METACOGNITION, SELF -EFFICACY AND TEACHING COMPETENCY OF HIGH SCHOOL MATHEMATICS TEACHERS IN SOUTHERN DISTRICTS OF TAMIL NADU

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R.S. PADMA REKHA

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Under the Guidance of

DR. B.C.SOBHA

Principal

N.V.K.S.D. College of Education , Attoor, Kanyakumari Dt. – 629 191

Through

N.V.K.S.D. College of Education (Autonomous), Attoor, KanyakumariDisrict. – 629 191

CENTRE FOR RESEARCH AND DEVELOPMENT

(Re-Accredited by NAAC with 'A' Grade)

April 2019

R.S. PADMA REKHA
Research Scholar,
Centre for Research and Development
N.V.K.S.D.College of Education,
Attoor, Kanniyakumari District.

DECLARATION

I declare that the thesis entitled **"METACOGNITION, SELF-EFFICACY AND TEACHING COMPETENCY OF HIGH SCHOOL MATHEMATICS TEACHERS IN THE SOUTHERN DISTRICTS OF TAMIL NADU"** submitted by me for the degree of Doctor of Philosophy (Ph.D) is the record of original work carried out by me during the period from 28-04-2014 TO 28-04-2019 under the guidance and supervision of Dr. B.C.SOBHA, Principal, N.V.K.S.D College of Education, Attoor and has not formed the basis for the award of any Degree, Diploma, Associateship, Fellowship, Titles in this University or any other University or other similar Institution of Higher Learning.

Place : Attoor R.S. Padma Rekha

Date : Research Scholar

Dr. B.C.Sobha
Principal
N.V.K.S.D.College of Education,
Attoor, Kanniyakumari District.

CERTIFICATE

I certify that the thesis entitled "METACOGNITION, SELF-EFFICACY AND TEACHING COMPETENCY OF HIGH SCHOOL MATHEMATICS TEACHERS IN THE SOUTHERN DISTRICTS OF TAMIL NADU" submitted for the degree of Doctor of Philosophy (Ph.D) by Mrs. R.S. Padma Rekha is the record of original research work carried out by her during the period from 28-04-2014 TO 28-04-2019 under my guidance and supervision and that this work has not formed the basis for the award of any Degree, Diploma, Associateship, Fellowship, Titles in this University or any other University or other similar Institution of Higher Learning.

Place : Attoor
Date :

Dr. B.C. Sobha
Research Supervisor

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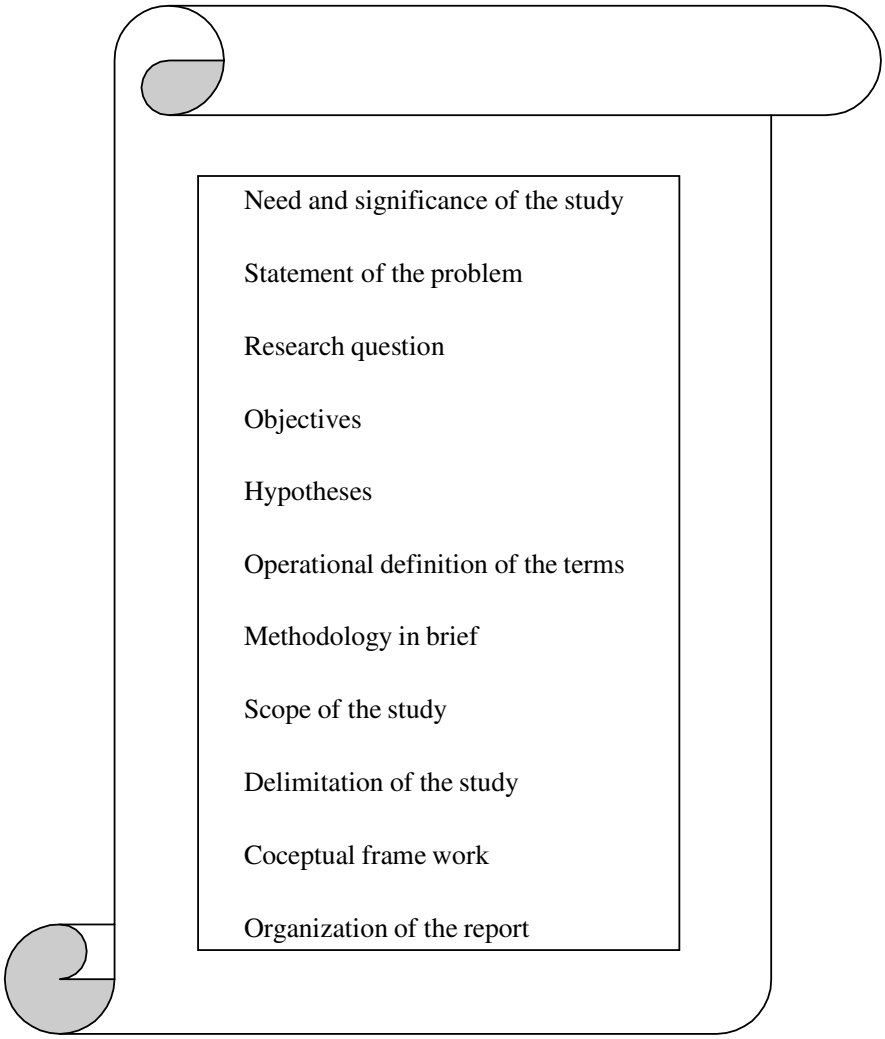
INTRODUCTION



Education is an essential tool for the bright future for all of us. It is the process of acquisition of knowledge, skills, values, beliefs, and habits. We can achieve anything good in life using the tool of education. Hence school education plays a vital role in everyone's life. The whole of education has been divided into three divisions such as the primary education, secondary education and higher secondary education. All these divisions of education have their own significance and benefits. Primary education prepares the base which helps throughout the life, secondary education prepares the path for further study and higher secondary education prepares the ultimate path of the future and whole life. Our education decides what type of person we would in the future. According to John Dewey (2016) "Education is not preparation for life; education is life itself."

Education is must for both men and women equally as both together make a healthy and educated society. It is an essential tool for getting bright future and plays a most important role in the development and progress of the country. Highly educated people become the base of the developed country. So, proper education makes the bright future of both, the individual and the country. It is only educated leaders who build the nation and lead it to the height of success and progress. Education makes people as perfect and noble as possible. In the words of Kant "Education is the development in the individual of all the perfection of which he is capable".

Education is an activity or a process, which transforms the behavior of a person from ‘instinctive behaviour’ to ‘human behaviour’. An individual needs training to use his own reason so that thereby he may learn to live orderly life or a moral life. It is the prime concern of education to direct the undeveloped capacities, attitudes, interests, urges and the needs of the young people into the most desirable channels. Education as direction envisages to impact of two things – persons and things. Main purpose of education is to educate individuals within society, to prepare and qualify them for work in economy as well as to integrate people into society and teach those values and morals of society. One of the essential tasks of education is to enable people to understand themselves. The importance of education for the development of a country must not be underestimated because education is the tool which alone can inculcate national and cultural values and liberate people of false prejudice, and ignorance. Education provides them required knowledge, technique, skill and information and enables them to know their rights and duties towards their family, their society and towards their motherland at large. The quality of education depends upon the competence, dedication and quality of teachers.

Today, in the world of education, a teacher's role is quite multifaceted. Their job is to counsel students, help them learn how to use their knowledge and integrate it into their lives so that they will be a valuable member to society. Teachers are also dispellers of darkness and enlighteners of minds. They bear the weight and responsibility of teaching, apart from parents, is the main source of knowledge and values for children. As Henry Brook Adams (n.d.) says, “Teachers affect eternity; they can never tell where their influence stops.” So teaching is the single most important profession in the world. A competent and committed teacher with required intelligence is in demand for today’s revolutionary era.

The most common role a teacher plays in the classroom is to teach knowledge to children. An effective teacher understands that teaching involves wearing multiple hats to ensure that the school day runs smoothly and all students receive a quality education. Instead of just lecturing in the classroom, teachers are facilitators of learning, providing students with the information and tools they need to master a subject. At times, teachers act like tutors, working with small groups of students or individual students within the classroom or after class. Teachers also play the role of evaluators, constantly assessing students' abilities through formal and informal assessments, providing suggestions for improvement and assigning grades. The advances in understanding the basis for metacognition may encourage the development of new perspectives that may help them to motivate the students to learn about their own learning processes. Also teachers with high efficacy will normally contribute more to the learning success of students. Hence, there is an urgent need to steer our efforts to improve the metacognition and self-efficacy to enhance teaching competencies at all levels.

A mathematics teacher is someone who inspires their students to look beyond the pages of the textbook to become problem solvers and critical thinkers. Every day his/her boundless passion and dedication has impact on each and every one of his/her students. Typically working with students from sixth standard to high school, mathematics teachers are responsible for preparing lectures, assigning homework and grading tests. As a mathematics teacher, the researcher can ensure that the students will have the knowledge and skills that will help them not only to succeed in the classroom, but also be empowered by mathematics to become productive citizens of our democratic society.

Need and significance of the study

Learning is a lifelong process. Teaching has the power to create a healthy, just, and peaceful world. Every individual is required to learn for attaining a better life. Teachers pass on knowledge and values to children, prepare them for further education and are main contributors to good education. They are one of the main pillars of a sound and progressive society. The education commission (1964-66) in India has emphasized the importance and role of teacher in the following words: "Of all the different factors which influence the quality of education and its contribution to national development; the quality, competency and character of teacher are undoubtedly the most significant". Thus the teacher's role in the educational system is recognized everywhere and at all levels. A competent teacher is one who is able to employ all possible methods to stimulate the thought of the learner.

Today, one of the main goals of education is to make the learners gain the thinking skills and strategies which they will use throughout their lives, rather than storing information. A good education should be able to show the students how to learn, how to remember, how to motivate themselves and how to control their own learning. For all these reasons, metacognitive skills are quite important for a mathematics teacher.

Metacognition refers to a level of thinking that involves active control over the process of thinking that is used in learning situations. Metacognition strategies are the sequential process individuals use to learn how to control themselves and to reach a goal. They significantly help the arrangements and control of the individual learning. Chowdhury and Chowdhury (2015) demonstrated that there is a significant positive relationship between teaching competencies and metacognition awareness. He also found that there is significant difference between male and female secondary teacher

educator in their teaching competency as well as in their metacognition awareness. Arul Sekar and Annaraja (2013) concluded that there exists significant relationship between metacognition and teaching competency of mathematics teacher trainees. Teachers' metacognition about their own practice lead to upper elementary grade students' metacognitive learning, scaffold students 'deeper understandings was the finding by Curwen, Miller, White-Smith& Calfee (2010).

The success of the teaching activities and practices depends to a great extent on teachers' self perception and confidence in their professional capacity to face up to the changes involved in learning-centred models. This self perception, called self-efficacy, plays a major role in how teachers select assignments and activities, shaping their efforts and perseverance when addressing certain challenges, and even in their emotional response to difficult situations. Self-efficacy ultimately accounts for a cognitive construct that mediates between knowledge and action. Along with other variables, this determines the success of the actions themselves (Prieto, 2003).

Teachers with a high sense of efficacy about their teaching capabilities may feel it easy to motivate their students and enhance their cognitive development. These teachers may also have a facile from setbacks and be more willing to experiment with new ideas or techniques. Low efficacious teachers may rely more on a controlled teaching style and may be more capable of observing and judging of students. Moreover self-efficacy belief has been shown to be important to motivation because confidence that one will be able to solve a problem is a precursor to investing the time and effort needed to tackle it. Klassen and Virginia (2014) concluded that self-efficacy was strongly associated with observed teaching performance.

The present age is also known for skill-development and innovations. The more mathematical we are in our approach, the more successful we will be. “Mathematics proficiency is the gateway to a number of incredible carriers that students may never have considered” Danica Mc Kellar (2010). Mathematics offers rationality to our thoughts. It is a tool in our hands to make our life simpler and easier. So the need for mathematics teachers is quite real. Mathematics teachers guide students through understanding of mathematical concepts from fundamental knowledge to complex problems. According to National council of mathematics education (2016), “A math teacher is someone who inspires their students to look beyond the pages of the textbook to become problem solvers and critical thinkers. Every day his/her boundless passion and dedication impacts each and every one of their students”. Ngan Hoe (2015) hope that teachers will become more conscious of the role that metacognition plays, and to better address it in the Mathematics classroom.

Tamil Nadu is geographically the 11th largest state in India with an area of 130,058 square kilometers accounting for 4% of the national area. Also it is one of the most literate states in India. Gupta (2013) reported for an education administration, there are 385 community development blocks, 64 Educational Districts. Some districts in Tamil Nadu have a higher literacy rate such as Kanniyakumari (91.75%), Chennai (90.18%), Thoothukudi (86.16%), According to 2011 Census; Literacy rate in Tamil Nadu has been upward trend and is 80.09 percent as per 2011 population census. Tirunelveli is known for its educational centres. Palayamkottai is called as the oxford of South India.

In today’s competency testing, the southern districts of Tamil Nadu are seeking to improve the quality of education for their students. In this effort, the

selection and retention of teachers who will be best suited for the instructional needs in a given district are of primary importance. The literature, our own beliefs and experience indicate there is a need for efficient teachers to promote good teaching and satisfy the students, parents and administrators.

The investigator being a teacher of Mathematics has made an attempt to study the teaching competency in relation to metacognition and self-efficacy expecting that the result of the study would have its far reaching implications on both teachers and students at high school level. Also the review of related literature revealed that there are only a minimum number of studies available with respect to the metacognition of teachers, which made the investigator to select metacognition as one of the variable.

