BASIC SKILLS IN MATHEMATICS AMONG ELEMENTARY TEACHER TRAINEES IN KOZHIKODE DISTRICT

NOOPURA.S

Dissertation submitted to the
University of Calicut for the partial fulfilment
of the requirements for the Degree of
MASTER OF EDUCATION

FAROOK TRAINING COLLEGE
UNIVERSITY OF CALICUT

2020

DECLARATION

I, NOOPURA.S, do hereby declare that this dissertation entitled, **BASIC SKILLS IN MATHEMATICS AMONG ELEMENTARY TEACHER TRAINEES IN KOZHIKODE DISTRICT,** has not been submitted by me for the award of any Degree, Diploma, Title or Recognition before.

Farook College
Date: 29.07.2020

Dr. T. MOHAMED SALEEM
Principal
Farook Training College
Calicut

CERTIFICATE

I, Dr. T. Mohamed Saleem, do hereby certify that the dissertation entitled, **BASIC SKILLS IN MATHEMATICS AMONG ELEMENTARY TEACHER TRAINEES IN KOZHIKODE DISTRICT**, is a record of bonafide study and research carried out by **NOOPURA. S.,** M.Ed student (2018-20), under my supervision and guidance, and has not been submitted by her for the award of any Degree, Diploma, Title or Recognition before.

Farook College
Date: 29.07.2020

Dr. T. Mohamed Saleem
Supervising Teacher

ACKNOWLEDGEMENT

The investigator is deeply indebted to her supervising Teacher and principal of Farook Training College, Dr. T. Mohamed Saleem for his constant encouragement, generous help and valuable suggestions combined with expert criticism.

The investigator extend her keen heart felt thanks and regards to Dr. C.A Jawahar, former principal of Farook Training College for his whole hearted support and encouragement to conduct this study.

The investigator express his sincere thanks to Dr. Niranjana K.P, Assistant Professor, Farook Training College, for providing support and coordinating the two year M.Ed. programme effectively.

Sincere thanks are extended to all faculty members, Librarian, library staff, office staff and special thanks to the research scholar Mr. Muneer of Farook Training College, for their support and encouragement throughout the study.

Finally the investigator is deeply indebted to Dr. Sunitha T.V, Akshay Mohan, Shibin, and her parents for providing whole-hearted support and help to complete the task successfully.

Farook Training College NOOPURA. S

CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF APPENDICES

CHAPTER I

INTRODUCTION

- Need and Significance of the Study
- Statement of the Problem
- Definition of Key Terms
- Variables of the Study
- Objectives of the Study
- Hypotheses of the Study
- Methodology
- Scope and Limitations of the Study
- Organisation of the Report

Education is an investment for economic and human development. It is influenced by the environment within which it subsists. Faith, traditions and culture affect the education system and simultaneously are also affected by it. Education is a process which fosters the creative potential of an individual and helps him to focus his energies on the aims he sets. Nations become rich not by wealth but by its citizens and contributing citizens are moulded by its education system. It is this important role of education in national development that has made teachers and educators occupy a respected position during ancient times and even today. Education also helps in establishing a society which enjoys peace and stability and moves towards development and advancement.

Education imbibes qualities of patience, unselfishness, faithfulness, endurance and a sense of sacrifice among people. Educated people nurture a vision that distinguishes between good and bad; they cultivate the habit to stand and fight for their rights and that of their comrades. The advancement of a nation depends on such educated people. Education forms the bedrock of a nation's development. Therefore it is obligatory on the government and relevant stakeholders of the country to give a serious thought and put in efforts to enhance the quality of its education system. Education is hence, central to growth and development of a nation and acts as a critical index for measuring the progress and development. It forms the fundamental instrument which drives the nation towards richness, resourcefulness, and ensures peace and stability. Education is no longer confined to just the three R's,

namely, reading, writing and arithmetic but has a wider aim of development of skills and competencies.

The world of the 21st century is changing rapidly and for our children to live in this new world they need to be educated in a new way. Educators must change the system in such a way that it will help the students to connect with the rapidly changing world, benefit from what they get from today's world and also will help them to face the challenges posed by it. 21st century schools are the nerve centers, a abode for students and teachers to connect with their community. In this new environment teachers are less of instructors and more of facilitators of information, preparing their students to develop the ability of converting knowledge into wisdom. 21st century teachers need to cultivate and maintain the child's interest and curiosity in the learning material by depicting how the learnt knowledge could be applied in the real world. They must also work towards increasing their student's motivation, which would make them lifelong learners. They should also bring in flexibility and variety in their teaching and motivate learners by providing the resources to continue learning outside the school. The ideal classroom of the 21st century should make children excited about learning at school, and disciplined since everyone is eager to learn. In such a classroom, learning experiences and lessons are related to the community. Students are to collaborate with their comrades and teachers from other schools and different countries to learn about issues that affect the globe, and how they can be solved for the future.

Children will need many skills in order to be successful. Collaborating ability, team work, presentation skills, written communication skills, willingness to examine

civic and global issues, ability to use technology, critical thinking skills, ability to conduct research to learn about issues, willingness and ability to learn about new career opportunities are a few of them. The educational curriculum of this century is to be revamped to incorporate these skills by making use of internet technology and multimedia. The future lessons should not be based on textbooks, but are to be process based. Skills and content should be learned through their research and projects and textbooks would be one of the many possible resources. Ideal schools of the 21st century should be spacious and cheerful, and students need to work with individual assignments and group projects. The walls of the classroom and schools will be hung with student work, and students exhibit their creations and performances for their parents and members of the community. Access to technology will be provided at all times to the students in schools. The schools will be equipped with learning centers and laboratories, and also studios for music, art, theatre. Classrooms should be equipped with video conferencing facilities and facilities for organizing discussion boards so that students can participate in real time synchronous conversations with experts all over the globe and also learn by watching school productions and presentations.

21 st century teachers need to be equipped with certain set of skills to provide such education to the students of this century. This would result in dramatic and positive changes in the way education is transacted to children. Students will be eager to learn and will be actively engaged in their learning. In fact, they would also continue their learning at their home and also over their leisure time too, and they will have access to the resources they need to continue learning where ever they are.

Such schools and its teachers would be able to foster a love of learning in its students.

Teacher Education today has become a substantial component in our educational system having a large scale network of institutions and also various areas of academic specialization. Rethinking of teacher education is necessary in order to bring out in future teachers precisely those who are human and possess intellectual qualities until they facilitate a fresh approach to teaching.

Teachers have a vivacious and vibrant role in the lives of the students they encounter. They impact what and how students learn every day in the classroom, and their encouragement and nurturing helps students do their best and reach goals. But their influence goes beyond what we see in the day-to-day interactions within the school walls. Effective teachers have the opportunity to contribute beyond the scope of the classroom and school day. Besides their responsibility to educate students, teachers play an important role in character development, shaping of a student's reputation, honour and integrity. When they form relationships with students by attending sports games, student productions, and other things, educators show care for their students beyond grades and success in the classroom. The ways in which teachers can lead are as diverse and varied as teachers themselves. Teachers take up a wide range of roles to handle their tasks at school and to contribute to student success. These roles are assigned to them formally and are shared by them informally to build the all inclusive community of students.

The educational system is an instrument for national development and it is intended to guarantee the effective functioning of the society. Modern civilizations

cannot dream of achieving the objectives of societal growth and high cultural standards without the utmost utilization of talents of their inhabitants. Such an effort has resulted in greater importance of relating the process of school education and teacher education. Teacher education is grounded on the theory that, “Teachers are made, not born” in contrary to the assumption, “Teachers are born, not made”. Since teaching is deliberated as an art and a science, the teacher has to not only acquire knowledge, but also has to get trained in skills and the so called tricks of the trade.

Need and Significance of the Study

Teachers influence the lives of a student much more significantly than we imagine. A teacher with right skills will inspires and influences entire student lives. They act as the instruments who can ignite powerful thoughts and ideas in students, helping them to unleash their true potential. To bring about such long-standing impacts, it is very important that teachers to have certain skills. Our attitude towards a skill and performance in that particular skill are correlated and our attitudes tend to affect our interest in improving our skills in all manner. Previous learning experiences and attitude, together with self-assessment of own skills have proven to be especially important.

The learning of mathematics itself valuable to every student. Everyone uses mathematical applications everyday within their everyday life. However, mastering the subject matter of mathematics is so much more important beyond that of its everyday use. Mastering basic mathematics skills, such as fractions, better prepares one for higher level mathematics such as algebra. If students don’t fully understand basic arithmetic concepts, be it with simple base ten numbers or fractions, they

likely will not be able to apply such concepts to equations with unknown variables. In order for students to be able to gain understanding from higher level mathematics courses, they must enter such courses with a strong foundational background (Brown and Quinn, 2007).

Acquiring mathematics skills is not only important for those students planning to attend higher education but also for those students who are not seeking further education beyond high school. According to Wang (2003), “Mathematics achievement is related positively to early labour market success”. This statement relates that even the success of students who opt out is still directly correlated to their mathematical skills. Those who develop a strong mathematics foundation and who continue to build upon acquire such skills as problem solving, critical thinking, reasoning, and perseverance.

Gibb (2015) in his writing says that; having a strong ground in mathematics is vital for young people in today’s world. These subject act as a basic filters. Good qualifications in Mathematics open the door to a wider variety of careers than would be possible without them. Research studies indicates Mathematics is not being taught as effectively as the evidence suggested they could. They were simply being let down by the curriculum and by some of the ideas emanating from university education faculties. At the time it was a curriculum that prioritised inefficient methods in Maths with an over-emphasis on concepts such as ‘learning to learn’ and ‘individualised instruction’ at the expense of content, practice and through that, fluency and mastery. Mathematics is one of the crucial subjects needed to get on in life whether through employment or further studies. It is therefore essential that a

world class, academically rigorous curriculum reflects this and supports all pupils in their studies.

Mathematics education at the elementary stage should help children to prepare for the challenges that they face further in life. In our vision, school mathematics takes place in a situation where children learn to enjoy mathematics and make it as a part of children's life experience which they talk about. Through this children pose and solve meaningful problems and also they use abstractions to perceive relationships and structure by understanding the basic structure of mathematics. Teachers expect to engage every child in class. On the other hand, mathematics education in our schools is beset with problems. There are many core areas of concern while talking about mathematics education. The prior and most important thing is that the sense of fear and failure regarding mathematics among a majority of children. Also crude methods of assessment that encourage perception of mathematics as mechanical computation make difficulties to children. Another main concern is the lack of teacher preparation and support in the teaching of mathematics. Systemic problems further aggravate the situation, in the sense that structures of social discrimination get reflected in mathematics education as well. Especially worth mentioning in this regard is the gender dimension, leading to a stereotype that boys are better at mathematics than girls.

In each year of elementary and high school, students learn new mathematical skills and concepts and also build upon what they learned in previous years. It is incredibly important that students should have a strong understanding of concepts

that they learn in one year in order to meet the challenges of the next year. Hence building strong foundation in mathematics is very important.

Loveless (2003) in his report based on "Trends in Math: The Importance of Basic Skills" pointed out that basic skills are a floor, not a ceiling. In recent years, a growing body of research has documented that the skills and knowledge students learn in school is correlated with success later in life. The goal of leaving no child behind is nothing but a pipe dream if children don’t learn arithmetic, the starting point in mathematics.

More so than any other content discipline, mathematics education relies very heavily on the preparation that the teacher has, in her own understanding of mathematics, of the nature of mathematics, and bag of pedagogic techniques. Textbook centred pedagogy dulls the teacher’s own mathematics activity. At two ends of the spectrum, mathematics teaching poses special problems. At the primary level, most teachers assume that they know all the mathematics needed, and in the absence of any specific pedagogic training, simply try and uncritically reproduce the techniques they experienced in their school days. Often this ends up perpetuating problems across time and space. In developing a child’s inner resources, the role that mathematics plays is mostly about thinking. Clarity of thought and pursuing assumptions to logical conclusions is central to the mathematical enterprise. There are many ways of thinking, and the kind of thinking one learns in mathematics is an ability to handle abstractions. Even more importantly, what mathematics offers is a way of doing things: to be able to solve mathematical problems, and more generally,

to have the right attitude for problem solving and to be able to attack all kinds of problems in a systematic manner.

While dealing with the basic mathematics education, One major problem is that of compartmentalisation: there is very little systematic communication between primary school and high school teachers of mathematics, and none at all between high school and college teachers of mathematics. Most school teachers have never even seen, let alone interacted with or consulted, research mathematicians. Those involved in teacher education are again typically outside the realm of college or research mathematics. Another important problem is that of curricular acceleration: a generation ago, calculus was first encountered by a student in college. Another generation earlier, analytical geometry was considered college mathematics. But these are all part of school curriculum now. Such acceleration has naturally meant pruning of some topics: there is far less solid geometry or spherical geometry now. One reason for the narrowing is that calculus and differential equations are critically important in undergraduate sciences, technology and engineering, and hence it is felt that early introduction of these topics helps students proceeding further on these lines. Whatever the logic, the shape of mathematics education has become taller and more spindly, rather than broad and rounded.

While inadequate teacher preparation and support acts negatively on all of school mathematics, at the primary stage, its main consequence is this: mathematics pedagogy rarely resonates with the findings of children’s psychology. At the upper primary stage, when the language of abstractions is formalised in algebra, inadequate teacher preparation reflects as inability to link formal mathematics with

experiential learning. Later on, it reflects as incapacity to offer connections within mathematics or across subject areas to applications in the sciences, thus depriving students of important motivation and appreciation.

Teacher education for the elementary stage is being carried at many institutions, which offer courses of two years duration and are open to candidates who have passed their senior secondary examination. At present the programme of elementary teacher education is termed as D.El.Ed (Diploma in elementary education) and regulated by NCTE (National council for teacher education).

The students from different streams including science and arts are enrolled for the teacher training. The teacher trainees who had completed the course can teach students up to elementary level. They are also supposed to teach every subjects in the school. So elementary teacher training included every respective subjects in their curriculum. But it seems that many teacher trainees have difficulty in learning subjects other than their specific stream. As we mentioned above Mathematics is one of the core subjects in the elementary level. It is also noticed that many teacher trainees found some sort of difficulty while dealing with the basic Mathematics part. Thus through this study researcher tries to investigate the basic skills in mathematics among elementary teacher trainees in Kozhikode district.

Statement of the Problem

The study is entitled as “BASIC SKILLS IN MATHEMATICS AMONG ELEMENTARY TEACHER TRAINEES IN KOZHIKODE DISTRICT.”

Definition of Key Terms

The definition of key terms used in the statement of problem are described below.

Basic skills in Mathematics

Zieky (1977) defined “Basic skills are the fundamental skills that are the basis of later learning and achievement.”

For the present study, the basic mathematical skills include applying, problem-solving, communicating, expressing, integrating, connecting, reasoning, implementing, understanding and recalling.

Elementary teacher trainees

The students who are doing diploma level course for (D.El.Ed) teaching at the elementary level.

Variable of the Study

The variable selected for the present study is the Basic skills in Mathematics.

Objectives of the Study

The objectives set for the study are as follows;

- To identify the extent of Basic skills in Mathematics among the elementary teacher trainees.
- To compare the Basic skills in Mathematics for the sub samples based on;

- Gender
- Plus two level streams
- Type of management
- Locale

Hypotheses of the Study

The hypotheses designed for the present study is as follows;

- The elementary teacher trainees are having an average level of Basic skills in Mathematics.
- There exist significant difference in the mean scores of Basic skills in Mathematics among elementary teacher trainees for the subsamples based on
  - Gender
  - Plus two level streams
  - Type of management
  - Locale

Methodology

The study is intended to investigate the Basic skills in Mathematics among elementary teacher trainees. The investigator used Survey method for conducting the study. A precise description of sample, tool and statistical technique used for the study are described here.

