

**CONCRETE OPERATIONAL ABILITY AMONG
ELEMENTARY SCHOOL STUDENTS
IN KERALA**

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DECLARATION

I, Nijila, Mohanan. E.P., do hereby declare that this dissertation **CONCRETE OPERATIONAL ABILITY AMONG ELEMENTARY SCHOOL STUDENTS IN KERALA** has not been submitted by me for the award of a Degree, Diploma, Title or Recognition before.

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CERTIFICATE

I, Anees Mohammed. C., Do hereby declare that this dissertation **CONCRETE OPERATIONAL ABILITY AMONG ELEMENTARY SCHOOL STUDENTS IN KERALA** is a record of bonafied study and research carried out by Nijila Mohanan E.P., under my guidance and supervision. The report has not been submitted by her for the award of a Degree, Diploma, Title or Recognition before.

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INTRODUCTION

- *Need and significance of the study*
- *Statement of the problem*
- *Operational Definition of key terms*
- *Objectives of the study*
- *Methodology*
- *Scope and Limitations of the study*
- *Organization of the report*

Education is the back bone of the every nation and it is considered as the foundation of intellectual power which shape the profile of the country. The progress of a country depends up on the quality of education. Educated person contribute for the development of the society. So education is considered as the important input for the development of individual, society and the nation. The education that we got from our childhood is most important because it helps to mould an individual into a perfect citizen. Children got this basic education first from parents and then from teachers. Education aims at shaping the behaviour of a person in a proper way and leads them to all-round development in their personality. Psychology as a discipline, studies the science of behaviour and has an important role in moulding such personality.

Educational psychology is one of the main branches of psychology deals mainly with the process and product of the education. It is the scientific study of human behaviour in educational situation. According to Stephen (1999) educational psychology is the systematic study of the educational growth and development of a child. The main function of the educational psychology helps the teacher to understand the theoretical and practical nature of educational process. Education and psychology are closely related with each other. Education helps to modify the behaviour through learning but at the same time psychology is the study of behaviour. It helps to understand the overt behaviour of an individual.

The aim of education is to show a markable change in the learner. These changes are due to growth and development of attitudes and habits of human

behaviour. The age between six and fourteen is considered as a middle childhood and early adolescence. It is very important time of the developmental stages of human being. A person acquires his/her basic character from his /her childhood onwards. If a country wants a good citizen the curriculum of elementary education should include some abilities that helps to mould a perfect citizen. Today each and every person has to face so many problems. If he wants to know what is right and what is wrong he should be provided with a proper elementary education.

Elementary education is also called primary education. Inmost of the countries in the world it is called as elementary education or elementary schools. In India we simply say primary education. Primary education starts at the age of 6 and ends when he or she is 14 year old. Elementary education is considered as the beginning of the formal education of a child. Education can be considered to be the most vital asset that the society has because knowledge is the priceless wealth that people will never mislay under any circumstances and further the knowledge gets shared. Therefore elementary education forms the foundation for gaining basic knowledge without which the dream of children will become impossible. It will make child to face some basic problems without fear and also it will make the children to understand what is right and what is wrong. Elementary education will help the children to know the society and also to interact with the society. So this is important that how a child reacts with this education, this is because each child have a different level of capability to grasp knowledge. Usually elementary education is provided during the period of six and fourteen years. According to Jean Piaget this period is known as concrete operational stages.

Piaget is a great psychologist. He proposed cognitive developmental theory. According to Piaget (1952) cognitive development arises as result of the interaction between the individual and the world and passes through a series of sequential stages. He identified four major stages in the cognitive development of an individual. 1- Sensory motor stage (1-2 year) 2- Pre- operational stage (2-7 years) 3- concrete operational stage (7-11 years) 4- Formal operational stages (12-adult hood).

The capacity of logical thought emerges in concrete operational stage. The thought process is limited to real events observed. They cannot handle abstract experiences. The major abilities during this stages are a) Inductive –deductive reasoning b) Flexibility in thinking c) Classification and serialization d) Transitivity e) Reversibility in thought f) Spatial operations g) Conservation, h) Decentration i) horizontal decalage. The child acquiring a lot of abilities during this stage. The abilities acquired differ for different children.

Parental educational qualification and employment can influence the child's cognitive development. Compared to parents with lower levels of education, highly educated parents encourage their children to do well in school, and have higher expectations for their children's academic achievement. Parents with higher levels of educational attainment promote children's cognitive development.

It is a true fact that now days educational systems worldwide have shown interest in the adoption of English as a medium of instruction. Similarly, Kerala is also using English as a medium of instruction particularly in elementary school system. Mother tongue based education has become an important concept in the field of primary education in the world. Concrete operational stage is a major

turning point in child's cognitive development. Because it is the beginning of logical operation in children's mind. If the language of the elementary education is foreign language or other than mother tongue, child has to struggle to grasp the language and cannot concentrate on developing mental activities.

Kerala is ranked as one of the most literate states in India. This shows that how important is education among Keralites. Kerala has made significant achievement in the field of social development and standard of life. Kerala has acquired a human development index when compared to the other developed countries. In Kerala, priority is always given to education and literacy. Today most educational institutions are run by government and private sectors. These institutions are affiliated with Indian Certificate of Secondary Education (ICSE), Central Board for Secondary Education (CBSE) and Kerala State Education Board. The medium of teaching in most of the school especially in private schools are English and in government schools it is either English or Malayalam. This study attempts to know the differences in concrete operational abilities among rural and urban children and among girls and boys children in elementary school students in Kerala.

Need and Significance

Elementary education is also called primary education. Elementary education is very important for a society and a country at large. Right to primary education or elementary education is a fundamental right in India. Elementary education considered to the first phase of compulsory education that children obtain during the few years of starting schooling. Elementary education will enable a child to learn to read and write. It will enable him to follow a story in his own language. The children

will learn the simple rules of arithmetic. Every child should get quality education.

The future of the country depend upon the children of today.

Concrete operational stage of development is the cognitive stage of development. In this stage a child is capable of performing so many mental operations. The ability to master the conservation task is the milestone benefit of a child who entered into the concrete operational stage. According to Piaget's four factors that influence cognitive behaviour. They are Maturation of nervous system, experience, social transmission of information or teaching and equilibration (Nyiti, 1973). Environment and age is another factor of cognitive development.

Now a days educational system in Kerala is changing in such a way that foreign language invaded into mother tongue. From the period of elementary education itself, the child acquire knowledge and values in the mother tongue. The personality of an individual is mould from his /her childhood itself. The main attributes achieved during his/her childhood are Inductive deductive reasoning, flexibility in thinking, classification and serialization, Reversibility in thought. Jean Piaget named these development as concrete operational stage. Now a days there is a new trend among parents of sending their children to English medium school.

Parent's educational qualification and employment can influence the child's cognitive development. Compared to parents with lower levels of education, highly educated parents encourage their children to do well in school, and have higher expectations for their children's academic achievement. Parents with higher levels of educational attainment promote children's cognitive development. The parental education is very important factor in predicting children's cognitive development.

Well Educated families pass on values, beliefs, and behaviours regarding the importance of education, work, and good mental health to their children. Parents' education, occupation, and income may influence the cognitive development of the child.

The cognitive development by Piaget is very popular in the world. Kerala is already on stands in educational field if compared with other states. The educational system in Kerala needs some efforts to improve the teaching-learning process. One of these efforts may include applying Piaget's cognitive development theory in the present curriculum. The significance of this study is to find out the concrete operational ability among elementary school students with respect to inductive deductive reasoning ability, logical thinking and things arrangement. This study will be important for those teachers who are teaching in elementary schools, for understanding awareness among students' cognitive development level and helpful in enhancing their cognitive learning ability.

Statement of the problem

The study helps to find out the significant difference in means scores on Concrete Operational Abilities among elementary school students based on relevant subsamples.

The proposed study entitled as "Concrete Operational Abilities among Elementary School Students in Kerala."

Operational Definitions of key terms

Concrete operational ability

The concrete operational stage is Piaget's third stages of cognitive development in children. In concrete operational stage of cognitive development (from the age 7 to 11 years) children gain the abilities and mental operations that allow them to think logically and attain the abilities such as principles, hierarchical classification, reversibility and spatial reasoning.

Medium of instruction

A medium of instruction is defined as the language used by the teacher to teach his students. Or simply we can say that it is a means of conveying information to students.

Elementary school students

Elementary school students are defined as the students who are undergoing 1-8 years of school education. Here I am considering fifth standard students as my subject of study.

Objectives of the study

1. To find whether there exists any significant difference in the inductive deductive reasoning abilities among elementary school students based on the sub samples.
 - Gender
 - Locale of the school

- Medium of instruction
 - Parental educational qualification
 - Parental employment
 - Type of management of school
2. To find whether there exists any significant difference in the logical thinking abilities among elementary school students based on the subsamples.
- Gender
 - Locale of the school
 - Medium of instruction
 - Parental educational qualification
 - Parental employment
 - Type of management of school
3. To find whether there exists any significant difference in the things arrangement ability among elementary school students based on the subsamples
- Gender
 - Locale of the school
 - Medium of instruction
 - Parental educational qualification
 - Parental employment
 - Type of management of school

4. To find whether there exists any significant difference in concrete operational abilities among elementary school students based on the subsamples
 - Gender
 - Locale of the school
 - Medium of instruction
 - Parental educational qualification
 - Parental employment
 - Type of management of school

Hypotheses of the study

1. There exists significant difference in inductive deductive reasoning among elementary school students based on the subsamples.
 - Gender
 - Locale of the school
 - Medium of instruction
 - Parental educational qualification
 - Parental employment
 - Type of management of school
2. There exists significant difference in logical thinking abilities among elementary school students based on the sub samples.
 - Gender

- Locale of the school
 - Medium of instruction
 - Parental educational qualification
 - Parental employment
 - Type of management of school
3. There exists significant difference in things arrangement ability among elementary school students based on the sub samples.
- Gender
 - Locale of the school
 - Medium of instruction
 - Parental educational qualification
 - Parental employment
 - Type of management of school
4. There exists significant difference in concrete operational ability among elementary school students based on the sub samples.
- Gender
 - Locale of the school
 - Medium of instruction
 - Parental educational qualification
 - Parental employment
 - Type of management of school

Methodology

Sample selected for the study

The present study was conducted on a representative sample of 527 students of fifth standard across the primary schools of Kozhikode, Malappuram and Wayanadu district. The stratified random sampling technique was used for the sampling.

Tools employed for the collection of data

Concrete operational ability test (Anees &Nijila, 2016)

To measure the concrete operational ability among the primary school students the investigator prepares a test on concrete operational ability with the help of supervising teacher.

Statistical technique used for analysing the data

The following are the statistical techniques used for the study.

- Preliminary analysis
- t-test
- One-way ANOVA

Scope of the study

The study has been intended for studying the Concrete operational abilities among elementary school students in Kerala. The study was conducted on a stratified sample of 527 students of fifth standard belonging to different elementary

schools from Malappuram, Wayanadu and Kozhikode districts. Due representation was given to factors like medium of instruction, gender, locality, type of management, parental qualification and parental employment.

Elementary education is considered as the beginning of formal education. The personality of an individual is mould from his childhood itself. So there is a wide scope to conduct the study at elementary stage. There exists a scope that to check concrete operational ability among elementary school students.

Even though precaution were taken to make the study as accurate as possible, certain limitations have crept to the study, the following are some limitations which the investigator could not consider due to the limitations of time and other practical difficulties.

1. The study was conducted on elementary schools at Kozhikode, Malappuram and Wayanadu districts assuming that they are representatives of elementary schools in Kerala. More general and stable results have obtained from the study of the sample if it were taken from all the districts of Kerala.
2. The study was limited to 6th standard students only. It will be more accurate as elementary school students are concerned if the study were extended to other standards or lower stages of development.
3. The study covers only three dimension of the concrete operational ability.
4. Study was conducted on limited number of elementary schools only.

Organization of the report

The report of the study is presented in five chapters. The details are incorporated in each chapter as follows.

Chapter 1. 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 of the study and organization of the report

Chapter 2. Presents the review of related literature which includes theoretical overview and review of related studies.

Chapter 3. Presents the methodology of study, details of variables, tool used, selection of the sample procedure for collection of data, scoring techniques used for analysis and statistical technique used.

Chapter 4. Brings out the details of statistical analysis of the data and discussion of result.

Chapter 5. Deals with summary of the study, major findings, educational implications of the study and suggestions for further research in this area.

REVIEW OF RELATED LITERATURE

- *Theoretical overview of Concrete Operational Ability*
- *Studies related to Concrete Operational Ability*
- *Conclusion*

REVIEW OF RELATED LITERATURE

Review of related literature is an essential aspects of any research. The summary of related literature provides better understanding of the problem which help the researcher in involving new insights and to build new approaches to the problem that is selected. The review of related literature involves the systematic identification, location, and analysis of documents containing information related to the research problem.

As Best and Khan (1995) “Since effective research is based upon past knowledge, review of related literature helps to eliminate the duplication of what has been done and provide useful hypotheses and helpful suggestion for significant investigation.”

The intention of the present study is to assess the concrete operational ability among elementary school students in Kerala. Theoretical outline of concrete operational ability, a review of studies related to the variables involved in the problem are presented in the chapter. The review of literature has been presented under the following heads.

- a) Theoretical overview of Concrete operational ability
- b) Review of related literature Studies related to concrete operational ability.

Theoretical over view of Concrete Operational Ability

Jean Piaget was one of the most popular researcher in the area of developmental psychology. Piaget originally trained in the areas of biology and

philosophy and considered himself a genetic etymologist. He believed that human beings are different from other animals in their ability to do abstract symbolic reasoning.

“There are two major aspects to his theory, the process of coming to know and the stages we move through as we gradually acquire this ability. Theory of cognitive development by Jean Piaget is considered as a leading theory in psychology.” (Flawell 1963). According to Piaget cognitive development or intellectual development is the result of continuous interaction between the organism and the environment. Based upon the nature of the interaction which is governed by the level of intellectual development.

Piaget’s observation of his own three children served as the basis for his description for development. Piaget watched carefully and also presented his son and two daughters with little tasks that helped reveal their understanding of the world.

Piaget conceived of human cognition as a network of mental structure created by an active organism constantly striving to make the sense of experience.

Stages of development

Piaget has identified four stages in human development. They are Sensory motor stage, Pre operational stage, Concrete operational stage, formal operational stage. Each stage of development provides the foundation for the next stage permitting effective adaptations to the environment. Each stage having several sub stages.

- Sensory motor stage(birth to 2 years)
- Pre operational OR Intuitive stage(2 to 7 years)
- Concrete operational stage (7 to 11 years)
- Formal operational stage (12 to adulthood)

Sensory motor stage

Sensory motor stage is the first stage of the Piaget's stages of development. In this stage intelligence is demonstrated through motor activity without the use of symbols. Knowledge of the world is limited because it's based on physical interactions. Children acquire object permanence at about seven months (memory). Physical development allows the child to begin developing new intellectual abilities. Some symbolic abilities are developed at the end of the stage. The major intellectual activity at this stage is interaction of senses and the environment. Children have not developed language. During this stage a phenomenon is called visual. During this stage cognitive activity is based on immediate experience through the sense (Meyer and Dusek 1979). The major intellectual activity here is the interaction of the senses and the environment. Children have not developed a language for labelling experiences or symbolizing and hence remembering events and ideas. During this stage a phenomenon is known as visual pursuit is manifested. The sensory motor stage is divided into six sub stages.they are

- Reflexive Schemes
- Primary circular reactions
- Secondary circular reactions

- Coordination of secondary circular reactions
- Tertiary circular reactions
- Mental representation (Berk 1996)

The circular reaction, a special means that infant use to adapt schemes, is first oriented towards the infant's own body, then turns outward to the surrounding world, and finally become experimental and creative. During the last three sub stages, infants make strides in intentional behaviours and understanding object permanence. By the final sub stage, they start to represent reality, display deferred imitation.