Statement of the problem

Over the past few years the education community in Tamil Nadu often discusses the issues concerning the quality and challenges which are threatening the student community. The school age children and youth feel lack of self- confidence and self-consciousness. Personal identity as self sensation begins to form in early childhood. In this process the important role are played by parents and other family members followed by the school. So teachers play the important role in the formation of self identity and self-consciousness in children. It is expected that schools provide not only knowledge and skills necessary for life, but also develop in the students the ability to face the challenges.

The teachers in modern school play not only the role of traditional teacher by giving new knowledge to students, but also act as a consultant, an advisor, elder friend, a researcher and so on. It is difficult to list all roles played by teacher in modern society. But teachers' knowledge, skills, personal qualities and values affect the emergence of their self-confidence.

Teachers and education are of crucial importance in preparing young people and society for the future. Investing in education and building a strong cadre of teaching professionals make good sense. Denying teachers the essential means to foster learning in the classroom is a crime against our children's future. In order to face the challenges of the society, teachers are being required to take on new roles and must have the knowledge, confidence and resources need to fulfill legitimate expectations of the community. Teachers must also learn throughout life and develop new skills if they are to be effective in teaching others to learn to know, to do, to be and to live together.

We live in a knowledge-based society, one in which the new information technologies are destined to change the ways in which we access and process information and communicate, and thus the ways in which we learn to know and to do. Teachers have a crucial role to play in not only in the execution of any educational reform designed to help societies prepare for the future, they must be intimately involved in the conception and design of reforms from the outset.

According to Voskoglou (2009), the role of the Mathematics teacher in the modern society can be compared more to the role of a conductor than to a composer, or perhaps better to the role of a director than to a writer of a play. The property of being a competent mathematics teacher is a talent, which has to be cultivated through the proper professional training. Under the demands of the modern society the teaching experience alone is not enough to mark out this talent, as it frequently happened in older times.

Cognition is the mental activity associated with thought, decision making, language and other higher mental process. Metacognition refers to any knowledge or cognitive process that monitors or controls cognition. Metacognition also plays an

important role in communication, reading comprehension, language acquisition, social cognition, attention, self-control, memory, self-instruction, writing, problem solving, and personality development. Teachers who demonstrate a wide range of metacognitive skills perform better in their teaching and complete work more efficiently.

Self-efficacy on the other hand, is a powerful predictor of how and whether a teacher will act. Teacher self-efficacy is the belief that one is capable of exercising personal control over one's behaviour, thinking, and emotions. Effective teachers believe that they can make a difference in children's lives, and they teach in ways that demonstrate this belief. What teachers' believe about their capability is a strong predictor of teacher effectiveness. Teachers with high efficacy will normally contribute more to the learning success of students. Self- efficacy is one of the important factors for teaching mathematics effectively. The study conducted by Unlu and Ertekin (2013) revealed that there is a positive relationship between mathematics teaching efficacy and mathematics self-efficacy. Researchers have shown the need for teacher self-efficacy and how that self-efficacy affects their classroom teaching.

Teacher competencies are outcome- based method for assessing teacher performance. They define key characteristics of successful teachers without prescribing any specific curriculum or instructional practices. Teaching competency refers to “the right way of conveying units of knowledge, application and skills to students.” The right way here includes knowledge of content, processes, methods and means of conveying content. Competent teachers would also create classroom conditions and climate which are conducive for student learning. Teachers having good metacognitive teaching competency can help their students to develop metacognitive ability in them.

Therefore the present study has been entitled as "Metacognition, Self-efficacy and Teaching Competency of High School Mathematics Teachers in the Southern Districts of Tamil Nadu".

Research question

We are now in the threshold of a knowledge age. The nations which will rise and prosper will depend on the quality of education provided. So teachers play the pivotal role.

Aim of the research is to find out

1. Whether there is metacognition among the mathematics teachers?
2. What are the perceived levels of self-efficacy for interactive engagement, classroom management, and instructional strategies among high-school Mathematics teachers?
3. Whether the high school mathematics teachers have competency in performance, attitude and context?

Objectives

1. To find out the level of Metacognition, Self efficacy and Teaching Competency of High school Mathematics teachers in the Southern Districts of Tamil Nadu.
2. To find out whether there is any significant difference in Metacognition, Self-efficacy and Teaching competency of High school Mathematics teachers in the Southern Districts of Tamil Nadu based on variables: sex, locality, marital status, educational qualification, district, type of management, nature of school, income and years of experience.

3. To find out the relationship between i) Metacognition and Teaching competency iii) Self-efficacy and Teaching competency of High school Mathematics teachers in the Southern Districts of Tamil Nadu with respect to dimensions.

4. To find out the relationship between i) Metacognition and Teaching competency iii) Self-efficacy and Teaching competency of High school Mathematics teachers in the Southern Districts of Tamil Nadu with respect to the background variables

5. To find out the significant influence of Metacognition and Self-efficacy on Teaching competency of high school Mathematics teachers.

6. To find out the significant factors with positive loadings of the variables namely Metacognition, Self-efficacy and Teaching competency of high school Mathematics teachers.

Hypotheses:

1) There exists significant difference among the high school mathematics teachers in southern districts of Tamil Nadu in their i) Metacognition ii) Self-efficacy iii)Teaching competency with respect to the back ground variables sex, locality, marital status, educational qualification, district, type of management, nature of school, income and years of experience.

2) There exists significant relationship between i) Self-efficacy and Teaching competency iii) Metacognition and Teaching competency of High school Mathematics teachers with respect to dimensions.

3) There exists significant relationship between i) Self-efficacy and Teaching competency iii) Metacognition and Teaching competency of High school Mathematics teachers with respect to the background variables.

4) There exists significant influence of metacognition and self-efficacy on teaching competency of high school Mathematics teachers.

5) There exists significant factors with positive loadings of the variables namely metacognition, self-efficacy and teaching competency of high school Mathematics teachers.

Operational definition of the terms

Metacognition

Metacognition is a deeper level of thinking that includes individual's ability to think about their thinking; how they understand, adapt, change, control and use their thought processes.

Self-efficacy

It is individual's belief about their capabilities to produce designated levels of performance that exercise influence over events that affect their lives.

Teaching Competency

Teaching competency is the ability to perform or carry out defined tasks in a teaching profession at a high level of excellence.

High school Mathematics Teachers

High school Mathematics Teachers refers to the teachers teaching in classes VI to X standards in government, aided and self financing schools following Tamil Nadu state syllabus.

Southern Districts

Southern districts are the districts which are in the southern part of Tamil Nadu namely Kanniyakumari, Tirunelveli and Thoothukudi.

Methodology in brief

Method

The present investigation was undertaken to study the metacognition, self-efficacy and teaching competency of high school Mathematics teachers in the southern districts of Tamil Nadu. For getting a wide representative data normative survey method was adopted. Study of relevant literature was done.

Variables of the study

In this study the investigator tries to explore the important issues relating to Metacognition, Self-efficacy and Teaching Competency of high school Mathematics teachers in southern districts of Tamil Nadu. This study also attempts to analyses the influence and relationships with the variables. Demographic variables included are sex, locality, marital status, educational qualification, district, type of management, nature of school, income and years of experience.

Tools used

The following tools were used for collecting data.

i) Questionnaire on Metacognition - developed by Usha Parvathi and Rasul Mohaideen (2011), and revalidated by the investigator.

ii) Self-efficacy scale – Constructed and validated by Padma Rekha and Sobha (2015)

iii) Teaching Competency scale - Constructed and validated by Padma Rekha and Sobha (2015)

Population

The population of the study consisted of high school Mathematics teachers in Tamil Nadu.

Sample

The sample for the study consisted of high school Mathematics teachers selected from schools of three districts viz, Kanniyakumari, Tirunelveli and Thoothukudi. The sample size was 303. Simple random sampling technique was adopted to select the sample.

Statistical Techniques

The analysis of data was done using Percentage analysis, *t* test, ANOVA followed by Scheffe's procedure, Correlation, Step-wise Regression analysis and Factor analysis

Scope of the study

Respectable research studies may be the simple descriptive fact – finding variety that lead to useful generalizations. This study is intended to know the teaching competency of mathematics teachers in Tamil Nadu and their influence in the society. Also it tries to find the influence of metacognition and self-efficacy on teaching competency. Moreover the investigator believes that the results of this study will pave way for the overall development of mathematics teachers.

Delimitation of the study

- The study is delimited to only three districts namely Kanniya kumari, Tirunelveli and Thoothukudi..
- The sample is delimited to high school mathematics teachers who are teaching in Tamil Nadu state board syllabus only.
- The current research has utilized self rating scale to measure the teaching competency of high school teachers.

Conceptual frame work

Metacognition

Cognition is the mental processing of information. It is a function of human mind that allows perceptions to grow into conceptions. Metacognition is defined in simplest terms as “thinking about your own thinking." The root “meta" means “beyond," so the term literally refers to “beyond thinking." Specifically, it means to encompass the processes of planning, tracking, and assessing your own understanding or performance. American developmental psychologist John H. Flavell originally coined the word “metacognition in the late 1970’s. It refers to “thinking about thinking”. Metacognition is the knowledge and awareness of one’s own cognitive processes (Flavell 1976). It is the ability to control one’s thinking processes through various strategies, such as organizing, monitoring, and adapting. According to Ahmed (cited by Dixit, 2010) metacognition is the internal awareness of cognitive abilities, including self-awareness of both learning and retrieved strategies. He also added metacognitive strategies assist one to become more efficient and powerful in his/her learning because they help to find information, evaluate thee need of additional resources and understand when to apply different approaches to solve instructional problems.

Metacognition plays an important role in the field of education. It is closely related to teaching styles adopted by the teacher. “Metacognitive skills include taking conscious control of learning, planning and selecting strategies, monitoring the progress of learning, correcting errors, analyzing the effectiveness of learning strategies and changing learning behaviours and strategies when necessary” (Ridley, Schutz, Glanz and Weinstein, 1992). Teacher can use a variety of these strategies to enhance metacognition independent of the grade level and subject areas. According to

National council for special education (2013), good teachers are highly metacognitive – they reflect on their expertise and teaching and refine their pedagogy accordingly. Metacognitive thinking will, therefore, also support the observation, planning, monitoring and evaluation that are involved in the school self-evaluation process.

Metacognition becomes essential when tasks are more challenging. This may occur at any stage in a contemplative situation from the beginning to the end (Naushad, 2008). Hence metacognition has been strongly linked with problem solving where problems are usually not of any standard type. All teachers and educators involved in the teaching of thinking need to have a belief system which affirms the positive possibilities for, and contributions from, all learners, including those from a wide range of cultural and socio-economic backgrounds.

Metacognition is not an easy concept to understand. Metacognitive and cognitive abilities are not naturally endowed but can and should be taught and learned. Based on his interaction with the teachers, Hoe (2015) found that a lot of Mathematics teachers have difficulty in articulating what is metacognition. Therefore there is a need for teacher training programmes which include activities through the development and support of metacognitive awareness and affective factors that will be helpful in terms of professional and personal development for Mathematics teacher trainees (Mulendema, Ndhlovu and Mulenga, 2016).

Components of Metacognition

According to psychology notes HQ (2013) Metacognition is classified as having three components – (1) Metacognitive knowledge, (2) Metacognitive regulation, and (3) Metacognitive experiences. Metacognitive knowledge refers to the awareness individuals possess about themselves and other people as cognitive

processors. Metacognitive regulation, on the other hand, has to do with people's control over cognition and learning experiences through a set of methods that help people regulate their learning while metacognitive experiences involve cognitive efforts that are currently taking place.

Literature focusing on how Mathematics teachers apply their metacognitive skills in the classroom. Teaching with metacognition referring to teachers thinking about their own thinking. thinking requires a language, in particular appropriate Mathematical language to communicate the thinking by both teacher and learners in the Mathematics classroom. The findings of Johanna Sandra (2014) suggests that teaching with metacognition is required for effective mathematics instruction.

Principles of Metacognition

.(i).Planning : Planning is the prerequisite of any activity (Dirkes 1985, as cited in Vrieling, Bastiaens, 2012). The success of any endeavor depends upon proper planning. Planning as far as any learning activity is concerned consists of the following aspects. The learners should have self-awareness on this aspects.. They are goal setting, time management, analyzing, strengths and weaknesses, analysis of previous learning, anticipation, self responsibility, self determination etc., (Borkoweski, 1983). Awareness on these aspects will be very helpful to take up the learning activity successfully.

(ii). Focusing attention: Focusing attention or selective listening is the next strategy for achievement. 'O' Malley and Chamot listed strategies which are the higher order executive skills that may entail planning, monitoringor evaluating the success of a learning activity.

(iii). Information management : In learning, the students have to adopt a number of metacognitive skills. They have to process the information for proper understanding. During processing of the information successful learners adopt number of techniques. They are translation, conceptualization, combination, assimilation and elaboration.

(iv).Memory: While learning, learners have to remember a number of facts, ideas, incidents, years, concepts, etc. New knowledge should be associated with previous knowledge to remember better (John Flavell, 1985). So the learner has to employ a number of techniques to remember the new information, retrieve previous knowledge, etc. Use of mnemonic strategies helps learners to retrieve the information they need. Successful learners deliberately employ certain mnemonic strategies to remember better.

(v).Monitoring: Self regulation or monitoring one's own learning plays an important role in metacognition (Hive, Newmann 1999,). Successful learners employ a number of techniques while learning to check their learning process. They are self questioning, self talk, self management of resources, strategies selection, self reporting, self appreciation etc. Metacognition involves the active monitoring and consequent regulation and orchestration of various processes such as meta memory and meta learning

1990).