Sample of the Study

The population for the study comprised of elementary teacher trainees in Kozhikode district. The sample of the study constituted 570 elementary teacher trainees from Kozhikode district of Kerala state. Stratified random sampling technique was conceived to be best suited for selection of the sample of the present study. Total number of 570 sample were collected by giving due representation to gender, locale, plus two level streams and type of management of institutions.

Tools Used for the Study

For the purpose of collecting relevant information from sample Test on Basic Skills in Mathematics (Noopura & Saleem, 2019) prepared by the co-investigator with the help of supervising teacher.

Statistical Techniques used for the Study

For the purpose of analysing the collected data following statistical techniques was used.

- Descriptive statistics.
- Percentage analysis
- Test of significance difference between mean scores of large independent sample(t test)
- Analysis of Variance (ANOVA)

Scope and Limitations of the Study

Scope of the Study

The study is intended to investigate the extend of Basic skills in Mathematics among elementary teacher trainees. Appropriate and standard tool was employed to measure the data. The investigator developed the tool with the help of supervising teacher. The population for the study comprised of elementary teacher trainees in Kozhikode district. The sample of the study constituted 570 elementary teacher trainees studying in Kozhikode district of Kerala state. Total number of 570 sample were collected by giving due representation to gender, locale and type of management of institutions. Analysis and interpretation were made by using of authentic statistical techniques. Hence, the investigator hope that the results yielded from the study would be reliable, valid and dependable. It is very essential to study Basic Skills in Mathematics among elementary teacher trainees in the educational scenario. It will helps the policy makers and teacher educators to make tremendous changes in the educational system from the elementary level. It also helps to increase the quality of teacher trainees and thereby our educational system.

Limitations of the Study

The investigator tried to make the study as successful as possible, certain limitations have crept to the study. Sample selected for the study is not a state wide sample. Due to the time limitation it was confined in to Kozhikode district of Kerala state. Objective type questions are used in the tool, hence detailed examination of

certain questions can not be done. Also only those students studying in first year D.Ed course were considered for the study.

Organisation of the Report

The report of the study is presented. The details incorporated in each chapter are described here.

Chapter I :

The first chapter presents a brief introduction of the study, statement of the problem, definition of key terms, variable of the study, objectives of the study, hypotheses, methodology, scope and limitations of the study and organisation of the report.

Chapter II:

The second chapter presents the review of related literature which includes theoretical overview and review of related studies.

Chapter III:

The third chapter describes methodology of the study, details of variables, tool used. selection of sample procedure for data collection, scoring techniques used for analysis and statistical technique used.

Chapter IV:

The fourth chapter brings out the details of statistical analysis of the data and discussion of the result.

Chapter V:

The fifth chapter deals with summary of the study, major findings, educational implications of the study and suggestions for further research in this area.

CHAPTER II

REVIEW OF RELATED LITERATURE

- Theoretical overview of Basic Skills in Mathematics
- Review of Related Literature

REVIEW OF RELATED LITERATURE

"Research takes advantage of the knowledge which has accumulated in the past as a result of constant human endeavour." (Koul,2011)

Research can never be undertaken in isolation of the work that has already been done on the problems which are directly or indirectly related to a study proposed by a researcher. Knowledge of the past gets accumulated as a result of constant human endeavour and research can take advantage of this accumulated knowledge. A review of the related literature must precede any well planned research study. Hence, a careful review of the research journal, books, dissertations, theses and other sources of information on the problem to be investigated is one of the important steps in the planning of any research study. The study is an attempt to understand the Basic Skills in Mathematics among the elementary teacher trainees in Kozhikode district.

Review of the related literature besides allowing the researcher to get acquainted with current knowledge in the field or area in which the research is being conducted serves various purposes. The review of related literature enables the researcher to define the limits of one's field. It helps the researcher to delimit and define the problem. The knowledge of related literature brings the researcher up-to-date on the work which others have done and thus helps in stating the objective clearly and concisely. And also by reviewing of related literature the researcher can avoid unfruitful and useless problem areas. The researcher is helped in selecting

those areas in which positive findings are very likely to result and the endeavours would be likely to add to the knowledge in a meaningful way. It is no use to replicate a study when the stability and validity of its results have been clearly established and through the review of related literature, the researcher can avoid unintentional duplication of well established findings. By reviewing of related literature the researcher gets an understanding of the research methodology which refers to the way the study is to be conducted. It gives the researcher knowledge about the tools and instruments which proved to be useful and promising in the previous studies. Insight in to the statistical methods to be used through which validity of results is to be established is also received. But the most important reason for reviewing the related literature is to know about the recommendations of previous researchers listed in then-studies for further research.

Theoretical Overview of Basic Skills in Mathematics

Theoretical framework about basic skills in mathematics is outlined briefly in this section of report.

Basic Skills in Mathematics

Basic Skills in Mathematics are those that involve making calculations of amounts, sizes or other measurements. These skills consist of core concepts like addition and subtraction, along with slightly more advanced concepts that build on top of those. Mbewe (2010) considered mathematical skills as the basic and integrated science process skills. According to Mbewe Observation, Classification, Quantification, Measurement, Inferring, Communication, Formulating hypothesis,

Experimenting, Making operational definition, Interpreting data, Predicting, Controlling variables, and Using space/time relations were considered as the Basic skills in Mathematics.

In 2015 NCSM (Network Communicate Support Motivate) has divided basic mathematical skills in to ten areas. All are basic to pupils development of the ability to reason effectively in varied situations. NCSM proposed the ten skills as Problem solving, Applying Mathematics to everyday situations, Alertness to the reasonableness of results, Estimation and Approximation, Appropriate computational skills, Geometry, Measurement, Reading, Interpreting, and Constructing tables, Charts, Graphs using Mathematics to predict and Computer literacy.

The National Center for Education Statistics in 1995 outlined "student skills required for success in mathematics". It includes Remember formulas and procedures, Think in sequential manner, Understand concepts, Think creatively, Understand math use in real world and Support solutions.

The NCTM (National Council of Teachers of Mathematics) in 2015 proposed that "process standards" are the first standards with long standing importance in mathematics education. They include problem solving skills, thinking skills and additional skills as Basic skills in Mathematics. NCTM (2015) detailed about problem solving skills were presented in Figure 1.

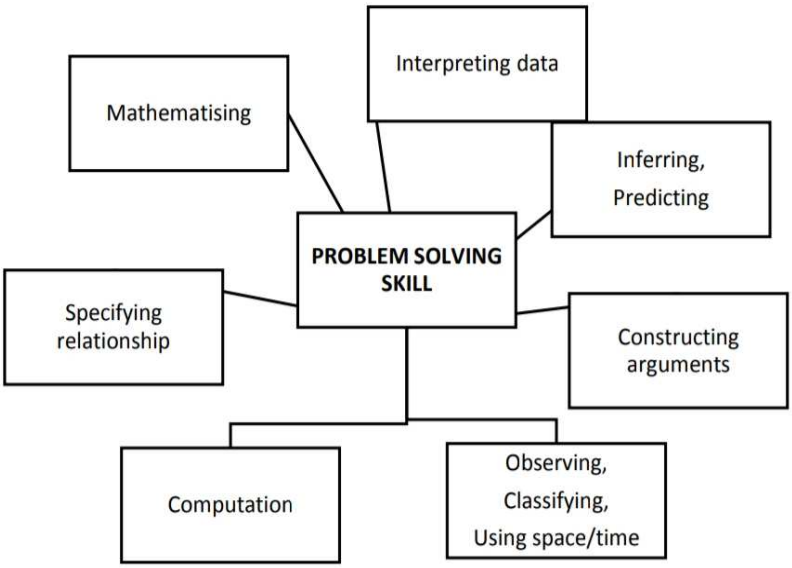


Figure 1. Problem Solving Skill by NCTM (2015*)*

According to NCTM, Thinking skills are the mental activities that is used to process information, make connections and create new ideas. Thinking skills were detailed in Figure 2.

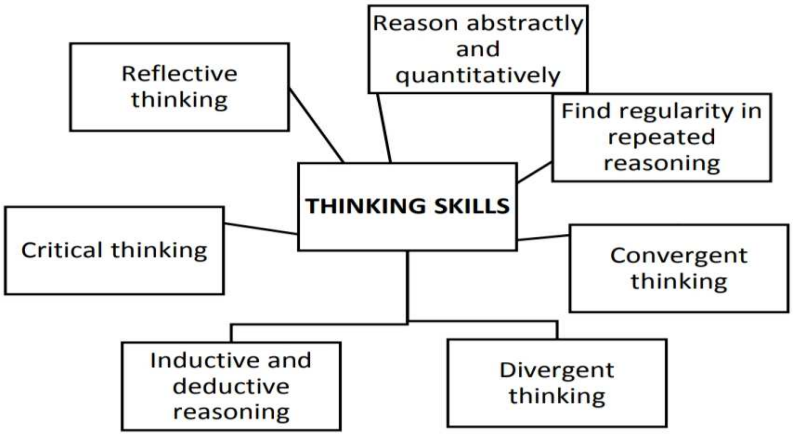


Figure 2. Thinking Skill by NCTM (2015*)*

According to NCTM, Additional Mathematics skills are those skills which is needed to fulfil the Mathematical needs. This include the using of tools, accuracy, and all. Additional Mathematics skills were detailed in Figure 3.

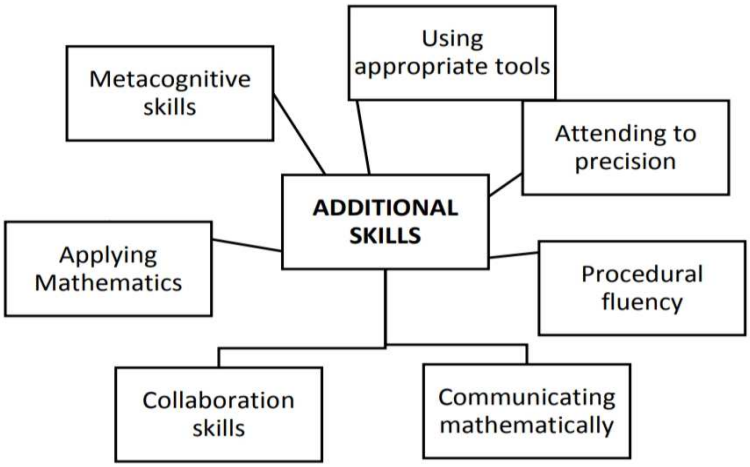


Figure 3. Additional Skill by NCTM (2015)

Borovik and Gardiner (2015) described the Mathematical skills as procedural fluency, strategic competence, adaptive reasoning, conceptual understanding and productive disposition.

- Procedural fluency: skill in carrying out procedures flexibly, accurately, efficiently, and appropriately.
- Strategic competence: ability to formulate, represent, and solve mathematical problems.
- Adaptive reasoning: capacity for logical thought, reflection, explanation, and justification.
- Conceptual understanding: comprehension of mathematical concepts, operations, and relations.

- Productive disposition: habitual inclination to see mathematics as sensible, useful, and worthwhile, coupled with a belief in diligence and one's own efficacy.

The Professional Development Service for Teachers (PDST) is one of the largest single support service offering professional learning opportunities to teachers and school leaders in a range of pedagogical, curricular and educational areas. PDST in 2010 describes Mathematics: Skills and Concept(s) Development as,

- Applying and problem-solving
- Communicating and expressing
- Integrating and connecting
- Reasoning
- Implementing
- Understanding and recalling

Skill: Applying and Problem-solving

According to PDST, Problem solving is an important component of mathematics education because it is the single vehicle which seems to be able to achieve at school level all three of the values of mathematics functional, logical and aesthetic.

- Select appropriate materials, concepts and processes for particular tasks and applications.
- Select and apply a variety of strategies to complete tasks and projects or solve problems.

- Reflect upon and evaluate solutions to problems.
- Apply concepts and processes in a variety of contexts.
- Analyse problems and plan an approach to solving them.

Tasks regarding to applying and problem solving skill are given in Table 1.

Table 1

Tasks regarding to Applying and Problem-solving Skill for Basic skills in Mathematics

First and second	**Third and fourth**	**Fifth**
• Select appropriate materials and processes for mathematical tasks and applications.	• Select appropriate materials, concepts and processes for mathematical tasks and applications	• Select appropriate materials, concepts and processes for particular tasks and applications
• Select and apply appropriate strategies for completing a task or solving a problem	• Select and apply a variety of strategies to complete tasks and projects or to solve problems	• Select and apply a variety of strategies to complete tasks and projects or solve problems
• Recognise solutions to problems	• Evaluate solutions to problems	• Reflect upon and evaluate solutions to problems
• Apply concepts and processes in a variety of contexts	• Apply concepts and processes in a variety of contexts	• Apply concepts and processes in a variety of contexts
	• Analyse problems and plan an approach to solving them	• Analyse problems and plan an approach to solving them

Skill: Communicating and expressing

According to PDST, Communication of mathematical ideas will help students clarify and solidify their understanding of mathematics. By sharing their mathematical understandings in written and oral form with their classmates, teachers, and parents, students develop confidence in themselves as mathematics learners and enable teachers to better monitor their progress.

- Discuss and explain the processes used and the results of mathematical activities, problems and projects in an organised way.
- Listen to and discuss other children's mathematical descriptions and explanations.
- Discuss and record the processes and results of work using a variety of methods.
- Discuss problems and carry out analyses.

Tasks regarding to communicating and expressing skill are given in Table 2.

Table 2

Tasks Regarding to Communicating and Expressing Skill for Basic skills in Mathematics

First and second	Third and fourth	Fifth
• Discuss and explain mathematical activities • Listen to and discuss other children's mathematical descriptions and explanations • Discuss and record the results of mathematical activities using diagrams, pictures and symbols • Discuss problems presented pictorially or orally	• Discuss and explain the processes used and the results of mathematical activities, problems, and projects • Listen to and discuss other children's mathematical descriptions and explanations • Discuss problems presented verbally or diagrammatically and carry out analyses	• Discuss and explain the processes used and the results of mathematical activities, problems and projects in an organised way • Listen to and discuss other children's mathematical descriptions and explanations • Discuss and record the processes and results of work using a variety of methods • Discuss problems and carry out analyses

Skill: Integrating and connecting

According to PDST, Many teachers struggle to link writing and mathematics and honor the integrity of both disciplines at the same time. Teachers of writing might say that if students are assigned to describe the process they used in solving a problem with no revision or editing, the quality of integration is drawn into question.

- Connect informally acquired mathematical ideas and processes with formal mathematical ideas and processes.
- Recognise mathematics in the environment.

- Represent mathematical ideas and processes in different modes: verbal, pictorial, diagrammatic and symbolic.
- Recognise and apply mathematical ideas and processes in other areas of the curriculum.

Tasks regarding to Integrating and connecting skill are given in Table 3.

Table 3

Tasks regarding to Integrating and Connecting skill for Basic Skills in Mathematics

First and second	Third and fourth	Fifth
• Connect informally acquired mathematical ideas with formal mathematical ideas • Recognise mathematics in the environment • Recognise the relationship between verbal, concrete, pictorial and symbolic modes of representing numbers • Carry out mathematical activities that involve other areas of the curriculum • Understand the mathematical ideas behind the procedures he/she uses	• Connect informally acquired mathematical ideas and processes with formal mathematical ideas and processes • Recognise mathematics in the environment • Represent mathematical ideas and processes in different modes: verbal, pictorial, diagrammatic, and symbolic • Recognise and apply mathematical ideas and processes in other areas of the curriculum	• Connect informally acquired mathematical ideas and processes with formal mathematical ideas and processes • Recognise mathematics in the environment • Represent mathematical ideas and processes in different modes: verbal, pictorial, diagrammatic and symbolic • Recognise and apply mathematical ideas and processes in other areas of the curriculum

Skill: Reasoning

According to PDST Mathematical reasoning is the critical skill that enables a student to make use of all other mathematical skills. With the development of mathematical reasoning, students recognize that mathematics makes sense and can be understood.