Pre operational stage

As children move from the sensory motor to the pre operational stage, the most obvious change is an extra ordinary increase in representational activity. Children usually go through this stage between in the age of two to seven year old. During this stage children' thought process are developing, although they are still considered to be far from "logical thought" in the adult sense of the world. The vocabulary of the child is also expanded and developed during this stage. Children are usually 'ego centric ', meaning that they are only able to consider things from their own point of view. 'Animism' is also a characteristics of the pre operational stage. This is when a person has the belief that everything that exist has some kind of consciousness. Another aspects of this stage in a child is that of 'symbolism'. This is when something is allowed to stand for or symbolise something else. 'Moral realism' is another aspect of the stage, this is the belief that the child's way of

thinking about the difference between right and wrong is shared by everyone else around them. Infants have some ability between the ages 2 and 7.

- Language and thought- Around the end of second and beginning of third year, tremendous strides in language takes place.
- Make-believe play- it provides another example of the development of representation during preoperational stage. Like language, it increases dramatically during early childhood.
- Pictorial representation- Children's drawings are another important mode of symbolic expression. (Berk 1996)

Some major characteristics of Piaget's preoperational stage are given below.

Egocentrism – pre operational children assume that others perceive, think, and feel just the way they do.

Animistic thinking – Preoperational children regard inanimate objects as having lifelike qualities, just like the self.

Irreversibility - Preoperational children do not think through a series of steps in a problem and then go backward, mentally returning to the starting point.

Centration – Preoperational children tend to centre on one aspect of a situation to the neglect of other important features.

Lack of hierarchical classification – Pre operational children have difficulty grouping objects into hierarchies of classes and subclasses.

Transductive reasoning – Preoperational children reason from particular event to particular event rather than in an appropriately casual fashion.

Concrete operational stage

This is the stage when child develops the ability for logical thinking. Piaget uses the term operational thought to describe the characteristic of this stage. This stage lasts around seven to eleven years of age, and is characterised by the development of organised and rationale thinking. Piaget (1954) considered concrete stage a major turning point in the child's cognitive development, because it marks the beginning of logical or operational thought. During this stage child gain some abilities. Logical thinking, conservation, decentration, reversibility, hierarchical classification, seriation, transitive inference, spatial operation, are the main operation in this stage.in this stage intelligence is demonstrated through logical and systematic manipulation of symbols related to concrete objects.

Piaget viewed the concrete operational stage, which spans the years from 7 to 11. It is the major turning point of the cognitive development. When children attain it their thought more closely resembles that of adults than that of sensory motor and preoperational child. According to Piaget concrete operational reasoning is far more logical, flexible and organised than cognition was during the preschool period. Major characteristics of the concrete operational stage are given below.

Conservation – Concrete operational children recognise that certain physical characteristic of objects remain the same even when their outward appearance changes.

Decentration – concrete operational children coordinate several important features of a task rather than centring on only the perceptually dominant one.

Reversibility – concrete operational children can think through the steps in problem and then go backward, returning to the starting point.

Hierarchical classification – Concrete operational children can flexibly group and regroup objects in to hierarchies of classes and sub classes.

Seriation – Concrete operational children are guided by an overall plan when arranging items in a series.

Transitive inference – concrete operational children can seriate mentally. After comparing A with B and B with C, they can infer the relationship between A and C.

Spatial Operation - Concrete operational children conserve distance, understand the relation among distance, time and speed; and create organised cognitive maps of familiar environments.

Horizontal decal age – Logical concepts are mastered gradually over the course of middle childhood.

Formal operational stage

According to Piaget, the capacity to think abstractly begins around the age eleven. This stage begins at approximately age twelve and lasts into adulthood. The children gain the ability to think in an abstract manner by manipulating ideas in their head without any dependence on concrete manipulation (Inhelder & Piaget 1958).

The child can do mathematical calculations, think creatively, use abstract reasoning, and imagine the outcome of particular action. The formal operational stage is characterized by the ability to formulate hypothesis and systematically test them to reach at a problem to a question. Another characteristic of the individual is their ability to reason contrary to fact. Concrete operational children can only operate reality but formal operational children can operate an operations. The two major feature of formal operational stage are summarised below.

Hypothetico- deductive reasoning – When faced with a problem, formal operational children think of all possible factors that could affect the outcome, even those not immediately suggested by the concrete features of the situation. Then they try them out in a step by step fashion to find out which ones work in the real world.

Propositional thought – formal operational children can evaluate the logic of statements by reflecting on the statements themselves. They do not need to consider them against real world circumstances.

Review of Studies Related to Concrete Operational Ability

Erling, Adinolfi, Hultgren, Buckler and Mukorera (2016) conducted a study on Medium of instruction policies in Ghanaian and Indian primary schools. This research report on a rigorous literature review of research into medium of instruction in Ghana and India, whose language-in education policies represent two contrasting models of use of local languages and the development of competence in English. The research have two parts. In the first part there are three areas they are the effectiveness of language-in-education policies, problems hindering the

implementation of these policies, and attitudes to these policies. The second provides an overview of the recommendations for how, given the obstacles in implementing the current policies, to better ensure the effectiveness of language-in-education policies in Ghana and India. The findings showed that similar issues arise that contribute to challenges of providing equitable, quality education.

Bashrin (2015) conducted a study on Piaget's pre operational stage in children. This research is a comparative study. The main aim of the research is to explore in what extent normal children's cognitive development differ from autistics children's cognitive development during Piaget's pre-operational stage. The finding of the research indicated that Piaget's theory is important to understand diverse ability of children.

Gazil and Ullah (2015) conducted a study on concrete operational stage of Piaget's cognitive development theory: an implication in learning general science. The main aim of the study was to apply concrete operational stage of Piaget's cognitive development theory in learning general science on students of age between seven and eleven years and to compare academic achievement of rural and urban students in general science falling in this stages of Piaget's theory. Sample of the study was two hundred students of age between seven and eleven years and the tool selected for the study was self-developed test to measure academic achievement of the students. Result of the study was most of the students have ability to solve problem in learning general science. However, urban students falling in Piaget's concrete operational stage have better performance in ability to solve problems in general science than rural students.

Shemla (2014) In this study, India is a country having a diversity of languages, religion and culture. Our education commissions have stressed the need to have one's mother tongue as the medium of instruction from primary classes to the postgraduate level. The people of Kerala claim to have 100% literacy rate but many Malayalees are ashamed to speak in their mother tongue Malayalam. This major issue is now under discussion inside and outside Kerala. Mother tongue influences the students to develop their innermost creative and innovative behaviour. As Malayalees we have known the greatness of our language, writers, cultural and historical backgrounds. Malayalam is the mother not foster mother of our state and people. It influences a child who learns at his mother's feet.

Safdar, Umar, Gulap & Karim (2014) conducted a study on Formal Operational Stage of Piaget's Cognitive Development Theory: An Implication in Learning Mathematics. The main aim of the study was apply Formal Operational Stage (12-16 years) of Piaget's Cognitive development theory in learning mathematics. This study was survey type in nature. Sample of the study was comprised of two hundred students of age twelve to sixteen years. Results of the study indicated that students of age twelve to sixteen years can do classification, intersection, ratio & proportion, and geometry to some extent while the academic achievement of the students falling in Piaget's formal operational stage (12-16 years) cannot do factorization and transitivity. The academic achievement of the urban students was better as compared to the rural students regarding Classification, Intersection, Ratio & Proportion, and Transitivity, while the academic achievement

of the rural students was better than the urban students regarding Factorization and Geometry.

Mauta (2014) conducted a Study on cognitive abilities of lower primary school pupils, in Igembe Central Division of Igembe District, Kenya. The main objectives of the result was to investigate the influence the school environment, age and culture have on the children's cognitive task performance. The investigator compared the student's performance based on the Piagetian cognitive task. The researcher interviewed 333 students from public and private primary school. The findings indicated that students from private primary school performed better than students from public primary school based on the cognitive task given.

Maedi (2013) conducted a study on Piaget's theory in the development of creative thinking. This study aims to examine a cognitive structure of students, which is a closely related to the Piaget's cognitive development theories of students when creative thinking. Students were given an open mathematical problem and were expected to be able to take advantage of sensitivity, fluency, flexibility, originality and elaboration which can be seen as clearly of their structure cognitive.

Lerra, Teka and Naba (2013) conducted a study to examine Wolaita Zone student's attitude towards their vernacular language as a medium of instruction and its major challenges. The study was a descriptive survey research questionnaires, interviews, focused-group discussion and document analysis were used to collect both qualitative and quantitative data from students, teachers, parents, principals. Simple random sampling technique were employed to select sample public and private school. The result focuses on the relationship between academic

achievement, Student's attitude and motivation towards vernacular language as a medium of instruction. The results indicated that grades 7 and 8 students had favourable attitude towards their native language as instructional medium and attitude was an important predictor of Wolaita language achievement.

Sumangala and Rinsa (2012) conducted a study about effect of thinking styles and deductive reasoning on problem solving ability in mathematics. Study was conducted on 500 high school students. The result of the study was the main effect of executive thinking style and deductive reasoning on a problem solving ability in mathematics is significant for the sample.

Senapati, Patnaik and Dash (2012) conducted a study to examine the effect of medium of instruction on the development cognitive processes. The study were done in 80 children, 40 each from fourth standard and 6th standard were selected from. The result revealed that significant main effect of medium of instruction for almost all measure of cognitive processes suggesting higher performance level of English medium school children in their counterparts.

Jose (2012) conducted a study about learning difficulties faced by Tamil medium students through English medium at college level. The researcher randomly selected 300 students in Kanyakumari district. The main findings of the study was Psychological learning difficulty are more in female than male students. There exist a significant difference in learning difficulty among the variable.

Cil and Cepni (2012) conducted a study on the cognitive abilities of children: Reflection from the entrance exam. In turkey, the children who completed their primary education will participate in an entrance exam. It is analysed according to

Piaget's theory of cognitive development. The main aim of the study was whether this entrance exam contributed to the development of the children's cognitive ability or not. Document analysis used for data collection. The findings obtained from three million students and result of the study was student's thinking ability is weak and children were rather unsuccessful in correlational cognitive ability.

Simatwa (2010) conducted a qualitative study on Piaget's theory of intellectual development and its implication for instructional management at pre secondary level. The researcher implies that understanding and application of Piaget's theory is important in the effective enhancement of teaching learning process at pre secondary level and researcher pointed out that teachers, teacher educators, practicing teachers need to keep Piaget's theory of cognitive development.

Fah (2009) studied the logical thinking ability among students in Malaysia. He measured 3500 student's logical thinking ability. The research finding show that the overall means of students logical thinking ability were low and there was no significant difference in the mean of logical thinking ability based on the student's gender.

McCormack (2009) Conducted a study on cognitive acceleration across the primary –second level transition. The aim of the research to implement the CASE methodology in to specific topic taught on the junior certificate science curriculum.

Chalachew (2007) conducted a study on English as a Medium of Instruction at the Second Cycle Primary Schools at Cheha Woreda Dergue zone. The research

study attempt to assess both teacher's and student's perceptions and attitude regards the adoption of English as a medium of instruction at grade five level in Cheha Woreda of Gurage zone. Questionnaire, semistructured interview and document analysis used for data collection. The researcher randomly selected teachers and students of three elementary school students. The findings indicated that the current level of teachers and students English proficiency is perceived to be inadequate to use English as a medium of instruction at grade 5 level.

Papalia & Olds (2007) "The term development refers to the process of change and stability that occur throughout the human life span". Piaget believed that the development of a child occurs through a continuous transformation of thought processes.

Namachwa and Edith (2007) studied a challenges using English as medium of instruction in the upper part of the primary school in rural Uganda. Head teacher and fifth and seventh standard students selected from primary school in Mpigi district were the sample of the study. Observation and in depth study was used for the study. From the study the researcher found that students and teachers experience dilemmas and tension in the teaching learning process. The study proved that children understand when they are taught in familiar language than non-familiar language.

Agger (2007) conducted a study on conservation of number task with small and large quantities on male and female preschool children. Observation method was used for data collection. The findings of the study indicated that children age three and five do not have ability to conserve the number in any manner.

Talat, Abro, Mohammed and Jamali (2003) conducted a study about cognitive development of learners at concrete operational stage in Pakistan. The main focus of the study is to test the theory in different areas. The investigator survey method is used for the collection of data. Tailor made test and inventory tools were used. The research findings showed that the majority of student from rural areas could not develop the logical operation that a child expected to develop.

Benson (2002) conducted a study on the importance of mother tongue-based schooling for educational quality. There are many factors involved in delivering quality basic education, language is clearly the key to communication and understanding in the classroom. Many developing countries are characterized by individual as well as societal multilingualism, yet continue to allow a single foreign language to dominate the education sector. The author concluded that Mother tongue-based bilingual education not only increases access to skills but also raises the quality of basic education by facilitating classroom interaction and integration of prior knowledge and experiences with new learning.

Weinert & Helmke (1998), “a developmental stage consists of a period of months or years when certain development takes place. Although students are usually grouped by chronological age, their development levels may differ significantly as well as the rate at which individual children pass through each stage”.

Flawell (1992) conducted a study cognitive development past present and future. Topic includes the child as constructive thinker; invention of new research methods; the diagnosis problem; recent changes in estimates of children's

competence; the question of general stages vs. domain-specific developments; the effects of expertise; natural domains and constraints; cognitive development as theory development; synchronisms, sequences, and qualitative changes; mechanisms of development; sociocultural influences; individual differences; practical applications; and suggestions about what develops. This article concludes with some guesses about future directions for the field.

Neubert and James (1992) conducted a study on inductive reasoning in the secondary class room. This study stimulate the teachers gave more attention to children's abilities in analysing, classifying, comparing, formulating hypothesis and reaches the conclusions. In this study researcher found that thinking skills is very essential for reasoning processes. This book gave a practical information in learning how to use inductive approach and teaching approach that actively involves the students in the use of their own reasoning while learning content area material.

Norman (1980) spatial reasoning is the capacity to understand and remember the relations among objects. This ability can be viewed as a unique type of intelligence distinguishes from other forms of intelligence, such as verbal ability, reasoning ability and memory skills. Spatial ability is made up of numerous sub skills which are interrelated among each other and develop throughout a person's life.

Siddiqi and Siddiqi (1977) conducted a study to analyse what percentage of primary school children (class 1-4) are at a) pre operational b) concrete operational c) formal operational stage. The study were carried out in to two phases. The study were done in 1206 students from 24 Delhi school of different localities. More Less

same task, Number task, Area task, Weight task, Displacement volume task tools are used for this study. The result found that majority of primary school students is either pre operational or concrete operational and a very small percentage students is at formal operational stage.

Webb, Daurio, and Stephen (1974) conducted a study on formal operation in very bright 8 to 14 year olds. This study examined the transition from concrete to formal operations bright children in an effort to determine whether-high ability in concrete operations would carry over into formal operational ability, and also to investigate precocity in, regard to formal operations. The result showed that high-ability in children over the age of 11 does carry over into formal operation.

Piaget (1973), “Cognition refers to the mental processes involved in gaining knowledge and comprehension, including thinking, knowing, remembering, judging, and problem solving. The development of cognition is primarily distributed into three stages: sensory-motor, concrete operational and formal operational”.

Conclusion

The reviewing of related literature helped the investigator to know about the various studies conducted in the area of concrete operational stage. It helps the investigator to know various tools and techniques used to measure the constructs and different components included in the preparation of tools. More number of studies were conducted on cognitive abilities of children. Studies related to concrete operational ability is very low when compared to other stages of development. The investigator was interested to know the concrete operational ability among

elementary school students with respect to inductive deductive reasoning ability, logical thinking and things arrangement. The investigator identified that the study is relevant in the modern era and decided to proceed with the study. The procedure adopted for the present study is explained in chapter III.