(vi).Evaluation: After the learning process, learner should evaluate themselves to find out whether they have reached the learning outcomes. It is termed as self evaluation. Self Evaluation helps the learners to check whether the objectives of learning are achieved or not. Some of the techniques are self checking, error detection, self correction, de bugging, self review, self questioning, and self judgement (Wong 1986).

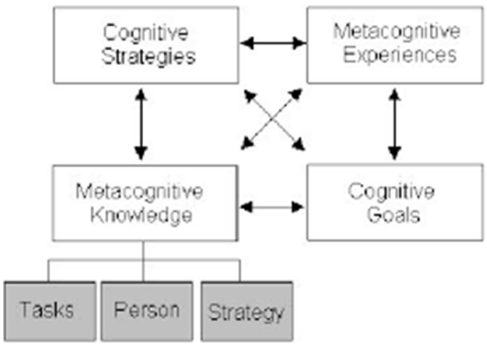
Models of Metacognition

A number of models have been proposed which are derived from different conceptualizations of metacognition. Among these Flavell's Model attempts to define the components of metacognition and the interactions among these components. Similarly, Brown's Model makes an important distinction of two different categories of metacognition: knowledge of cognition and regulation of cognition (Metacognition and Reflection, n.d.).

Flavell's model of cognitive monitorin :

According to Flavell (1979) the four components of metacognition are (a) metacognitive knowledge, (b) metacognitive experiences, (c) goals or tasks, (d) actions or strategies. A person's ability to control a wide variety of cognitive enterprises depends on the actions and interactions among these components. This model is important to define what metacognitive knowledge is and what are the main factors that most likely influence its content and development. The following figure shows the relations between them.

Fig: 1.1: Flavell's model of metacognition



Metacognitive knowledge is one's acquired world knowledge about cognitive processes, a personal perspective of one's own cognitive abilities as well as others.

A metacognitive experience is a cognitive or affective experience that accompanies a cognitive action. In other words, it is the conscious consideration of intellectual experiences that accompany any success or failures in learning or other cognitive enterprise

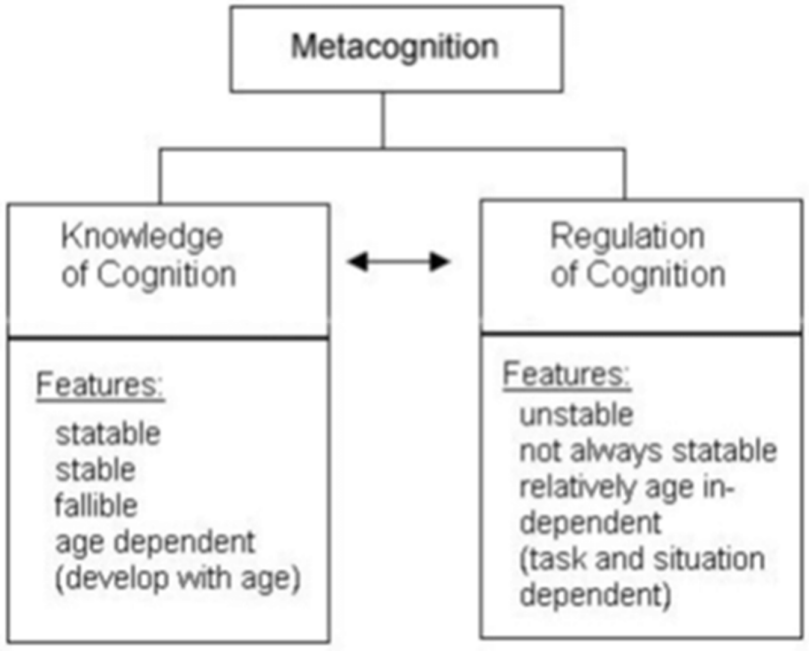
The goals or tasks refer to the actual objectives of a cognitive endeavour, which will trigger the use of metacognitive knowledge and lead to new metacognitive experiences.

Actions or strategies refer to the utilization of specific techniques that may assist in achieving those goals

Brown's model of metacognition:

Brown (1987) divides metacognition into two broad categories as knowledge of cognition and regulation of cognition . According to Brown, these two forms of metacognition are closely related, each feeding on the other recursively, although they can be readily distinguishable. Brown's model of metacognition is shown in the following figure.

Figure 1.2: Brown's model of metacognition



Knowledge about cognition refers to the stable, statable, often fallible, and often late developing information that human thinkers have about their own cognitive processes as it requires that learners step back and consider their own cognitive processes as object of thought and reflection; traditionally this has been referred to as knowing that (Brown, 1987).

Regulation of cognition consists of the activities used to regulate and oversee learning. These processes include planning activities prior to undertaking a problem; monitoring activities during learning; and checking outcomes.

Need of Metacognition for Teachers:

It is important for a teacher to foster the process of metacognitive skill development in students. This will help the students to become aware of the art of learning. Although cognitive work is usually invisible, there has to be an environment

created by the teachers to help students rely on their own intuitive thought processes and logical reasoning to understand the topics discussed.

Development of competence and professional skills are the major objectives of most of the teachers' educator programmes. The methodology adopted by the teacher in the classroom needs frequent change as the students' attitude and aptitude change year after year. The challenges posed by technological developments and the results of neuro psychological studies demand a comprehensive teaching methodology to get the designed output in the classroom. In the creation of metacognitive environment, teachers monitor and apply their knowledge deliberately modeling metacognitive behavior to assist students in becoming aware of their own thinking. Metacognitive strategies are already in teachers' repertoires. The teachers must become alert to these strategies, and consciously model them for students. Problem-solving and research activities in all subjects provide opportunities for developing metacognitive strategies. Teachers need to focus student attention on how tasks are accomplished. Process goals, in addition to content goals, must be established and evaluated with students so that they discover that understanding and transferring thinking processes improve learning. If the appropriate strategies are employed, teachers can make learners better users of their Metacognitive Skills.

The role of metacognition in mathematics sets new goals for teachers, since teachers' ability to cultivate learners with metacognition during learning is tied to teachers' own metacognition. If teachers are incapable of activating metacognitive skills, it will be difficult for them to instill these skills in their students. Teachers need to explicitly instruct their students to monitor and subsequently control their learning processes in order to become more self-directed in their mathematical

performance. Research indicates that metacognition is not attained spontaneously; it demands explicit scaffolding (Kramarski and Michalsky 2010). Zohar (1999) points out that the course which prepare teachers for instruction of higher order thinking should address extensively the issue of metacognition of thinking skills.

Metacognition refers to "thinking about thinking" and was introduced as a concept in by John Flavell, who is typically seen as a founding scholar of the field. Metacognition is the knowledge and awareness of one's own we have of our own cognitive processes Flavell (1976). It is the ability to control one's thinking processes through various strategies, such as organizing, monitoring, and adapting. Additionally, it is our ability to reflect upon the tasks or processes we undertake and to select and utilize the appropriate strategies necessary in our intercultural interactions. Metacognition is the ability to monitor, regulate and evaluate one's thinking (Brown 1987). It serves many diverse functions. He identified three major categories of metacognition as metamemory and metacomprehension, problem solving, and critical thinking Flavell (1979) defines metacognition as "knowledge and cognition about cognitive phenomena and monitoring of one's own memory, comprehension, and other cognitive processes."

Metacognition is the internal processes. It leads the cognitive strategies to monitor and control the memory and hence the learning processes occurs. Metacognition is, put simply, thinking about one's thinking. More precisely, it refers to the processes used to plan, monitor, and assess one's understanding and performance. Metacognition includes a critical awareness of a) one's thinking and learning and b) oneself as a thinker and learner. (Baker & Brown, 1984; Flavell, 1985),

Metacognition involves active control over the thinking processes involved in learning. Activities such as planning how to approach a given learning task, monitoring comprehension, and evaluating progress toward the completion of a task are metacognitive in nature. Because metacognition plays a critical role in successful learning it is important for both students and teachers. Metacognition has been linked with intelligence and it has been shown that those with greater metacognitive abilities tend to be more successful thinkers. 'Meta' means 'beyond'. In metacognition, the students are trained beyond cognition. So Damar, Ozdemir & Unal, (2015) suggested teachers metacognitive knowledge about instructional methods, students' pre-instructional knowledge, and the task of teaching needs to be improved

Literature focusing on how Mathematics teachers apply their metacognitive skills in the classroom. Teaching with metacognition referring to teachers thinking about their own thinking. thinking requires a language, in particular appropriate mathematical language to communicate the thinking by both teacher and learners in the Mathematics classroom. The findings of Sandra (2014) suggests that teaching with metacognition is required for effective mathematics instruction.

The findings of Alzahrani(2017) showed that in the initial stages of improve implementation, lessons were delivered ineffectively. Through practice this improved, as the seven steps of improve were better adhered to. The teacher's choice of activities was more appropriate for metacognitive teaching. This made students enthusiastic to solve problems, and after correction, they fully understood the problem.

Metacognition is the people's awareness of their own cognitive machinery. This metacognitive knowledge is used to regulate cognitive process such as reasoning,

comprehension, problem solving, learning etc. It can be divided into five primary components

1. Preparing and planning for learning

2. Selecting and using learning strategies

3. Monitoring strategy use

4. Orchestrating various strategies

5. Evaluating strategy use and learning

Teaching Strategies for helping students use Metacognition; Marilyn(2015)

- Recognize that strategies are a key aspect of solving problems.
- Model effective strategies for students.
- Give students many Opportunities to practice the strategies.
- Encourage students to monitor the effectiveness of their new strategy in comparison to the effectiveness of old strategies.
- Remember that it takes students considersable amount of time to learn how to use an effective strategy.
- Understand that students need to be motivated to use the strategies.
- Encourage children to use multiple strategies.
- Read more about strategy instruction.
- Give students practice recognizing what they don't understand.
- Provide opportunities to reflect on coursework

SELF-EFFICACY

Self-efficacy is the belief we have in our own abilities, specifically our ability to meet the challenges ahead of us and complete a task successfully (Akhtar, 2008). According to Maddux, Kleiman and gosselin (2017) self-efficacy theory was first described by Albert Bandura in 1977 in an article in the journal Psychological Review titled "Self-Efficacy: Toward a Unifying Theory of Behavioral Change". Bandura defined self-efficacy beliefs (or expectancies) as the beliefs regarding one's ability to perform the tasks that one views as necessary for attaining valued goals. Bandura (1997 as cited in Eberle, 2011) defined self-efficacy as a judgement of one's ability to organize and execute given types of performances. Furthermore, he suggests that the outcomes people anticipate depend largely upon their judgements of how well they will be able to perform in given situations.

Bandura (1994) defined self-efficacy as "people's beliefs about their capabilities to produce designated levels of performance that exercise influence over events that affect their lives",

According to Bandura, there are four main sources of self-efficacy beliefs:

1. Mastery experiences
2. Vicarious experiences
3. Verbal persuasion
4. Emotional and physiological states (Akhtar, 2008, Steven Watson, n.d.).

Figure 1.3: Sources of Self-efficacy

Mastery experiences refer to the experiences we gain when we take on a new challenge and succeed. The best way to learn a skill or improve our performance is practice, and part of the reason this works so well is because we are teaching ourselves that we are capable. Bandura (1994) quoted as the most effective way of developing a strong sense of efficacy is through mastery experiences.

The second influential way of crating and strengthening efficacy beliefs is through the vicarious experience. Vicarious experience is having a role model to observe and emulate. Usually when we have positive role models who display a healthy level of self-efficacy, we are likely to absorb some of those positive beliefs about the self. Vicarious experiences can come from a wide range of sources, including parents, grandparents, aunts and uncles, older siblings, teachers and administrative staff, coaches, mentors, and counselors.

The verbal persuasion factor describes the positive impact that our words can have on someone's self-efficacy; telling a child that she is capable and up to facing any challenge ahead of her can encourage and motivate her, as well as adding to her growing belief in her own ability to succeed. Cook (2017) suggests identifying the ways to improve employee self-efficacy in order to motivate them and improve their performance

Finally, emotional and physiological states refer to the importance of context and overall health and well-being in the development and maintenance of self-efficacy. It's difficult to have a healthy level of well-being when you are struggling with anxiety or depression, or battling a serious health condition—it's not impossible, of course, but it is certainly much easier to boost your self-efficacy when you're healthy and well! Paying attention to your own mental state and emotional well-being (or that of your child's) is a vital piece of the self-efficacy puzzle.

Self-efficacy and teachers

Better educational outcomes depend on the level of teacher self-efficacy. According to Gulistan, Hussain and Mushtaq (2017) high levels of teacher self-efficacy may inhibit the better level of Mathematics achievement in students. Teacher self-efficacy has been defined According to Bandura(2001) as "the extent to which a teacher is confident enough to his or her ability to promote students' learning".

Teachers' sense of efficacy can potentially influence both the kind of environment that they create as well as the various instructional practices introduced in the classroom (Bandura, 1997). Furthermore, teachers with a high sense of self-efficacy are confident that even the most difficult students can be reached if they exert extra effort; teachers with lower self-efficacy, on the other hand, feel a sense of helplessness when it comes to dealing with difficult and unmotivated students (Gibson & Dembo, 1984). The literature widely documents the pervasive influence of self-efficacy beliefs and corroborates social cognitive theory that places these beliefs at the roots of human agency (Bandura, 2001).