- Search for and investigate mathematical patterns and relationships.
- Justify processes and results of mathematical activities, problems and projects.
- Make informal deductions.
- Reason systematically in a mathematical context.

Tasks regarding to reasoning skill are given in Table 4.

Table 4

Tasks Regarding to Reasoning Skill for Basic Skills in Mathematics

First and second	Third and fourth	Fifth
• Classify objects into logical categories • Make guesses and carry out experiments to test them • Recognise and create mathematical patterns and relationships • Justify the processes and results of mathematical activities	• Make hypotheses and carry out experiments to test them • Explore and investigate mathematical patterns and relationships • Justify processes and results of mathematical activities, problems and projects • Reason systematically in a mathematical context	• Search for and investigate mathematical patterns and relationships • Justify processes and results of mathematical activities, problems and projects • Make informal deductions • Reason systematically in a mathematical context

Skill: Implementing

According to PDST, Implementation is the carrying out, execution, or practice of a plan, a method, or any design, idea, model, specification, standard or policy for doing something. As such, implementation is the action that must follow any preliminary thinking in order for something to actually happen.

- Devise and use mental strategies and procedures for carrying out mathematical task.
- Use appropriate manipulative's to carry out mathematical procedures.
- Execute standard procedures efficiently with a variety of tools.

Tasks regarding to implementing skill are given in Table 5.

Table 5

Tasks Regarding to Implementing skill for Basic skills in Mathematics

First and second	Third and fourth	Fifth
• Devise and use mental strategies and procedures for carrying out mathematical tasks	• Devise and use mental strategies and procedures for carrying out mathematical task.	• Devise and use mental strategies and procedures for carrying out mathematical task
• Use appropriate manipulatives to carry out mathematical tasks and procedures	• Use appropriate manipulatives to carry out mathematical procedures	• Use appropriate manipulatives to carry out mathematical procedures
• Execute procedures efficiently	• Execute standard procedures efficiently with a variety of tools	• Execute standard procedures efficiently with a variety of tools

Skill: Understanding and recalling

According to PDST, Mathematics is often thought of as a subject that a student either understands or doesn't, with little in between. In reality, mathematics encompasses a wide variety of skills and concepts. Although these skills and concepts are related and often build on one another, it is possible to master some and still struggle with others.

- Understand and recall terminology, facts and definitions.

Tasks regarding to understanding and recalling skill are given in Table 6.

Table 6

Tasks regarding to understanding and recalling skill for Basic skills in Mathematics

First and second	Third and fourth	Fifth
• Understand and recall terminology and facts	• Understand and recall terminology, facts and definitions	• Understand and recall facts, definitions and formulae

Based on this review the investigator prepared a test to assess the Basic skill of elementary teacher trainees in Mathematics.

Reviews Related to Basic Skills in Mathematics

In this section review of related books and research papers have been carried out. Long and Herr (1973) studied about the teacher perceptions of basic mathematics skill needs in secondary vocational education. The results indicated that Mathematics teachers as well as specialists in other subject matter areas, are

confronted by the need to assist student's in understanding the importance of their subject to different areas of application. It is necessary, therefore to articulate learning within the objectives of a particular course sequence to other courses, educational experiences, or vocational tasks to which the learning is a requisite. This helps the learning of specific content become something more than an isolated academic exercise in getting the correct answers. The purposes of the study reported here included identifying which of 66 basic mathematical skills are requisite to success in selected vocational educational courses.

Long and Elizabeth (1975) conducted a study on teacher perceptions of the basic mathematics skill needs in business education. The purpose of the study was to identify the basic mathematics skills that are essential for success in business education and to identify the basic mathematics skills in which business student's are reported to be least prepared. These findings have implications for business education teachers, counsellors and curriculum builders.

Gan (1982) conducted a study about development of mathematical concepts and skills in primary school children. The results indicated that the teacher is primarily the provider of a mathematical environment, an organiser of learning aids and materials and a supervisor who guides the child through telling, questioning and discussion to form concepts and to learn skills. The teacher has to be aware of each child's needs and the stage of development so that it will be able to make the best. Results also pointed that the teacher will be performing a role that provides each child with the teaching and learning that suits the student best.

Gregor (1988) studied the achievement in basic math skills for low performing students to investigate the effects of math instruction (with and without CAI) and the influence of teachers' personalities (rated positive and negative) on the achievement of 117 remedial math students. Analysis of post test results showed that students who had positive teachers were significantly different from those in negative classes. Students who received CAI showed more improvement than those who did not, but to a lesser degree. The most effective combination is a positive teacher who uses CAI. As there were no interactive effects, the results indicated that the personality of the teacher is a major influence on student achievement, regardless of the method of instruction.

Trombley and David (1993) conducted a study on the measurement of basic skills in mathematics to examines the process of developing a measuring instrument to measure basic skills in mathematics for those students entering post-secondary vocational education programs. The study is organized around the steps in the process of developing such an instrument. The first section addresses the need to define conceptually the construct of basic mathematical skills. The paper concluded that, in order to develop a diagnostic test battery for measuring mathematical ability, the domain structure must be clearly defined, continued research must clarify the nature of mathematical ability, and methods of providing maximal diagnostic capability in a minimal amount of student testing time must be developed.

Sheehan and Mislevy (1994) conducted their study on a tree-based analysis of items from an assessment of basic mathematics skills. Here the operating characteristics of 114 mathematics pretest items from the Praxis I: Computer Based

Test were analyzed in terms of item attributes and test developers' judgments of item difficulty. Item operating characteristics were defined as the difficulty, discrimination, and asymptote parameters of a three parameter logistic item response theory (IRT) model. Three types of item attributes were considered: surface features, aspects of the solution process and response type. In addition, the tree-based approach was found to be particularly useful for identifying important interaction effects and for developing graphical summaries of the modeling results.

Ridgway and Passey (1995) conducted a study to understand the mathematical needs of engineering apprentices, triggered by a decline in the basic number skills of applicants. The mathematical challenges of engineering differ from the mathematics taught in school. In particular, great precision is required and different techniques; a good deal of practical problem solving is necessary, too. Conventional measures of educational attainment had high predictive validity; a test created to sample the mathematical skills directly involved in engineering had low predictive validity. They concluded that perfect mathematical technique is essential in engineering; the competencies learned from a broad-based education generalise to practical work; acquisition of mathematical technique does not; technical perfection is not a ‘foundation’, but rather is a component of mathematical education; mathematics education should encourage the development of a broad range of skills and some successful application of technique; and the deployment of skills in a range of contexts should be encouraged.

Loveless (2003) conducted a study about trends in Math: the importance of basic skills. The results indicated that basic skills are necessary to advance in math.

Insisting that students master computation skills is not to advocate that they stop at the basics. Basic skills are a floor, not a ceiling. Students must learn arithmetic so that they can move on to more demanding mathematics: algebra, geometry, calculus. An emphasis on the basics should never be used as an excuse to straitjacket students or to slow their progress in the math curriculum. In recent years, a growing body of research has documented that the skills and knowledge students learn in school is correlated with success later in life.

Fore, Boon, Lawson and Martin (2007) studied using curriculum-based measurement for formative instructional decision-making in basic mathematics skills. In their studies they pointed out that many students believe that math is something one learns about, but they do not understand that it is a tool for learning about other concepts. Mathematics is a language used to describe the relationship between objects, events, and time. Learning math requires that a student interacts with a system of symbols just as a person interacts with alphabetic symbols, syntactical and semantic rules when reading a book. Unfortunately, many students in the United States are not learning the "language" of math.

Wilson and Gillivray (2007) conducted a research on counting on the basics: mathematical skills among tertiary entrants. The study report on basic, mostly pre-senior mathematical skills, as measured by a multiple choice questionnaire, of 566 students enrolled in a first year introductory data analysis subject within a science or broadly scientific degree programme. Most students had previously undertaken a senior high-school algebra and calculus based mathematics subject. Rasch analysis was used to validate the questionnaire and assist in the description of levels of skill.

General linear models demonstrated that a student's skills score depended on the result obtained in senior mathematics, whether or not the student was a mathematics student, gender, whether or not higher level mathematics had been studied, self-efficacy and year. It is concluded that in order to have full and confident use of basic, pre-senior mathematical skills, algebra-based mathematics needs to be studied beyond this level.

King (2008) conducted a study on higher order thinking skills. The results indicated that higher order thinking skills (in Bloom's learning Taxonomy) include critical, logical, reflective, metacognitive, and creative thinking. In Mathematics education these skills are activated when individuals encounter unfamiliar problems, uncertainties, questions, or dilemmas. Successful applications of the skills result in explanations, decisions, performances, and products that are valid within the context of available knowledge and experience and that promote continued growth in these and other intellectual skills. Higher order thinking skills are grounded in lower order skills such as discriminations, simple application and analysis, and cognitive strategies and are linked to prior knowledge of subject matter content. Thus, from the results it is evident that appropriate teaching strategies and learning environments facilitate student persistence, self-monitoring, and open-minded and flexible attitudes.

Noser, Tanner and Situl (2008) studied about having basic mathematical skills grown obsolete in the computer age for assessing basic mathematical skills and forecasting performance in a business statistics course. The purpose of this study was to measure the comprehension of basic mathematical skills of students enrolled

in statistics classes at a large regional university, and to determine if the scores earned on a basic math skills test are useful in forecasting student performance in these statistics classes, and to determine if students' basic math skills have changed over time. The results showed that 22 percent of the students' final grades in business statistics courses were explained by their scores on this skills test. These findings may be of use to statistics faculty in identifying students who experience difficulties in these courses in the future. The current students' scores were compared to scores from a test previously given to students in 1992/1993. The students from the first group had significantly higher scores than the current group of students.

Becker and Vanderwood (2009) studied the evaluation of the relationship between literacy and mathematics skills as assessed by curriculum-based measures. The purpose of this study was to evaluate the extent that reading performance (as measured by curriculum-based measures [CBM] of oral reading fluency [ORF] and Maze reading comprehension), is related to math performance (as measured by CBM math computation and applied math). Additionally, this study examined which of the two reading measures was a better predictor of applied math performance. Results of multiple hierarchical regression analyses indicated that math computation was the best predictor of applied math performance, followed by the Maze task. The results also indicated that ORF did not significantly predict applied math test scores above and beyond math computation and Maze. Thus, from these results it is evident that for fourth and fifth grade students, reading comprehension as measured by the Maze plays a more important role in predicting applied math performance than oral reading fluency.

Hassi, Hannulam and Nevado (2010) studied at the contexts and situation of Finnish adult education in basic mathematical skills. Challenges for and observations of adults' learning of basic mathematics in Finland will be illustrated. Studying mathematics and numeracy are considered against its role in social and personal empowerment. Case studies of Finnish adults' experiences of and personal empowerment by learning mathematics are described by using interview data from two different learning contexts. The first case study deals with older women taking basic mathematics courses in a folk high school and the second one describes learning and teaching of basic mathematics in a prison. Finally, suggestions are offered for future perspectives and education research on adults' basic skills in mathematics in Finland.

Lunsford and Poplin (2011) conducted a study to determine factors that would possibly predict student success in an introductory statistics course. They found that the students basic mathematical skills, as measured on a test created by Johnson and Kuennen, were a significant predictor of student success in the course. They also found a significant professor effect. These results have prompted them to evaluate and modify the teaching of their introductory statistics course.

Piirto (2011) studied about the creativity for 21st Century Skills and how to Embed Creativity into the Curriculum. The results indicated that Mathematical education is closely related to the first group but the others may and must be improved directly and indirectly. These include Ways of Thinking (Creativity and innovation; Critical thinking, problem solving, decision making; Metacognition), Ways of Working (Communication; Collaboration), Tools for Working (Information

literacy, ICT literacy) and Living in the World (Citizenship; Life and career; Personal and social responsibility).

Lin (2013) investigated about the comparison of basic mathematic skills between students with different studying approaches. The purpose of this research was to compare basic mathematic skills based on the students studying approaches. In order to carry out this study, a sample of 139 students in the second (spring) semester of 2009 academic year studying in Ahwaz university were chosen through a cluster method at random. Approaches Study Skills Inventory for Students (ASSIST) is used to measure the student studying approaches. Based on Bayesian information criterion (BIC) regarding ASSIST scale, the students are classified into three groups. By two-step cluster method analysis the students are classified as strategic, surface and deep studying approaches. The findings of one-way (ANOVA) showed that students mathematic basic skills were significantly different among students who adopted different studying approaches and strategies, surface and deep approach. LSD post hoc test indicated that the students with the deep studying approach have higher basic mathematical skills in comparison with that of students with surface and strategic studying approaches.

Hamiyet (2015) conducted a research to analyze the relationship between playing computer games and learning basic mathematics skills. It shows the role computer games play in the learning and achievement of basic mathematical skills by students. Nowadays it is clear that individuals, especially young persons are very fond of computer and computer games. Since students are very interested in computers, they can be used to achieve education and instructional objectives. The

results of the study showed that there is no significant difference between the group that learned basic mathematical skills with the aid of math computer games and the other group that learned basic mathematical skills alone without playing computer game.

Hesse (2015) conducted a study on mathematics skills difficulties faced by students during mathematics problem-solving so as to understand the issues faced by them. The study was carried out using a qualitative method involving a group of fourteen years old students. Test, observations and semi-structured interviews were used to gather data. Results showed that the students have a mixture of difficulties in mathematics skills and their cognitive abilities in learning further intricate the difficulties faced by the students in their mathematics problem-solving.

Niss (2015) conducted a study for the development of mathematical skills with commonly used computer software. The results indicated that technology advances very quickly and life is also always changing. So educational goals must be revised periodically. Learners have to know which skills they must possess. Mathematics education must develop higher-order thinking skills in such away that students can apply them not only in intra-mathematical situations but in real life. Thinking mathematically and solving mathematical problems successfully are skills which evolve in the course of learning mathematics in a school context, as well as in an everyday context. Using everyday spreadsheet software to demonstrate and practice mathematics skills is likely to aid teachers and students in developing these skills.

Wriston (2015) conducted a study about the importance of a strong Mathematical foundation. In the study, it is examined that the mathematical skills students learn from kindergarten through eighth grade are the foundational skills upon which all higher level mathematics courses build. It is highly beneficial that students master previous mathematics concepts, applications, and skills and other higher level mathematical courses. To better aid in the creation of strong mathematical foundations educators should strive to assess student understanding prior to instruction and teach students based off their current understanding and not their current grade level. Study also concluded that the educators should also be sure to not only teach procedural knowledge but also conceptual understanding.

Bartelet, Ghysels, Groot, Haelermans and Brink (2016) conducted a study on the differential effect of basic mathematics skills homework via a web-based intelligent tutoring system across achievement subgroups and mathematics domains. The study examined an educational experiment with a unique combination of 3 elements: homework, the use of information and communication technology and a large degree of freedom of choice (student autonomy). More particularly, we study the effectiveness of a web-based intelligent tutoring system (ITS) that a school offers to its students as optional homework, in a sample of 355 first-year secondary students, using an experimental design. The results showed that whether students make this non compulsory homework in the web-based ITS is dependent on their prior achievement and their teacher, and if they practice, they tend to choose easier modules. Students thus do not seem to optimize learning gains, but rather balance their perceived value of practising and their “expectancy,” as found previously for

regular (compulsory, non-ITS) homework. Regarding the value of choice, findings suggested that students may be poor judges of their most beneficial exercises pattern.

Chumark, Charung and Vichian (2016) studied the development of basic mathematical skills in preschool children by using plasticized clay. The experiment was conducted by using plasticized clay in art activities for 6 weeks, 3 days per week or totaled to 18 times. The study covered all the 6 basic skills in mathematics viz. observation, categorization, comparison, classification, order arrangement and measurement, which consists of 3 activities per skill, totaled to 18 activities, as per the activity table. The same set of test has been conducted to test the basic skill in mathematics by pre-test and post-test design. The research findings indicate that, the art activities using plasticized clay is highly effective to develop basic mathematical skills in pre-school children. And the children in this research exhibited a higher level of development in mathematical skill after participating in the activities.