METHODOLOGY

- *Variables of the study*
- *Design of the study*
- *Tools used for data collection*
- *Data collection procedure*
- *Scoring and consolidation of data*
- *Statistical techniques used for analysis*

METHODOLOGY

The procedure or technique employed in a research study is known as methodology of research. The adopted methods and tools determine the validity of the study and accuracy of the result. The methodology of the chapter points to the generalizability of the result by the collection and the analysis of the relevant data.

The study that the investigator conducted was intended to find out concrete operational ability among elementary school students in Kerala. The study was based on the subsamples gender, medium of instruction, locality, parental qualification, parental employment and type of management. The design of the study is described under the following major sections.

1. Variables
2. Sample used for the study
3. Tools used for the study
4. Data collection procedure ,scoring and consolidation of data
5. Statistical techniques used for the study

The details of each of the above are given below.

Variable

The major variable of the study is concrete operational ability among elementary school students in Kerala.

The sub variable like gender, locality, and type of management, parental qualification, parental employment and medium of instruction are taken as the independent variable of the study.

Sample used for the study

Due to the limitations of conducting the study on the total population, the investigator confined the study to a representative sample of the population. The sample for the present study covers 6th standard students from Calicut, Wayanadu, and Malappuram districts. The following categories were considered for the selection of the sample for the study

1. Gender Viz; Male and Female
2. Locale viz; Rural and Urban
3. Medium of instruction viz ; Malayalam and English
4. Parental educational qualification viz; Above plus two and Below plus two
5. Parental employment viz; Collie, Professional and Business
6. Type of management viz; Govt, Aided and Unaided

Stratified random sampling was used on the basis of gender, locality, type of management, parental qualification, medium of instruction and parental employment. The study was conducted on 527 students from 12 schools of Calicut, Wayanadu, and Malappuram districts. The sample is given in the table below.

Table 1

Details of the final sample

SI. NO	Name of The Schools	Type of Management	Sample Size
1	AUP School Choolur	Aided	25
2	G HSS Nayarkuzhi Chathamangalam	Govt.	32
3	C K H Memorial High School Vazhakkadu, Malappuram	Aided	63
4	NSS EM HSS Wayandu Kalppatta	Un Aided	44
5	SKMJ Higher Secondary School , Kalppatta	Aided	28
6	GOVT.Higher Secondary School Kalppatta	Govt	59
7	GOVT. Higher Secondary School ,Neeleswaram	Govt	38
8	AUPS Padinjarethara Wayanadu	Aided	63
9	ST. MARY'S School, Kozhikode	Un Aided	29
10	AUPS Kunnamangalam, Kozhikode	Aided	30
11	GOVT HSS Vazhakkadu	Govt	82
12	Jyothidhara UP School, Malappuram	Unaided	34

Tool used for the study

To carry out the research, researcher must gather data with which to test the hypothesis or Answer the questions. So the data collection is the major part of the research process. For an effective data collection, a tool/technique has to be selected and necessary steps in the preparation of the tool or conduction of technique were to be adopted. The tool or technique may vary as per the complexity, design, administration and interpretation of the research.

The investigator used Concrete operational ability test (Anees Mohammed and Nijila Mohanan) for the study.

Description of the tool

Test on concrete operational ability

The test on concrete operational ability was prepared by the investigator with the help of the supervising teacher to find concrete operational ability of elementary school students. After planning the components for the term concrete operational ability, prepared a test consists of 36 questions.

Components of Concrete Operational Ability

Inductive deductive reasoning

Piaget determined that in this stage of concrete operation, Children are able to incorporate inductive reasoning. Inductive reasoning involves drawing inferences from observations and to make a generalization among the children. Deductive reasoning involves using generalized principle in order to predict the outcome of an event.

Logical thinking

Children begin to organize objects by classes and subclasses. They can perform mathematical operations and understand transformations such as addition, subtraction, multiplication, division. By the end of this stage children will develop true mental operations and master the concept of transitivity and conservation.

- Transitivity is Transiting the concept of relation. Concrete operational children can seriate mentally. After comparing A with B and B with C, they can infer the relationship between A and C.
- Conservation involves the ability to understand when the amount of something remains constant across two or more situation despite the appearance of that thing changing across these situations.

Thing Arrangement Ability

Things Arrangement is the ability to effectively organise objects or concepts with respect to the situation demands. By the end this stage children will master the concept of seriation, reversibility and master.

- Seriation is the ability to sort objects or situations according to any Characteristics such as size colour, shape, or type.
- Reversibility is the idea that something can be changed back to its original state after it has been altered.
- Assimilation is the absorption of new ideas, information or experience into a person's existing cognitive structure or what they already know or understand of the world.

Data collection Procedure, Scoring and consolidation of data

Administration of tool

After selecting the sample, the researcher contacted the heads of the institution and sought permission to administer the tool. The heads of the institutions, teaching and non-teaching staffs were so co-operative during the time of data collection. The tools were distributed among the students and were given enough time to answer the questions after some general instruction by the researcher. The researcher clarified the doubts of students during the time of administration of tools.

Scoring and consolidation of data

The score of the subject for each of the three dimensions is calculated and profile obtained. The calculation of the scores for elementary school students done by using a scoring key. The manual and scoring key are attached in the Appendix III.

Validity of the tool

“Validity refers to the degree to which evidence and theory support the interpretation of test scores entailed by proposed use of test. A test is valid if it measure what it claims to measure. Test however does not possess universal and eternal validity. It may be valid for using one situation” (Koul 2009)

According to Best and Khan (2012) validity is that quality of a data gathering instrument or procedure that enables to measure what is supposed to measure.” The validity of the present test is done through face validity. A test is said to have face

validity when it appears to measure whatever the author had in mind namely what he thought he was measuring (Garret 2012). To ensure the face validity the investigator consulted experts in the area during the development of the tool and the tool was given to the experts for approval of items for testing concrete operational ability among elementary school students. Thus ensured the face validity.

Statistical techniques used in the study

Preliminary analysis

Preliminary analysis was done in order to arrive at conclusion about the nature of the distribution. Preliminary analysis involves the following statistical techniques.

- Mean
- Median
- Skewness
- Kurtosis

Test of significance of difference between means for different categories.

The statistical techniques “Test of significance of difference between mean for different categories” was used to find out if there exists any significant difference in concrete operational ability among elementary school students in the relevant subsamples.

The test of significance of difference between means for different categories is known as 't' test. The tabulated value for 0.01 level of significance is 2.58 and the tabulated value 0.05 level of significance is 1.96.

$$t = \frac{\bar{X}_1 - \bar{X}_2}{\sqrt{\frac{\sigma_1^2}{N_1} + \frac{\sigma_2^2}{N_2}}} \text{---(Garrette, 2005)}$$

Where,

\bar{X}_1 = Mean of the group I

\bar{X}_2 = Mean of the group II

σ_1 = Standard deviation of group I

σ_2 = Standard deviation of group II

N_1 = Sample size of group I

N_2 = sample size of group II

If the obtained critical ratio is greater than the required value for significance. The mean difference is considered to be significant.

One way ANOVA

ANOVA or Analysis of variance is used to compare the means of more than two populations. ANOVA uses the F- statistics, which test if the groups, formed by independent variable or a combination of independent variables, are significantly different. The larger the calculated F-ratio the greater in difference between groups

is compared to within group difference. An F-ratio equal or less than the table value indicates that there is no significant difference between two groups.

In the present study one way ANOVA is used to find out whether there exists any significant mean differences in concrete operational ability among elementary school students in Kerala based on their type of management and parental employment. Type of management is categorised into three groups government, aided and unaided. Parental employment is categorised into three business, professional and coolie. Hence for the present study the investigator used one way ANOVA.

ANALYSIS AND INTERPRETATION

- *Objectives of the study*
- *Hypotheses of the study*
- *Variables of the study*
- *Preliminary analysis*
- *Major analysis*

ANALYSIS AND INTERPRETATION

The chapter deals with the statistical analysis and information collected data. According to Good (1959) “analysis is a process which enter in to research in one form or another form the very beginning. It may be fair to say that research consist of two large steps, the collection of data and analysis of these data, but no amount of analysis in validity extract from the data factors which are not present.”

The process of analysis, interpretation, and generalisation involves organization, editing, classifying, and tabulating the data. Analysis of data means studying and tabulating the data. Further it help the investigator to interpret the data. This will lead to a meaningful conclusion of the study. The process of interpretation is essentially one of stating what the result show, their meaning and significance.

The present study is to assess concrete operational ability among elementary school students in Kerala. This chapter deals with the analysis and interpretation of the data as per the following objectives

Objectives of the study

1. To find whether there exists any significant difference in the inductive deductive reasoning abilities among elementary school students based on the sub samples.

- Gender
- Locale of the school
- Medium of instruction

- Parental educational qualification
 - Parental employment
 - Type of management of school
2. To find whether there exists any significant difference in the logical thinking abilities among elementary school students based on the subsamples.
- Gender
 - Locale of the school
 - Medium of instruction
 - Parental educational qualification
 - Parental employment
 - Type of management of school
3. To find whether there exists any significant difference in the things arrangement ability among elementary school students based on the subsamples.
- Gender
 - Locale of the school
 - Medium of instruction
 - Parental educational qualification
 - Parental employment
 - Type of management of school

4. To find whether there exists any significant difference in concrete operational abilities among elementary school students based on the subsamples
 - Gender
 - Locale of the school
 - Medium of instruction
 - Parental educational qualification
 - Parental employment
 - Type of management of school

Hypotheses of the study

1. There exists a significant difference in inductive deductive reasoning among elementary school students based on the subsamples.
 - Gender
 - Locale of the school
 - Medium of instruction
 - Parental educational qualification
 - Parental employment
 - Type of management of school
2. There exists a significant difference in logical thinking abilities among elementary school students based on the sub samples.
 - Gender

- Locale of the school
 - Medium of instruction
 - Parental educational qualification
 - Parental employment
 - Type of management of school
3. There exists significant difference in things arrangement ability among elementary school students based on the sub samples.
- Gender
 - Locale of the school
 - Medium of instruction
 - Parental educational qualification
 - Parental employment
 - Type of management of school
4. There exists significant difference in concrete operational ability among elementary school students based on the sub samples.
- Gender
 - Locale of the school
 - Medium of instruction
 - Parental educational qualification
 - Parental employment
 - Type of management of school

Preliminary analysis of test scores

The important statistical properties of scores on the variable under the study were analysed as preliminary step. The mean, median, mode, standard deviation, skewness and kurtosis were computed for the whole sample. The details of the statistics are presented in the table 2.

Table 2

The details of preliminary analysis

Ability	N	Mean	Mode	Median	Standard deviation	Skewness	Kurtosis
Inductive deductive reasoning	527	13.78	10	14	4.92	-0.26	-0.17
Logical thinking	527	4.79	5	5	1.65	-0.50	1.33
Things arrangement ability	527	23.82	24	24	6.26	-0.31	0.69
Concrete operational ability	527	42.39	45	43	10.98	-0.50	0.73

The important statistical constants of selected abilities for the total and subsample were analysed. The measures like Mean, Mode, Median, Standard Deviation, Skewness, and Kurtosis were computed for the whole sample.

For Inductive deductive reasoning, the value of Mean and median are similar (13.78), the value of mode is 10 and the Standard Deviation is 4.92. The value of Skewness and Kurtosis indicate that the distribution is negatively Skewed and Leptokurtic.

For Logical thinking ability, the value of mean, mode and median are similar (5), the standard deviation is 1.65. The value of skewness and kurtosis indicate that the distribution is negatively skewed and platy kurtic.

For things arrangement ability, the value of mean, mode and median are similar (24), the standard deviation is 6.26. The value of skewness and kurtosis indicate that the distribution is negatively skewed and platy kurtic.

For concrete operational ability, the value of mean is 42.39, the value of mode is 45 and value of median is 43. The standard deviation is 10.98. The value of skewness and kurtosis indicate that the distribution is negatively skewed and platy kurtic.

Comparison of mean scores of Inductive deductive reasoning ability between male and female elementary school students

In this analysis the investigator compared the difference of significance between male and female elementary school students in Inductive deductive reasoning ability. Comparison of total mean scores of Inductive deductive reasoning ability between male and female was done. The result obtained is presented in the table 3.

Table 3

Data and results of the Test of Significance of difference in Inductive Deductive reasoning ability between male and female students

Sample	N	Mean	Standard Deviation	't' value	Level of significance
Male	263	13.71	5.15	0.29	NS
Female	264	13.84	4.68		

From the table, it is found that the mean scores of Logical thinking ability obtained for male and female elementary school students are 13.71 and 13.84. The standard deviation obtained are 5.15 and 4.68 respectively. The calculated value of 't' is 0.29. Since the calculated 't' value is less than the tabled value, it can be inferred that there is no significant difference in Inductive deductive reasoning ability between male and female elementary school students.

The analysis of above data shows that there is no significant difference in mean scores between male and female students in Inductive deductive reasoning ability. Hence it can be concluded that male and female students show similar Inductive deductive reasoning ability.

Comparison of mean scores of Logical thinking ability between male and female elementary school students

In this analysis the investigator compared the difference of significance between male and female elementary school students in Logical thinking ability.

Comparison of total mean scores of Logical thinking ability between male and female was done. The result obtained is presented in the table 4.

Table 4

Data and results of the Test of Significance of difference in Logical thinking ability between male and female students

Sample	N	Mean	Standard Deviation	't' value	Level of significance
Male	263	4.88	1.73	1.26	NS
Female	264	4.70	1.57		

From the table, it is found that the mean scores of Logical thinking ability obtained for male and female elementary school students are 4.88 and 4.70. The standard deviation obtained are 1.73 and 1.57 respectively. The calculated value of 't' is 1.26. Since the calculated 't' value is less than the tabled value, it can be inferred that there is no significant difference in Logical thinking ability between male and female elementary school students.

The analysis of above data shows that there is no significant difference in mean scores between male and female students in Logical thinking ability. Hence it can be concluded that male and female students show similar Logical thinking ability.

Comparison of mean scores of Things arrangement ability between male and female elementary school students

In this analysis the investigator compared the difference of significance between male and female elementary school students in Things arrangement ability. Comparison of total mean scores of things arrangement ability between male and female was done. The result obtained is presented in the table 5.

Table 5

Data and results of the Test of Significance of difference in Things arrangement ability between male and female students

Sample	N	Mean	Standard Deviation	't' value	Level of significance
Male	263	23.82	6.49	0.001	NS
Female	264	23.82	6.03		

From the table, it is found that the mean scores of Things arrangement ability obtained for male and female elementary school students are 23.82. The standard deviation obtained are 6.49 and 6.03 respectively. The calculated value of 't' is 0.001. Since the calculated 't' value is less than the tabled value, it can be inferred that there is no significant difference in Things arrangement ability between male and female elementary school students.

The analysis of above data shows that there is no significant difference in mean scores between male and female students in Things arrangement ability.

Hence it can be concluded that male and female students show similar Things arrangement ability.

Comparison of mean scores of Concrete operational ability between male and female elementary school students

In this analysis the investigator compared the difference of significance between male and female elementary school students in Concrete operational ability. Comparison of total mean scores of Concrete operational ability between male and female was done. The result obtained is presented in the table 6.

Table 6

Data and results of the Test of Significance of difference in concrete operational ability between male and female students

Sample	N	Mean	Standard Deviation	't' value	Level of significance
Male	263	42.41	11.5	0.06	NS
Female	264	42.36	10.47		

From the table, it is found that the mean scores of Concrete operational ability obtained for male and female elementary school students are 42.41 and 42.36. The standard deviation obtained are 11.5 and 10.47 respectively. The calculated value of 't' is 0.06. Since the calculated 't' value is less than the tabled value, it can be inferred that there is no significant difference in Concrete operational ability between male and female elementary school students.

The analysis of above data shows that there is no significant difference in mean scores between male and female students in Concrete operational ability.