A teacher's self-efficacy beliefs improve his/her motivation which may have a significant contribution to school society. A teacher with a high level of self-efficacy

is successful in student engagement, instructional strategies and classroom management by letting students participate in the lesson, improving teaching practices and carrying out a good orchestration of the learning environment. self-confidence of mathematics teaching had an effect on the efficacy in teaching and of self-efficacy beliefs towards mathematics teaching (Peker 2016). Effective teachers can do wonders in classrooms. They believe that they can make a difference in student learning outcomes and they teach in a way that demonstrates that belief (Giffs, 2002). Teachers who have "a high sense of efficacy about their teaching capabilities can motivate their students and enhance their students' cognitive development" (Bandura, 1994). Teacher self-efficacy has three dimensions, which are efficacy for student engagement, efficacy for instructional strategies, and efficacy for classroom management (Tschannen-Moran and Hoy, 2001).

The findings of Gibbs (2003) states that teachers' personal sense of control, and their beliefs in their capability to exercise control of their thinking during teaching, impacts on how they think, feel and teach.

CHARACTERISTICS SELF-EFFICACY

People who have low self-efficacy have the following characteristics. Monika A Frank (n.d.)

1.Fear of risks.

Individuals with low self-efficacy see themselves as unable to be successful. As a result, they are often unwilling to take risks or try new things because they are convinced that the result will be failure. This is particularly unfortunate because the main way to increase self-efficacy is through practice and experience.

2) Fear of uncertainty.

Low self-efficacy often is related to self-doubt and uncertainty. The individual doesn't want to try without a guarantee of success. As a result, they may never discover things at which they could be successful.

3) Feelings of failure.

Those with low self-efficacy frequently have feelings of failure. As indicated above they might avoid or not try new things due to the risk involved. Or, they might only try something half-heartedly. As a result, they are less likely to experience success and more likely to see themselves as a failure.

4) Impression management.

Impression management is the attempt to control how others might perceive you in order to be seen more positively. People with low self-efficacy feel they are not capable but may try to present a successful and competent image to others. They may put a great deal of energy into behaving in a way to obtain approval from others and experience a great deal of worry about being found out to be a fraud. For instance, they may try to hide mistakes from others rather than learn from them which prevents them from increasing their sense of self-efficacy.

Characteristics of high self-efficacy

1) Self-confidence.

One of the most obvious characteristics of high self-efficacy is self-confidence. They approach tasks or situations with a sense of their ability to be successful. This self-confidence tends to lead to more experience which increases their ability which leads to greater self-confidence. This positive cycle lends itself to increasing self-efficacy even further.

2) Accurate self-evaluation.

Individuals with high self-efficacy tend to be able to accurately evaluate their performance. They are neither overly-critical nor overly positive but are able to examine themselves realistically in order to pursue self-improvement.

3) Willingness to take risks.

Those with high self-efficacy are willing to take risks because they understand that taking calculated risks increases the chances of success. As they are not fearful of failure or mistakes, reasonable risks can only increase self-efficacy.

4) Sense of accomplishment.

Generally those with high self-efficacy feel a sense of accomplishment because they are often more successful due to the willingness to take risk and to pursue interests. Even if they fail or make mistakes they feel a sense of accomplishment because they view mistakes as opportunities to improve themselves. (Monika A Frank , n.d.)

Teaching Competency

The role of the teacher is to equip students with skills. To develop the 21st century skills in students the faculty members are expected to possess the following competencies such as personal efficiency, communication, fostering conducive environment for learning, organizing the curriculum, continuous learning and effective learning experience (Selvi, 2017). According to the department of education the common teaching competencies are subject matter knowledge, communication skills, instructional practice, evaluation, problem solving, equity and professionalism.

Competency is a desired quality of job performance. It is the capacity to apply or use a set of related knowledge, skills, and abilities required to successfully perform "critical work functions" or tasks in a defined work setting. Accordingly teaching

competency may be defined as successful completion of a majority of the educational tasks identified for as many educational contexts as involved in the function of a teacher role. i.e., the right way of conveying units of knowledge, application and skills to the students. The right way includes knowledge of contents as well as the process, methods and means of conveying them in an interesting way, involving the activities of children. Teacher competencies facilitate physical, intellectual, social, and emotional development of the students. In short, a competent teacher makes the teaching-learning process a joyous experience for children and also for himself/herself.

Competency of experienced teachers is higher than inexperienced teachers Chauhan and Gupta (2014). Every teacher needs to review/update his/her potential in all possible novel/new/innovative strategies, to modify and improve his/her teaching competency Fathima, Sasikumar and Roja (2014).

The teacher competence includes a thorough knowledge of the content. It mainly includes the strategies, understanding of student psychology and the process of thinking. With regard to the former, plenty of resource material is available. But, the latter has been in continuous experimentation throughout the world. Cognitive Psychology contributes substantially in enhancing teaching competence. In recent times, researches have demanded the teaching competence to be redefined in order to meet the challenges To emphasis' this, teachers model skilful and, and make their own thinking explicit as part of their everyday practice. The impact of thinking on class room activities and other educational activities is more to enhancing the teaching competency.

A competency is more than just knowledge and skills; it involves the ability to meet complex demands by drawing on and mobilizing psychosocial resources (including skills and attitudes) in a particular context. Competency is essential to an educator's pursuit of excellence. Teachers need a wide range of competencies in order to face the complex challenges of today's world. Teaching competency is an inherent element that aspires to contribute to the welfare of a particular country or the world, itself. The teachers are the central figures in the educational process. The success of training and education depends on their preparation, erudition and performance quality.

Jocelyn Butler (2006) defines competencies as knowledge, skills, attributes and behaviour or traits required for individual and organizational success.

According to Sharma (2001), "Competency is ordinarily defined as adequacy for a task or as possession of required knowledge, skills and abilities. It emphasizes on the ability to do rather to demonstrate knowledge".

Classification of competencies

Konkani (2013) classified competencies under 5 major categories as detailed below:

1. Cognitive Based Competencies: Cognitive based competencies define knowledge and intelligence skills and abilities that are expected for learners. They are content based and help to enlarge the sphere of activities.
2. Performance Based Competencies: Instead of mere knowledge as stated above the learner demonstrates that he/she can perform some activity rather than simply being aware of facts. Performance based competencies are skills based and overt action oriented.
3. Consequence Based Competencies: To demonstrate this competency a person is required to bring change in others. The level of success in not measured by

what one knows or does but by what one accomplishes. The achievement of pupils is a standard measure of consequence based competency.

4. Affective Competencies: The affective competencies defined the expected attitudes and values and tend to resist specificity. These competencies are expressed in terms of behaviour rather than percept.

5. Exploratory Competencies: These types of competencies are those that cannot be fitted into any of the above four types in competency based teacher education. The activities provide opportunity to students to learn, but specific nature of outcome cannot be desired. They are also referred as experience objective or expressive objectives

NCTE -identified the following ten competency categories in the teacher education.

1. Contextual competencies: It is necessary for the teachers to understand the forces of contextual interactions in terms of constitutional commitments, government policies, resultant programmes and causes for their success and failure. They need to become aware of the changes around them and about the role in bringing about desired changes in the society.

2. Conceptual competencies: Since competency based approach to education is new and involves mixture of old and new concepts and theories, the teachers will need help in facilitating the learning of children and helping them to achieve mastery of competencies.

3. Content competencies: Concepts are always inter-related with one another and their relationships are generally stated in terms of rules, principles or laws. This involves the need to develop content competencies that enable them to implement the minimum levels of learning.

4. Transactional competencies: Education is a paedocentric in nature and , therefore, a good teacher is one who, rather than imposing teaching, facilitates children's learning. Hence the teacher will have to develop certain new transactional competencies in order to augment the possibility of optimum learning and achievement at the mastery level.

5. Competencies related to other educational activities: Co-curricular activities provide amble scope for incidental learning. It helps to build some kind of a balance among various developmental aspects of the child's personality. As a result teacher participation in co-curricular programmes leads in developing an increased amount of motivation among pupils for their active participation in all activities.

6. Competencies to develop teaching learning material: In order to make the teaching effective, the teacher is expected to be resourceful and competent to select and use the existing material to develop and prepare teaching learning material as per subject needs, particularly when the available material is not useful.

7. Evaluation competencies: The teacher is expected to know different ways, techniques and methods of evaluation for diagnostic and prognostic purposes along with knowledge of various types of tests ,their appropriate selection for the expected mastery level of the pupil and identification of the underachievers for devising relevant remedial programmes to maximize their learning competence and achievements.

8. Management competencies: Management competencies of teachers are aimed at providing a wholesome learning and living environment for the pupils to

maximize their performance, achievement and increasing their ability to assume responsibility of self management as individuals and also as group members.

9. competencies related to working with parents: To facilitate the child's learning teachers require the co-operation of parents. The crucial role of parents in education of the child needs to be kept in view while organizing parent teacher associations and identifying their role performance for their child's proper growth and development.

10. competencies related to working with community and other agencies: The school needs to establish close relationship with various formal as well as informal educational agencies in order to make the process of schooling relevant to contemporary needs and aspirations. Hence there is a need to develop competencies for building wholesome relationship between school and the community.

Inorder to enhance students learning teachers demonstrate the high level of knowledge, skills, abilities and commitments which reflected in the following five essential strategies (Majid,2014).

1. Teachers are steadfast in their commitment to students and their learning.

2. Teachers know the subjects they teach and how to teach those subjects to students.

3. Teachers are responsible for handling and observing student learning.

4. Teachers think systematically about their practice.

5. Teachers are lifelong learners

So it is the emerging trend to teachers equipped with a broad grounding in every aspects needed.

1.11 Organization of the report

The present study is organized and presented in five chapters

Chapter I- Introduction

The first chapter contains introduction, need and significance of the study, statement of the problem, research questions, definition of the key terms, objective of the study, hypotheses formulated, methodology in brief, scope and delimitations of the study and conceptual frame work.

Chapter II – Review of related literature

In this chapter a brief review of literature and studies on metacognition, self-efficacy and teaching competency and critical review of the studies are discussed.

Chapter III - Methodology

This chapter describes the method adopted for the study, details of variables, population and samples used for the study, tools used, data collection procedures, administration and scoring of the tools and statistical techniques used for the analysis of data.

Chapter IV –Analysis and interpretation of data

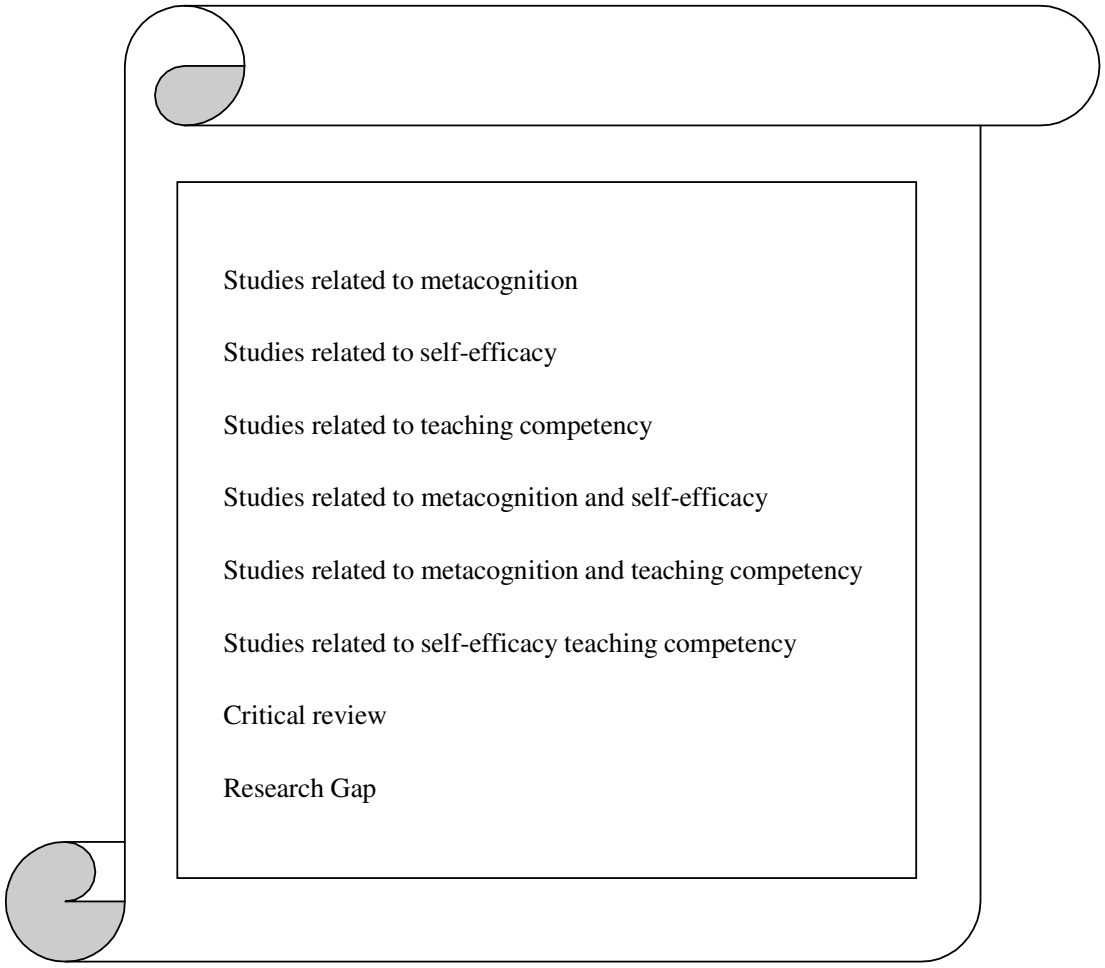
In this chapter the details regarding the analysis and interpretation of the collected data are discussed.