Rahayu, Kusumah and Darhim (2017) conducted a study to examine the improvement of prospective teachers' basic skills of teaching mathematics through search-solve-create-share learning strategy based on overall and Mathematical Prior Knowledge (MPK) and interaction of both. Quasi experiments with the design of experimental-non-equivalent control group design involved 67 students at the mathematics program of STKIP Garut. The result of this study showed that, there is improvement and achievement of the basic skills of teaching mathematics of the prospective teachers who get the learning of search-solve-create-share strategy is better than the improvement and achievement of the prospective teachers who get

the conventional learning as a whole and based on MPK. The study also pointed that there is no interaction between the learning used and MPK on improving and achieving basic skills of teaching mathematics.

Pohjolainen, Nykanen, Venho and Kangas (2018) conducted a study about analysing and improving student's mathematical skills by using ICT tools. The study was conducted by using the measures include Basic Skill's Test (BST), Mathematics Remedial Instruction (MRI), and student profiling based on students attitudes on learning. Thus from the result it is evident that student learner profiles agree with their average success in the basic skill test for mathematics.

Mejias, Muller and Schiltz (2019) studied about assessing mathematical school readiness. The study showed that early math skills matter for later formal mathematical performances, academic and professional success. Accordingly, it is important to accurately assess mathematical school readiness (MSR) at the beginning of elementary school. This would help identifying children who are at risk of encountering difficulties in math and then stimulate their acquisition of mathematical skills as soon as possible. By using MSR test, it is possible to identify pupils at risk of developing low math skills right from the start of formal schooling. This will help as a foundation for student's future academic and professional carrier.

Conclusion

The review of related studies enabled the investigator to gather extensive information and gave wide perception on the present problem. Various studies about Basic Skills in Mathematics clearly said that mathematical skills are essential in ones life. It has applications in day today life to a great extend. In each year, students

learn new mathematical skills and concepts and also build upon what they learned in previous years. It is incredibly important that students should have a strong understanding of concepts that they learn in one year in order to meet the challenges of the next year. Hence building strong foundation in mathematics is very important. Hence the investigator feel that it is worthwhile to undertake a study to analyse the Basic Skills in Mathematics among elementary teacher trainees.

CHAPTER III

METHODOLOGY

- Variable of the Study
- Objectives of the Study
- Hypothesis of the Study
- Sample Selected for the Study
- Tool used for Data Collection
- Data Collection Procedure
- Scoring and Consolidation of Data
- Statistical Technique used for Data Collection

METHODOLOGY

The section for methodology illustrates research approach and design considered for current study. It has been noted as an endeavour towards the process of elucidating as well as justifying apt mode of research design in terms of apprehending the problem of the research. It is the source to imply the collection of data as well as techniques to attain analysis of the data. Methodology is subject to offer connection between research problem and the procedure by which this problem can be analysed. This section has been categorized under two distinctive parts. These are implication of types of data and the method of the research; and the in-depth analysis of collected data. The conclusion of methodology is a brief note about the ethics related to the research and relevance of accuracy towards the same.

This chapter on Methodology offers an overview about the research design, types of data to be collected, sampling design and relevant interpretation towards the conducting of respective research and necessary statistical tools selected for proposed hypotheses of the research.

The methodology adopted for the study is described under the following major headings:

- Variable of the study
- Objectives of the study
- Hypotheses of the study
- Sample selected for the study

- Tool used for data collection
- Data collection procedure
- Scoring and consolidation of data
- Statistical technique used for data collection

Variable of the Study

The variable selected for the proposed study is the Basic skills in Mathematics.

Objectives of the Study

The objectives set for the study are as follows;

- To identify the extent of Basic skills in Mathematics among the elementary teacher trainees.
- To compare the Basic skills in Mathematics for the sub samples based on;
  - Gender
  - Plus two level streams
  - Type of management
  - Locale

Hypotheses of the Study

The hypotheses designed for the present study is as follows;

- The elementary teacher trainees are having an average level of Basic skills in Mathematics.

- There exist significant difference in the mean scores of Basic skills in Mathematics among elementary teacher trainees for the subsamples based on
  - Gender
  - Plus two level streams
  - Type of management
  - Locale

Sample Selected for the Study

Selection of the suitable sample is an important part of any research work. A sample is a small proportion of the population that is selected for observation and analysis, one can make certain inferences about the characteristics of the population from which it was drawn (Best & Khan, 2014).

A good sample must be as nearly representative of the entire population as possible and ideally it must be provide the whole of the information about the population as possible and ideally it must provide the whole of the information about the population from which the sample has been drawn (Koul, 2011).

The population for the study comprised of elementary teacher trainees in Kozhikode district. The sample of the study constituted 570 elementary teacher trainees studying in Kozhikode district of Kerala state. Stratified random sampling technique was conceived to be best suited for selection of the sample of the present study. Total number of 570 sample were collected by giving due representation to gender, locale and type of management of institutions.

The breakup of the final sample is given in Table 7.

Table 7

Breakup of the Final Sample

Sample	Categories	Number of students	Total
Gender	Male	175	570
	Female	395	
Type of management	Aided	39	570
	Unaided	435	
	Government	62	
	DIET	34	
Plus two level streams	Science	201	570
	Commerce	111	
	Humanities	258	
Locale	Rural	320	570
	Urban	250	

The factors or strata taken in to consideration while selecting the sample are the following.

Gender

Gender has great influence on the findings of the research. Many studies in reviewed revealed that sex difference make change in their basic mathematical skills. So, the investigator decided to give due weightage to male and female student's.

Locale

Locale is an important factor which inference the students basic mathematical skills. Most of the previous studies showed that the basic skills in mathematics of urban student's differ from rural area student's. So the investigator decided to give due weightages to the locality of the elementary teacher training institutions.

Plus two level streams

Plus two level streams in Kerala can be mainly categorised as science, commerce and humanities.

So the investigator decided to consider the streams of subject areas of students, while dealing with the data collected from the sample.

Type of Management

The institutions in Kerala fall in to broad categories viz., Government, aided and unaided. So the investigator decided to give due weightages to the type of management based on Government, aided and unaided in the elementary teacher training institutions.

Details of the institutions selected for the data collection are given as Appendix I.

Tools Used for Data Collection

For the purpose of collecting data, the investigator used the tool

- Test on Basic Skills in Mathematics (Noopura & Saleem,2019)

Detailed description of the tool is given below.

Test on Basic Skills in Mathematics (Noopura & Saleem, 2019)

Test on basic skills in mathematics is a test used to measure the basic skills in mathematics among the elementary teacher trainees. The investigator prepared and standardized an achievement test to get valid and reliable data under the guidance of the supervising teacher. The procedure adopted at different stages of preparation and standardization of Achievement Test is described below:

a) Planning of the test

The first step in the construction of the tool was planning of the test. After selecting the topic, the investigator had gone through the theoretical background and analysed the related studies. It is found that basic skills in mathematics is an essential component for the elementary teacher trainees. In this study investigator try to find out the basic skills in mathematics among the elementary teacher trainees. After the discussion with the supervising teacher, the investigator prepared a test to measure the basic skills in mathematics among elementary teacher trainees. The test was constructed on the basis of skills prescribed by the Professional Development Service for Teachers (PDST).The basic mathematical skills include; Applying and

problem-solving, Communicating and expressing, Integrating and connecting, Reasoning, Implementing, Understanding and recalling.

b) Preparation of the test

Based on the above mentioned components, the investigator developed a test on basic skills in mathematics. The draft consist of 44 items.

The study was to find out the basic skills in mathematics among elementary teacher trainees. The investigator required the data relating to basic skills in mathematics of the sample under study. Based on the components fixed the investigator pooled items to the test. After consulting with supervising teacher and subject experts the test items were modified and finally 44 items were pooled for draft test.

A copy of the draft test on Basic Skills in Mathematics among elementary teacher trainees is given as Appendix II.

The design of the Achievement Test on Basic Skills in Mathematics is described below:

Weightage to Objectives

Items for Achievement Test on Basic Skills in Mathematics were prepared on the basis of levels of the cognitive domain suggested by Anderson and Krathwohl (2001) in Revised Bloom’s Taxonomy. The objectives under cognitive domains are remembering, understanding, applying, analyzing, evaluating, and creating. The weightage given to the objectives in Achievement Test is given in Table 8.

Table 8

Weightage to Objectives

Sl. No.	Objectives	No. of questions	Marks	Percentage
1	Remembering	11	11	25
2	Understanding	9	9	21
3	Applying	7	7	16
4	Analysing	4	4	9
5	Evaluating	8	8	18
6	Creating	5	5	11
	Total	44	44	100

Weightage to Content

To ensure the comprehensiveness of the test, the investigator consulted with supervising teacher and subjects experts. The weightage given to the content in Achievement test is presented in the Table 9.

Table 9

Weightage to Content

Sl. No.	Content	No. of questions	Marks	Percentage
1	Applying and problem solving	11	11	25
2	Communicating and expressing	4	4	9
3	Integrating and connecting	8	8	18
4	Reasoning	5	5	11
5	Implementing	7	7	16
6	Understanding and recalling	9	9	21
	Total	44	44	100

Weightage to form of Questions

The weightage given to form of questions in Achievement Test is presented in Table 10.

Table 10

Weightage to Form of Questions

Sl. No.	Form of Questions	Number of Questions	Mark	Percentage
1	Objective	44	44	100
2	Short answer	0	0	0
3	Essay	0	0	0
	Total	44	44	100

Weightage to Difficulty Level

While constructing the test items due care was given to include items in three levels of difficulty i.e. easy, average and difficult. The weightage given to level of difficulty in Achievement Test is presented in the Table11.

Table 11

Weightage to Level of Difficulty

SL. No.	Difficulty level	No. of questions	Marks	Percentage
1	Easy	12	12	27
2	Average	28	28	64
3	Difficult	4	4	9
	Total	44	44	100

Blue Print

A two dimensional blue print which helps to visualize the coverage of content and objectives of the planned achievement test was prepared by the investigator. The blue print of Achievement Test on Basic Skills in Mathematics is presented in the Table 12.

Table 12

Blue Print of Achievement Test on Basic Skills in Mathematics

Objectives	**LOTS**									**HOTS**									Total no. of questions	Mark
	Remembering			**understanding**			**applying**			**analysing**			**evaluating**			**creating**				
Form of question Content	**O**	**S**	**E**	**O**	**S**	**E**	**O**	**S**	**E**	**O**	**S**	**E**	**O**	**S**	**E**	**O**	**S**	**E**		
Applying and problem solving	11 (11)																		11	11
Communicating and expressing				9 (9)															9	9
Integrating and connecting							7 (7)												7	7
Reasoning										4 (4)									4	4
Implementing													8 (8)						8	8
Understanding and recalling																5 (5)			5	5
Total No. of questions	11			9			7			4			8			5			44	
Total Mark	11			9			7			4			8			5				44

Note: Figures inside brackets indicate number of questions and those outside brackets indicate marks

It was decided to include 44 items while preparing the preliminary test on Basic Skills in Mathematics. Utmost care was taken by the investigator while preparing the items to include required number of items based on all objectives and content. The selection of items was done by consulting with the experienced teachers who are teaching Mathematics in addition to the supervising teacher.

Examples of items based on the objectives are given below:

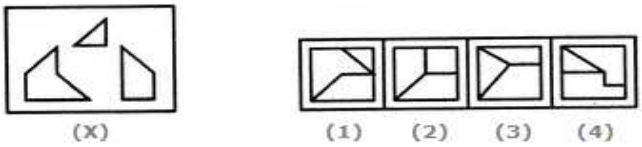
Remembering

1. ___% of 400=60

a. 6 b.12 c. 15 d. 20

Understanding

2. Find out which of the figures (1),(2),(3) and (4)can be formed from the pieces given in figure(X).



a.1 b.2 c.3 d.4

Applying

3. Six bells commence tolling together and toll at intervals of 2, 4, 6, 8, 10, 12 seconds respectively. In 30 minutes, how many times do they toll together?

a.4 b.10 c.15 d.16

Analysing

4. What are the two numbers that have a sum of 15 and a product of 26?

a. 10,5 b. 13,2 c. 2,-13 d. -2,-13

Evaluating

5. How many times will minute hand and hour hand coincide in one day?

a. 21 b. 22 c. 23 d. 24

Creating

6. A father is 30 years older than his son. He will be three times as ols as his son after 5 years. What is the fathers present age?

a. 35 b. 45 c. 40 d. 30

c) Scoring Procedure

The response sheets were scored by giving 1 mark to the correct answer and 0 mark to the wrong one. Later they were consolidated and tabulated for further statistical analysis. The total score obtained for a student on test in Basic Skills in Mathematics was calculated and taken as score of Basic Skills in Mathematics of elementary teacher trainees. While scoring incomplete response sheets were rejected.

d) Try out

The draft test with 44 multiple choice items was tried out on a sample of 370 elementary teacher trainees by the investigator. Due representation was given to the

subgroups of the population based on gender, type of management, plus two level streams and locale while selecting the sample for try out. Before administering the test, necessary instructions were given to the students regarding the method of marking the responses. In addition to that the purpose of the test is made clear to the students. With the help of scoring key, all response sheets were scored and subjected to item analysis. Only 370 response sheets which are completely filled by the respondents were selected for the item analysis.

e) Item Analysis

Item analysis was carried out by the investigator to ensure the quality of test items and for selecting items for the final test. The procedure suggested by Ebel (1972) was employed for item analysis. The response sheet of 370 students complete in all respects were arranged in the order of the scores from high to low. Then based on total score obtained by the students in order to identity the upper and lower group separately, the upper 27 percent and lower 27 percent of total sample were identified. The 27 percent of the respondents with highest total score is considered as upper group (100 pupils with highest score). The 27 percent of the respondents with lowest total score is considered as lower group (100 pupils with lowest score) and then, counted the number of right responses for each item, both in upper and lower group. The difficulty index and discriminating power of each item was calculated for selecting the items in final achievement test.

Difficulty Index

The difficulty index of an item is represented by the percentage of students

who responded to a particular item correctly. The difficulty index was found out by using the formula,

$$DI= (U+L)/ 2N$$

Where,

U = is the number of right responses of an item in the upper group

L = is the number of right responses of an item in the lower group

N = is the size of the sample of the upper or lower group (=100)

Discriminating Power

The discriminating power of an item is the power of the item to discriminate between the upper and the lower group. The Discriminating Power (DP) was calculated by using the formula,

$$DP= (U-L)/ N$$

Where,

U = is the number of right responses of an item in the upper group

L = is the number of right responses of an item in the lower group

N = is the size of the sample of the upper or lower group (=100)

The difficulty index and discriminating power of each item in Achievement Test on Basic Skills in Mathematics are given in Table 13.