Hence it can be concluded that male and female students show similar concrete operational ability.

Comparison of mean scores of Inductive deductive reasoning ability between urban and rural elementary school students

In this analysis the investigator compared the difference of significance between urban and rural elementary school students in Inductive deductive reasoning ability. Comparison of total mean scores of Inductive deductive reasoning ability between urban and rural was done. The result obtained is presented in the table 7.

Table 7

Data and results of the Test of Significance of difference in Inductive Deductive reasoning ability between urban and rural students

Sample	N	Mean	Standard Deviation	't' value	Level of significance
Urban	308	13.44	4.64	1.90	NS
Rural	219	14.26	5.26		

From the table, it is found that the mean scores of Inductive deductive reasoning ability obtained for urban and rural elementary school students are 13.44 and 14.26. The standard deviation obtained are 4.64 and 5.26 respectively. The calculated value of 't' is 1.90. Since the calculated 't' value is less than the tabled value, it can be inferred that there is no significant difference in Inductive deductive reasoning ability between urban and rural elementary school students.

The analysis of above data shows that there is no significant difference in mean scores between urban and rural students in Inductive deductive reasoning ability. Hence it can be concluded that urban elementary school students show more Inductive deductive reasoning ability than their counterparts.

Comparison of mean scores of Logical thinking ability between urban and rural elementary school students

In this analysis the investigator compared the difference of significance between urban and rural elementary school students in Logical thinking ability. Comparison of total mean scores of Logical thinking ability between urban and rural was done. The result obtained is presented in the table 8.

Table 8

Data and results of the Test of Significance of difference in Logical thinking ability between urban and rural students

Sample	N	Mean	Standard Deviation	't' value	Level of significance
Urban	308	4.80	1.59	0.13	NS
Rural	219	4.78	1.75		

From the table, it is found that the mean scores of Logical thinking ability obtained for urban and rural elementary school students are 4.80 and 4.78. The standard deviation obtained are 1.59 and 1.75 respectively. The calculated value of 't' is 0.13. Since the calculated 't' value is less than the tabled value, it can be

inferred that there is no significant difference in Logical thinking ability between urban and rural elementary school students.

The analysis of above data shows that there is no significant difference in mean scores between urban and rural students in Logical thinking ability. Hence it can be concluded that urban and rural elementary school students show similar Logical thinking ability.

Comparison of mean scores of Things arrangement ability between urban and rural elementary school students

In this analysis the investigator compared the difference of significance between urban and rural elementary school students in Things arrangement ability. Comparison of total mean scores of Things arrangement ability between urban and rural was done. The result obtained is presented in the table 9.

Table 9

Data and results of the Test of Significance of difference in Things arrangement ability between urban and rural students

Sample	N	Mean	Standard Deviation	't' value	Level of significance
Urban	308	23.75	6.11	0.3	NS
Rural	219	23.92	6.49		

From the table, it is found that the mean scores of Things arrangement ability obtained for urban and rural elementary school students are 23.75 and 23.92. The standard deviation obtained are 6.11 and 6.49 respectively. The calculated value of

't' is 0.3. Since the calculated 't' value is less than the tabled value, it can be inferred that there is no significant difference in Things arrangement ability between urban and rural elementary school students.

The analysis of above data shows that there is no significant difference in mean scores between urban and rural students in Things arrangement ability. Hence, it can be concluded that urban and rural elementary school students show similar Things arrangement ability.

Comparison of mean scores of Concrete operational ability between urban and rural elementary school students

In this analysis the investigator compared the difference of significance between urban and rural elementary school students in Concrete operational ability. Comparison of total mean scores of Concrete operational ability between urban and rural was done. The result obtained is presented in the table 10.

Table 10

Data and results of the Test of Significance of difference in concrete operational ability between urban and rural students

Sample	N	Mean	Standard Deviation	't' value	Level of significance
Urban	308	41.98	10.26	1.00	NS
Rural	219	42.95	11.92		

From the table, it is found that the mean scores of Concrete operational ability obtained for urban and rural elementary school students are 41.98 and 42.95.

The standard deviation obtained are 10.26 and 11.92 respectively. The calculated value of 't' is 1.00. Since the calculated 't' value is less than the tabled value, it can be inferred that there is no significant difference in Concrete operational ability between urban and rural elementary school students.

The analysis of above data shows there is no significant difference in mean scores between urban and rural students in Concrete operational ability. Hence, it can be concluded that urban elementary school students show more concrete operational ability than their counterparts.

Comparison of mean scores of Inductive deductive reasoning ability between English and Malayalam medium elementary school students

In this analysis the investigator compared the difference of significance between English and Malayalam medium elementary school students in Inductive deductive reasoning ability. Comparison of total mean scores of Inductive deductive reasoning ability between English and Malayalam medium was done. The result obtained is presented in the table 11.

Table 11

Data and results of the Test of Significance of difference in Inductive Deductive reasoning ability between English and Malayalam medium students

Sample	N	Mean	Standard Deviation	't' value	Level of significance
English	297	15.40	4.61	9.26	0.01
Malayalam	230	11.69	4.51		

From the table, it is found that the mean scores of Inductive deductive reasoning ability obtained for English and Malayalam medium elementary school students are 15.40 and 11.69 respectively. The standard deviation obtained are 4.61 and 4.51 respectively. The calculated value of 't' is 9.26 and the tabled value of 't' at 0.01 level of significance is 2.58. Since the calculated value is greater than the tabled value, it can be inferred that there is a significant difference in Inductive deductive reasoning ability between English and Malayalam medium students.

The analysis of above data shows that there is a significant difference in mean scores between English and Malayalam medium students in Inductive deductive reasoning ability. Hence it can be concluded that English medium students show more Inductive deductive reasoning ability than their counterparts.

Comparison of mean scores of Logical thinking ability between English and Malayalam medium elementary school students

In this analysis the investigator compared the difference of significance between English and Malayalam medium elementary school students in Logical thinking ability. Comparison of total mean scores of Logical thinking ability between English and Malayalam medium was done. The result obtained is presented in the table 12.

Table 12

Data and results of the Test Significance of difference in Logical thinking ability between English and Malayalam medium students

Sample	N	Mean	Standard Deviation	't' value	Level of significance
English	297	5.09	1.65	4.84	0.01
Malayalam	230	4.40	1.56		

From the table, it is found that the mean scores of Logical thinking ability obtained for English and Malayalam medium elementary school students are 5.09 and 4.40 respectively. The standard deviation obtained are 1.65 and 1.56 respectively. The calculated value of 't' is 4.84 and the tabled value of 't' at 0.01 level of significance is 2.58. Since the calculated value is greater than the tabled value, it can be inferred that there is a significant difference in Logical thinking ability between English and Malayalam medium students.

The analysis of above data shows that there is a significant difference in mean scores between English and Malayalam medium students in Logical thinking ability. Hence it can be concluded that English medium students show more Logical thinking ability than their counterparts.

Comparison of mean scores of Things arrangement ability between English and Malayalam medium elementary school students

In this analysis the investigator compared the difference of significance between English and Malayalam medium elementary school students in Things arrangement ability. Comparison of total mean scores of Things arrangement ability between English and Malayalam medium was done. The result obtained is presented in the table 13.

Table 13

Data and results of the Test of Significance of difference in Things arrangement ability between English and Malayalam medium students

Sample	N	Mean	Standard Deviation	't' value	Level of significance
English	297	25.69	5.61	8.25	0.01
Malayalam	230	21.41	6.25		

From the table, it is found that the mean scores of Things arrangement ability obtained for English and Malayalam medium elementary school students are 25.69 and 21.41 respectively. The standard deviation obtained are 5.61 and 6.25 respectively. The calculated value of 't' is 8.25 and the tabled value of 't' at 0.01 level of significance is 2.58. Since the calculated value is greater than the tabled value, it can be inferred that there is a significant difference in Things arrangement ability between English and Malayalam medium students.

The analysis of above data shows that there is a significant difference in mean scores between English and Malayalam medium students in Things

arrangement ability. Hence it can be concluded that English medium students show more Things arrangement ability than their counterparts.

Comparison of mean scores of Concrete operational ability between English and Malayalam medium elementary school students

In this analysis the investigator compared the difference of significance between English and Malayalam medium elementary school students in Concrete operational ability. Comparison of total mean scores of Concrete operational ability between English and Malayalam medium was done. The result obtained is presented in the table 14.

Table 14

Data and results of the Test of Significance of difference in Concrete operational ability between English and Malayalam medium students

Sample	N	Mean	Standard Deviation	't' value	Level of significance
English	297	46.18	9.91	9.77	0.01
Malayalam	230	37.50	10.36		

From the table, it is found that the mean scores of Concrete operational ability obtained for English and Malayalam medium elementary school students are 46.18 and 37.50 respectively. The standard deviation obtained are 9.91 and 10.36 respectively. The calculated value of 't' is 9.77 and the tabled value of 't' at 0.01 level of significance is 2.58. Since the calculated value is greater than the tabled

value, it can be inferred that there is a significant difference in Concrete operational ability between English and Malayalam medium students.

The analysis of above data shows that there is a significant difference in mean scores between English and Malayalam medium students in Concrete operational ability. Hence it can be concluded that English medium students show more Concrete operational ability than their counterparts.

Comparison of mean scores of Inductive deductive reasoning ability between elementary school students of Parental qualification below plus two and above plus two

In this analysis the investigator compared the difference of significance between Parental qualification below plus two and above plus two among elementary school students in Inductive deductive reasoning ability. Comparison of total mean scores of Inductive deductive reasoning ability between Parental qualification below plus two and above plus two among elementary school students was done. The result obtained is presented in the table 15.

Table 15

Data and results of the Test of Significance of difference in Inductive Deductive reasoning ability between elementary school students of Parental qualification below plus two and above plus two

Sample	N	Mean	Standard Deviation	't' value	Level of significance
Below plus two	281	12.63	4.84	5.89	0.01
above plus two	246	15.09	4.69		

From the table, it is found that the mean scores of Inductive deductive reasoning ability obtained forelementary school students of Parental qualification below plus two and above plus two are 12.63and 15.09 respectively. The standard deviation obtained are 4.84 and 4.69 respectively. The calculated value of 't' is 5.89 and the tabled value of 't' at 0.01 level of significance is 2.58.Since the calculated value is greater than the tabled value, it be inferred that there is a significant difference in Inductive deductive reasoning ability between Parental qualification below plus two and above plus two.

The analysis of above data shows that there is a significant difference in mean scores between Parental qualification below plus two and above plus two among elementary school students in Inductive deductive reasoning ability. Hence, it can be concluded that parental qualification above plus two show more Inductive deductive reasoning ability than their counterparts.

Comparison of mean scores of Logical thinking ability between elementary school students of Parental qualification below plus two and above plus two

In this analysis the investigator compared the difference of significance between Parental qualification below plus two and above plus two among elementary school students in Logical thinking ability. Comparison of total mean scores of Logical thinking ability between Parental qualification below plus two and above plus two among elementary school students was done. The result obtained is presented in the table 16.

Table 16

Data and results of the Test of Significance of difference in Logical thinking ability between elementary school students of Parental qualification below plus two and above plus two

Sample	N	Mean	Standard Deviation	't' value	Level of significance
Below plus two	281	4.30	1.73	7.58	0.01
Above plus two	246	5.34	1.37		

From the table, it is found that the mean scores of Logical thinking ability obtained for elementary school students of Parental qualification below plus two and above plus two are 4.30 and 5.34 respectively. The standard deviation obtained are 1.73 and 1.37 respectively. The calculated value of 't' is 7.58 and the tabled value of 't' at 0.01 level of significance is 2.58. Since the calculated value is greater than the tabled value, it can be inferred that there is a significant difference in Logical thinking ability between Parental qualification below plus two and above plus two.

The analysis of above data shows that there is a significant difference in mean scores between Parental qualification below plus two and above plus two among elementary school students in Logical thinking ability. Hence, it can be concluded that parental qualification above plus two show more Logical thinking ability than their counterparts.

Comparison of mean scores of Things arrangement ability between elementary school students of Parental qualification below plus two and above plus two

In this analysis the investigator compared the difference of significance between Parental qualification below plus two and above plus two among elementary school students in Things arrangement ability. Comparison of total mean scores of Things arrangement ability between Parental qualification below plus two and above plus two among elementary school students was done. The result obtained is presented in the table 17.

Table 17

Data and results of the Test Significance of difference in Things arrangement ability between elementary school students of Parental qualification below plus two and above plus two

Sample	N	Mean	Standard Deviation	't' value	Level of significance
Below plus two	281	22.00	6.14	7.52	0.01
Above plus two	246	25.91	5.74		

From the table, it is found that the mean scores of Things arrangement ability obtained for elementary school students of Parental qualification below plus two and above plus two are 22.00 and 25.91 respectively. The standard deviation obtained are 6.14 and 5.74 respectively. The calculated value of 't' is 7.520 and the tabled value of 't' at 0.01 level of significance is 2.58. Since the calculated value is greater than the tabled value, it can be inferred that there is a significant difference in

Things arrangement ability between Parental qualification below plus two and above plus two.

The analysis of above data shows that there is a significant difference in mean scores between Parental qualification below plus two and above plus two among elementary school students in Things arrangement ability. Hence, it can be concluded that parental qualification above plus two show more Things arrangement ability than their counterparts.

Comparison of mean scores of Concrete operational ability between elementary school students of Parental qualification below plus two and above plus two

In this analysis the investigator compared the difference of significance between Parental qualification below plus two and above plus two among elementary school students in Concrete operational ability. Comparison of total mean scores of Concrete operational ability between Parental qualifications below plus two and above plus two among elementary school students was done. The result obtained is presented in the table18.

Table 18

Data and results of the Test of Significance of difference in Concrete operational ability between elementary school students of Parental qualification below plus two and above plus two

Sample	N	Mean	Standard Deviation	't' value	Level of significance
Below plus two	281	38.93	10.85	8.19	0.01
Above plus two	246	46.33	9.75		

From the table, it is found that the mean scores of Concrete operational ability obtained for elementary school students of Parental qualification below plus two and above plus two are 38.93 and 46.33 respectively. The standard deviation obtained are 10.85 and 9.75 respectively. The calculated value of 't' is 8.19 and the tabled value of 't' at 0.01 level of significance is 2.58. Since the calculated value is greater than the tabled value, it can be inferred that there is a significant difference in Concrete operational ability between Parental qualification below plus two and above plus two.

The analysis of above data shows that there is a significant difference in mean scores between Parental qualification below plus two and above plus two among elementary school students in Concrete operational ability. Hence, it can be concluded that parental qualification above plus two show more Things arrangement ability than their counterparts.

One way ANOVA

Comparison of mean scores of Inductive deductive reasoning ability among elementary school students of Parental employment

To find out whether there exist any significant difference in Inductive deductive reasoning ability among elementary school students based on parental employment Viz. Business, Coolie and professional. The investigator used the technique of one way ANOVA. The details of ANOVA are given in the table 19.

Table 19

Summary of one-way ANOVA of Inductive deductive reasoning ability among elementary school students of parental employment as Business, Professional and Coolie

Inductive deductive reasoning	Sum of squares	Df	Mean squares	F
Between groups	872.09	2	436.04	19.28
Within groups	11848.94	524	22.61	
Total	12721.02	526		

From the table, it can be seen that the F- value obtained is 19.28 is greater than the F-value required for significance at 0.01 level with (2,524) degrees of freedom 4.65. It means that the 3 groups differ significantly in their Inductive deductive reasoning ability mean scores. To identify the groups which differ significantly, Scheffe’s F was calculated as post hoc analysis. The result of scheffe’s test is given as a table 20.