Chapter V -Conclusion

This chapter contains restatement of the problem, variables selected for the study, major findings, discussions, implications recommendations, conclusions and suggestions for further research**.**

CHAPTER-II

REVIEW OF RELATRD LITERATURE



Review of related literature provides a background for the development of the present study and brings the reader up to date. It enables the researcher to define the limits of his field and helps to delimit and define his problem. It also helps in framing objectives and hypotheses valuable in formulating the problem. Through the review of related literature the researcher can avoid unintentional duplication of well-established findings. It helps to know about the tools and instruments, which provide to be useful for the studies.

Understanding the importance of the review of related literature, Cater V. Good emphasized that "the key to the vast store house of published literature may open doors to sources of significant problems and explanatory hypotheses and provide helpful orientation for definition of the problem of results. In order to creative and original, one must read extensively and critically as a stimulus to thinking".

Studies Related to Metacognition

The study conducted by Hidayat (2018) investigated the influence of metacognition on mathematical modeling competency in students of mathematics education programmes. Results indicate that metacognition positively influence mathematical modeling competency. Moreover, metacognition dimensions planning, cognitive strategy and self-checking are positive partial mediators. In conclusion, metacognition positively affect students' mathematical modeling competency and metacognition positively influence mathematical modeling competency

Alzahrani (2017) conducted a study to explore teachers' and students' perspectives regarding metacognition and its role in mathematics learning. The instruments used for data collection were semi-structured interviews and classroom observation. The finding revealed that the traditional method can hinder mathematics teaching and learning through metacognition. Also although metacognitive mathematics instruction should be planned, the strategy that is introduced should be directly targeted at improving the monitoring and regulation of students' thought when dealing with mathematics problems.

Kaur (2017) studied the influence of gender, socio-economic status and parents' education on metacognition of higher secondary students. The results of the study revealed that gender has no significant impact on the metacognition of higher secondary students. Family income does not make significant influence on the metacognition of students. Moreover, mothers' education has significant impact on the metacognition of the students in comparison to fathers' educational qualification. Further positive correlation was found between the metacognition and critical thinking of higher secondary students.

Jiang, Ma and Gao (2016) conducted a study on Assessing teachers' metacognition in teaching to develop a metacognition inventory scale. All findings suggested that the teacher metacognition inventory was an effective instrument and can be used to assess teacher metacognition in educational practice.

Mulendema, Ndhlovu and Mulenga (2016) studied student teachers cognitive-metacognitive awareness in mathematics in colleges of education in Zambia. The key findings indicated that student teachers had moderately high metacognitive awareness levels. This study recommends that teacher training programmes should include

activities through the development and support of metacognitive awareness and affective factors that will be helpful in terms of professional and personal development for mathematics teacher trainees.

Abdellah (2015) examined the relationship between metacognitive awareness and academic achievement, and its relation to teaching performance of pre-service female teachers. Findings asserted the importance of metacognition in learning. It recommends that college professor have to adopt teaching technique and strategies in presenting information to students in a way that encourage use of metacognitive skills that has an effective impact on the academic achievement and teaching performance.

Damar, Ozdemir & Unal, (2015) made a study to investigate pre-service physics teachers' metacognitive knowledge about their instructional practices The result showed that pre-service physics teachers' metacognitive knowledge about their content knowledge was quite satisfactory; however, their metacognitive knowledge about instructional methods, students' pre-instructional knowledge, and the task of teaching needs to be improved. Again the study provided evidence that metacognitive knowledge on teaching is a fruitful framework to generate interpretations about the participants' instructional processes.

Demirel, Ask□n and Yagci (2015) conducted a study to investigate teacher candidates' metacognitive skills. The result revealed that the metacognitive skills of the teacher candidates have been in middle level and it has shown a meaningful different for the advantage of the female students and it has not shown any difference depending on the type of the graduates school level.

Gupta and Padhi (2015) examined metacognition of undergraduate students in context of certain demographic variables. They found that there is significant association between the level of metacognition and gender of undergraduate students,

besides a significant association between the level of metacognition and caste of undergraduate students.

Hart and Memnun (2015) investigated the metacognitive awareness and the beliefs about mathematics teaching and learning of preservice elementary mathematics teachers and to explore the relationship between the two. The results revealed that elementary mathematics preservice teachers' knowledge about cognition and regulation of cognition specific domains of metacognition did predict together their beliefs about mathematics teaching and learning.

Through his project, Hoe (2015) investigated metacognitive awareness of teachers while they are teaching in class. The project aims to find out teachers' awareness and practice of metacognition, so as to identify any gaps in their use of it in the Mathematics classroom. He observed that there is a lack of resources on metacognitive instructional strategies for teachers.

Vijakumari and D'Souza (2014) tried to find the significance of metacognitive strategies on learning Mathematics in cooperative groups. The findings of the study revealed that metacognitive cooperative learning approach enhances Mathematics achievement among secondary school students. The study also showed that the approach is significantly more effective in high achievers than low achievers.

Ben-David and Orion (2013) examined the new insight, on behalf of science teachers, into the integration of metacognition into science education. Participants were 44 elementary school science teachers attending an in-service teacher-training programme. The findings show that teachers expressed a willingness to continue their professional development toward expanding their abilities to integrate metacognition as an inseparable component of the science curriculum. Teachers also identified the

affective character of metacognitive experiences as the most significant facet of metacognition, which acts as a mediator between teaching and learning.

Rani and Govil (2013) conducted a study to investigate correlates of metacognition of undergraduate students. The findings of the study revealed that gender has no significant impact on the metacognition of undergraduate students on the other hand the metacognitive level of urban students differs significantly from their rural counterparts. Moreover, fathers' educational qualification found to have no significant impact on metacognition of the students under study while mothers' education has significant impact on it.

Vrieling, Bastiaens and Stijnen (2012) focused on the relationships between student teachers' self-regulated learning opportunities, their motivation for learning and their use of metacognitive learning strategies. Results of the study indicated that student teachers' use of metacognitive skills increased significantly in learning environments with increased self-regulated learning opportunities. Student teachers' motivation for learning was also enhanced, although to a lesser degree. Finally, significant correlations were found between the metacognitive study process construct and the motivational constructs measured.

Aydin (2011) analysed geography teaching and the influence of metacognition. In his study he found that in all educational processes, supportive teaching for metacognitive skills should be done to achieve the goals set in the teaching of geography. The study also revealed the fact that metacognition is one of the basic approaches that directs the activities of thinking in the teaching of geography.

Devaki and Pushpam (2011) examined a study on metacognitive ability and academic achievement in chemistry. The results show that the metacognitive ability of

government school student is slightly higher than the metacognitive ability of aided school students. The metacognitive ability of boy's school students is lower than that of the metacognitive ability of girls and coeducation school students.Medium of instruction, group taken by the students and family income do not influence the metacognitive ability.

Parvathi and Mohaideen (2011) conducted a study on Metacognition of prospective teachers in Thoothukudi district.100 student teachers were taken as the sample of the study. The study revealed that student teachers are having average metacognition. Also the post graduate student teachers are having better metacognition than under graduate prospective teachers in the dimension of monitoring.

Pope (2011) carried out a study to develop a better understanding of how metacognitive development is embedded in an inquiry based college level geometry content course for pre-service elementary teachers. Metacognitive awareness inventory was used to collect the data. This study suggested the presence of an underlying classroom structure that promotes the sharing of thinking and importance of class discussions to encourage metacognitive development, but there is a need to help students refine their thinking to make discussions more effective.

Curwen, Miller, White-Smith& Calfee (2010) explored how increasing teachers' metacognition develops students' higher learning during content area literacy instruction. Findings of the study revealed that teachers' metacognition about their own practice leading to upper elementary grade students' higher learning by developing students' metacognition and reflection exploration and depth in content domains and integration of literacy in content areas.

Dixit (2010) investigated prospective secondary teachers' readiness towards the use of metacognition. The result showed that the prospective secondary teachers' evince high readiness towards the use of metacognition in their learning process.

Wilson, Nance S. and Haiyan Bai (2010) conducted a study on the relationships and impact of teachers' metacognitive knowledge and pedagogical understandings of metacognition. One hundred-five graduate teachers in education participated in this study. The data analysis results, using mixed research method, suggest that the participant's metacognitive knowledge had a significant impact on his/her pedagogical understanding of metacognition. The results revealed that teachers who have a rich understanding of metacognition report that teaching students to be metacognitive requires a complex understanding of both the concept of metacognition and metacognitive thinking strategies.

Toit and Kotze (2009) investigated the use of metacognitive strategies by Grade 11 mathematics learners and their teachers. The findings indicated that planning strategy and evaluating the way of thinking and acting were used most by both teachers and learners. Journal-keeping and thinking aloud were used least by teachers and learners.

In his experimental study, Baylor (2002) examined the preservice teachers' metacognitive awareness of instructional planning through pedagogical agents. 135 preservice teachers developed an instructional plan for a case study within the Multiple Intelligent Mentors Instructing Collaboratively computer-based environment. The research design consisted of two factors, (a) instructivist agent and (b) constructivist agent with metacognitive awareness. The study revealed that when the constructivist agent was present, participants tended to report a change in their

perspective of instructional planning, reflected less on their thinking, and developed instructional plans rated as more constructivist in underlying pedagogy.

Studies related to Self-efficacy

Cook (2017) explored the relationship between math anxiety and perceived self-efficacy for teaching Mathematics in preschool teachers. The result revealed that age was a statistically significant predictor for Mathematics teaching eficacy beliefs. Correlation analysis indicated participants' math anxiety and self-efficacy for teaching mathematics were negatively correlated.

Gulistan, Hussain and Mushtaq (2017) conducted a study to explore relationship of mathematics teachers' self-efficacy with students' academic achievement at secondary level. No significant difference was found between mean scores of male teachers' self-efficacy and female teachers' self-efficacy. Gender differences in students' mathematics achievement were also determined. Comparison of both male students' academic achievement and female students' academic achievement indicated no significant difference. The findings of the study reflected a strong correlation between mathematics teachers' self-efficacy and their students' academic achievement. Recommendations were made to build higher level efficacy beliefs of teachers during in-service training programs and promotion link training programs.

Huyen (2017) conducted a study to investigate the self-efficacy of Vietnamese elementary school teachers. The findings revealed that the elementary school teachers in this area had high self-efficacy in all dimensions of teaching including instructional strategies, classroom management and student engagement. Moreover, the findings also showed that the factors including teachers' gender, teachers' years of teaching experience, teachers' degree did not affect to their self-efficacy. However, the

teachers' school location was proved to be the influential factor of their self-efficacy. Particularly, teachers teaching in rural areas had lower self-efficacy than their colleagues in urban areas.

Turkoglu, Cansoy and Parlar (2017) examined the relationship between teachers' self-efficacy and their job satisfaction. The participants of the study were having 1-29 years experience. The results showed that a significant positive relationship was found between teacher self-efficacy and job satisfaction and teacher self-efficacy was a significant predictor of job satisfaction.

Peker, Murat (2016) investigated the relationship between pre-service primary school teachers' mathematics teaching anxiety and their self-efficacy beliefs toward mathematics teaching through path analysis with 250 pre-service primary school teachers. The study revealed that the content knowledge dimension and the teaching knowledge dimension and effective teaching dimensions of mathematics teaching anxiety had a negative effect on the efficacy in teaching, but self-confidence dimension of mathematics teaching anxiety affected the efficacy in teaching and of self-efficacy beliefs toward mathematic teaching negatively.

Unsal, Korkmaz and Pedrin (2016) investigated an analysis of Mathematics teachers' self-efficacy levels concerning the teaching process. According to the findings, it was observed that mathematics teachers stated opinions on having high self-efficacy beliefs concerning the teaching process, that these opinions differed based on the gender, year of service, level of school of profession variables and that these opinions did not differ based on the type of school of graduation, educational background and type of school variables.

Zuya, Kwalat and Attah (2016) studied the pre-service mathematics teachers' mathematics self-efficacy and mathematics teaching self-efficacy. The study was aimed at finding whether their mathematics self-efficacy and teaching self-efficacy were related. The findings of the study revealed that pre-service mathematics teachers had above average confidence levels in both mathematics self-efficacy and mathematics teachers' mathematics self-efficacy. The study also revealed that the pre-service mathematics teachers' mathematics self-efficacy and mathematics teachers' mathematics self-efficacy were significantly related.

Shoulders and Krei (2015) analysed the rural high school teachers' self-eficacy in student engagement, instructional strategies, and classroom management. Result showed that there exists significant mean differences between different levels of education in self-efficacy for instructional practices and classroom management, and years of teaching experience both instructional practices and classroom management, while gender differences were not significant.

Thompson (2015) examined to determine the degree of relationship among the predictor variables of fifth-grade science teachers' personal science teaching efficacy and science teaching outcome expectancy to the criterion variable of student achievement in science in a large urban school district in North Carolina. The result indicated no statistically significant correlation existed between the two variables.

Chabra and Grover (2014) conducted a study on self-efficacy of adolescents: Interplay of gender and locality. The objectives of the study are to study the self-efficacy of adolescents and the difference in self-efficacy of adolescents on the basis of gender and locality. The findings revealed that most of the adolescents had below

average level self-efficacy. Significant gender difference also existed in females than males and there is no significant difference exists in adolescents based on locality.

Klassen and Virginia (2014) analysed teachers' self-efficacy, personality, and teaching effectiveness. The strongest effect found was for self-efficacy was strongly associated with observed teaching performance. Also personality was modestly related with observed teaching performance.

