-tailed)	.000	.000	.000	.000	.000	.000	.000	.000	
	N	278	278	278	278	278	278	278	278	278

**. Correlation is significant at the 0.01 level (2-tailed).

Appendix K: Results of Students' Test Scores

Students' Test Scores

The Test to be Conducted by Primary Students from Grade 1 to 6 (N=395)

Students' Test		M	SD	Meaning	Rank
1	Grade 1	8.33	2.37	Pass	1
2	Grade 2	4.79	3.11	False	5
3	Grade 3	4.17	2.85	False	6
4	Grade 4	5.88	2.65	Pass	3
5	Grade 5	6.00	2.41	Pass	2
6	Grade 6	4.88	2.46	False	4
	Overall	5.68	2.96	Pass	

The Students' Test of Grade 1 (N=66)

Students' Test (G1)		M	SD	Meaning	Rank
1	Item 1	1.88	0.48	Pass	1
2	Item 2	1.82	0.58	Pass	2
3	Item 3	1.76	0.66	Pass	3
4	Item 4	1.21	0.99	Pass	5
5	Item 5	1.67	0.75	Pass	4
	Overall	1.67	0.47	Pass	

The Students' Test of Grade 2 (N=68)

Students' Test (G2)		M	SD	Meaning	Rank
1	Item 1	1.03	1.01	Pass	2
2	Item 2	0.94	1.01	False	4
3	Item 3	1.12	1.00	Pass	1
4	Item 4	1.03	1.01	Pass	2
5	Item 5	0.68	0.95	False	5
	Overall	0.96	0.62	False	

The Students' Test of Grade 3 (N=63)

Students' Test (G3)		M	SD	Meaning	Rank
1	Item 1	1.03	1.03	Pass	2
2	Item 2	0.59	0.94	False	4
3	Item 3	0.81	1.01	False	3
4	Item 4	0.51	0.88	False	5
5	Item 5	1.24	0.98	Pass	1
	Overall	0.83	0.57	False	

The Students' Test of Grade 4 (N=66)

	Students' Test (G4)	M	SD	Meaning	Rank
1	Item 1	1.18	0.99	Pass	3
2	Item 2	1.82	0.58	Pass	1
3	Item 3	0.61	0.93	False	5
4	Item 4	1.52	0.86	Pass	2
5	Item 5	0.76	0.98	False	4
	Overall	1.18	0.53	Pass	

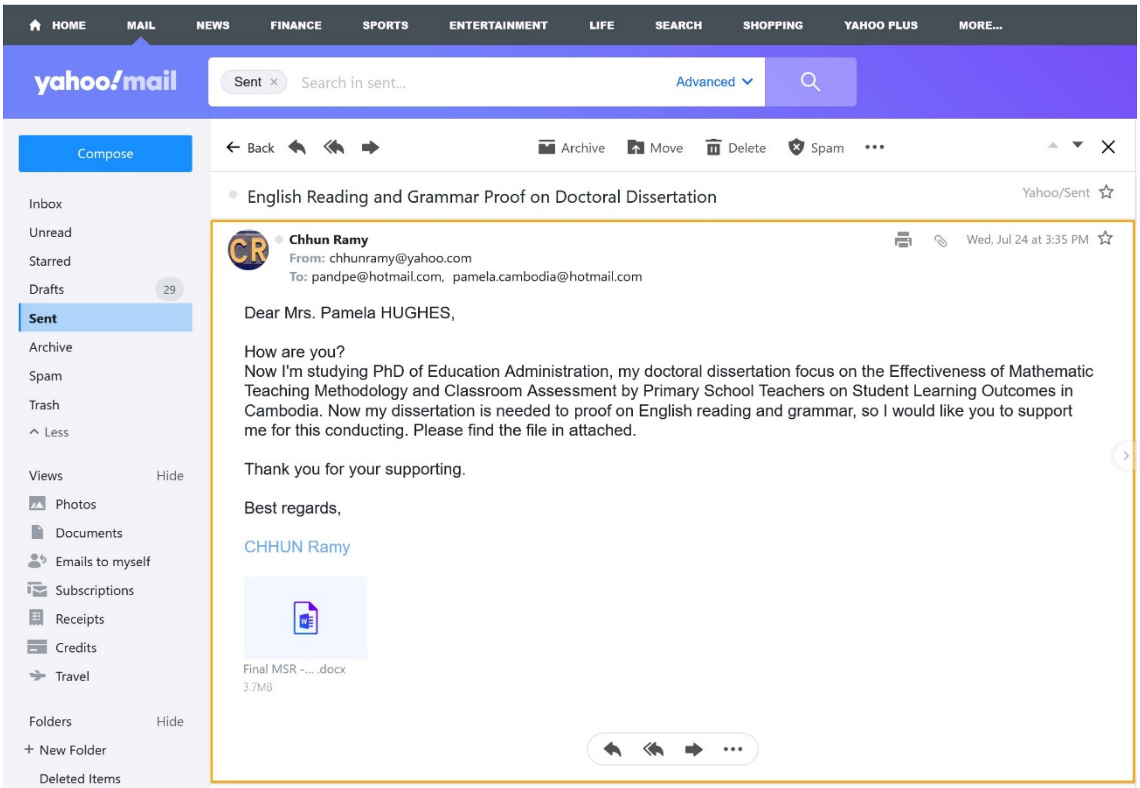
The Students' Test of Grade 5 (N=66)