Table 20

The result of Scheffe’s test is given as table of Inductive deductive reasoning ability among elementary school students of parental employment as Business, Professional and Coolie

Parental employment	N	0.05 level	
		1	2
Business	255	12.48	
Professional	147		14.65
Coolie	125		15.40

From the table 19 result of Scheffe’s test shows that there exists the significant difference among three parental employments. It is found that the F value of business, professional and coolie are 12.48, 14.65 and 15.40 respectively. It

shows that there is no significant difference between the F values of professional and coolie employment. There exist a significant difference between the F values of business and coolie employment and business and professional employment.

Comparison of mean scores of Logical thinking ability among elementary school students of Parental employment

To find out whether there exist any significant difference in Logical thinking ability among elementary school students based on parental employment Viz. Business, Coolie and professional. The investigator used the technique of one way ANOVA. The details of ANOVA are given in the table 21.

Table 21

Summary of one-way ANOVA of Logical thinking ability among elementary school students of parental employment as Business, Professional and Coolie.

Logical thinking ability	Sum of squares	Df	Mean squares	F
Between groups	77.94	2	38.97	15.04
Within groups	1358.26	524	2.59	
Total	1436.20	526		

From the table, it can be seen that the F- value obtained is 15.04 is greater than the F-value required for significance at 0.01 level with (2,524) degrees of freedom 4.65. It means that the 3 groups differ significantly in their Logical thinking ability mean scores. To identify the groups which differ significantly, Scheffe’s F was calculated as post hoc analysis. The result of scheffe’s test is given as a table 22.

Table 22

The result of Scheffe's test is given as table of logical thinking ability among elementary school students of parental employment as Business, Professional and Coolie

Parental employment	N	0.05 level	
		1	2
Business	255	4.41	
Professional	147		4.98
Coolie	125		5.33

From the table result of Scheffe's test shows that there exist the significant difference among three groups of parental employments in logical thinking ability. It is found that the F value of business, professional and coolie are 4.41, 4.98 and 5.33 respectively. It shows that there is no significant difference between the F values of professional and coolie employment. There exist a significant difference between the F values of business and coolie employment and business and professional employment.

Comparison of mean scores of Things arrangement ability among elementary school students of Parental employment

To find out whether there exist any significant difference in Things arrangement ability among elementary school students based on parental employment Viz. Business, Coolie and professional. The investigator used the technique of one way ANOVA. The details of ANOVA are given in the table 23.

Table 23

Summary of one – way ANOVA of Things arrangement ability among elementary school students of parental employment as Business, Professional and Coolie.

Things arrangement ability	Sum of squares	Df	Mean squares	F
Between groups	1635.87	2	817.93	22.58
Within groups	18985.37	524	36.232.	
Total	20621.23	526		

From the table, it can be seen that the F- value obtained is 22.58 is greater than the F-value required for significance at 0.01 level with (2,524) degrees of freedom 4.65. It means that the 3 groups differ significantly in their Things arrangement ability mean scores. To identify the groups which differ significantly, Scheffe’s F was calculated as post hoc analysis. The result of scheffe’s test is given as a table 24.

Table 24

The result of Scheffe’s test is given as table of things arrangement ability among elementary school students of parental employment as Business, Professional and Coolie

Parental employment	N	0.05 level	
		1	2
Business	255	22.06	
Professional	147		24.89
Coolie	125		26.15

From the table result of Scheffe’s test shows that there exist the significant difference among three groups of parental employments in things arrangement

ability. It is found that the F value of business, professional and coolie are 22.06, 24.89 and 26.15 respectively. It shows that there is no significant difference between the F values of professional and coolie employment. There exist a significant difference between the F values of business and coolie employment and business and professional employment.

Comparison of mean scores of Concrete operational ability among elementary school students of Parental employment

To find out whether there exist any significant difference in Concrete operational ability among elementary school students based on parental employment Viz. Business, Coolie and professional. The investigator used the technique of one way ANOVA. The details of ANOVA are given in the table 25.

Table 25

Summary of one- way ANOVA of Concrete operational ability among elementary school students of parental employment as Business, Professional and Coolie.

Concrete operational ability	Sum of squares	Df	Mean squares	F
Between groups	6201.73	2	3100.86	28.38
Within groups	57243.30	524	109.24	
Total	63445.03	526		

From the table, it can be seen that the F- value obtained is 28.38 is greater than the F-value required for significance at 0.01 level with (2,524) degrees of freedom 4.65. It means that the 3 groups differ significantly in their Concrete operational ability mean scores. To identify the groups which differ significantly,

Scheffe’s F was calculated as post hoc analysis. The result of scheffe’s test is given as a table 26.

Table 26

The result of Scheffe’s test is given as table of concrete operational ability among elementary school students of parental employment as Business, Professional and Coolie

Parental employment	N	0.05 level	
		1	2
Business	255	38.95	
Professional	147		44.52
Coolie	125		46.88

From the table result of Scheffe’s test shows that there exist the significant difference among three groups of parental employments in things arrangement ability. It is found that the F value of business, professional and coolie are 38.95, 44.52 and 46.88 respectively. It shows that there is no significant difference between the F values of professional and coolie employment. There exist a significant difference between the F values of business and coolie employment and business and professional employment.

Comparison of mean scores of Inductive deductive reasoning ability among elementary school students of Type of management

To find out whether there exist any significant difference in Inductive deductive reasoning ability among elementary school students based on type of management Viz. Government, aided, unaided. The investigator used the technique of one way ANOVA. The details of ANOVA are given in the table 27.

Table 27

Summary of one – way ANOVA of Inductive deductive reasoning ability among elementary school students of type of management as Government, Aided and Unaided.

Inductive deductive reasoning	Sum of squares	Df	Mean squares	F
Between groups	1848.66	2	924.33	44.55
Within groups	10872.36	524	20.75	
Total	12721.03	526		

From the table, it can be seen that the F- value obtained is 44.55 is greater than the F-value required for significance at 0.01 level with (2,524) degrees of freedom 4.65. It means that the 3 groups differ significantly in their Inductive deductive reasoning ability mean scores. To identify the groups which differ significantly, Scheffe’s F was calculated as post hoc analysis. The result of scheffe’s test is given as a table 28.

Table 28

The result of Scheffe’s test is given as table of inductive deductive reasoning ability among elementary school students of type of management as Government, Aided and Unaided.

Type of management	N	0.05 level	
		1	2
Govt	211	12.70	
Aided	211	12.99	
Unaided	105		17.52

From the table result of Scheffe’s test shows that there exist the significant difference among three groups of type of management in inductive deductive

reasoning ability. It is found that the F value of government, aided and unaided are 12.70, 12.99 and 17.52 respectively. It shows that there is no significant difference between the F values of government and aided management. There exist a significant difference between the F values of government and unaided and aided and unaided management.

Comparison of mean scores of Logical thinking ability among elementary school students of Type of management

To find out whether there exist any significant difference in Logical thinking ability among elementary school students based on type of management Viz. Government, aided, unaided. The investigator used the technique of one way ANOVA. The details of ANOVA are given in the table 29.

Table 29

Summary of one-way ANOVA of Logical thinking ability among elementary school students of type of management as Government, Aided and Unaided.

Logical thinking	Sum of squares	Df	Mean squares	F
Between groups	92.80	2	46.40	18.10
Within groups	1343.40	524	2.56	
Total	1436.20	526		

From the table, it can be seen that the F- value obtained is 18.10 is greater than the F-value required for significance at 0.01 level with (2,524) degrees of freedom 4.65. It means that the 3 groups differ significantly in their Logical thinking ability mean scores. To identify the groups which differ significantly, Scheffe’s F was calculated as post hoc analysis. The result of scheffe’s test is given as a table 30.

Table 30

The result of Scheffe's test is given as table of logical thinking ability among elementary school students of type of management as Government, Aided and Unaided.

Type of management	N	0.05 level	
		1	2
Govt	211	4.57	
Aided	211	4.59	
Unaided	105		5.63

From the table result of Scheffe's test shows that there exist the significant difference among three groups of type of management in logical thinking ability. It is found that the F value of government, aided and unaided are 4.57, 4.59 and 5.63 respectively. It shows that there is no significant difference between the F values of government and aided management. There exist a significant difference between the F values of government and unaided and aided and unaided management.

Comparison of mean scores of Things arrangement ability among elementary school students of Type of management

To find out whether there exist any significant difference in Things arrangement ability among elementary school students based on type of management Viz. Government, aided, unaided. The investigator used the technique of one way ANOVA. The details of ANOVA are given in the table 31.

Table 31

Summary of one - way ANOVA of Things arrangement ability among elementary school students of type of management as Government, Aided and Unaided.

Things arrangement ability	Sum of squares	Df	Mean squares	F
Between groups	4275.61	2	2137.81	68.53
Within groups	16345.62	524	31.19	
Total	20621.23	526		

From the table, it can be seen that the F- value obtained is 68.53 is greater than the F-value required for significance at 0.01 level with (2,524) degrees of freedom 4.65. It means that the 3 groups differ significantly in their Things arrangement ability mean scores. To identify the groups which differ significantly, Scheffe’s F was calculated as post hoc analysis. The result of scheffe’s test is given as a table 32.

Table 32

The result of Scheffe’s test is given as table of things arrangement ability among elementary school students of type of management as Government, Aided and Unaided.

Type of management	N	0.05 level		
		1	2	3
Govt	211	21.16		
Aided	211		23.96	
Unaided	105			28.96

From the table result of Scheffe’s test shows that there exist the significant difference among three groups of type of management in things arrangement ability. It is found that the F value of government, aided and unaided are 21.16,

23.96 and 28.96 respectively. There exist a significant difference between the F values of government and aided, aided and unaided and government and unaided management.

Comparison of mean scores of Concrete operational ability among elementary school students of Type of management

To find out whether there exist any significant difference in Concrete operational ability among elementary school students based on type of management Viz. Government, aided, unaided. The investigator used the technique of one way ANOVA. The details of ANOVA are given in the table 33.

Table 33

Summary of one- way ANOVA of Concrete operational ability among elementary school students of type of management as Government, Aided and Unaided.

Concrete operational ability	Sum of squares	Df	Mean squares	F
Between groups	13383.56	2	6691.78	70.04
Within groups	50061.47	524	95.54	
Total	63445.03	526		

From the table, it can be seen that the F- value obtained is 70.04 is greater than the F-value required for significance at 0.01 level with (2,524) degrees of freedom 4.65. It means that the 3 groups differ significantly in their Things arrangement ability mean scores. To identify the groups which differ significantly, Scheffe’s F was calculated as post hoc analysis. The result of scheffe’s test is given as a table 34.

Table 34

The result of Scheffe's test is given as table of concrete operational ability among elementary school students of type of management as Government, Aided and Unaided.

Type of management	N	0.05 level		
		1	2	3
Govt	211	38.45		
Aided	211		41.49	
Unaided	105			52.11

From the table result of Scheffe's test shows that there exist the significant difference among three groups of type of management in concrete operational ability. It is found that the F value of government, aided and unaided are 38.45, 41.49 and 52.11 respectively. There exist a significant difference between the F values of government and aided, aided and unaided and government and unaided management.

**SUMMARY, FINDINGS AND
SUGGESTIONS**

- *Study In Retrospect*
- *Variables of the study*
- *Objectives of the study*
- *Hypotheses of the study*
- *Methodology of the study*
- *Major Findings*
- *Tenability of Hypotheses*
- *Educational Implication*
- *Suggestions for Further Research*

SUMMARY, FINDINGS AND SUGGESTIONS

This chapter provides a retrospective view of study, major findings, educational implications, and suggestion for further research in this area.

Study in retrospect

The present investigation is entitled as “Concrete operational ability among elementary school students in Kerala”.

Objectives of the study

1. To find whether there exists any significant difference in the inductive deductive reasoning abilities among elementary school students based on the sub samples.
 - Gender
 - Locale of the school
 - Medium of instruction
 - Parental educational qualification
 - Parental employment
 - Type of management of school

2. To find whether there exists any significant difference in the logical thinking abilities among elementary school students based on the subsamples.
 - Gender
 - Locale of the school

- Medium of instruction
 - Parental educational qualification
 - Parental employment
 - Type of management of school
3. To find whether there exists any significant difference in the things arrangement ability among elementary school students based on the subsamples
- Gender
 - Locale of the school
 - Medium of instruction
 - Parental educational qualification
 - Parental employment
 - Type of management of school
4. To find whether there exists any significant difference in concrete operational abilities among elementary school students based on the subsamples
- Gender
 - Locale of the school
 - Medium of instruction
 - Parental educational qualification
 - Parental employment
 - Type of management of school

Hypotheses of the study

1. There exists a significant difference in inductive deductive reasoning among elementary school students based on the subsamples.
 - . Gender
 - Locale of school
 - Medium of instruction
 - Parental educational qualification.
 - Parental employment
 - Type of management of school

2. There exists a significant difference in logical thinking abilities among elementary school students based on the sub samples.
 - Gender
 - Locale of school
 - Medium of instruction
 - Parental educational qualification.
 - Parental employment
 - Type of management of school

3. There exists significant difference in things arrangement ability among elementary school students based on the sub samples.
 - Gender
 - Locale of school

- Medium of instruction
 - Parental educational qualification.
 - Parental employment
 - Type of management of school
4. There exists significant difference in concrete operational ability among elementary school students based on the sub samples.
- Gender
 - Locale of school
 - Medium of instruction
 - Parental educational qualification.
 - Parental employment
 - Type of management of school

Methodology

It deals with brief description of the methodology of the present study with precise description of the sample used for the study, tools and statistical technique used.

Sample

The present study was conducted on a representative sample of 527 elementary school students of Kozhikode, Malappuram and Wayanadu districts. The sampling technique used was stratified random sampling method giving due

representation to factors like gender, locality, type of management, parental educational qualification, Parental employment and medium of instruction.

The tool used for the present study

Concrete operational ability test (Anees &Nijila, 2016)

Statistical techniques for the study

- Preliminary analysis Mean, Median, Mode, Standard Deviation, Skewness, Kurtosis.
- t-test (Test of significance of mean difference)
- One-way ANOVA

Major findings of the study

1. There is no significant difference in inductive deductive reasoning ability between male and female elementary school students. ($t= 0.29$)
2. There is no significant difference in logical thinking ability between male and female elementary school students. ($t= 1.26$)
3. There is no significant difference in things arrangement ability between male and female elementary school students. ($t= 0.001$)
4. There is no significant difference in concrete operational ability between male and female elementary school students. ($t= 0.06$)
5. There is no significant difference between urban and rural elementary school students in inductive deductive reasoning ability. ($t= 1.90$)

6. There is no significant difference between urban and rural elementary school students in logical thinking ability. (t= 0.13)
7. There is no significant difference between urban and rural elementary school students in things arrangement ability. (t= 0.3)
8. There is no significant difference between urban and rural elementary school students in concrete operational ability. (t= 1.00)
9. There is significant difference between English and Malayalam medium elementary school students in Inductive deductive reasoning ability.(t= 9.26)
10. There is significant difference between English and Malayalam medium elementary school students in logical thinking ability.(t= 4.84)
11. There is significant difference between English and Malayalam medium elementary school students in things arrangement ability.(t= 8.25)
12. There is significant difference between English and Malayalam medium elementary school students in concrete operational ability.(t= 9.77)
13. There is significant difference between Parental qualification below plus two and above plus two among elementary school students in Inductive deductive reasoning ability. (t= 5.89)
14. There is significant difference between Parental qualification below plus two and above plus two among elementary school students in logical thinking ability. (t= 7.58)

15. There is significant difference between Parental qualification below plus two and above plus two among elementary school students in things arrangement ability. (t= 7.52)
16. There is significant difference between Parental qualification below plus two and above plus two among elementary school students in concrete operational ability. (t= 8.19)
17. There is a significant difference between business, professional and coolie as parental employment of elementary school students in inductive deductive reasoning ability.
18. There is a significant difference in parental employment as business and professional in their inductive deductive reasoning ability.
19. There is a significant difference in parental employment as business and coolie in their inductive deductive reasoning ability.
20. There is no significant difference in parental employment as professional and coolie in their inductive deductive reasoning ability.
21. There is a significant difference between business, professional and coolie as parental employment of elementary school students in logical thinking ability.
22. There is a significant difference in parental employment as business and professional in their logical thinking ability.