Murali and Nair (2014) found out the relationship between self-efficacy of secondary school teachers and academic achievement of students of Kanyakumari District. The result revealed that there is no significant difference between secondary school teachers in their self-efficacy with reference to gender and locality. But significant difference was found between teachers with reference to educational qualification, teaching experience and type of management. Also there is no correlation found between self-efficacy and students achievement.

Chadha and Thind (2013) investigated the self-efficacy of teachers in relation to their role conflict. The study concludes that the male teachers of schools and colleges show significant relationship between role conflict and self-efficacy. Also there exists significant relationship between school teachers and college teachers in regard to self-efficacy and role conflict.

Holzberger, Philipp and Kunter(2013) analysed How teachers' self-efficacy is related to instructional quality. The analyses revealed a reverse effect of instructional quality on teachers' self-efficacy, with students' experience of cognitive activation and teachers' ratings of classroom management predicting teachers' subsequent self-efficacy. The findings emphasize the importance of examining teachers' self-efficacy not only as a cause but also as a consequence of educational processes.

Jacob (2013) studied the impact of self-efficacy on motivation and performance of employees. He attempted to assess the influence of self-efficacy on the performance of individuals at workplace and the mechanism by which self-efficacy of an individual determines his/her work related performance and motivation. From the results of the study it is observed that self-efficacy theory can be applied for work related performance in terms of motivating different employee. Also it is necessary to identify the practical implications of the outcomes related to improve employee self-efficacy in order to motivate them and improve their performance.

Unlu and Ertekin (2013) the study aims to investigate the relationship between mathematics teaching self-efficacy and mathematics self-efficacy of pre-service elementary mathematics teachers. The results of the study revealed that pre-service elementary mathematics teachers' self -efficacy beliefs scores towards mathematics teaching and mathematics are high and there is a positive relationship between mathematics teaching efficacy and mathematics self-efficacy.

Achurra and Villardon (2012) analysed teacher' self beliefs and their relationship to students' perceived learning. The result shown teachers' self-efficacy beliefs are significantly, but moderately related to students' perceived learning. Teachers with higher levels of overall efficacy have students with higher perceived learning levels than teachers with lower self-efficacy levels.

Davis (2012) examined the relationships among teaching styles, teacher's perceptions of their self-efficacy and student's mathematics achievement. From the study no statistically significant relationship were found between elementary school teachers' self-efficacy and student's mathematics achievement levels. But Mathematics achievement was predicted by teaching styles.

Sahni (2012) studied the influence of occupational self-efficacy, personality and their interaction on emotional intelligence of secondary school teachers. The study revealed that there is significant independent effect of occupational self-efficacy and personality on emotional intelligence.

Simons (2012) conducted a study to determine the variables that influence teacher self-efficacy in novice nurse faculty who teach in an associate degree nursing. In this study novice nurse educators did not have a high sense of teacher self-efficacy and also the formal education courses did not influence teacher self-efficacy.

Eberle (2011) investigated whether a relationship between teachers' feeling of self-efficacy and their students' overall achievement with respect to North Carolina Reading and Math End-Of-Grads tests. Data collection was focused on teachers' feeling of self-efficacy. Survey was administered to teachers who were working in high performing schools. It was discovered that each of the respondents, regardless of perceived self-efficacy score, had both reading and math significantly higher than that of the state average. It was also discovered that a relationship existed between teachers with lower perceived self-efficacy scores and North Carolina math test scores.

Harris (2011) studied teachers' perception related to teacher preparedness, self-efficacy and cultural competence to instruct culturally diverse students. The findings of this correlated study revealed that a relationship existed between cultural competence and self- efficacy. The study also revealed that there exists no relationship between teacher preparation and cultural competence and between teacher preparation and self- efficacy.

Shillingford (2011) examined the preservice teachers' self-efficacy and knowledge of emotional and behavioural disorders. The age of the participants were ranged from nineteen to fifty one. The result revealed that the participants had an overall high sense of efficacy but had higher efficacy in instructional strategies than in classroom management, student engagement and instructional abilities.

Smith and Joan (2011) attempted to find the relationship among mathematics anxiety, mathematical self-efficacy, mathematical teaching self-efficacy and the instructional practices of elementary school teachers. The results indicated a statistically significant relationship between mathematical teaching self-efficacy and mastery approaches to instruction, as well as a significant relationship between mathematical teaching self-efficacy and performance based instruction. Also when teaching mathematics as it relates to mathematics content, teachers are confident in their abilities to provide performance based instruction.

Smith and Jacqolin (2011) studied the self efficacy of personal stress among public school teachers with objectives to explore perceived self-efficacy and personal stress levels in relationship to the requirement to administer the Texas assessment of knowledge and skills assessment. Perceived self-efficacy was measured with the Teachers sense of self-efficacy scale, and Stress inventory scale The findings reveled that positive social change can be fostered.

Wagoner and Cynthia (2011) conducted a study on self efficacy and commitment among music teachers. A significant three way interaction effect was found in music teacher commitment at the 6-10 years of teaching experience.

Zagorski (2011) analysed a study to explore the relationship between teaching online in isolation and teachers feeling of self-efficacy. Also find what were those

same teachers levels of self-reported feelings of self efficacy. The result conclude that first and second grade online teachers did feel isolated and felt more isolated compared to when they worked in the bricks and mortar settings.

In his experimental study, Mc Donald (2010) analysed two groups of middle school Mathematics teachers with high and low student gain. The result of the study was teachers with a high sense of self-efficacy had higher student gains. The study's primary implication is that Mathematics teachers' professional and educational backgrounds may significantly impact student achievement.

Paula (2010) examined how self-efficacy relates to new teachers' commitment. His findings indicate that the teachers with higher levels of self-efficacy were more committed to teaching in general. There was a decline as self-efficacy declines from graduation to one year after teaching. Teachers who graduate with more positive self-efficacy beliefs were less inclined to be committed to their schools.

The relationship between teacher self-efficacy and student outcomes and subsequent inferences for magnifying school effectiveness are examined by Towner (2010) in their study. The result revealed that individual levels of the teachers' self-efficacy are correlated with aggregated mean scores of student achievement. Such demand to increase student achievement has highlighted the importance of understanding the role of teacher efficacy.

Jose and Annaraja (2008) investigated the emotional intelligence and self-efficacy of the teacher educators. It was noted that no significant difference between rural and urban teacher educators in their emotional intelligence. Also there was no significant difference between male and female teacher educators in their self-

efficacy. But there was significant positive correlation between self-efficacy and emotional intelligence of teacher educators.

Studies related to Teaching Competency

Dogan (2019) examined the preservice teachers' mathematics teaching competencies by the practice teachers in their schools. The findings revealed that although the level of professional knowledge of the preservice teachers was generally good, it was not seen that they were sufficient in professional skills because of being inexperienced. It was stated that pre-service teachers had a positive relationship with students in the classroom, but discipline problems could arise when students felt it especially when the preservice teachers were unprepared.

Soysal and Radmard (2018) explored the initial teaching competencies of 211 prospective teachers through an examination of their pedagogical content knowledge (PCK) documentations that were obtained through a PCK Construction Task. ANOVA results showed that even though all teaching groups were relatively competent in documenting their knowledge of taught content and knowledge of instructional strategies and representations, they were less knowledgeable with regard to their students' understanding.

Wu, Chao, Cheng, Tuan and Guo (2018) conducted a study on elementary teachers' perceptions of their professional teaching competencies for teachers of Mathematics/Science majors and Non-Mathematics/Science majors in Taiwan. The results indicated that there were 9 key factors in which significant difference between the Mathematics and Science groups of teachers existed. Considering their practical significance, two factors focusing respectively on teachers' self-efficacy in inquiry skills and abilities to provide students a learning environment that helps them

understand the nature of math/science were identified as areas in which professional competencies for non-mathematics/science majors need to be strengthened.

Nair (2017) conducted a study on identifying teaching competencies and factors affecting teaching competencies. The study concluded that there is a significant influence of gender, marital status, teaching experience, academic qualification and effect of income on teaching competency.

Das and Nalinilatha (2017) aimed to identify the teaching competency of secondary school teachers. The findings revealed that there is no significant difference towards teaching competency among selected secondary school teachers with respect to personal variables like gender, marital status, educational qualification, type of management and teaching experience.

Farmer and Ramsdale (2016) identified key competency areas that lead to success in online instruction and to develop a framework that supports professional development and self-assessment. The resulting analysis produced the Online Teaching Competency Matrix including five competency areas: Community & Netiquette, Active Teaching/Facilitating, Instructional Design, Tools & Technology, and Leadership & Instruction

Joseph (2016) tried to assess the achievement motivation and teaching competency of B.Ed students. The results revealed that there is a significant and positive relationship between achievement motivation and teaching competency of B.Ed students. Findings showed that students have low achievement motivation and just above average level of teaching competency. Female students have more scores on achievement motivation and teaching competency. The rural students have higher achievement motivation than the urban students.

The study conducted by Maheswari (2016) investigated the relationship between teaching competency and teacher responsibility of training college teachers with 400 teachers from Cuddalore, Nagapattinam, Perambalur and Thanjavur districts. The study showed that training college teachers have average level teaching competency and teacher responsibility. It is also found that training college teachers differ in their professional qualification but do not differ in their years of experience with regard to teaching competency. There is significant relationship between teaching competency and teacher responsibility in training college teachers.

Ochieng, Kiplagat and Nyongesa (2016) tried to establish the influence of teacher competence on mathematics performance among public secondary schools in Kenya. The study findings revealed positive correlations between; teacher educational qualifications with mathematics performance, teacher training with mathematics performance, and teacher experience with mathematics performance.

Kaur and Paramjot (2016) developed a study to investigate the relationship between teacher efficacy and teaching competency of secondary school teachers. The study also examined the differences in teacher efficacy and teaching competency of secondary school teachers with respect to locale and gender. The results of the investigation revealed that no significant gender difference in scores of teacher efficacy and teaching competency. The study further revealed that there is significant difference in teacher efficacy and teaching competency of secondary school teachers with respect to locale. However negative relationship between teacher efficacy and teaching competency of secondary school teachers is found.

Plasilda and Muthupandi (2016) examined a study to find out the significance of the ICT competency and teaching of higher secondary teachers. The major finding is that there is no major significant difference in ICT competency

and teaching competency of higher secondary teachers with reference to gender, marital status, educational board, locality and type of institution.

Shanmugam (2016) studied the differential aptitude and teaching competency of student teachers in Kancheepuram district. It was found that student teachers having higher level of differential aptitude possessed greater teaching competency.

Kalaiarasan (2015) conducted a study on teaching competency of the student teachers in respect to intelligence and aptitude with objectives as the relationship between teaching competency and aptitude, teaching competency and intelligence of the student teachers. General teaching competency scale was used. The findings reflect that there exists a very high significant positive relationship between teaching competency and attitude, teaching competency and intelligence and teaching aptitude and intelligence among the student teachers.

Selvakumari and Samy (2015) attempted to study the relationship between ICT skills and teaching competency of B.Ed trainees. The findings revealed that there is no significant difference between ICT skills and teaching competency in respect to gender. But there is significant relationship between ICT skills and teaching competency of B-Ed students.

Chauhan and Gupta (2014) compared the teaching competency of different groups working at secondary schools level in Ghaziabad. The result attained showed that the teaching competency of female teachers is higher than the male teachers working in secondary schools. teaching competency of urban teachers is higher than the rural teachers. It was also found that competency of experienced teachers is higher than inexperienced teachers but their competency has been found negligible positive.

Cheng (2014) evaluated the innovative and theory-based initial teacher education course entitled Learning Study, aimed to develop the instructional design and teaching competency of pre-service teachers in Hong Kong. The findings of the study indicated that theory-based tutorials, consultative support, and research practicums are confirmed to be the predictors of learning outcomes which include instructional design skills, teaching competency, and clinical experience.

Gokalp (2016) Investigated classroom teaching competencies of pre service elementary mathematics teachers. The findings indicated a significant and positive relationship between the sub dimensions of pre service teachers' teaching competencies. In addition, there was a significant difference between competency score in terms of different grade levels. According to observation scores, pre service teachers were significantly competent in 6th grade classrooms than in 8th grade classrooms.

Kaur and Talwar (2014) examined the relationship between teaching competency and emotional intelligence of secondary school teachers. The findings of the study revealed that a significant positive relationship between teachers' teaching competency and their emotional intelligence. But insignificant difference is found between teaching competency and emotional intelligence of secondary school teachers teaching in government and private schools and with respect to their gender. The study also indicated that teaching competency and emotional intelligence are not influenced by gender.

Shrivastava (2014) attempted to predict the teaching competency of secondary school teachers. The findings revealed that teachers of science stream possess more teacher competency than teacher of arts and commerce stream.

Shukla (2014) conducted a study aimed to find the relationship between i) teaching competency and job satisfaction ii) teaching competency and professional commitment among primary school teachers. The result revealed very low positive correlation exists between teaching competency and job satisfaction and teaching competency and professional commitment.

Nzilano (2013) investigated the competencies of pre-service teachers from Tanzania's University of Dar es Salaam during practice teaching in secondary schools and teacher education colleges. Results revealed the limited competencies among pre-service teachers in classroom teaching. The study recommended reforms of the pre-service teachers' professional development program, the improvement of the educational policies, and the cooperation between educational managers from schools, colleges, and the Ministry of Education for quality education.