Table 13

Difficulty Index and Discriminating Power of Items in Achievement Test on Basic Skills in Mathematics

No.	U	L	DI	DP	Selected	No.	U	L	DI	DP	Selected
1	68	37	0.52	0.31	Accepted	23	87	52	0.69	0.35	Accepted
2	80	44	0.62	0.36	Accepted	24	77	58	0.67	0.19	Rejected
3	73	42	0.57	0.31	Accepted	25	58	26	0.42	0.32	Accepted
4	45	9	0.27	0.36	Accepted	26	78	47	0.62	0.31	Accepted
5	73	39	0.56	0.34	Accepted	27	80	50	0.65	0.30	Accepted
6	78	14	0.46	0.64	Accepted	28	75	43	0.59	0.32	Accepted
7	83	31	0.57	0.52	Accepted	29	66	43	0.54	0.23	Rejected
8	58	29	0.43	0.30	Accepted	30	60	29	0.44	0.31	Accepted
9	81	12	0.46	0.69	Accepted	31	59	27	0.43	0.32	Accepted
10	63	21	0.42	0.42	Accepted	32	69	36	0.52	0.33	Accepted
11	85	44	0.64	0.41	Accepted	33	71	31	0.51	0.40	Accepted
12	87	46	0.66	0.41	Accepted	34	67	25	0.46	0.42	Accepted
13	78	32	0.55	0.46	Accepted	35	66	29	0.47	0.37	Accepted
14	77	46	0.61	0.31	Accepted	36	69	48	0.58	0.21	Rejected
15	69	40	0.54	0.30	Accepted	37	71	33	0.52	0.38	Accepted
16	80	46	0.63	0.34	Accepted	38	69	31	0.50	0.38	Accepted
17	76	44	0.60	0.32	Accepted	39	69	50	0.59	0.19	Rejected
18	85	51	0.68	0.34	Accepted	40	59	24	0.41	0.35	Accepted
19	87	52	0.69	0.35	Accepted	41	65	23	0.44	0.42	Accepted
20	85	56	0.70	0.30	Accepted	42	88	23	0.55	0.52	Accepted
21	77	43	0.60	0.34	Accepted	43	82	25	0.53	0.44	Accepted
22	87	46	0.64	0.41	Accepted	44	79	27	0.53	0.52	Accepted

f) Finalisation of the Test

Selection of objective type items for the final test was done on the basis of the Difficulty Index and Discriminating Power of the items in accordance with the suggestions provided by Ebel (1972). Thus items having Difficulty Index between 0.20 and 0.80 and Discriminating Power greater than or equal to 0.30 were selected. Thus 40 objective type questions were selected for the final test.

A copy of the final version of the tool the Test on basic skills in mathematics and response sheet are appended as Appendix III and Appendix IV.

Reliability of the Tool

Reliability is the degree of consistency that instrument or procedure demonstrate whatever it is measuring, it does so consistently(Best & Kahn, 2014). To ensure the reliability of the test on basic skills in mathematics Cronbach Alpha was used to determine the internal consistency. The Cronbach Alpha coefficient is 0.85 for the items on the test in Basic Skills in Mathematics. Hence the tool is highly reliable.

Validity of the Tool

Validity is that quality of a data gathering instrument or procedure that enables it to measure what it is supposed to measure (Best & Khan, 2011). The investigator ensured the validity of the tool by using face validity and construct validity. Face validity was ensured by giving the prepared draft test to the experts and after considering their suggestions, some modifications was made.

Construct validity is concerned with the meaning and interpretation of the test obtained in terms of psychological or theoretical constructs (Koul, 2009). Test on basic skills in mathematics has a strong theoretical support. The test was constructed on the basis of skills prescribed by the Professional Development Service for Teachers (PDST).

Statistical Techniques Used

For the purpose of analysing the collected data following statistical techniques were used:

- Descriptive statistics
- Percentage analysis
- Test the significant difference between the means of two groups(t test)
- Analysis of Variance (ANOVA)

Descriptive Statistics

To know the basic properties of the variables mean, median, mode and standard deviation was calculated to the variables.

Percentage Analysis

Percentage analysis is one of the basic statistical tools which is widely used in analysis and interpretation of primary data. It deals with the number of respondents response to a particular question is percentage arrived from the total population selected for the study.

t-Test (Test the significant difference between the means of two groups)

The statistical technique ‘Test of Significance of Mean Difference for Large Independent Sample is used to find out if there exist any significant difference among the relevant subsamples.

The test of significance of mean difference for large independent sample is known as t-test.

$$t = \frac{(X_1 - X_2)}{\sqrt{\frac{(s_1)^2}{n_1} + \frac{(s_2)^2}{n_2}}}$$

Where,

X_1 – Mean of the group I

X_2 – Mean of the group II

S_1 – Standard deviation of the group I

S_2 – Standard deviation of the group II

n_1 – Sample size of the group I

n_2 – Sample size of group II

Analysis of Variance (ANOVA)

The analysis of variance is an effective way is an effective way to determine whether the means of more than two samples are different to attribute to sampling error. It helps us to know whether any of the differences between the means of the given samples are significant. in a single classification or one-way analysis of

variance, the relationship between one independent and one dependent variable is examined. (Best & Kahn, 2014)

The Analysis of Variance consist of these operations

- The variance of the score for four groups is combined into one composite group known as the total group variance (vt)
- The mean value of the variance of each of the four groups, computed separately is known as within groups variance (vw)
- The difference between the total groups' variance and the within groups variance is known as the between variance groups (vt-vw=vb)
- The F ratio is computed by,

F= vb/vw= (between groups variance)/ (within groups variance)

For the present study the investigator used analysis of variance (ANOVA) to determine the basic skills in Mathematics of elementary teacher trainees based on plus two level streams and type of management.

CHAPTER IV

ANALYSIS AND INTERPRETATION OF DATA

- Objectives of the Study
- Hypotheses of the Study
- Preliminary Analysis
- Major Analysis
- Conclusion

ANALYSIS AND INTERPRETATION OF DATA

Data analysis is the process of extracting information from data. It is a method in which data is collected and organised so that one can derive helpful information from it. In other words, the main purpose of data analysis is to look at what the data is trying to tell us. Analysis of data include studying the organised material in order to discover inherent facts. The data are studied from as many angles possible to explore new facts and findings. Statistical techniques have contributed greatly in gathering, organising, analysing and interpreting numerical data (Koul,2014).

The main purpose of the study is to find out the basic skills in mathematics among elementary teacher trainees in Kozhikode district. This chapter describes the details of statistical analysis of the data collected. The collected data was analysed statistically and the results are presented and discussed in this chapter.

The analysis and interpretation of data done on the basis of the objectives and hypotheses determined for the study are as follows.

Objectives of the Study

The objectives set for the study are as follows;

- To identify the extent of Basic skills in Mathematics among the elementary teacher trainees.

- To compare the Basic skills in Mathematics for the sub samples based on;
  - Gender
  - Plus two level streams
  - Type of management
  - Locale

Hypotheses of the Study

The hypotheses designed for the present study is as follows;

- The elementary teacher trainees are having an average level of Basic skills in Mathematics.
- There exist significant difference in the mean scores of Basic skills in Mathematics among elementary teacher trainees for the subsamples based on
  - Gender
  - Plus two level streams
  - Type of management
  - Locale

The discussion and interpretation of data are emerged in to two sections i.e., analysis and major analysis.

Preliminary Analysis

At the first step of analysis the descriptive statistical techniques such as mean, median, mode, standard deviation, skewness and kurtosis were worked out for

the variable, basic skills in mathematics, for the total sample and subsample based on gender, plus two level stream, type of management and locale to know the basic properties of the variables.

The results of descriptive statistics for the distribution of score for basic skills in mathematics of elementary teacher trainees for total sample and subsample based on gender, plus two level stream, type of management and locale are calculated and presented in Table 14.

Table 14

Descriptive Statistics of the Variable Basic Skills in Mathematics of Elementary Teacher Trainees for Total Sample and Subsample based on Gender, Plus two level Stream, Type of Management and Locale.

Variable		Category	N	Mean	Median	Mode	SD	Skewness	Kurtosis
Basic Skills in Mathematics	Gender	Male	175	23.731	24	26	3.715	.044	.018
		Female	395	23.562	24	24	3.694	.266	.227
	Type of management	Aided	39	23.794	23	21	3.188	.423	-.354
		Unaided	435	23.446	24	24	3.763	.187	.205
		Govt.	62	24.403	24	20	3.838	.292	-.335
		DIET	34	24.117	24	25	2.972	.232	-.326
	Plus two level stream	Science	201	24.616	25	26	3.811	.284	-.097
		Commerce	111	23.207	24	26	3.549	-.133	.199
		Humanities	258	23	23	24	3.516	.161	.152
	Locale	Rural	320	23.531	24	26	3.815	.143	.105
		Urban	250	23.72	24	22	3.549	.300	.178
		Total	570	23.614	24	24	3.698	.197	.142

Table 14 shows the Basic Skills in Mathematics based on gender, plus two level stream, type of management and locale. From the table it seems that based on gender the obtained value of mean, median and mode for male is 23.73, 24, 26 and for female it is 23.562, 24, 24. It indicate that the value of mean, median and mode coincide approximately for the subsample. For male students the indices of skewness (0.044), kurtosis (0.018) and for female students the indices of skewness (0.044), kurtosis (0.018) indicates that the distribution is positively skewed and leptokurtic in nature.

Table 14 point out the obtained value of mean, median and mode for aided (23.794, 23, 21), unaided (23.446, 24, 24), government (24.403,24,20) and DIET (24.117,24,25) based on types of management. It indicates that the value of mean, median and mode coincide approximately for the subsample. Data showed that for aided, government, DIET the indices of skewness is 0.423, 0.292, 0.232 and kurtosis -0.354, -0.335, -0.326 respectively. This indicates that the distribution is positively skewed and slightly leptokurtic in nature. Table also showed that for unaided the indices of skewness is 0.187 and kurtosis 0.205. This indicates that the distribution is positively skewed and leptokurtic in nature.

Table 14 showed that the obtained value of mean, median and mode for science (24.616,25,26), commerce (23.207,24,26) and humanities (23,23,24) based on plus two level streams. It indicates that the value of mean, median and mode coincide approximately for the subsample. Data showed that for science, commerce, humanities the indices of skewness is 0.24, -0.133, 0.161 and kurtosis -0.097, 0.199, 0.152 respectively. This indicates that the distribution of science, humanities stream

is positively skewed and slightly negatively skewed for commerce stream. Scores also indicate that it is slightly leptokurtic in nature.

From the table based on locale, the obtained value of mean, median and mode of the variable for rural is 23.531, 24, 26 and for urban it is 23.72, 24, 22. It indicates that the value of mean, median and mode coincide approximately for the subsample. For rural the indices of skewness (0.143), kurtosis (0.105) and for urban the indices of skewness (0.300), kurtosis (0.178) indicates that the distribution is positively skewed and leptokurtic in nature.

Table 14 shows that the obtained value of mean, median and mode of the variable, Basic skills in mathematics among elementary teacher trainees are 23.61, 24 and 24 for the total sample. It indicates that the value of mean, median and mode coincide approximately for the total sample. The indices of skewness (sk = 0.197) shows that the distribution of scores for the Basic skills in mathematics among elementary teacher trainees is positively skewed for the total sample. The indices of kurtosis for Basic skills in mathematics among elementary teacher trainees reveals that the distribution scores of Basic skills in Mathematics (K =0.142) is leptokurtic in nature for the total sample of elementary teacher trainees.

Table 14 also shows that the distribution of scores of Basic skills in mathematics for subsamples based on gender, type of management, plus two level streams and locale coincide approximately. Thus the distribution of the scores of Basic skills in mathematics among elementary teacher trainees shows that the distribution is almost normal for the total sample and subsample.

The graphical representation of the distribution of scores of Basic skills in mathematics for the total sample is given in Figure 4,

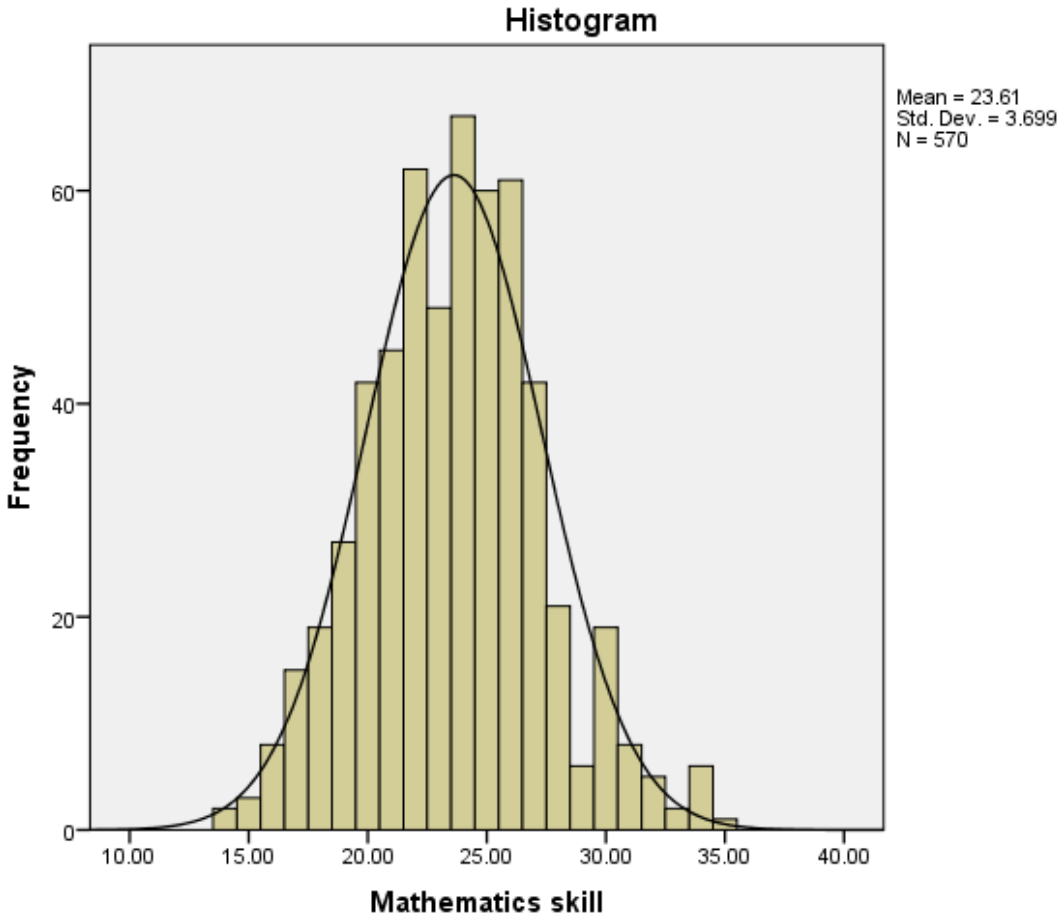


Figure 4. Graphical representation of the distribution of scores of Basic skills in mathematics for the total sample

From the Figure 4 it was evident that the distribution of scores of Basic skills in mathematics of elementary teacher trainees is approximately normal.

Major Analysis

The objectives of the study is to identify the extent of Basic Skills in Mathematics among the elementary teacher trainees. Percentage analysis was used to find this. Percentage analysis is one of the basic statistical tools which is widely used in analysis and interpretation of primary data. The second objective is to compare the Basic Skills in Mathematics for the sub samples based on Gender, Plus two level streams, Type of management and Locale. t test is one type of inferential statistics. To determine whether there exist significant difference in the mean scores of Basic Skills in Mathematics of elementary teacher trainees for the subsamples t test was used.

Extent of Basic Skills in Mathematics among the elementary teacher trainees

The first objective of the study is to find out the extent of Basic Skills in Mathematics among the elementary teacher trainees. The classification of the sample in to those having high Basic Skills in Mathematics, average Basic Skills in Mathematics and low Basic Skills in Mathematics group were done on the basis of sigma (σ**)** distance from the mean. Students having a score with M+σ and above (27 and above) were treated as high Basic Skill in Mathematics group, those students having a score with M-σ and below (20 and below) were treated as low Basic Skills in Mathematics group and those students having a score between M-σ and M+σ (between 20 & 27) were treated as average Basic Skill in Mathematics group. Percentage analysis was used to determine the percentage of students in each group.

The elementary teacher trainees having high Basic Skills in Mathematics, average Basic Skills in Mathematics and low Basic Sklls in Mathematics skill group are presented in Table 15.