23. There is a significant difference in parental employment as business and coolie in their logical thinking ability.
24. There is no significant difference in parental employment as coolie and professional in their logical thinking ability.
25. There is a significant difference between business, professional and coolie as parental employment of elementary school students in things arrangement ability.
26. There is a significant difference in parental employment as business and professional in their things arrangement ability.
27. There is a significant difference in parental employment as business and coolie in their things arrangement ability.
28. There is no significant difference in parental employment as coolie and professional in their things arrangement ability.
29. There is a significant difference between business, professional and coolie as parental employment of elementary school students in concrete operational ability.
30. There is a significant difference in parental employment as business and professional in their concrete operational ability.
31. There is a significant difference in parental employment as business and coolie in their concrete operational ability.

32. There is no significant difference in parental employment as professional and coolie in their concrete operational ability.
33. There is a significant difference between government, aided and unaided as management of elementary school students in inductive deductive reasoning ability.
34. There is no significant difference between government and aided management elementary school students in inductive deductive reasoning ability.
35. There is a significant difference between government and unaided management elementary school students in inductive deductive reasoning ability.
36. There is a significant difference between aided and unaided management elementary school students in inductive deductive reasoning ability.
37. There is a significant difference between government, aided and unaided management elementary school students in logical thinking ability.
38. There is no significant difference between government and aided management elementary school students in logical thinking ability.
39. There is a significant difference between government and unaided management elementary school students in logical thinking ability.
40. There is a significant difference between aided and unaided management elementary school students in logical thinking ability.

41. There is a significant difference between government, aided and unaided management elementary school students in things arrangement ability.
42. There is a significant difference between government and aided management elementary school students in things arrangement ability.
43. There is a significant difference between government and unaided management elementary school students in things arrangement ability.
44. There is a significant difference between aided and unaided management elementary school students in things arrangement ability.
45. There is a significant difference between government, aided and unaided management elementary school students in concrete operational ability.
46. There is a significant difference between government and aided management elementary school students in concrete operational ability.
47. There is a significant difference between government and unaided management elementary school students in concrete operational ability.
48. There is a significant difference between aided and unaided management elementary school students in concrete operational ability.

Tenability of hypothesis

The tenability of hypothesis is examined in the light of the above findings.

Hypothesis 1 (a) states that there exists a significant difference between male and female elementary school students in inductive deductive reasoning ability. The

findings reveal that there is no significant difference between male and female elementary school students in inductive deductive reasoning ability ($t=0.29$).

Hypothesis 1(b) states that there exists a significant difference between urban and rural elementary school students in inductive deductive reasoning ability. The findings reveal that there is no significant difference between urban and rural elementary school students in inductive deductive reasoning ability ($t=1.90$).

Hypothesis 1(c) states that there exists a significant difference between English and Malayalam medium elementary school students in inductive deductive reasoning ability. The findings reveal that there is significant difference between English and Malayalam medium elementary school students in inductive deductive reasoning ability ($t=9.26$).

Hypothesis 1(d) states that there exists a significant difference between parental qualification below plus two and above plus two elementary school students in inductive deductive reasoning ability. The findings reveal that there is significant difference between parental qualification below plus two and above plus two elementary school students in inductive deductive reasoning ability ($t=5.89$).

Hypothesis 1(e) states that there exists a significant difference between parental employment business, professional and coolie in inductive deductive reasoning ability. The findings reveal that there is significant difference between business, professional and coolie parental employment in inductive deductive reasoning ability. There is a significant difference between business and professional parental employment in inductive deductive reasoning ability. There is a significant

difference between business and coolie parental employment in inductive deductive reasoning ability. But there is no significant difference between professional and coolie parental employment in inductive deductive reasoning ability.

Hypothesis 1(f) states that there exists a significant difference between type of management government, aided and unaided elementary school students in inductive deductive reasoning ability. The findings reveal that there is a significant difference between government, aided and unaided management elementary school students in inductive deductive reasoning ability. There is no significant difference between government and aided management elementary school students in inductive deductive reasoning ability. But there is a significant difference between government and unaided management elementary school students in inductive deductive reasoning ability. There is a significant difference between aided and unaided management elementary school students in inductive deductive reasoning ability.

Hypothesis 2 (a) states that there exists a significant difference between male and female elementary school students in logical thinking ability. The findings reveal that there is no significant difference between male and female elementary school students in logical thinking ability ($t=1.26$).

Hypothesis 2 (b) states that there exists a significant difference between urban and rural elementary school students in logical thinking ability. The findings reveal that there is no significant difference between urban and rural elementary school students in logical thinking ability ($t=0.13$).

Hypothesis 2 (c) states that there exists a significant difference between English and Malayalam medium elementary school students in logical thinking

ability. The findings reveal that there is significant difference between English and Malayalam medium elementary school students in logical thinking ability ($t=4.84$).

Hypothesis 2 (d) states that there exists a significant difference between parental qualification below plus two and above plus two elementary school students in logical thinking ability. The findings reveal that there is significant difference between parental qualification below plus two and above plus two elementary school students in logical thinking ability ($t=7.58$).

Hypothesis 2(e) states that there exists a significant difference between parental employment business, professional and coolie in logical thinking ability. The findings reveal that there is significant difference between business, professional and coolie parental employment in logical thinking ability. There is a significant difference between business and professional parental employment in logical thinking ability. There is a significant difference between business and coolie parental employment in logical thinking ability. But there is no significant difference between professional and coolie parental employment in logical thinking ability.

Hypothesis 2(f) states that there exists a significant difference between type of management government, aided and unaided elementary school students in logical thinking ability. The findings reveal that there is a significant difference between government, aided and unaided management elementary school students in logical thinking ability. But there is no significant difference between government and aided management elementary school students in logical thinking ability. There is a significant difference between government and unaided management elementary school students in logical thinking ability. There is a significant difference between

aided and unaided management elementary school students in logical thinking ability.

Hypothesis 3 (a) states that there exists a significant difference between male and female elementary school students in things arrangement ability. The findings reveal that there is no significant difference between male and female elementary school students in things arrangement ability ($t=0.001$).

Hypothesis 3 (b) states that there exists a significant difference between urban and rural elementary school students in things arrangement ability. The findings reveal that there is no significant difference between urban and rural elementary school students in things arrangement ability ($t=0.3$).

Hypothesis 3 (c) states that there exists a significant difference between English and Malayalam medium elementary school students in things arrangement ability. The findings reveal that there is significant difference between English and Malayalam medium elementary school students in things arrangement ability ($t=8.25$).

Hypothesis 3 (d) states that there exists a significant difference between parental qualification below plus two and above plus two elementary school students in things arrangement ability. The findings reveal that there is significant difference between parental qualification below plus two and above plus two elementary school students in things arrangement ability ($t=7.52$).

Hypothesis 3(e) states that there exists a significant difference between parental employment business, professional and coolie in things arrangement ability.

The findings reveal that there is significant difference between business, professional and coolie parental employment in things arrangement ability. There is a significant difference between business and professional parental employment in things arrangement ability. There is a significant difference between business and coolie parental employment in things arrangement ability. But there is no significant difference between professional and coolie parental employment in things arrangement ability.

Hypothesis 3(f) states that there exists a significant difference between type of management government, aided and unaided elementary school students in things arrangement ability. The findings reveal that there is a significant difference between government, aided and unaided management elementary school students in things arrangement ability. There is a significant difference between government and aided management elementary school students in things arrangement ability. There is a significant difference between government and unaided management elementary school students in things arrangement ability. There is a significant difference between aided and unaided management elementary school students in things arrangement ability.

Hypothesis 4 (a) states that there exists a significant difference between male and female elementary school students in concrete operational ability. The findings reveal that there is no significant difference between male and female elementary school students in concrete operational ability ($t=0.06$).

Hypothesis 4 (b) states that there exists a significant difference between urban and rural elementary school students in concrete operational ability. The

findings reveal that there is no significant difference between urban and rural elementary school students in concrete operational ability ($t=1.00$).

Hypothesis 4 (c) states that there exists a significant difference between English and Malayalam medium elementary school students in concrete operational ability. The findings reveal that there is significant difference between English and Malayalam medium elementary school students in concrete operational ability ($t=9.77$).

Hypothesis 4 (d) states that there exists a significant difference between Parental qualification below plus two and above plus two elementary school students in concrete operational ability. The findings reveal that there is significant difference between parental qualification below plus two and above plus two elementary school students in concrete operational ability ($t=8.19$).

Hypothesis 4(e) states that there exists a significant difference between parental employment business, professional and coolie in concrete operational ability. The findings reveal that there is significant difference between business, professional and coolie parental employment in concrete operational ability. There is a significant difference between business and professional parental employment in concrete operational ability. There is a significant difference between business and coolie parental employment in concrete operational ability. But there is no significant difference between professional and coolie parental employment in concrete operational ability.

Hypothesis 4(f) states that there exists a significant difference between type of management government, aided and unaided elementary school students in concrete operational ability. The findings reveal that there is a significant difference between government, aided and unaided management elementary school students in concrete operational ability. There is a significant difference between government and aided management elementary school students in concrete operational ability. There is a significant difference between government and unaided management elementary school students in concrete operational ability. There is a significant difference between aided and unaided management elementary school students in concrete operational ability.

Educational implication

The value of any piece of research in education lies in the implications of the study. Based on the major findings of the present study, some practical suggestions have been given by the investigator to improve educational practices.

Concrete operational stage is the third stage of Piaget's theory of cognitive development. During this stage children gain a better understanding of mental operations. They begins to think logically about concrete events. The investigator likes to suggest some programmes to develop concrete operational ability among elementary school students, which are as follows,

- Apply Piaget's cognitive developmental theory in the present curriculum. Text books should be revised according to the mental level of students comes under concrete operational stage.

- Conduct workshop, classes, exhibition, and science fair program among elementary school students to foster mental ability and numerical ability of the children.
- Experimental and research based activities in laboratories should be started in all primary and middle schools for active participation of the students.
- Teaching should be made interesting. It is useful to minimize the learning difficulties in the class room.
- Curriculum may be reviewed and sequenced in order to bring up at par with the cognitive level of the child.
- Give children the opportunities to classify and group information, use outlines and hierarchies to facilitate assimilation of new information with previously learned knowledge.
- Concrete operational ability can be improved through visual media. Visual programs should be performed and developed by expert team on incorporating topics like mental ability and mathematics.

Suggestion for Further Research

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

- The study becomes more relevant if the data collected from fourth and fifth class students also.

- The present study can be extended to other districts.
- A comparative study of concrete operational ability in Kerala with other states can be conducted.
- The study can be extended to other stages of development. That is pre operational stage and formal operational stage.

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APPENDICES

APPENDIX I
FAROOK TRAINING COLLEGE
Concrete Operational Ability Test

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Nijila Mohanan EP
MEd Student

Directions

- The test contains 36 questions. Try to give answer to all questions
- Please read carefully all the instructions in the questions
- Some questions is provided with choices A, B, C, D having one correct answer. Choose the correct answer from the choices.

1. A student walks 10 meter towards north. Then he turn towards right and walks 5 meter. Then he again turns right and walk 10 meter. In which direction he is now from his starting place.
a) South b) West c) North d) East
2. The mirror image of the word MALAYALAM is
a) MALAYALAM b) MA AYA AM
c) WA7AYALAM d) MALAYA AM
3. The given is the mirror image of the word 'EVITCEFFE' found by the child guess which is that
a) E77ECIVTE b) EVITCEFF
b) EFFECTIVE d) EE CIV

4. Raju's mother told him to find out the current time that time was 3'0'clock when he turns back he saw the same time in a mirror in different way. Can you guess that time?
- a) 9'0' clock b) 6'0' clock
d) 7'0' clock e) 8'0' clock
5. B is the father of C, but C is not the son B. Then find out the relationship between B & C
- a) Wife b) daughter c) Son d) Son in law
6. Meena ranks 21st in a class of 51 students. What is her rank from the last
- a) 30th b)32nd c) 20th d) 31st
7. Q is taller than P. but P smaller than R. R & S are equal in height who is smaller among them
- a) P b) Q c) R d) S
8. A boy walks 2km from his home towards north. He turns left side and walks 2km. Again moves towards left side and walk 2km. In which direction he is standing now from starting point.
- a) West b) East c) Northwest d) North East
9. Complete the word
- A e__ __ ca __ __ on
- a) u, d, i, t
b) d, u, i, t
c) i, u, d, t
d) u, i, d, t

B Thi ___ vana ___ puram

- a) r, u, d, h, a b) u, r, d, h
 c) a, u, r, d, h d) h, u, d, u, r

10. It requires five minutes to boil one egg. Then how much time does it requires to boil five eggs together.

- a) 4 minutes b) minutes c) 10 minutes d) 5 minutes

11. Given below is a square which consist 16 boxes with 4 columns and rows each

- No repetition of Numbers in a single row and columns
- Use 1 to 4 numbers
- Find out the number in the box marked as ‘?’

a)

- A) 1 _B) 2 C) 3 D) 4

?	1	3	4
3	4	1	
			1

b)

- A) 2 _B) 4 C) 3 D) 1

		3	
4			3
?	1		4

c)

A) 3 _B) 4 C) 1 D) 2

?	3	4	
		1	3
		3	4
1			

d)

A) 3 _B) 4 C) 2 D) 1

	1	3	
2	3	4	
1	4		
	?		4

e)

A) 3 _B) 1 C) 2 D) 4

			?
1	2	3	4
	3	1	
	1	2	

12. Some of the important days are given below, all the days are mismatched can you correct it.

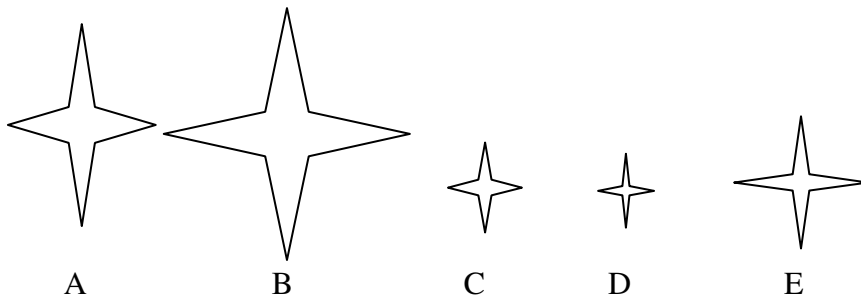
October	25
January	14
December	15
August	26
November	2

13. Arrange the numbers in ascending order

13-1, 4x5, 3+3, 14-9, 5x2

A B C D E

14. Arrange the stars based on their size from big to small



15. Arrange the district from north to south (A) Malappuram
 (B) Thiruvananthapuram (C) Idukki (D) Wayanad (E) Kannur
 (F) Thrissur (G) Palakkad

16. A) LOOHCS :SCHOOL

NOITACUDE :-----

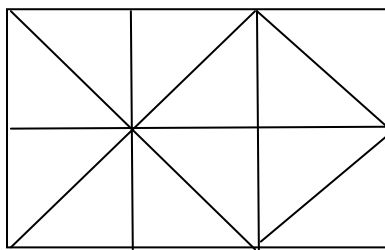
B) TEACHER : STUDENT

DOCTOR -----

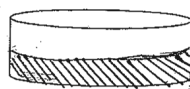
C) DRAMA : DIRECTOR

MAGAZINE :-----

17. In how many forms you can found '8' by using any two numbers among 5, 3, 6, 2, 10
18. Odd one out
- a. 2, 4, 6, 8, 9.
 - b. Sun, Earth, Venues, Saturn, Mercury
 - c. Giraffe , Lion Crocodile, Bear, Elephant
 - d. Sun flower, Hibiscus, Lotus, Rose, Jasmine
 - e. Kerala, TamilNadu, Gujarat, Bihar, Kozhikode
19. One is different out of four. Can you findit?
- a) Apple, Orange, Banana, Carrot
 - b) PAST, BEST, LAST, FAST
 - c) BOAT=TO ,ROAD=DO ,LOAF=OF ,REAM=ME
20. How many squares are there in the below figure

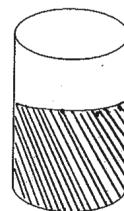


21. Vinu bought two solutions during his journey. He poured the two solution in to two glasses of different shape. After pouring the solutions in to the glasses Vinu had doubt which have greater amount



A

A



B

B

- 1) A 2) B 3) A&B

22. Fill in the blanks

Hint – when the numbers of columns or rows are added the answer should be same

15	8	
	12	
		9

23. Complete the magical square.

	29	6	13	20
28			19	
9	11	18	25	27
15	17	24	26	
16		30	7	14

24. Some of familiar words are given but the letters are shuffled. Can you correct it? Hints are given in the bracket.

- a) GONAM (A kind of fruit)
- b) YAAALLMM (An Indian language)
- c) ASPNI (Name of country)
- d) ICKOH (Place in a Kerala)
- e) UNDDEHR (A number)

25. In the questions given below one among the five is different find out

- a) Cricket, Hockey, Football, Tennis, Racing
- b) Mother, Father, Brother, Sister, Female
- c) Novel, Drama, Poem, Story, Book

Numerical series

26. A) 2, 4, 6, 8, -----

B) 2, 4, 7, 11, -----

Letter series

27. A) CBA, WVU, IHG, TSR, -----

B) 10J, 13M, 17Q, 20T, -----

28. Fill in the blanks using the given hints

	3				6			6		
2	9	4		6	16	3		1	?	2

A) 3

B) 4

C) 9

D) 12

29. In the given question the letters are arranged in a special manner. In each question one letter is missing. Fill up the missing letter.