Bhatia (2012) conducted a study on evaluation of teaching competencies of teacher trainees during test lessons. The study revealed that majority teacher trainees did not use methods to develop the reasoning ability of the pupils. They did not ask questions of critical thinking. The evaluation has mostly knowledge based questions than understanding and skill based question.

Studies related to Mtacognition and Self-efficacy

Moores, Chang and Smith (2006) tried to develop an instrument that attempts to measure both self-efficacy and metacognition with respect to one's performance on a test covering declarative and procedural knowledge. The results of this study suggested that self-efficacy and metacognition are distinct but related constructs. The implications of these results suggested further research is needed to compare and contrast the role of these constructs in assessing learning outcomes.

Hermitta and Thamrin (2015) conducted a study on metacognition toward academic self-efficacy among Indonesian Private University Scholarship Students. The study examined the etacognition awareness and its correlation and contribution towards academic self-efficacy. The results of simple correlation showed that positive relationship exists between metacognition awareness and academic self-efficacy.

Studies related to Metacognition and Teaching Competency

Fathima, Sasikumar and Roja (2014) conducted a study on Enhancing Teaching Competency of Graduate Teacher Trainees through Metacognitive Intervention Strategies. The findings revealed that there is a continuous improvement in all the dimensions of teaching competency. It further shows that every teacher needs to review/update his/her potential in all possible novel/new/innovative strategies, to modify and improve his/her teaching competency

Choudhury and Chowdhury (2015) attempted to explore the effectiveness of Metacognition skills in developing the teaching competency among secondary teacher educators. The study demonstrated that there is a significant positive relationship between teaching competencies and Metacognition awareness. The study also revealed that there is significant difference between male and female secondary teacher educator in their teaching competency as well as in their Metacognition awareness.

Sekar and Annaraja (2013) found out the metacognition and teaching competency of mathematics teacher trainees and the relationship between metacognition and teaching competency of mathematics teacher trainees with respect to gender, locality and educational qualification. The study showed that there was no significant difference in knowledge cognition metacognition and efficacy in teaching

competency with regard to gander and there is significant relationship between metacognition and teaching competency of mathematics teacher-trainees of colleges of education.

Kapadia (2013) compared metacognition and perceived teacher competency of secondary school students. Results showed that students of all the school types consider that their teachers are equally competent. A significant, direct, positive correlation was found between total metacognition and total teacher competency scores. Also it indicated that the teachers' communication skill, evaluation ability, class room management, mastery over content and ability to organize information is related to metacognition of students.

Studies related to Self-efficacy and Teaching Competency

Daniel and Alexander (2014) analysed the teaching competency and self-efficacy of primary school teachers with reference to gender, locality and marital status. The findings revealed that the level of teaching competency and self-efficacy with reference to the mentioned variables are average. Also there is no significant difference between self-efficacy and teaching competency of teachers with reference to gender and locality. But there is significant difference between self-efficacy and teaching competency of teachers with reference to marital status. Also there is significant correlation between self-efficacy and teaching competency of teachers with reference to gender and locality.

Anisha (2008) conducted a study to find the relationship between self-efficacy and teaching competency of secondary teacher education students. The result showed that there was positive significant relationship between self-efficacy and teaching competency of secondary teacher education students.

Critical Review

The researcher has reviewed eighty four studies related to the variables under study namely metacognition, self-efficacy and teaching competency. Of these, twenty four studies related to metacognition, thirty one studies related to self-efficacy ,twenty two studies related to teaching competency, two studies related to metacognition and self-efficacy, four studies related to metacognition and teaching competency and two studies related to self-efficacy and teaching competency. The review of related studies enabled the investigator to develop a perspective of the nature of interaction of the variables concerned by the present investigation.

The studies reviewed by the investigator on metacognition show that metacognoition is positively related to Mathematics teaching and learning process. It is also closely related to the teaching style adapted by the teacher (Jiang, Ma and Gao, 2016; Mulendema, Ndhlovu and Mulenga, 2016; Hart and Memnun, 2015; Hoe, 2015; Vijakumari and D'Souza, 2014; Toit and Kotze, 2009). Metacognition is related to teaching skills of teachers (Demirel, Ask□n and Yagci, 2015). Metacognition of teachers are related with the achievement of students (Curwen, Miller, White-Smith& Calfee, 2010; Baylor, 2002). Influence of metacognition on pedagogical understanding (Dixit, 2010; Wilson, Nance S. and Haiyan Bai, 2010). Metacognition has significant role in teaching various subjects (Ben-David and Orion, 2013; Aydin, 2011).

A critical study of researches on self-efficacy revealed that self efficacy is highly related with mathematics teaching(Unsal, Korkmaz and Pedrin, 2016; Peker, Murat, 2016; Zuya, Kwalat and Attah, 2016; Klassen and Virginia, 2014; Smith and Joan, 2011).

Studies had shown that gender (Gulistan, Hussain and Mushtaq,2017; Chabra and Grover,2014),locality (Huyen, 2017),year of experience (Shoulders and Krei ,2015; Murali and Nair,2014), educational qualification (Murali and Nair,2014) are significant factors of self efficacy. Self-efficacy of teachers influenced the achievement of students (Gulistan, Hussain and Mushtaq, 2017; Shoulders and Krei,2015; Thompson,2015; Achurra and Villardon,2012; Eberle,2011; Mc Donald, 2010).

Critical analysis of researches on teaching competency indicated that teaching competency is related with students achievement (Dogan,2019). Teaching competency influences Mathematics performance (Ochieng, Kiplagat and Nyongesa,2016). Effect of teaching competency on teaching various subjects(Wu, Chao, Cheng, Tuan and Guom,2018; Shrivastava,2014),Studies have shown that gender(Chauhan and Gupta,2014),grade level(Gokalp,2016),year of experience (Chauhan and Gupta,2014),locality(Chauhan and Gupta,2014) are significant factors of self-efficacy.

A critical study of researches on metacognition and self-efficacy showed positive relation between metacognition and academic self-efficacy (Moores, Chang and Smith,2006; Hermitta and Thamrin, 2015).

The studies conducted by (Choudhury and Chowdhury, 2015; Kapadia, 2013) showed a significant relationship between teaching competency and metacognition. Studies have shown that gender(Choudhury and Chowdhury, 2015; Sekar and Annaraja, 2013),locality (Sekar and Annaraja, 2013),educational qualification(Sekar and Annaraja, 2013) are significant factors of metacognition and self-efficacy. The

study conducted by Fathima, Sasikumar and Roja (2014) showed how to enhance the teaching competency of teachers.

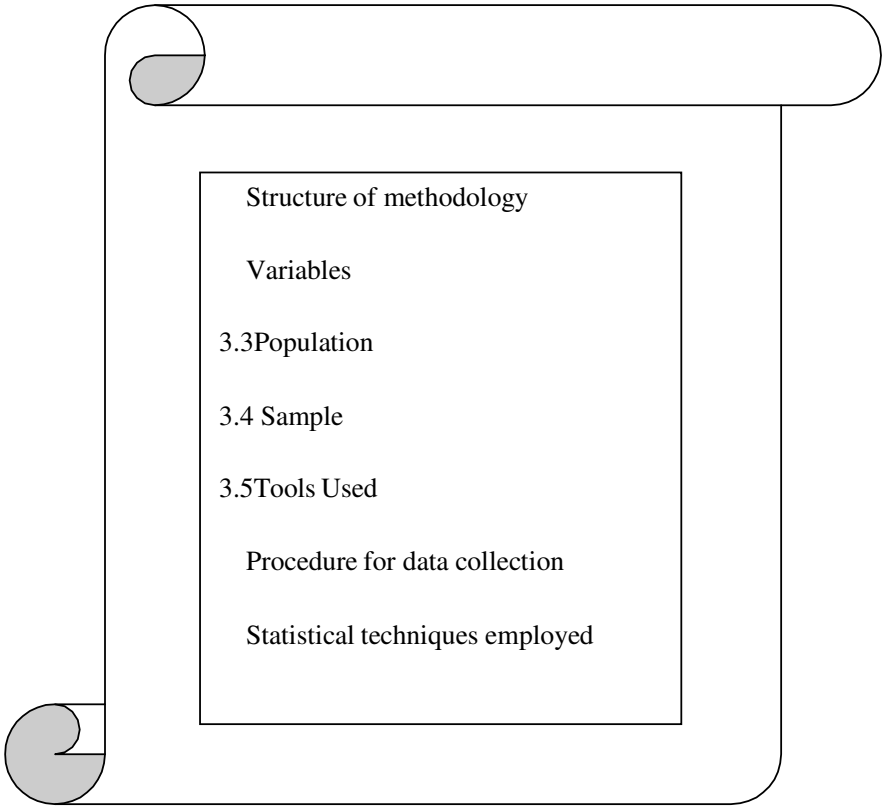
The study conducted by Anisha (2008) showed a positive siginificant relationship between self-efficacy and teaching competency. Daniel and Alexander (2014) found that there is a correlation between self-efficacy and teaching competency with respect to gender and locality.

Research gap

The following research gap has been identified by the investigator while reviewing related literature. Though metacognition is a much needed element for Mathematics only a few studies were conducted to find the possible relation between metacognition and Mathematics teaching. Majority of the study in metacognition had been conducted on school and college students. Only a few studies were done to find the metacognition of Mathematics teachers. The present study is unique for several reasons. To the best knowledge of the investigator,no study has been undertaken so far with the combination of variables namely, metacognition self-efficacy and teaching competency. This study also differs from the above studies in terms of area, methodology, population and sample.

CHAPTER-III

METHODOLOGY



Methodology occupies a very prominent role in any kind of research. It includes sources of data, details about sample, methods of gathering data, reliability of the instrument, statistical procedure used on analysis of data. Proper use of methodology shows the dignity of the research study. They describe the various steps of the plan of attack to be adopted in solving a research problem. An apt methodology saves the researcher from wastage of time, money and effort.

This chapter has been presented under three sections.

Section A: Details of research design

Section B: Development and validation of the tools.

Section C: Statistical techniques

Section A: Research design

3.1 Structure of Methodology

This study is intended to investigate the influence of metacognition, self-efficacy on teaching competency of high school Mathematics teachers in the southern districts of Tamil Nadu. Normative survey method was employed for the present study. The investigator used the simple random sampling technique to select the sample. The investigator adapted the metacognition questionnaire developed by Ushaparvathi and Rasul Mohaideen (2011). Self-efficacy scale and Teaching Competency scale were developed and validated by the investigator with the help of the guide.

3.2 Variables

A variable refers to a characteristic or the attribute of an individual or an organization that can be measured or observed and that varies among the people or organization being studied. (Creswell, 2007). Variables are the conditions or characteristics that the researcher manipulates, controls or observes. In this study teaching competency was the dependent variable and metacognition and self-efficacy were considered as independent variables. The data related to demographic variables such as sex of the subject (male/female), locality of institution (rural/urban), marital status (married/unmarried), educational qualification (graduates / post graduates), districts (Kanniyakumari / Tirunelveli / Thoothukudi), type of management (Government / aided / self-financing), nature of school (boys/girls/ co-education), income (Rs.5,000-10,000/11,000-15,000/16,000-20, 000 /21,000-25,000 /26, 000 & above) and years of experience (1-5years/6-10 years /11-15 years /16-20 years /21&above) were taken as the background variables in this study.

3.3 Population

"A population is any group of individuals who has one or more characteristics in common that are of interest to the researcher. The population may be all the individuals of a particular type or a statistical part of the group". Best, & Kahn (2005).

The population for the study consisted of the high school Mathematics teachers in Tamil Nadu.

3.4 Sample

"A sample is a small proportion of a population selected for observation and analysis. By observing the characteristics of the sample, one can make certain inferences about the characteristics of the population from which it is drawn"- Best, & Kahn (2005).

The sample for the study consisted of high school Mathematics teachers from select schools in three districts in Kanniyakumari, Tirunelveli and Thoothukudi. The sample size was 303. Simple random sampling technique was adopted to select the sample.

Details of the sample selected for the present study.

Table 3.1

List of Number of Schools selected in district wise

District	Number of schools
Kanniyakumari	88
Tirunelveli	80
Thoothukudi	41

Distribution of the Sample

Table 3.2

Distribution of the Sample in Terms of Sex

Sex	Number	Percentage
Male	96	31.7
Female	207	68.3
Total	303	100

It is inferred from the above table that the sample consisted of 31.7% of male Mathematics teachers and 68.3% of them were female Mathematics teachers.

Table 3.3

Distribution of the sample in terms of Locality

Locality	Number	Percentage
Rural	197	65.0
Urban	106	35.0
Total	303	100

It is inferred from the above table that the sample consisted of 65% of Mathematics teachers from rural area and 35% of them were from urban area.

Table 3.4

Distribution of the Sample in terms of Marital status

Marital Status	Number	Percentage
Married	256	84.5
Unmarried	47	15.5
Total	303	100

It is inferred from the above table that the sample consisted of 84.5% of married Mathematics teachers and 15.5% of them were unmarried Mathematics teachers.

Table 3.5

Distribution of the Sample in terms of Qualification

Qualification	Number	Percentage
Graduate	106	35.0
Post graduate	197	65.0
Total	303	100

It is inferred from the above table that the sample consisted of 35% of graduate Mathematics teachers and 65% of them were post graduates Mathematics teachers.

Table 3.6

Distribution of the Sample in terms of District

District	Number	Percentage
Kanniyakumari	122	40.3
Tirunelveli	114	37.6
Thoothukudi	67	22.1
Total	303	100

It is inferred from the above table that 37.6% of the high school Mathematics teachers are from Tirunelveli district, 22.1% from Thoothukudi district and 40.3% of them were from Kanniyakumari district.