	Students' Test (G5)	M	SD	Meaning	Rank
1	Item 1	1.88	0.48	Pass	1
2	Item 2	1.76	0.66	Pass	2
3	Item 3	0.85	1.00	False	4
4	Item 4	1.36	0.94	Pass	3
5	Item 5	0.15	0.53	False	5
	Overall	1.20	0.48	Pass	

The Students' Test of Grade 6 (N=66)

	Students' Test (G6)	M	SD	Meaning	Rank
1	Item 1	1.45	0.90	Pass	1
2	Item 2	1.45	0.90	Pass	1
3	Item 3	0.27	0.69	False	5
4	Item 4	1.36	1.12	Pass	3
5	Item 5	0.33	0.75	False	4
	Overall	0.98	0.49	False	

Appendix L: Request and Accept for Dissertation Proofreader



English Reading and Grammar Proof on Doctoral Dissertation

Chhun Ramy
From: chhunramy@yahoo.com
To: pandpe@hotmail.com, pamela.cambodia@hotmail.com
Wed, Jul 24 at 3:35 PM

Dear Mrs. Pamela HUGHES,

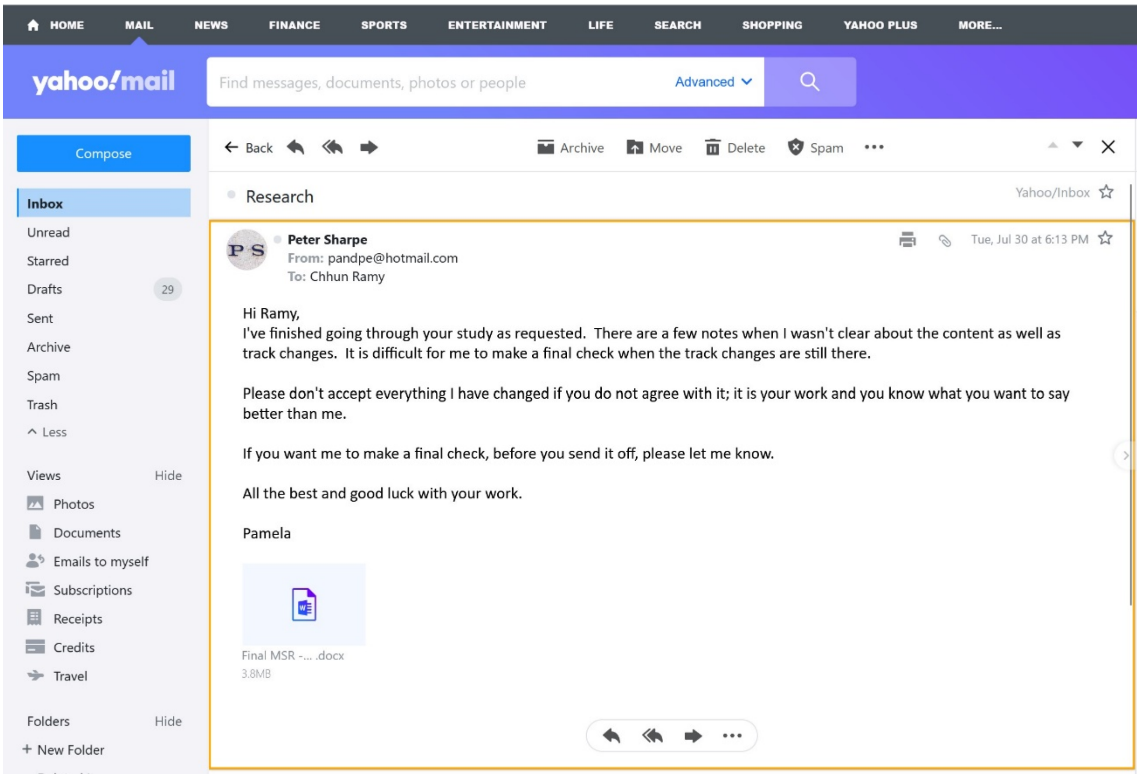
How are you?
Now I'm studying PhD of Education Administration, my doctoral dissertation focus on the Effectiveness of Mathematic Teaching Methodology and Classroom Assessment by Primary School Teachers on Student Learning Outcomes in Cambodia. Now my dissertation is needed to proof on English reading and grammar, so I would like you to support me for this conducting. Please find the file in attached.

Thank you for your supporting.

Best regards,

CHHUN Ramy

Final MSR -... .docx
3.7MB



Research

Peter Sharpe
From: pandpe@hotmail.com
To: Chhun Ramy
Tue, Jul 30 at 6:13 PM

Hi Ramy,
I've finished going through your study as requested. There are a few notes when I wasn't clear about the content as well as track changes. It is difficult for me to make a final check when the track changes are still there.

Please don't accept everything I have changed if you do not agree with it; it is your work and you know what you want to say better than me.