A) ക, ഗ, ണ, ഛ, -----

B) ക, ച, ട, ത, -----

C) ക, ണ, ച, ണ, -----

D) ച, മ, മ, ത, -----

E) ക, മ, ഖ, ഭ, -----

30. Find out the next number

A) 45, 34, 25, 18, 13 -----

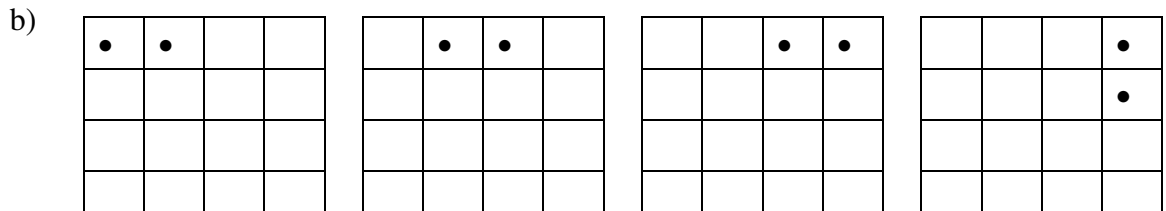
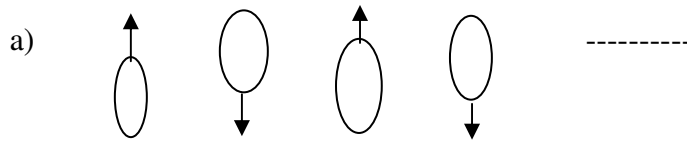
B) 2, 6, 12, 20, 30, -----

C) 2, 5, 10, 17, 26 -----

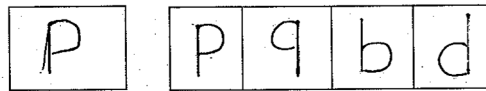
31. Find out the difference in the given picture



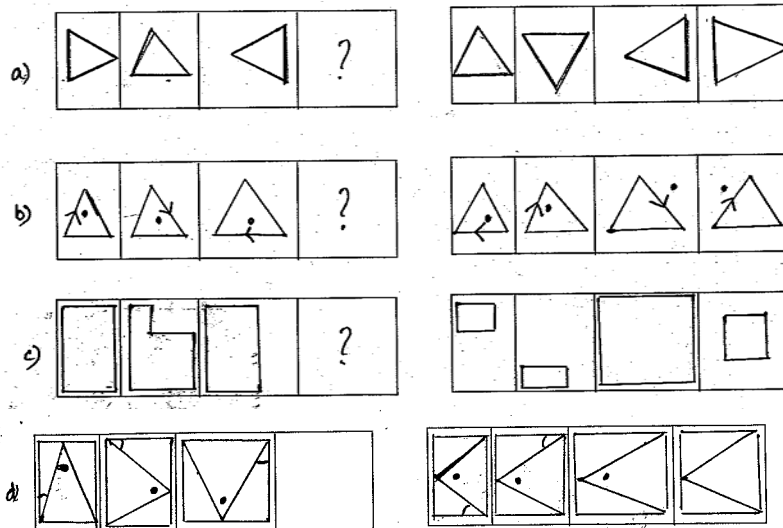
32. Which will be next figure



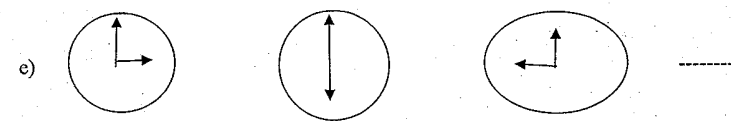
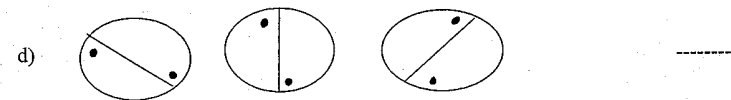
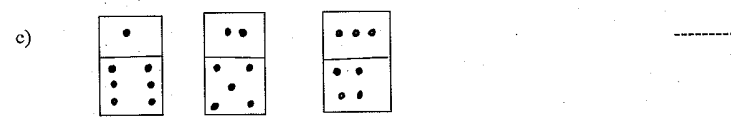
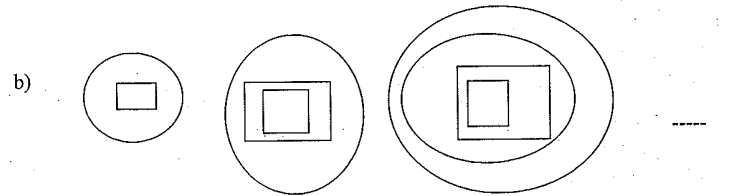
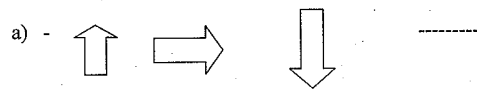
33. Which will be mirror image of the picture



34. Observe the first three figures then find out the fourth one



35. Observe the correct relationship and till in the blanks



36. Observe and fill up the blanks

a) 729, 243, -----, -----, 3, 1

b) 5, 10, 7, 12, 9, 14, -----, -----

c) 11, 4, 7, -----, 13, -----

APPENDIX II
Farook Training College
Concrete Operational ability test

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Assistant Prof.,
Farook Training college

NIJILA Mohan.EP
MEd Student

നിർദ്ദേശങ്ങൾ

- 36ചോദ്യങ്ങൾ ഉൾപ്പെടെ ഒരു ചോദ്യപേപ്പർ ആണ് നൽകിയിരിക്കുന്നത്
- ചോദ്യങ്ങൾ നല്ലപോലെ വായിച്ചതിനു ശേഷം മാത്രം ഉത്തരം നൽകുക
- ഓപ്ഷനുകൾ ഉള്ള ചോദ്യങ്ങൾക്ക് ശരിയായ ഉത്തരം രേഖപ്പെടുത്തിയ ഓപ്ഷൻ മാത്രം എഴുതുക.
- -എല്ലാ ചോദ്യങ്ങൾക്കും ഉത്തരം കണ്ടെത്തുവാൻ ശ്രമിക്കുക

1. ഒരു വിദ്യാർത്ഥി ഒരു സ്ഥലത്തു നിന്നും കിഴക്കോട്ട് തിരിഞ്ഞ് 10 മീറ്റർ നടന്നു അവിടെ നിന്ന് വലത്തേക്ക് തിരിഞ്ഞ് 5 മീറ്റർ നടന്നു. അവിടെ നിന്ന് വീണ്ടും വലത്തേക്ക് തിരിഞ്ഞ് 10 മീറ്റർ കൂടി നടന്നു. പുറപ്പെട്ട സ്ഥലത്ത് നിന്നും കുട്ടി നിൽക്കുന്നത് ഏത് ഭാഗത്തായിരിക്കും.

- എ) തെക്ക്
- ബി) പടിഞ്ഞാറ്
- സി) വടക്ക്
- ഡി) കിഴക്ക്

2. MALAYALAM എന്ന വാക്ക് കണ്ണാടിയിലൂടെ നോക്കിയാൽ നമുക്ക് കാണാനാവുക

- എ) MALAYALAM
- ബി) MA AYA AM
- സി) MA AYA AM
- ഡി) MALAYA AM

3. EVITCEFFE എന്ന വാക്ക് കണ്ണാടിയിലൂടെ വായിച്ചപ്പോൾ കുട്ടി കണ്ടതാണ് കൊടുത്തിരിക്കുന്നത് . ഏതായിരിക്കും എന്ന് ഊഹിക്കാമോ?

- എ) E77ECIVTE
- ബി) EVITCEFFE
- സി) EFFECTIVE
- ഡി) EE CIVT

4. രാജുവിന്റെ അമ്മ രാജുവിനെ സമയം നോക്കുവാൻ പറഞ്ഞയച്ചു. സമയം 3 മണി എന്ന് കണ്ടു. സമയം നോക്കി തിരിഞ്ഞു നോക്കുമ്പോൾ അവന്റെ മുൻപിലുള്ള കണ്ണാടിയിലൂടെ ഇതേ സമയം വേറെ ഒരു രീതിയിലാണ് അവൻ കണ്ടത് രാജു കണ്ണാടിയിലൂടെ കണ്ട സമയം ഊഹിക്കാമോ?

- എ) 9 മണി
- ബി) 6 മണി
- സി) 7 മണി
- ഡി) 8 മണി

5. ഇയുടെ അച്ഛൻ ആണ്ആഎന്നാൽ B യുടെ മകനല്ല C അങ്ങനെ ആണെങ്കിൽ B യും C യും തമ്മിലുള്ള ബന്ധം എന്താണ്
 എ) ഭാര്യ ബി) മകൾ സി) മകൻ ഡി) മരുമകൻ
6. 50 കുട്ടികളുള്ളഒരു ക്ലാസിൽമീന 21-ാം റാങ്ക്കാരിആണ്. അങ്ങനെ ആണെങ്കിൽ അവസാനത്തേതിൽ നിന്ന് മീനയുടെറാങ്ക് എത്ര ആയിരിക്കും
 എ) 30th ബി) 32nd സി) 20th ഡി) 31st
7. Q എന്ന ആളിനേക്കാളും നീളമുണ്ട് P എന്ന ആളിന് പക്ഷേ P എന്ന ആള് R എന്ന ആളിനേക്കാളും കുറവുമാണ്. ഞനും S എന്ന ആളിനും ഒരേ നീളമാണ് ഈ നാലുപേരിൽ നീളം കുറഞ്ഞ ആൾ ആരായിരിക്കും.
 എ) P ബി) Q സി) R ഡി) S
8. ഒരു കുട്ടി അവന്റെ വീട്ടിൽ നിന്നും വടക്ക് ഭാഗത്തേക്ക് 2km നടന്നു. അവിടെ നിന്ന് ഇടത് ഭാഗത്തേക്ക് തിരിഞ്ഞ് 2km കൂടി നടന്നു. അവിടുന്ന് വീണ്ടും ഇടത് ഭാഗത്തേക്ക് തിരിഞ്ഞ് 2km കൂടി നടന്നു. ഇപ്പോൾ അവൻ തുടങ്ങിയ സ്ഥലത്ത് നിന്ന് നോക്കുമ്പോൾ ഏത് ഭാഗത്തായിരിക്കും.
 എ) പടിഞ്ഞാറ് ബി) കിഴക്ക് സി) വടക്ക് പടിഞ്ഞാറ് ഡി)വടക്ക്കിഴക്ക്
9. വാക്കുകളിലെ ചില അക്ഷരങ്ങൾ വിട്ടു പോയിരിക്കുന്നു. യോജിച്ചവ തിരഞ്ഞെടുത്ത് എഴുതുക.
 മ) വി----്യ-----്യാസം
 എ) വ, ര
 ബി) ദ, ഭ
 സി) ധ ഹ
 ഡി) ഗ ഭ
 യ) ---ി-----വ-----പു-----ം
 എ) ന പ ത ഞ ക
 ബി) വ ധ ന ക ര
 സി) ത ര ന ഞ ര
 ഡി) ശ ര ന ധ ച
10. ഒരു കോഴിമുട്ട പുഴുങ്ങുമ്പോൾ 5 മിനുട്ട് സമയം ആവശ്യമാണ് എങ്കിൽ 5 മുട്ട ഒന്നിച്ച് പുഴുങ്ങുവാൻ എത്ര സമയം ആവശ്യമായിവരും.
 എ) 4മിനുട്ട്സ് ബി) 2മിനുട്ട്സ് സി) 10മിനുട്ട്സ് ഡി)5മിനുട്ട്സ്
11. 16 കള്ളികൾ ഉള്ള സമചതുരമാണ് താഴെയുള്ളത് ഓരോ നിരയിലും വരിയിലും 4 കള്ളികൾ വീതം ഉണ്ട്
 - ഓരോ നിരയിലും വരിയിലും ഒരേ അക്കങ്ങൾ വരുവാൻ പാടില്ല.
 - 1മുതൽ 4 വരെയുള്ള അക്കങ്ങളാണ് ഉപയോഗിക്കുന്നത്

- ചോദ്യചിഹ്നം ഇട്ട കള്ളിയിലെ അക്കം ഏതായിരിക്കും.

a) എ) 1 ബി) 2 സി) 3 ഡി) 4

?	1	3	4
3	4	1	
			1

b) എ) 2 ബി) 4 സി) 3 ഡി) 1

		3	
4			3
?	1		4

c) എ) 3 ബി) 4 സി) 1 ഡി) 2

?	3	4	
		1	3
		3	4
1			

d) എ) 3 ബി) 4 സി) 2 ഡി) 1

	1	3	
2	3	4	
1	4		
	?		4

e) എ) 3 ബി) 1 സി) 2 ഡി) 4

			?
1	2	3	4
	3	1	
	1	2	

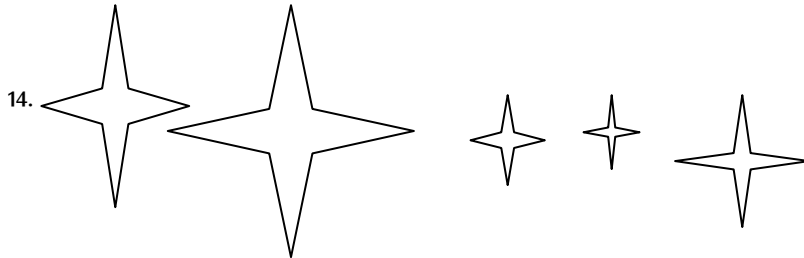
12. വളരെ പ്രധാനപ്പെട്ട കുറച്ച് ദിവസങ്ങളാണ് നൽകിയിരിക്കുന്നത്. നോക്കിയപ്പോൾ ദിവസങ്ങളെല്ലാം മാറിയാണ് കിടക്കുന്നത്. നിങ്ങൾക്ക് അത് ശരിയാക്കാമോ?

ഒക്ടോബർ	25
ജനുവരി	14
ഡിസംബർ	15
ആഗസ്ത്	26
നവംബർ	2

13. തന്നിരിക്കുന്ന സംഖ്യകളെ ആരോഹണക്രമത്തിൽ ക്രമീകരിച്ചെഴുതാമോ?