Table 15

Data and Result of Extent of Basic Skills in Mathematics Among the Elementary Teacher Trainees

Basic Skills in Mathematics					
High mathematics skill		Average mathematics skill		Low mathematics skill	
N	%	N	%	N	%
110	19.29	386	67.71	74	12.98

Table 15 shows that, out of 570 elementary teacher trainees 110 teacher trainees (19.26%) are having high Basic Skills in Mathematics, 386 students (67.71%) i.e. majority of elementary teacher trainees are having an average Basic Skills in Mathematics and 74 students (12.98%) are having low Basic Skills in Mathematics. Thus it can be concluded that the majority of the elementary teacher trainees are having average level of Basic Skills in Mathematics.

Discussion

The extent of basic skills in mathematics among the elementary teacher trainees were analysed. Out of 570 elementary teacher trainees 110 teacher trainees (19.26%) are having high Basic Skills in Mathematics, 386 students (67.71%) i.e. majority of elementary teacher trainees are having an average Basic Skills in Mathematics and 74 students (12.98%) are having low Basic Skills in Mathematics.

From the calculations it was concluded that the Basis Skill in Mathematics is average for the elementary teacher trainees.

Comparison of Basic Skills in Mathematics for male and female elementary teacher trainees

The results of test of significance difference between mean scores of Basic Skills in Mathematics for male and female elementary teacher trainees are given in Table 16.

Table 16

Data and Results of the Test of Significance difference between Mean scores of Basic Skills in Mathematics for Male and Female Elementary Teacher Trainees

Variable	Gender	N	Mean	Std. Deviation	t
Basic Skills in Mathematics	Male	175	23.7314	3.71575	.504
	Female	395	23.5620	3.69498	

Table 16 indicates that the mean scores of Basic Skills in Mathematics obtained for male students is 23.73 and the mean score of mean scores of Basic Skills in Mathematics obtained for female students is 23.56. Standard deviation obtained for male students is 3.71 and for the female students it is 3.69. The t value obtained is 0.504 which is which is less than the tabled value at 0.05 level (1.96). Since the t-value obtained is less than the tabled value, it can be concluded that there exists no significant difference in the mean scores of Basic Skills in Mathematics obtained for male and female students.

Discussion

The mean scores of Basic Skills in Mathematics obtained for male and female students were analysed. It was found that there is no significant difference in the mean scores of Basic Skills in Mathematics for male and female elementary teacher trainees. So it can be concluded that male and female elementary teacher trainees are having the same level of Basic Skills in Mathematics.

Comparison of Basic Skills in Mathematics between urban and rural elementary teacher trainees

The results of test of significance difference between mean scores of Basic Skills in Mathematics between urban and rural elementary teacher trainees are given in Table 17.

Table 17

Data and Results of the test of Significance Difference between Mean scores of Basic Skills in Mathematics between Urban and Rural Elementary Teacher Trainees

Variable	Locale	N	Mean	Std. Deviation	t
Basic Skills in Mathematics	Rural	320	23.5313	3.81537	.604
	Urban	250	23.7200	3.54908	

Table 17 indicates that the mean scores of Basic Skills in Mathematics obtained for rural students is 23.53 and the mean score of mean scores of Basic Skills in Mathematics obtained for urban students is 23.72. Standard deviation obtained for Basic Skills in Mathematics in rural students is 3.81 and for the urban

students it is 3.55. The t value obtained is 0.604 which is less than the tabled value at 0.05 level (1.96). Since the t-value obtained is less than the tabled value, it can be concluded that there exists no significant difference in the mean scores of Basic Skills in Mathematics obtained between urban and rural elementary teacher trainees.

Discussion

The mean scores of Basic Skills in Mathematics obtained between urban and rural elementary teacher trainees were analysed. It was found that there is no significant difference in the mean scores of Basic skills in Mathematics between urban and rural elementary teacher trainees. So it can be concluded that urban and rural elementary teacher trainees are having the same level of Basic Skills in Mathematics.

Comparison of Basic Skills in Mathematics based on Plus two level streams

The results of the one way ANOVA of Basic Skills in Mathematics for the subgroups based on plus two level streams are presented in the Table 18.

Table 18

Summary of Analysis of Variance of Basic Skills in Mathematics for the subgroups based on Plus two level Streams.

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	315.367	2	157.683		
Within Groups	7469.721	567	13.174	11.969	.00
Total	7785.088	569			

From table 18, it is evident that the F value obtained for basic skills in Mathematics for the subsamples based on plus two level streams is 11.969 for (2,569) df is greater than the tabled value of F (4.643). Thus, there exists significant difference in the mean scores for Basic Skills in Mathematics for the subsamples based on plus two level streams such as science, commerce and humanities streams of elementary teacher trainees.

Discussion

The results of one-way ANOVA for basic skills in Mathematics for the subsamples based on plus two level streams reveals that the F value is greater than the tabled value at 0.01 level of significance. Hence the difference in the mean scores of basic skills in Mathematics among elementary teacher trainees studied plus two science, commerce and humanities streams differ significantly. This prompts for the Post Hoc test. In order to know which groups differ in their mean scores in Basic Skills in Mathematics, Scheffe test of Post Hoc comparison of mean scores in Basic Skills in Mathematics for the subsamples based on plus two level streams are presented in Table 19.

Table 19

Summary of Scheffe Test of Post Hoc Comparison of Basic Skills in Mathematics based on Plus two Level Streams

Stream	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean	
					Lower Bound	Upper Bound
Science	201	24.616	3.811	.2688	23.8812	25.2154
Commerce	111	23.207	3.549	.3368	22.9128	23.7216
Humanities	258	23	3.516	.2188	22.7286	23.3874

Table 19 shows that the difference in the mean scores of basic skills in Mathematics for the streams science, commerce and humanities is significant. The graphical representation of basic skills on Mathematics for the subgroups based on plus two level streams is given in Figure 5.

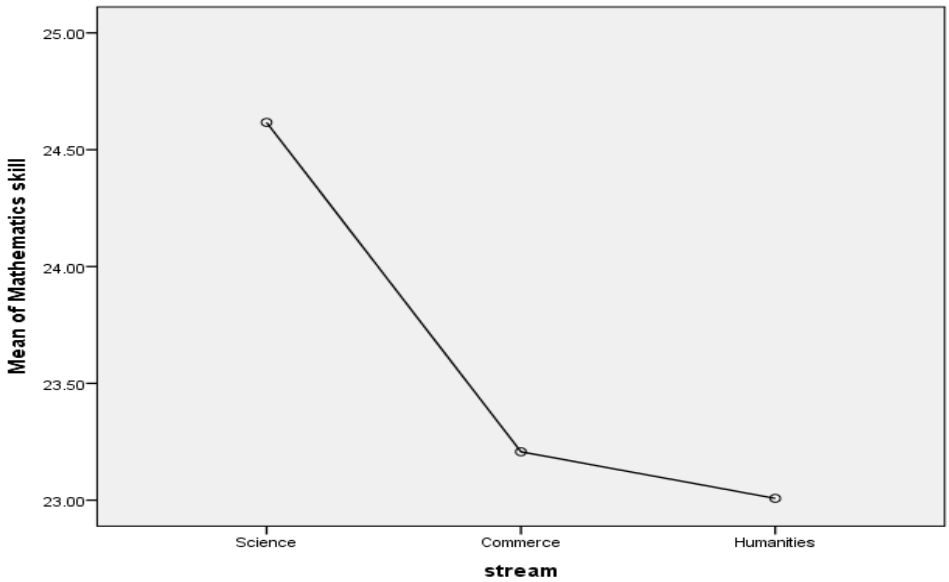


Figure 5. The graphical representation of distribution of scores on Basic skills in Mathematics for the subgroups based on plus two level streams

Figure 5 indicates the significant difference in the Basic skills in Mathematics for the subgroups based on plus two level streams. Students in science stream achieved more scores when compare to others. From the figure its also clear that students from humanities get low scores. Therefore, there exists significant influence of plus two level streams in Basic Skills in Mathematics for total sample.

Comparison of basic skills on Mathematics based on type of management

The results of the one way ANOVA of Basic Skills in Mathematics for the subsamples based on type of management are presented in the Table 20.

Table 20

Summary of Analysis of Variance of Basic Skills in Mathematics for the Subgroups based on Type of Management

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	60.800	3	20.267		
Within Groups	7724.288	566	13.647	1.485	.218
Total	7785.088	569			

From table 20, shows that the F value obtained for basic skills on Mathematics for the subgroups based on type of management is 1.485 for (3,569) df is greater than the tabled value of F. Thus, there is significant difference in the mean scores for basic skills on Mathematics for the subgroups based on type of management such as government, aided, unaided and DIET of elementary teacher trainees.

Discussion

The results of one-way ANOVA for basic skills on Mathematics for the subgroups based on type of management reveals that the F value is greater than the tabled value at 0.01 level of significance. Hence the difference in the mean scores of Basic Skills in Mathematics among government, aided, unaided and DIET of elementary teacher trainees differ significantly. This prompts for the Post Hoc test. In order to know which groups differ differ in their scores on Basic Skills in Mathematics, Scheffe test of Post Hoc comparison of mean scores in Basic Skills in Mathematics for the subgroups based on type of management are presented in Table 21.

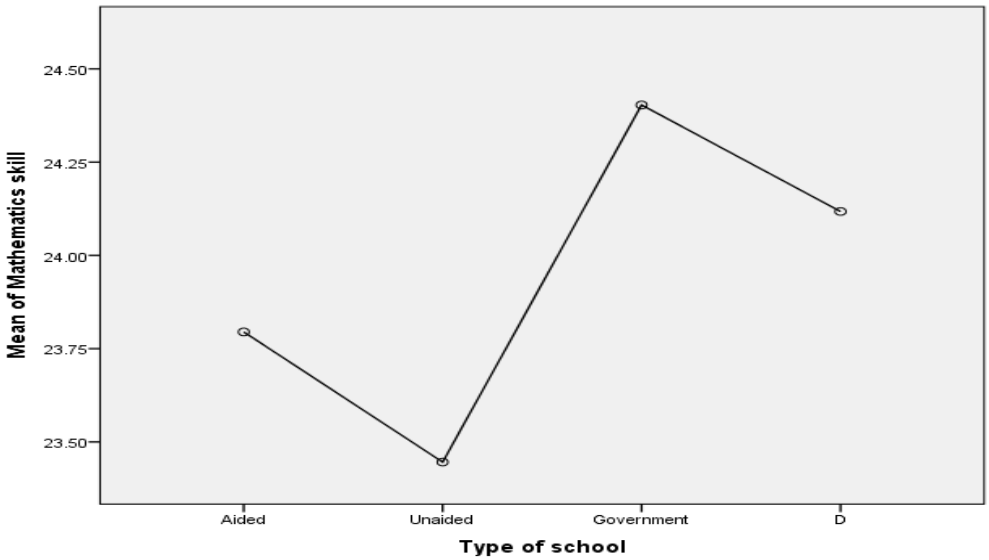
Table 21

Summary of Scheffe Test of Post Hoc comparison of Basic Skills in Mathematics based on Type of Management

	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean	
					Lower Bound	Upper Bound
Aided	39	23.7949	3.18863	.51059	22.7612	24.8285
Unaided	435	23.4460	3.76360	.18045	23.0913	23.8006
Government	62	24.4032	3.83880	.48753	23.4284	25.3781
DIET	34	24.1176	2.97224	.50974	23.0806	25.1547

Table 21 shows that the difference in the mean scores of Basic Skills in Mathematics for type of management such as Aided, Unaided, Government and

DIET is significant. The graphical representation of Basic Skills in Mathematics for the subgroups based on type of management is given in Figure 6.



IET

Figure 6. The graphical representation of distribution of scores on Basic skills in Mathematics for the subgroups based on type of management.

Figure 6 indicates the significant difference in the Basic skills in Mathematics for the subgroups based on type of management. From the figure is clear that the Basic Skills in Mathematics is relatively high for the teacher trainees at the government institutions. Therefore, there exists significant influence on type of management in Basic Skills in Mathematics for total sample.

Conclusion

The distribution of scores of Basic skills in Mathematics for subsamples based on gender, type of management, plus two level streams and locale coincide approximately. Thus the distribution of the scores of Basic skills in Mathematics

among elementary teacher trainees shows that the distribution is almost normal for the total sample and subsample.

From the calculations it was concluded that the extend of Basic Skill in Mathematics is average for the elementary teacher trainees.The mean scores of Basic Skills in Mathematics obtained shows that there is no significant difference in the mean scores for male and female elementary teacher trainees.

The mean scores of Basic Skills in Mathematics obtained indicates that there is no significant difference in the mean scores between urban and rural elementary teacher trainees. Study also indicates there is significant difference in the Basic Skills in Mathematics for the subgroups based on plus two level streams. There is significant difference in the Basic skills in Mathematics for the subgroups based on type of management.

CHAPTER V

SUMMARY, FINDINGS, CONCLUSION AND SUGGESTIONS

- Study in Retrospect
- Major Findings
- Conclusion
- Tenability of Hypotheses
- Educational Implications for the Study
- Suggestions for Further Research

SUMMARY, FINDINGS, CONCLUSION AND SUGGESTIONS

This chapter provides an overview of the significant aspects of the various stages of the study, the major findings of the study and their educational implications, and suggestions for further research. The chapter is organized under the following headings:

- Study in Retrospect
- Major Findings of the Study
- Tenability of Hypotheses
- Educational Implications
- Suggestions for Further Research

Study in Retrospect

Restatement of the Problem

The present study is aimed to find out the Basic Skills in Mathematics among elementary teacher trainees in Kozhikode district. Thus, the present study is entitled as “BASIC SKILLS IN MATHEMATICS AMONG ELEMENTARY TEACHER TRAINEES IN KOZHIKODE DISTRICT.”

Variable of the Study

The variable selected for the proposed study is the Basic skills in Mathematics.

Objectives of the Study

The objectives set for the study are as follows;

- To identify the extent of Basic skills in Mathematics among the elementary teacher trainees.
- To compare the Basic skills in Mathematics for the sub samples based on;
  - Gender
  - Plus two level streams
  - Type of management
  - Locale

Hypotheses of the Study

The hypotheses designed for the present study is as follows;

- The elementary teacher trainees are having an average level of Basic skills in Mathematics.
- There exist significant difference in the mean scores of Basic skills in Mathematics among elementary teacher trainees for the subsamples based on
  - Gender
  - Plus two level streams
  - Type of management
  - Locale

Methodology

The study is intended to investigate the Basic Skills in Mathematics among elementary teacher trainees. The investigator used Survey method for gathering the data and further procedures in the study.

Sample of the Study

The population for the study comprised of elementary teacher trainees in Kozhikode district. The sample of the study constituted 570 elementary teacher trainees studying in Kozhikode district of Kerala state. Stratified random sampling technique was conceived to be best suited for selection of the sample of the present study. Total number of 570 sample were collected by giving due representation to gender, locale and type of management of institutions.

Tools used for the study

For the purpose collecting data from the sample, Test on Basic Skills in Mathematics (Noopura & Saleem, 2019) were used as the tool.

Statistical Techniques used for the study

For the purpose of analysing the collected data following statistical techniques was used.

- Descriptive statistics.
- Percentage analysis
- Test of significance difference between mean scores of large independent sample (t test)
- Analysis of Variance (ANOVA)

Major Findings of the Study

Major findings of the study are as following

- The extent of Basic Skills in Mathematics among the elementary teacher trainees out of 570 teacher trainees, 110 teacher trainees (19.26%) are having high Basic Skills in Mathematics, 386 students (67.71%) i.e. majority of elementary teacher trainees are having an average Basic Skills in Mathematics and 74 students (12.98%) are having low Basic Skills in Mathematics. Thus majority of the elementary teacher trainees are having average level of Basic Skills in Mathematics.

- While comparing the Basic Skills in Mathematics between male and female teacher trainees the t value obtained is 0.504 which is less than the tabled value at 0.05 level (1.96). Since the t-value obtained is less than the tabled value, there exists no significant difference in the mean scores of Basic Skills in Mathematics obtained for male and female elementary teacher trainees.