If you want me to make a final check, before you send it off, please let me know.

All the best and good luck with your work.

Pamela

Final MSR -... .docx
3.8MB

Appendix M: Nomination Letter of Assessment Committee

ព្រះរាជាណាចក្រកម្ពុជា
ជាតិ សាសនា ព្រះមហាក្សត្រ

ក្រសួងអប់រំ យុវជន និងកីឡា
លេខ: ១៣០៧ អយក.[illegible]

លិខិតឧទ្ទេសនាម

យោង៖ - លិខិតលេខ ៨១៥ អយក ឧទន ចុះថ្ងៃទី០៣ ខែកុម្ភៈ ឆ្នាំ២០២៥ របស់ក្រសួងអប់រំ យុវជន និងកីឡា។

- លិខិតលេខ៤០៦/២៤ សក/លច ចុះថ្ងៃទី៣១ ខែតុលា ឆ្នាំ២០២៤ របស់សាកលវិទ្យាល័យកម្ពុជា។

លោក លោកស្រី ដូចមានរាយនាមខាងក្រោម ត្រូវបានចាត់តាំងជាគណៈកម្មការវាយតម្លៃការការពារនិក្ខេបបទបញ្ចប់ការសិក្សារបស់និស្សិតថ្នាក់បណ្ឌិត ជំនាន់ទី១០ ជំនាញរដ្ឋបាលអប់រំ នៅមហាវិទ្យាល័យអប់រំ នៃសាកលវិទ្យាល័យកម្ពុជា។

ល.រ	គោត្តនាម-នាម	សញ្ញាបត្រ	មុខងារ	ឯកទេស	តួនាទីគណៈកម្មការ
១	អ៊ី រតនា	បណ្ឌិត	គ្រូ	សង្គមវិទ្យា	ប្រធាន
២	សំ រ៉ានី	បណ្ឌិត	គ្រូ	អប់រំ	គ្រូវាយតម្លៃទី១
៣	វង់ សំអូន	បណ្ឌិត	គ្រូ	ការអភិវឌ្ឍកម្មវិធីសិក្សានិងវិធីសាស្ត្របង្រៀន	គ្រូវាយតម្លៃទី២
៤	គួយ សុគាន	បណ្ឌិត	គ្រូ	វិទ្យាសាស្ត្រអប់រំ	គ្រូវាយតម្លៃទី៣
៥	ម៉ុក សារ៉ុម	បណ្ឌិត	គ្រូ	គ្រប់គ្រងអប់រំនិងភាសាវិទ្យាអនុវត្តន៍	សមាជិក
៦	ផុន សុផល	បណ្ឌិត	គ្រូ	ការបង្រៀននិងបច្ចេកវិទ្យា	សមាជិក
៧	ប៉ុក វិសាលបុត្ត	បណ្ឌិត	គ្រូ	សង្គមទំនើបនិងវប្បធម៌	សមាជិក

- បេក្ខជនបណ្ឌិត ៖ **ឈុន រ៉ាមី** ភេទ ប្រុស
- ប្រធានបទ ៖ ប្រសិទ្ធភាពនៃវិធីសាស្ត្របង្រៀនគណិតវិទ្យានិងការវាយតម្លៃកម្រិតសាលារៀនរបស់គ្រូបឋមសិក្សា លើលទ្ធផលសិក្សារបស់សិស្សនៅកម្ពុជា
- កាលបរិច្ឆេទ ៖ ថ្ងៃទី ០១ ខែមិនា ឆ្នាំ២០២៥ ម៉ោង៖ ១៤ : ០០នាទី
- ជំនាញ ៖ **រដ្ឋបាលអប់រំ**
- គ្រូណែនាំ ៖ លោកបណ្ឌិត ម៉ុក សារ៉ុម និង លោកបណ្ឌិត ផុន សុផល
- លេខាកត់ត្រា ៖ លោកបណ្ឌិត ឡូច រតនា

ថ្ងៃ ច័ន្ទ ៥កើត ខែមាឃ ឆ្នាំរោង ឆស័ក ព.ស.២៥៦៨
រាជធានីភ្នំពេញ ថ្ងៃទី១៧ ខែកុម្ភៈ ឆ្នាំ២០២៥
ឧបនាយករដ្ឋមន្ត្រី
រដ្ឋមន្ត្រីក្រសួងអប់រំ យុវជន និងកីឡា

បណ្ឌិតសភាចារ្យ **ហង់ជួន ណារ៉ុន**

កន្លែងទទួល៖
- អគ្គនាយកដ្ឋានឧត្តមសិក្សា
- អគ្គលេខាធិការដ្ឋាន
- ខុទ្ទកាល័យឯកឧត្តមបណ្ឌិតសភាចារ្យឧបនាយករដ្ឋមន្ត្រី "ដើម្បីជូនជ្រាបជាព័ត៌មាន"
- សាកលវិទ្យាល័យកម្ពុជា
- សាមីជន "ដើម្បីអនុវត្ត"
- កាលប្បវត្តិ
- ឯកសារ នាយកដ្ឋានស្រាវជ្រាវនិងនវានុវត្តន៍