13-1, 4 85, 3+3, 14-9, 582

A B C D E



എ) ബി) സി) ഡി) ഇ)

വലിപ്പക്രമത്തിൽ നക്ഷത്രങ്ങളെ ക്രമീകരിക്കുക

15. മലപ്പുറം, തിരുവനന്തപുരം, ഇടുക്കി, വയനാട്, കണ്ണൂർ, തൃശ്ശൂർ, പാലക്കാട്, ഈ ജില്ലകളെ വടക്ക് നിന്ന് തെക്കോട്ട് എന്ന ക്രമത്തിൽ ക്രമീകരിക്കുക.

16. എ) LOOHCS : SCHOOL

NOITACUDE : -----

ബി) TEACHER : STUDENT

DOCTOR :-----

സി) നാടകം : സംവിധായകൻ

മാഗസിൻ :-----

17. 5, 3, 6, 2, 10 ഈ സംഖ്യകളിൽ ഏതെങ്കിലും രണ്ട് സംഖ്യകളുടെ ഉപയോഗിച്ച് '8' എന്ന ഉത്തരം എത്ര രീതിയിൽ കണ്ടെത്താൻ സാധിക്കും?

18. ഒറ്റയാനെ കണ്ടെത്തുക

എ) 2, 4, 6, 8, 9

ബി) സൂര്യൻ, ഭൂമി, ചൊവ്വ, ബുധൻ, വ്യാഴം

സി) ജിറാഫ്, സിംഹം, മുതല, കരടി, ആന

ഡി) സൂര്യകാന്തി, ചെമ്പരത്തി, താമര, റോസ്, മുല്ല

ഇ) കേരളം, തമിഴ്നാട്, ഗുജറാത്ത്, ബിഹാർ, കോഴിക്കോട്

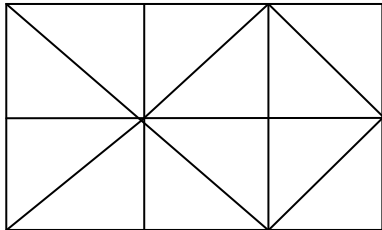
19. കൂട്ടത്തിൽ പെടാത്തത് തിരഞ്ഞെടുത്ത് എഴുതുക

എ) ആപ്പിൾ, ഓറഞ്ച്, പഴം, കാരറ്റ്

ബി) PAST, BEST, LAST, FAST

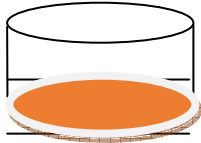
സി) BOAT = TO ROAD=DO, LOAF = OF, REAM = ME

20.

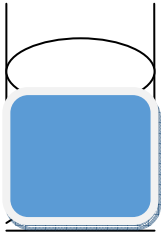


മുകളിൽകൊടുത്തിരിക്കുന്ന ചിത്രത്തിൽ എത്ര സമചതുരങ്ങൾ കാണാം

21. വിനു ഒരു യാത്രക്കിടയിൽ ഒരേ അളവിലുള്ള രണ്ട് ലായനികൾ വാങ്ങിച്ചു. വീട്ടിലെത്തി രണ്ട് പാനീയങ്ങളും ചിത്രത്തിൽ കാണിച്ചതുപോലെ രണ്ട് പാത്രങ്ങളിലേക്ക് ഒഴിച്ചു. ഒരേ തരത്തിലുള്ള പാത്രം കിട്ടിയില്ല. പാത്രങ്ങളിലേക്ക് മാറ്റിയപ്പോൾ വിനുവിനു സംശയം ഏത് പാത്രത്തിലെ പാനീയം ആയിരിക്കും കൂടുതൽ ഉറപ്പാക്കുക.



A



B

- എ) 'A' യിൽ കൂടുതൽ
- ബി) 'B' യിൽ കൂടുതൽ
- സി) രണ്ടിലും തുല്യം

22. വിട്ടുപോയകളെങ്കിലും പൂരിപ്പിക്കുക

സൂചന: കള്ളികളിലെ അക്കങ്ങൾ തമ്മിൽ കുത്തനെ കൂട്ടിയാലും വിലങ്ങനെ കൂട്ടിയാലും ഒരേ സംഖ്യ തന്നെ കിട്ടണം.

15	8	
	12	
		9

23. തന്നിരിക്കുന്ന മാന്ത്രികചതുരം പൂരിപ്പിക്കുക

	29	6	13	20
28			19	
9	11	18	25	27
15	17	24	26	
16		30	7	14

24. പരിചയമുള്ള ചില വാക്കുകൾ തന്നിരിക്കുന്നു. പക്ഷേ അവയുടെ അക്ഷരങ്ങളെല്ലാംതെറ്റിയാണ് കിടക്കുന്നത്. നിങ്ങൾക്ക് അത് ശരിയാക്കുവാൻ സാധിക്കുമോ? അതിനുള്ള സൂചന ബ്രാക്കറ്റിൽ നൽകിയിട്ടുണ്ട്.

- എ) GONAM (ഒരുതരത്തിലുള്ള പഴം)
- ബി) YAAALLMM (ഇന്ത്യയിലെഒരുസംസ്ഥാനത്തിന്റെ ഭാഷ)
- സി) ASPNI (ലോകത്തിലെഒരുരാജ്യം)
- ഡി) ICKOH (കേരളത്തിലെഒരുസ്ഥലം)
- ഇ) UNDDEHR (ഒരുസംഖ്യ)

25. താഴെകൊടുത്തിരിക്കുന്ന ചോദ്യങ്ങളിൽ 5 എണ്ണത്തിൽഒരേണ്ണം വ്യത്യസ്തനാണ് വ്യത്യസ്തയുള്ളത് കണ്ടെത്തി എഴുതുക.

- എ) ക്രിക്കറ്റ് ഹോക്കി ഫുട്ബോൾ ടെന്നീസ് ഓട്ടം
- ബി) അമ്മ അച്ഛൻ അനിയൻ അനിയത്തി സ്ത്രീ
- സി) നോവൽ, നാടകം കവിത കഥ പുസ്തകം

Numerical series

- 26. എ) 2, 4, 6, 8 -----
- ബി) 2, 4, 7, 11 -----

27. Letter series

- A) CBA, WVU, IHG, TSR -----
- B) 10J, 13M, 17Q, 20T -----

28. താഴെ കൊടുത്തിരിക്കുന്ന ചിത്രത്തിന്റെ സൂചന അനുസരിച്ച് വിട്ടുപോയ കള്ളി പൂരിപ്പിക്കുക.

		3				6				6	
2	9	4		6	16	3		1	?	2	
എ)	3		ബി)	4		സി)	1		ഡി)	12	

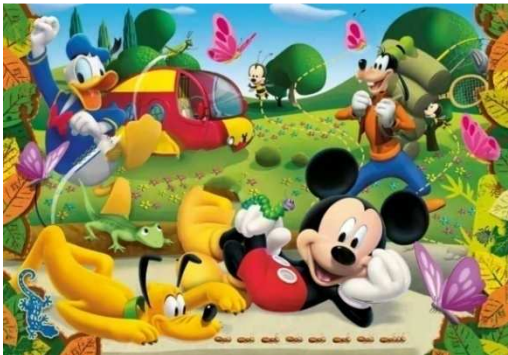
29. താഴെ കൊടുത്തിരിക്കുന്ന ചോദ്യങ്ങളിൽ അക്ഷരങ്ങൾ ഒരു പ്രത്യേകരീതിയിലാണ് ക്രിമീകരിച്ചിട്ടുള്ളത്. ഓരോ ചോദ്യത്തിലും ഓരോ അക്ഷരം വിട്ടുപോയിരിക്കുന്നു. വിട്ടുപോയ സ്ഥാനത്ത് അക്ഷരം എഴുതുക.

- എ) ക, ഗ, ഒ, ചര, ----
- ബി) ക, ച, ട, ത, ----
- സി) ക, ഒ, ച, ണ, ----
- ഡി) ച, ചാ, മി, മീ, തു, ----
- ഇ) ക, മ, വ, ഭ, ----

30. തന്നിരിക്കുന്നവയിൽ നിന്ന് അടുത്ത അക്കം കെ ത്തി എഴുതുക

- എ) 45, 34, 25, 18, 13, ----
- ബി) 2, 6, 12, 20, 30, ----
- സി) 2, 5, 10, 17, 26, ----

31. തന്നിരിക്കുന്ന ചിത്രങ്ങളിലെ ഏതെങ്കിലും മൂന്ന് പ്രധാന വ്യത്യാസം ക ളുപിടിക്കുക



32. അടുത്ത ചിത്രം എന്തായിരിക്കും

a)

b)

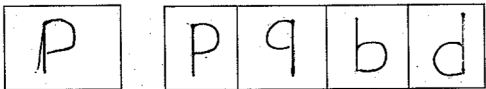
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		•	•

			•
			•

33. താഴെ കൊടുത്തിരിക്കുന്ന ചിത്രങ്ങളുടെ കണ്ണാടിയിൽ കാണുന്ന ചിത്രം എന്തായിരിക്കും.



34. ആദ്യത്തെ മൂന്ന് കള്ളികളിലെ ചിത്രങ്ങൾ പരിശോധിച്ച് തന്നിരിക്കുന്ന കള്ളികളിൽ നിന്ന് അനുയോജ്യമായവ കെ ണ്തി 4-ാമത്തെ കള്ളി പൂരിപ്പിക്കുക

a)

			?
--	--	--	---

--	--	--	--

b)

			?
--	--	--	---

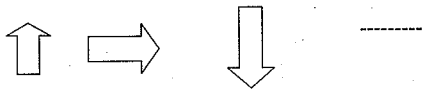
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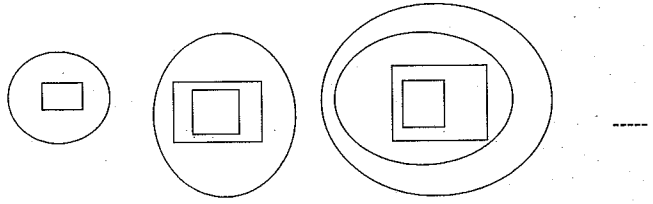
c)

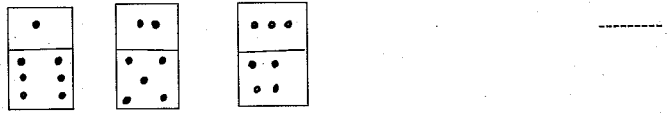
			?
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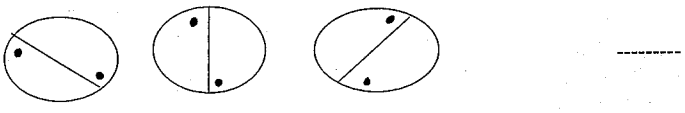
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35. ചിത്രങ്ങളുടെ ബന്ധം നോക്കി ബാക്കിയുള്ളവ പൂരിപ്പിക്കുക

a) - 

b) 

c) 

d) 

e) 

36. ശരിയായ ബന്ധം നോക്കിവിട്ടുപോയ ഭാഗം പൂരിപ്പിക്കുക

- a. 729, 243, -----, -----, 3, 1
- b. 5, 10, 7, 12, 9, 14 -----, -----
- c. 1, 4, 7, -----, 13, -----

APPENDIX III

FAROOK TRAINING COLLEGE

Concrete Operational Ability Test

Mr.Anees Mohammed. C
Assistant Prof, Farook Training college

Nijila Mohanan E.P
MEd Student

SCORING KEY

1. A
2. B
3. C
4. A
5. B
6. D
7. B
8. A
- 9.
- A. B
- B. C
10. D
- 11.
- A. B
- B. C
- C. D
- D. C
- E. B

12.

JANUARY	26
AUGUST	15
OCTOBER	2
NOVEMBER	14
DECEMBER	25

13. D, C, E, A, B.

14. B, A, E, C, D.

15. E, D, A, F, G, C, B.

16.

A. EDUCATION

B. PATIENT

C. EDITOR

17. 3

18.

A. 9

B. SUN

C. CROCODILE

D. LOTUS

E. KOZHIKODE

19.

A. CARROT

B. BEST

C. LOAF=OF

20. 9

21. C

22.

15	8	13
10	12	14
11	16	9

23.

22	29	6	13	20
28	10	12	19	21
9	11	18	25	27
15	17	24	26	8
16	23	30	7	14

24.

- A. MANGO
- B. MALAYALAM
- C. SPAIN
- D. KOCHI
- E. HUNDRED

25.

- A. RACING
- B. FEMALE
- C. BOOK

26.

- A. 10
- B. 16

27.

- A. ONM
- B. 24X

28. C

29.

- A. ര
- B. പ
- C. ട
- D. ു

E. ∞

30.

A. 10

B. 42

C. 37

31.

a. BUTTERFLY

b. GRASSHOPPER

c. FROG

32.

A.



B.

			•
			•

33. B

34.

A. B

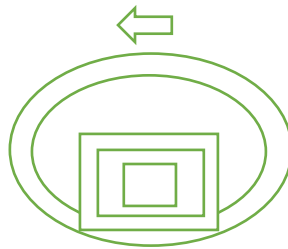
B. B

C. A

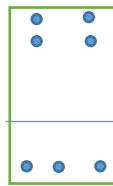
D. A

35.

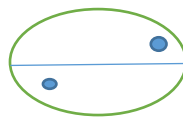
A.



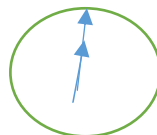
B.



C.



D.



36.

A. 27, 9

B. 11, 16

C. 10, 16

APPENDIX IV

FAROOK TRAINING COLLEGE

Concrete Operational Ability Test

Mr.Anees Mohammed. C
Assistant Prof, Farook Training college

Nijila Mohanan E.P
MEd Student

SCORING KEY

1 A

2 B

3 C

4 A

5 B

6 D

7 B

8 A

9

10 B

11 C

12 D

13

14 B

15 C

16 D

17 C

18 B

19.

ജനുവരി	26
ആഗസ്റ്റ്	15
ഒക്ടോബർ	2
നവംബർ	14
ഡിസംബർ	25

20. D, C, E, A, B.

2.1 B, A, E, C, D.

22. E, D, A, F, G, C, B.

23.

D. വിദ്യാഭ്യാസം

E. രോഗി

F. എഡിറ്റർ

24. 3

25.

F. 9

G. സൂര്യൻ

H. മുതല

I. താമര

J. കോഴിക്കോട്

26. MM

D. കാരറ്റ്

E. BEST

F. LOAF=OF

27. 9

28. C

29.

15	8	13
10	12	14
11	16	9

22	29	6	13	20
28	10	12	19	21
9	11	18	25	27
15	17	24	26	8
16	23	30	7	14

30

F. MANGO

G. MALAYALAM

H. SPAIN

I. KOCHI

J. HUNDRED

31.

D. ഓട്ടം

E. സ്ത്രീ

F. പുസ്തകം

32.

C. 10

D. 16

33.

C. ONM

D. 24X

34. C

35.

F. ഡ

G. പ

H. ട

I. തൂ

J. ഗ

36.

D. 10

E. 42

F. 37

37.

a. ചിത്രശലഭം

b. പുൽച്ചാടി

c. തവള

38.

C.



D.

			•
			•

39. B

40.

E. B

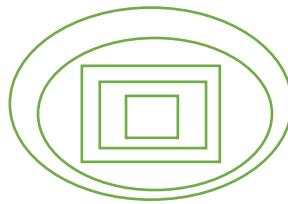
F. B

G. A

H. A

41.

E.

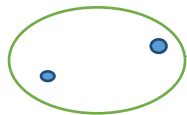


F.

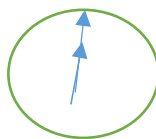
G.



H.



I.



42.

D. 27, 9

E. 11, 16

F. 10, 16