- While comparing the Basic Skills in Mathematics between urban and rural teacher trainees the t value obtained is 0.604 which is less than the tabled value at 0.05 level (1.96). Since the t-value obtained is less than the tabled value, there exists no significant difference in the mean scores of Basic Skills in Mathematics obtained between urban and rural elementary teacher trainees.

- The results of one-way ANOVA for Basic Skills in Mathematics for the subgroups based on plus two level streams reveals that the F value is greater than the tabled value at 0.01 level of significance. This indicates the significant difference in the Basic skills in Mathematics for the subgroups based on plus two level streams. Therefore, there exists significant difference of plus two level streams in Basic skills in Mathematics for total sample.

- The results of one-way ANOVA for Basic Skills in Mathematics for the subgroups based on type of management reveals that the F value is greater than the tabled value at 0.01 level of significance. Hence the difference in the mean scores of Basic Skills in Mathematics among elementary teacher trainees in government, aided, unaided and DIET differ significantly. Therefore, there exists significant influence of type of management on Basic Skills in Mathematics of elementary teacher trainees.

Conclusion

The distribution of the variable Basic skills in Mathematics among elementary teacher trainees is appropriately normal. From the analysis it is found that the majority of elementary teacher trainees are having average level of Basic Skills in Mathematics. It emphasis the current level of elementary teacher trainees on Basic Skills in Mathematics.

The results indicate that Basic Skills in Mathematics of elementary teacher trainees do not differ on the subsamples based on gender and locale of the institutions. Here we can say that gender and locale does not effect the Basic Skills

in Mathematics of the teacher trainees. While examining other subsamples, there exist significant difference in Basic Skills in Mathematics of elementary teacher trainees based on plus two level streams and type of management. Results shows that students with science as plus two level stream are having high Basic Skills in Mathematics when compared to others. It also seems that students at government institutions scores high on Basic Skills in Mathematics while comparing with rest. Hence we can conclude that plus two level streams and type of management has an effect on the Basic Skills in Mathematics at elementary teacher trainees.

Tenability of Hypotheses

The *first hypothesis states that the elementary teacher trainees are having an average level of Basic skills in Mathematics.* The results showed that the majority of elementary teacher trainees are having average level of Basic Skills in Mathematics. Thus, the first hypotheses is accepted.

The *second hypotheses states that there exist significant difference in the mean scores of Basic skills in Mathematics among elementary teacher trainees for the subsamples based on Gender, Plus two level streams, Type of management and Locale.* In this study it was found there exist no significant difference in the mean scores for Basic Skills in Mathematics based on gender and locale. And also it was found there exist significant difference in the mean scores for Basic Skills in Mathematics based on plus two level streams and type of management. Thus, the second hypotheses is partially accepted.

Educational Implications of the Study

The result of the study has various implications in educational field which may help in the field of education. Teacher act as the instruments who can ignite powerful thoughts and ideas in students, helping them to unleash their true potential. To bring about such long-standing impacts, it is very important that teachers to have certain skills. Mathematics education at the elementary stage should help children prepare for the challenges they face further in life.

It is very important that teacher should be able to tackle the need of students. Study point out that the majority of the elementary teacher trainees are having average level of Basic Skills in Mathematics. We all know that Mathematics is one of the core subjects in educational setting. Hence teacher education should emphasis more on that. It seems that the students who came from science stream at plus two level are having high level of Basic Skills in Mathematics when compared to others. This is beacuse they had a continuity in learning Mathematics as one of their core subjects from the beginning. Students from other stream lack this continuity at some points. Due to this problem it may effect the teaching learning process in future. An elementary teacher should be able to handle every subjects for the children.

The lack of Basic skills in Mathematics may effect the teaching process and also the teacher may find difficulty to solve the problems put forth by childen in the school. Curriculum developers should implement a package to improve the Basic skills in Mathematics for elementary teacher trainees. This will help to increase the quality of education. The package should be able to meet the needs of teacher trainees and also in a way which is useful for their future classroom settings.

Likewise special training can also be given to the teacher trainees to build strong foundations in subjects.

The number of unaided colleges are more at teacher education sector. But it seems that the students had comparatively less scores while comparing with others. This shows the difference in the quality of education provided or the quality of the students enrolled in the college. Like every sectors privatisation has cletches in educational sector also. So there should be immense care and attention for the students at unaided colleges. The number of government and aided colleges should also increased for better educational oppurtunities for children.

Suggestion for Further Research

The findings of the study and limitations encountered in the present study helped the investigator to suggest the following areas for further research.

- The present study is concluded in Kozhikode district only. The same study can be extended to other districts of kerala.
- A comparitive study on Basic Skills in Mathematics and other subjects among elementary teacher training level can be carried out.
- Development and validation of programmes to enhance Basic Skills in Mathematics among students can be carried out.
- Experimental studies to understand the effectiveness of Basic Skills in Mathematics can be carried out.

- Studies can be conducted to examine the various cognitive factors effecting Basic Skills in Mathematics.
- Studies can be conducted to examine the difficulties faced by elementary teacher trainees while dealing with mathematical skills.
- Experimental study to understand the effectiveness of strategies of Basic Skills in Mathematics can be carried out.

BIBLIOGRAPHY

BIBLIOGRAPHY

Anderson, W. L., & Krathwohl, D. R. (2001). A Taxonomy for learning, teaching, and assessing: A revision of bloom's taxonomy of educational objectives. Boston : Allyn & Bacon.

Bartelet, D., Ghysels, J., Groot, W., Haelermans, C., & Brink, H. (2016). The differential effect of basic mathematics skills homework via a web-based intelligent tutoring system across achievement subgroups and mathematics domains: A randomized field experiment. *Journal of Educational Psychology*, *108*(1), 11-26.

Becker, K. J., & Vanderwood, M. L. (2009). Evaluation of the relationship between literacy and mathematics skills as assessed by curriculum-based measures. *The California School Psychologist*, 14(1), 23-34.doi:10.1037/0022-0663.89.4.710.

Best, J. W., & Khan, J. V. (2014). *Research in education.* (10th ed.). NewDelhi: Prentice Hall of India.

Borovik, A., & Gardiner, T. (2015). Mathematical Abilities and Mathematical Skills. *World Federation of National Mathematics.* 4(1), 10-25. Retrieved from http://eprints.ma.man.ac.uk/839/01/covered/MIMS_ep2007_109.pdf

Brown, G., & Quinn, R. J. (2007). Fraction Proficiency and Success in Algebra: What Does Research Say?. *Australian Mathematics Teacher*, 63(3), 23-30.

Chumark, K., Charung, L., & Vichian, R. (2016). Developing Basic Mathematical Skills of Pre-School Children by Using Plasticized Clay. *Journal of Education and Practice*, 12(7) 180-183, doi: 10.1006/ rep.199.1026

Ebel, R. L. (1972). *Essentials of educational measurement.* Englewood Cliffs,NJ: Prentice-Hall.

Fore III, C., Boon, R. T., Lawson Sr, C., & Martin, C. (2007). Using curriculum-based measurement for formative instructional decision-making in basic mathematics skills. *Education*, *128*(2), 324-333.

Gan, K. S. (1982). Development of mathematical concepts and skills in primary school children. *Teaching and Learning*, *3*(1), 14-20.

Gibb, N. (2015). The Importance of Maths and English in our Schools and Colleges. *Journal Of Educational Research*, 72(1), 18-32. Retrieved from https://www.nickgibb.org.uk/news/importance-maths-and-english-our-schools-and-colleges

Gregor, L. (1988). Revisiting Mathematics Manipulative skills. *Australian Mathematics Classroom*, 15(2), 13-19.

Hamiyet, S. (2015). The effects of computer games on the achievement of basic mathematical skills. *Educational Research and Reviews*, *10*(22), 2846–2853. doi: 10.5897/err2015.2172

Hassi, M. L., Hannula, A., & Nevado, L. (2010). Basic Mathematical Skills and Empowerment: Challenges and Opportunities in Finnish Adult Education. *Adults Learning Mathematics*, *5*(1), 6-22.

Hesse, F. A. (2015) Framework for Teachable Collaborative Problem Solving Skills. *Assessment and Teaching of 21st Century Skills*, 2(3), 38-56.

King, F. (2008). Higher Order Thinking Skills: Definition, Teaching, Strategies, Assessment. *Advancement of Learning and Assessment*, 2(5), 176-189. Retrieved from: http://www.cala.fsu.edu/files/higher_order_thinking _skills. pdf.

Koul, L. (2011). *Methodology of education research.* Noida India: Vikash publishing House

Lin, C. (2013). Preservice Teachers' Conceptual and Procedural Knowledge of Operations: A Comparative Study of the United States and Taiwan. *School Science and Mathematics*, 113(1), 41-45.

Long, T. E., & Herr, E. L. (1973). Teacher perceptions of basic mathematics skill needs in secondary vocational education. *The Mathematics Teacher*, *66*(1), 61-66. doi:10.1037/0022-3514.72.1.218

Long, T. E., & Elizabeth, K.C. (1975). Teacher perceptions of the basic mathematics skill needs in business education. *Delta Pi Epsilon Journal*, 17(3),37.

Loveless, T. (2016). Trends in Math: The Importance of Basic Skills. *Journal of Educational Research.* 72(1), 218-232. Retrieved from https://www.brookings.edu/articles/trends-in-math-the-importance-of-basic-skills/

Lunsford, M. L., & Poplin, P. (2011). From Research to Practice: Basic Mathematics Skills and Success in Introductory Statistics. *Journal of Statistics Education*, 19(1). doi: 10.1080/10691898.2011.11889604

Mbewe, S. (2010). Pre-service teachers' familiarity, interest and conceptual understanding of science process skills. *Problems of Education in the 21st Century.* 3(2), 76-86. doi:10. 1037// 0022-3514.80.3.501.

Mejias, S., Muller, C., & Schiltz, C. (2019). Assessing Mathematical School Readiness. *Frontiers in Psychology*, 10, 1173.

NCES (1995). National Center for Education Statistics. Retrieved from http;//www.nces.ed.gov.in/rightside/link/pdf/educationstatistics/mathematicsns1995.pdf

NCTM (2015). National Council of Teachers of Mathematics: Principles and Standards. Retrieved from http://www.nctm.org/

Network Communicate Support Motivate: Position Paper on Basic Mathematical Skills (2015). Retrieved from http://midcentral-coop.org/uploads/Basic%20Skills%20Position%20Paper.pdf.

Niss, M. (2015). Assessing Mathematical Literacy: The PISA Experience. *Mathematical Competencies and PISA*, 12(4), 35-56. doi: 10.1007/s10339-015-0748-z.

Noser, T. C., Tanner, J. R., & Situl, S. (2008). Have Basic Mathematical Skills Grown Obsolete In The Computer Age: Assessing Basic Mathematical Skills And Forecasting Performance In A Business Statistics Course. *Journal of College Teaching & Learning (TLC), 5*(4). doi: 10.19030/tlc.v5i4.1263

Piirto, J. (2011). Creativity for 21 st Century Skills; How to Embed Creativity into the Curriculum. *Journal of Statistics Education*, 10(2),195-211.

Pohjolainen, S., Nykänen, O., Venho, J., & Kangas, J. (2018). Analysing and improving students' mathematics skills using ICT-tools. *Eurasia Journal of Mathematics, Science and Technology Education*, *14*(4), 1221-1227.

PDST. (2010). Retrieved from: https://pdst.ie/sites/default/files/Maths%20skill %20 line%20of%20development_0

Rahayu, D. H.,Kusumah,Y. S., & Darhim (2017). Improving the basic skills of teaching mathematics through learning with search-solve-create-share strategy. *Journal of Physics: Conference Series*, 10(3), 75-93. doi: 10.5688/ ajpe79564

Ridgway, J., & Passey, D. (1995). When basic mathematics skills predict nothing: Implications for education and training. *Educational psychology*, *15*(1), 35-44.

Sheehan, K., & Mislevy, R. J. (1994). A Tree-Based Analysis of Items from an Assessment of Basic Mathematics Skills. Literacy Today, 2(6), 23-39.doi: 10.31 02/00346543067001088.

Trombley, L & David, E. (1993). Measurement of Basic Skills in Mathematics. *The mathematics teacher,* 3(2), 28-39. Retrieved from http://digitalcommons. usu.edu/etd/4674

Wang, J. (2003). Importance of Middle School Mathematics on High School Students' Mathematics Achievement. *Journal of Educational Research*, 97(1), 3-19. doi:10.1023/ A:1011965830686.

Wilson, T. M & Gillivray, H. L. (2007). Counting on the basics: mathematical skills among tertiary entrants. *International Journal of Mathematical Education in Science and Technology*, 38(1), 19-41. DOI: 10.1080/00207390600819029.

Wriston, J. M. (2015). The Importance of a Strong Mathematical Foundation. *Educational Research and Reviews,* 3(2),177-192. Retrieved from: https:// ideaexchange. zuakron.edu/honors_research_projects/177

Zieky, M. J. (1977). Standard setting issues and methods. *Applied Psychological Measurement*, 4(4), 447-467. doi:10.1186/1472-6920-12-4.

APPENDICES

APPENDIX 1

LIST OF INSTITUTIONS

No.	Name of institutions
1	Govt. TTI Kozhikode
2	Govt. TTI Women
3	AWH TTI, Kallai
4	Calicut Orphanage TTI, Kolathara
5	Darul Huda TTI, Vanimel
6	DHM TTI, Maniyur
7	DIET Vatakara
8	Farook institute of teacher education
9	KMCT TTI, Manasseri
10	KMO TTI Koduvally
11	MAM TTI, Mukkam
12	Meppayur Salafi TTI
13	MO TTI, Cheruvatta
14	SSM TTI, Kodiyathur
15	St. Vincent Colony TTI, Kozhikode
16	JDT TTI, Vellimadukunnu

APPENDIX II

FAROOK TRAINING COLLEGE

DEPARTMENT OF EDUCATION

BASIC SKILLS IN MATHEMATICS AMONG ELEMENTARY TEACHER TRAINEES IN KOZHIKODE DISTRICT

TEST FOR ELEMENTARY TEACHER TRAINEES

(DRAFT)

Dr.T.Mohamed Saleem **Noopura.S**
Research Guide M.Ed student

Suggestions:

The following questions are intended to seek information about the basic skills in mathematics among elementary teacher trainees. Read each questions carefully and choose the correct answer for each questions. Your responses will be kept confidential and used only for research purpose.

Name of the student:

Name of the institution:

Government/Aided/Unaided Gender: Male/Female/Transgender

Plus two level stream: Science/Humanities/Commerce/others(specify)

1. (1+2+3+.....+99+100)= ?

   a.5050 b.1001 c.5051 d.1011

2. What is the unit digit of 2^{10} ?

   a.5 b.4 c.9 d.1

3. 100000÷1000÷10= ?

   a.1000 b.100 c.101 d.10

4. Which of the following is greatest?

   a.0.1 b.0.01 c.$(0.11)^2$ d.0.001

5. If $0.13 \div p^2 = 13$, then p= ?

   a.10 b.0.01 c.0.1 d.100

6. Which of the following fractions lies between 3/5 and 2/3 ?

   a.2/5 b.1/3 c.1/15 d.31/50

7. 1-[1-{1-(1-1)}] = ?

   a.0 b.1 c.2 d.-1

8. What are two numbers that have a sum of 15 and a product of 26?

   a.10,5 b.13,2 c.2,-13 d.-2,-13

9. Which of the following satisfying Pythagoras theorem ?

   a.(2,3,5) b.(5,7,9) c.(6,9,11) d.(8,15,17)

10. Six bells commence tolling together and toll at intervals of 2, 4, 6, 8, 10, 12 seconds respectively. In 30 minutes, how many times do they toll together?

    a.4 b.10 c.15 d.16

11. Which of the following is the smallest fraction?

    a.7/6 b.7/9 c.4/5 d.5/7

12. __ ? % of 400=60

    a.6 b.12 c.15 d.20

13. Out of an earning of Rs.720, ram spends 65%. How much does he save?

    a.Rs.350 b.Rs.390 c.Rs.252 d.Rs.316

14. 40% of a number is 256.What is the 25% of same number?

    a.120 b.160 c.150 d.140

15. On selling 100 pencils a shopkeeper gains a sum equal to the selling price of 20 pencils. His gain percent is?

    a.25% b.20% c.15% d.12%

16. Which is the next in the series?

    3,13,31,57,…

    a.91 b.87 c.93 d.90

17. A man covers half of his journey at 6km/hr and the remaining half at 3km/hr. Then what will be the average speed?

    a.9km/hr b.4.5km/hr c.4km/hr d.3km/hr

18. How much time will it take for an amount of Rs.450 to yield Rs.81 as interest at 4.5% per annum of simple interest?

    a.3.5 years b.4 years c.4.5 years d.5 years

19. At the end of three years what will be the compound interest at the rate of 10% per annum on an amount of Rs.20000?

    a.Rs.6620 b. Rs.6500 c. Rs.6800 d.Rs.6400

20. 56 men can complete a piece of work in 24 days. In how many days can 42 men complete the same piece of work ?

    a.18 b.32 c.98 d.48

21. How many times will minute hand and hour hand coincide in one day?

    a.21 b.22 c.23 d.24

22. If A:B = 3:4 , B:C =8:9 ,then A:C= ?

    a.1:3 b.3:2 c.2:3 d.1:2

23. In an office, there are 4800 employees. If 3200 of them are male, then what is ratio of the male employees to female?

    a.2:1 b.3:2 c.4:5 d.3:1

24. The product of two whole numbers is 37. What is the square root of the difference of the numbers?

    a.8 b.7.5 c.6 d.4.5

25. A, B and C started a business by investing Rs.2500,Rs.3000 and Rs.3500 respectively. Find the share of B, out of an annual profit of Rs.1872?

    a.Rs.654 b.Rs.624 c.Rs.634 d.Rs.662

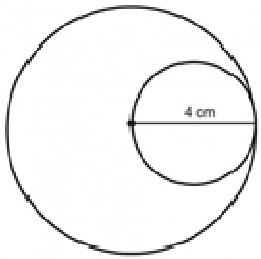
26. $(17)^{3.5} \times (17)^{?} = 17^{8}$

    a.2.29 b.2.75 c.4.25 d.4.5

27. If the largest angle in a right triangle is 70^0, what is the possible value of the smallest angle of the triangle?

    a.60^0 b.40^0 c.20^0 d.30^0

28. What is (area of large circle) – (area of small circle) in the figure?



a.8 π cm^2 b.10 π cm^2 c.12 π cm^2 d.16 π cm^2

29. The ratio in which two sugar solutions of concentrations 15% and 40% are to be mixed to get a solution of concentration 30% is ?

a.2:3 b.3:2 c.8:9 d.9:8

30. A parallelogram has sides 30m and 14m and one of its diagonals is 40m long. Then what will be its area?

a.336m^2 b.168m^2 c.480m^2 d.372m^2

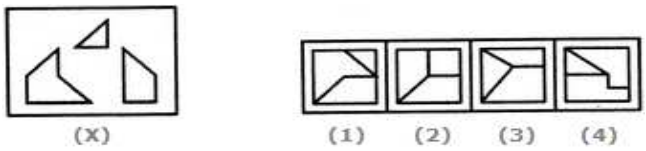
31. In a rectangle length is greater than its breadth by 4cm. Its perimeter is 20cm.Then what is the area?

a.36cm^2 b.21cm^2 c.30cm^2 d.40cm^2

32. The length of diagonal of a cube is $4\sqrt{3}$ cm. What will be its volume?

a.16cm^2 b.27cm^2 c.64cm^2 d.48cm^2

33. Find out which of the figures (1),(2),(3) and (4)can be formed from the pieces given in figure(X).



a.1 b.2 c.3 d.4

34. The probability that a number selected at random from the first 50 natural numbers is a composite number is ___?

a. 21/25 b.17/25 c.4/25 d.8/25

35. A father is 30 years older than his son. He will be three times as old as his son after 5 years. What is the father's present age?

a.35 b.45 c.40 d.30

36. A sold a watch to B at 20% gain, B sold it to C at a loss of 10%. If C bought the watch for Rs.216, at what price did A purchase it?

a.Rs.200 b.Rs.216 c.Rs.250 d.Rs.176

37. There are eight mango trees in a straight line. The distance between each mango tree with other is 3 metres. What is the distance between first tree and eighth tree?

a.24m b.27m c.30m d.21m

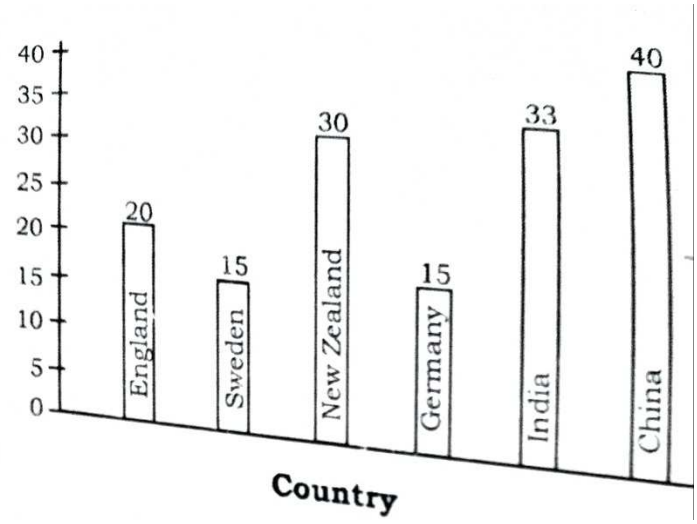
38. Anu had a total of Rs.320 in the denominations of 1-rupee coins, 5-rupee coins & 10-rupee coins. Given that the number of coins for all the denominations is same. What is the total no. of coins that she has?

a.45 b.60 c.75 d.90

39. The diameter of the base of a conical tent is 19.2m and its height is 2.8m. What is the area of the canvas required to build such a tent?

a.3017.10m^2 b.3170m^2 c.301.71m^2 d.30.17m^2

40. Study the following graph and answer the questions based on it. (Q.no 40-44)



The birth-rate of which country is25% more than that of Germany?

a. India b. China c. England d. New Zealand

41. The birth rate of India is what percent of the birth-rate of England?

a.165% b.155% c.140% d.100%

42. The birth-rate of China is how many times the birth-rate of Germany?

a.0.4 b.5.2 c.4.0 d.2.5

43. What is the ratio of birth-rate of India to that of Sweden?

    a.5:11 b.11:5 c.2:1 d.1:2

44. By how much percent is the birth-rate of England less than the birth rate of New Zealand?

    a.30% b.33.33% c.45% d.50%

APPENDIX III

FAROOK TRAINING COLLEGE

DEPARTMENT OF EDUCATION

BASIC SKILLS IN MATHEMATICS AMONG ELEMENTARY TEACHER TRAINEES IN KOZHIKODE DISTRICT

TEST FOR ELEMENTARY TEACHER TRAINEES

(FINAL)

Dr.T.Mohamed Saleem **Noopura.S**
Research Guide M.Ed student

Suggestions:

The following questions are intended to seek information about the basic skills in mathematics among elementary teacher trainees. Read each questions carefully and choose the correct answer for each questions. Your responses will be kept confidential and used only for research purpose.

Name of the student:

Name of the institution:

Government/Aided/Unaided Gender: Male/Female/Transgender

Plus two level stream: Science/Humanities/Commerce/others(specify)

1. (1+2+3+.....+99+100)= ?

   a.5050 b.1001 c.5051 d.1011

2. What is the unit digit of 2^{10} ?

   a.5 b.4 c.9 d.1

3. 100000÷1000÷10= ?

   a.1000 b.100 c.101 d.10

4. Which of the following is greatest?

   a.0.1 b.0.01 c.$(0.11)^2$ d.0.001

5. If $0.13 \div p^2 = 13$, then p= ?

   a.10 b.0.01 c.0.1 d.100

6. Which of the following fractions lies between 3/5 and 2/3 ?

   a.2/5 b.1/3 c.1/15 d.31/50

7. 1-[1-{1-(1-1)}] = ?

   a.0 b.1 c.2 d.-1

8. What are two numbers that have a sum of 15 and a product of 26?

   a.10,5 b.13,2 c.2,-13 d.-2,-13

9. Which of the following satisfying Pythagoras theorem ?

   a.(2,3,5) b.(5,7,9) c.(6,9,11) d.(8,15,17)

10. Six bells commence tolling together and toll at intervals of 2, 4, 6, 8, 10, 12 seconds respectively. In 30 minutes, how many times do they toll together?

    a.4 b.10 c.15 d.16

11. Which of the following is the smallest fraction?

    a.7/6 b.7/9 c.4/5 d.5/7

12. __ ? % of 400=60

    a.6 b.12 c.15 d.20

13. Out of an earning of Rs.720, ram spends 65%. How much does he save?

    a.Rs.350 b.Rs.390 c.Rs.252 d.Rs.316

14. 40% of a number is 256.What is the 25% of same number?

    a.120 b.160 c.150 d.140

15. On selling 100 pencils a shopkeeper gains a sum equal to the selling price of 20 pencils. His gain percent is?

    a.25% b.20% c.15% d.12%

16. Which is the next in the series?

    3,13,31,57,…

    a.91 b.87 c.93 d.90

17. A man covers half of his journey at 6km/hr and the remaining half at 3km/hr. Then what will be the average speed?

    a.9km/hr b.4.5km/hr c.4km/hr d.3km/hr

18. How much time will it take for an amount of Rs.450 to yield Rs.81 as interest at 4.5% per annum of simple interest?

    a.3.5 years b.4 years c.4.5 years d.5 years

19. At the end of three years what will be the compound interest at the rate of 10% per annum on an amount of Rs.20000?

    a.Rs.6620 b. Rs.6500 c. Rs.6800 d.Rs.6400

20. 56 men can complete a piece of work in 24 days. In how many days can 42 men complete the same piece of work ?

    a.18 b.32 c.98 d.48

21. How many times will minute hand and hour hand coincide in one day?

    a.21 b.22 c.23 d.24

22. If A:B = 3:4 , B:C =8:9 ,then A:C= ?

    a.1:3 b.3:2 c.2:3 d.1:2

23. In an office, there are 4800 employees. If 3200 of them are male, then what is ratio of the male employees to female?

    a.2:1 b.3:2 c.4:5 d.3:1

24. A, B and C started a business by investing Rs.2500,Rs.3000 and Rs.3500 respectively. Find the share of B, out of an annual profit of Rs.1872?

    a.Rs.654 b.Rs.624 c.Rs.634 d.Rs.662

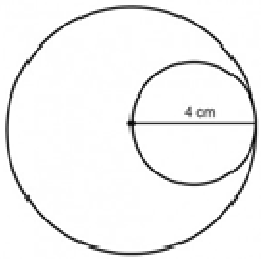
25. $(17)^{3.5} \times (17)^{?} = 17^{8}$

    a.2.29 b.2.75 c.4.25 d.4.5

26. If the largest angle in a right triangle is 70^0, what is the possible value of the smallest angle of the triangle?

    a.60^0 b.40^0 c.20^0 d.30^0

27. What is (area of large circle) – (area of small circle) in the figure?



a.8 π cm^2 b.10 π cm^2 c.12 π cm^2 d.16 π cm^2

28. A parallelogram has sides 30m and 14m and one of its diagonals is 40m long. Then what will be its area?

a.336m^2 b.168m^2 c.480m^2 d.372m^2

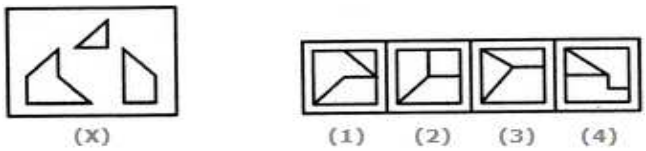
29. In a rectangle length is greater than its breadth by 4cm. Its perimeter is 20cm.Then what is the area?

a.36cm^2 b.21cm^2 c.30cm^2 d.40cm^2

30. The length of diagonal of a cube is $4\sqrt{3}$ cm. What will be its volume?

a.16cm^2 b.27cm^2 c.64cm^2 d.48cm^2

31. Find out which of the figures (1),(2),(3) and (4)can be formed from the pieces given in figure(X).



a.1 b.2 c.3 d.4

32. The probability that a number selected at random from the first 50 natural numbers is a composite number is ___?

a. 21/25 b.17/25 c.4/25 d.8/25

33. A father is 30 years older than his son. He will be three times as old as his son after 5 years. What is the father's present age?

a.35 b.45 c.40 d.30

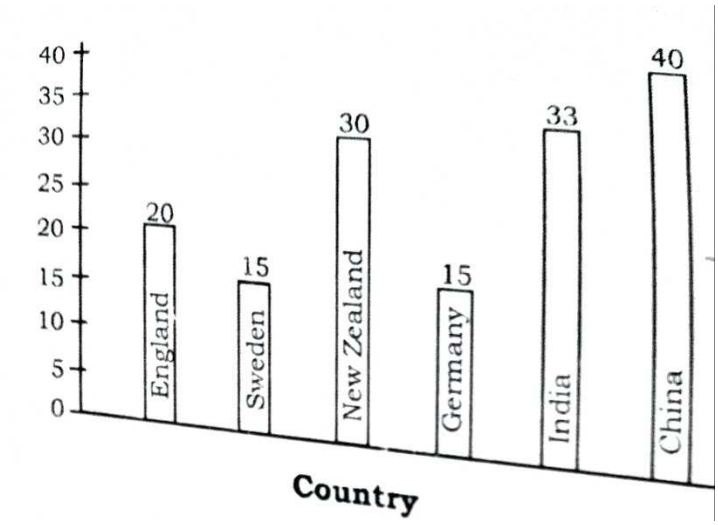
34. There are eight mango trees in a straight line. The distance between each mango tree with other is 3 metres. What is the distance between first tree and eighth tree?

a.24m b.27m c.30m d.21m

35. Anu had a total of Rs.320 in the denominations of 1-rupee coins, 5-rupee coins & 10-rupee coins. Given that the number of coins for all the denominations is same. What is the total no. of coins that she has?

a.45 b.60 c.75 d.90

36. Study the following graph and answer the questions based on it. (Q.no 36-40)



The birth-rate of which country is25% more than that of Germany?

a. India b. China c. England d. New Zealand

37. The birth rate of India is what percent of the birth-rate of England?

a.165% b.155% c.140% d.100%

38. The birth-rate of China is how many times the birth-rate of Germany?

a.0.4 b.5.2 c.4.0 d.2.5

39. What is the ratio of birth-rate of India to that of Sweden?

a.5:11 b.11:5 c.2:1 d.1:2

40. By how much percent is the birth-rate of England less than the birth rate of New Zealand?

a.30% b.33.33% c.45% d.50%

RESPONSE SHEET

BASIC SKILLS IN MATHEMATICS AMONG ELEMENTARY TEACHER TRAINEES IN KOZHIKODE DISTRICT

TEST FOR ELEMENTARY TEACHER TRAINEES

Name of the student :

Name of the institution :

Type of management : Government/Aided/Unaided

Gender : Male/Female/Transgender

Plus two level stream : Science/Humanities/Commerce/others(specify)

Q. No	Response	Q. No	Response	Q. No	Response	Q. No	Response
1		11		21		31	
2		12		22		32	
3		13		23		33	
4		14		24		34	
5		15		25		35	
6		16		26		36	
7		17		27		37	
8		18		28		38	
9		19		29		39	
10		20		30		40	