Table 3.7

Distribution of the Sample in terms of Type of Management

Type of management	Number	Percentage
Government	136	44.9
Aided	80	26.4
Self-financing	87	28.7
Total	303	100

It is inferred from the above table that 44.9% of the high school Mathematics teachers are from Government schools, 26.4% from Aided schools and 28.7% of them were from Self-financing schools.

Table 3.8

Distribution of the Sample in terms of Nature of School

Nature of school	Number	Percentage
Boys	31	10.2
Girls	39	12.9
Coeducation	233	76.9
Total	303	100

It is inferred from the above table that 10.2% of the high school Mathematics teachers are from Boys schools, 12.9% from Girls schools and 76.9% of them were from co-education schools.

Table 3.9

Distribution of the Sample in terms of Income

Income	Number	Percentage
`.5,000-10,000	55	18.2
`.11,000-15,000	31	10.2
`.16,000-20,000	11	3.6
`. 21,000-25,000	9	2.9
`.26,000 & above	197	65.0
Total	303	100

It is inferred from the above table that 18.2% of the high school Mathematics teachers were having `.5,000-10,000 income, 10.2% were having `.11000-15000 income, 3.6 % were having `.16000-20000 income, 2.9 % were having□`.2.921000-25.000 income and 65.0 % were having `. 26000 income.

Table 3.10

Distribution of the Sample in terms of Year of Experience

Year of experience	Number	Percentage
1-5 years	80	26.4
6-10 years	118	38.9
11-15 years	60	19.8
16-20 years	19	06.3
21 & above	26	08.6
Total	303	100

Tools used

Selection of the tool is an important ingredient of a successful research study. There are various tools available to collect the necessary data for research study. Each tool is particularly appropriate for certain sources of data, yielding information of the kind and in the form that would be most effectively used. A researcher can select an existing research tool if it is suitable for his study. In case such tools are not available it may be advisable to prepare necessary tools which are appropriate for the study. The following were the tools used in the study

i) Questionnaire on Metacognition - developed by Usha Parvathi and Rasul Mohaideen (2011), and revalidated by the investigator.

ii) Self-efficacy scale – Constructed and validated by Padma Rekha and Sobha (2015)

iii) Teaching Competency scale - Constructed and validated by Padma Rekha and Sobha (2015)

3.5.1 Description of the Tools

In this section, the investigator has described in detail, the construction and validation of tools used for the study. Two of the tools were constructed by the investigator in consultation with the supervisor and experts.

a) Questionnaire on Metacognition.

Questionnaire on Metacognition developed by Usha Parvathi and Rasul Mohaideen (2011) was adopted to measure the metacognition of High School Mathematics teachers for the present study. The dimensions of the Questionnaire are i) Planning ii) Memory iii) Monitoring iv) Evaluation and v) Achievement. Due considerations were given to the dimensions for writing the items.

A brief description of the dimensions of Metacognition is given below:

i) Planning: It involves metacognition that is related to starting of a problem and organization of knowledge. This refers to individuals' self-awareness, goal setting, time management, self determination and self responsibility.

ii) Memory: This refers to individuals' awareness of knowledge about their own memory systems and using their memories effectively.

iii) Monitoring: It involves metacognition that is related to checking the progress of a solution to a problem. Its focus is on the ability of individuals themselves to monitor their solving process and to maintain the attitude necessary to solve a problem such as self checking, self talk, self appreciation, self questioning, and so on.

iv) Evaluation: It involves metacognition that is related to checking the reasonableness of a solution to a problem. Some of the techniques are self checking, error detection, self correction, self review and self judgment.

v) Achievement: It involves metacognition that is related to basic ideas of Mathematics. Some of the techniques are to recall basic skills and recall the basic ideas.

Questionnaire on Metacognition consists of a total of 25 items with each dimension having 5 items, in the form of multiple choice type. It has four alternatives in which the respondent has to select the correct response by putting a tick mark (✓). For each correct response a score of 'one' is given and for wrong response a score of 'zero' is given.

Reliability.

For establishing the reliability of the Questionnaire on Metacognition, the test – retest method was followed. Test – retest method of reliability was calculated on a sample of sixty Mathematics teachers in the interval of three weeks. The reliability coefficient was found to be 0.809. Cronbach's alpha reliability was also calculated on a sample of sixty and the value was found to be 0.723.

Table 3.11

Reliability coefficient for Questionnaire on Metacognition

Sl. No.	Co-efficient of correlation	r-value
1	Test-retest	0.81
2	Cronbach's Alpha	0.72

Validity.

Content Validity

Questionnaire on Metacognition possessed adequate content and face validity as per the opinion of experts.

The copy of Questionnaire on Metacognition was attached in Appendix 1A

Scoring

The tool consists of 25 items. The responses were scored as 1 for correct response and 0 for wrong response. The maximum mark would be 25 and the minimum 0.

b) Self-efficacy Scale

i) Planning

Self-efficacy scale was designed by Padma Rekha and Sobha (2015) for measuring self-efficacy of Mathematics teachers. The dimensions are instructional self-efficacy, behavioural self-efficacy, cultural self-efficacy and decision making self-efficacy. The investigator identified these dimensions as suggested by Gibbs (2002) and Bandura (2006). To establish the authenticity of the scale, expert opinion and authentic reference were sought.

ii) Item Writing

After a thorough and careful study of the literature available in books, e-sources, journals, and other descriptive materials, the investigator collected materials and prepared the items. Initially the investigator included 80 statements which were distributed over the four dimensions: instructional self-efficacy (20 items), behavioural self-efficacy (20 items), cultural self-efficacy (20 items) and decision making self-efficacy (20 items).

A brief description of the dimensions of Self-efficacy scale is given below.

i) Instructional self-efficacy

Teacher should have the efficacy in handling the classroom effectively. Instructional self-efficacy included the teachers' efficacy in handling most difficult students, help students on task of difficult assignments, increase students' memory of what they have been taught in previous lessons, motivate students who showed slow

interest in school work, make them to do their home work and provide good guidance and instruction to all students regardless of their level of ability. For example the items included

1. I can provide useful feedback to the learners.
2. I always accept students' ideas and proposals.

ii) Behavioural self-efficacy

Self-efficacy directly affects teachers' behaviour. Behaviour is thought to be influenced not only by the belief that a particular action will lead to desirable outcomes, but also by the belief that one has the ability to perform that action. Behavioural self-efficacy of a teacher is the self-belief in one's capability as a teacher to perform specific actions to deal with specific teaching situations. For example the items such as

1. I feel that students respond positively to my requests.
2. I am aware of student behaviour when teaching.

iii) Cultural self-efficacy

The cultural self-efficacy indicates the degree of confidence that the teachers possess to provide culturally competent care. Cultural self-efficacy is the self-belief in one's capability as a teacher to perform specific actions in culturally-appropriate ways in specific teaching situations. For example the items such as

1. I can communicate with parents effectively when necessary.
2. I get community groups involved in working with the school.

iv) Decision making Self-efficacy

Decision making self-efficacy refers to the decisions that are made by the teachers in the school, and express the views freely on important school matters. For example the items such as

1. I can influence the decisions that are made in the school
2. I can express my views freely on important school matters.

Construction and validation of Teaching Competency scale

iii) Item Editing

Item editing is the process of checking and scrutinizing items. To establish the authenticity of the scale, expert opinion and authentic reference were sought. The language of all the items was kept clear. The ambiguous items were rewritten in simple meaningful manner and certain items were eliminated. After preliminary screening of the items, for the administration of the pilot study only 63 statements were retained. The draft was prepared by printing the items and followed Likert model with five alternatives to mark responses. The five response categories were very true of me, true of me, neutral, untrue of me, very untrue of me.

iv) Preliminary Try out of the Tool

A preliminary try out was made to find out the weakness and workability of the items. This step helped the investigators to modify certain items, which were vague and questionable. For this purpose, the preliminary try out was administered on twenty Mathematics teachers. The difficulties in responding the items were noted. Major changes were made in the sentence construction, language and vocabulary. Then the rough draft was administered to high school Mathematics teachers.

v) Pilot study /try-out

The pilot study was conducted with 60 high school Mathematics teachers from the three educational districts viz Kanniyakumari district. A copy of draft form of self-efficacy scale is appended in Appendix- 1B.

vi) Item Analysis

In order to prepare a valid scale, it is necessary to go for item analysis. Item analysis was done as per the instruction given in Anne Anastasia item analysis table (Anastasi & Urbina, 2012). The final Self-efficacy scale consisted of forty four items. Anastasia item analysis was based on item difficulty and item discriminatory power.

The range is from 0 to 100 per cent, higher the value, easier the item. P value above 0.90 is very easy items and might be a concept not worth testing. P values below 0.20 indicate difficult items and should be reviewed for possible confusing language or the content needs reconstruction.

Self-efficacy scale and teaching competency scale were administered to a sample of sixty. The 60 response sheets were arranged on the basis of 20 sheets with the highest and 20 with the lowest test scores. Then the three groups of papers were Upper (U), Middle (M), and Lower (L) respectively. The discriminative value of each item can be found by subtracting the number of persons answering it correctly in the lower group from the number answering it correctly in the upper group.ie, U-L. A measure of item difficulty can be obtained with the same data by adding the number passing each item in all three criterion groups (U+M+L).

A copy of item analysis of the variable Self-efficacy is given in the Appendix-2B

vii) Item Selection

The items for the final scale were selected on the basis of item analysis procedure of Anastasia. Items having high discriminatory power and average difficulty index were

selected. The final form of the self-efficacy scale consisted of forty four items. A copy of final form of Self-efficacy scale is given in the appendix-3B

viii) Scoring

After administering the scale, the next task was to score the scale according to the predetermined scoring key. The positive statement carry a weightage of 5,4,3,2,1 for the answer A,B,C,D & E respectively. ie, A score of five marks is given to very true of me, four marks to true of me, three to neutral, two to untrue of me and one to very untrue of me.

Reliability

For this scale, the researcher decided to use the test-retest method and split-half method of estimating the reliability and the consistency of the measurement. The reliability by test-retest method is the simplest obvious method of obtaining repeated measures for the same individuals of the same ability.

For this, the self-efficacy scale was administered to 60 high school Mathematics teachers. After three weeks, the same scale was given to the same set of sample. The test retest method of reliability was calculated both dimension wise and in total for the Self-efficacy scale. The reliability co-efficient calculated in total was found to be 0.6914. Then by split-half method, the co-efficient of correlation between odd half and even half was calculated both dimension wise and in total and the reliability coefficient in total was found to be 0.7774.

Reliability Coefficient for Self-efficacy scale dimension wise and in total was given below.

Table 3.12

Test-retest Reliability of Self efficacy scale

S. No.	Dimension of Self efficacy	Reliability co-efficient
1	Instructional Self efficacy	0.5400
2	Behavioural Self efficacy	0.7120
3	Cultural Self-efficacy	0.6165
4	Decision making Self-efficacy	0.6301
	Self efficacy	0.6914

Table 3.13

Split -half Reliability of Self efficacy scale

S. No.	Dimension of Self efficacy	Reliability co-efficient
1	Instructional Self efficacy	0.821
2	Behavioural Self efficacy	0.747
3	Cultural Self-efficacy	0.819
4	Decision making Self- efficacy	0.732
	Self efficacy	0.777

Validity

Content validity

For content validity, the final tool was given to the panel of experts in the field of Education, Psychology and Mathematics for evaluating the worthiness of the items in the tool.

Concurrent validity

The Self-efficacy scale was validated by correlating it with Bandura's Instrument Teacher Self-efficacy scale (2014). The validity co-efficient of the scale was found to be 0.85.

c) Teaching Competency Scale

i) Planning

Teaching Competency Scale was developed and validated by Padma Rekha and Sobha (2015) for measuring teaching competency of Mathematics teachers. The dimensions included are a) Performance based competency, b) Affective based competency c) Contextual based competency d) Communication based competency e) Consequence based competency. The investigator identified these dimensions suggested by Konkani (2013) and National Council for Teacher Education (1998). To establish the authenticity of the scale, expert opinion and authentic reference were sought.

ii) Item Writing

The important step in the construction of any research tool was writing of suitable item. After a thorough survey on the available tools, e-resources and the literature, the investigator went for a suitable tool that would measure the important variable of the study, teaching competency of high school mathematics teachers. Experts in the field of education were also consulted and their suggestions were considered. It was decided to include five dimensions in teaching competency scale. The investigator initially pooled 116 statements distributed over five dimensions. They are Performance based competency (22), Affective based competency (25), Contextual

based competency (24), Communication based competency(23) and Consequence based competency(22).

A brief description of the dimensions of Teaching Competency Scale

i) Performance based competency

Instead of mere knowledge the learner demonstrates that he/she can perform some activity rather than simply being aware of facts. Performance based competencies are skills based and overt action oriented. It includes performance in the classroom, school level, out of school activities, parental care and co-operation and community contact. For example the items included were

1. I finish the lesson on time.
2. I go on improving my knowledge.

ii) Affective based competencies:

The affective competencies define the expected attitudes and values and tend to resist specificity. These competencies are expressed in terms of behaviour rather than percept. For example the items such as

1. I accept and encourage student autonomy and initiative.
2. I show respect for the enlightened individual.

iii) Contextual based competency

According to contextual learning theory, learning occurs only when learners process new information or knowledge in such a way that it makes sense to them in their own frames of reference (their own inner worlds of memory, experience, and

response). This approach to learning and teaching assumes that the mind naturally seeks meaning in context—that is, in relation to the person's current environment—and that it does so by searching for relationships that make sense and appear useful. It is necessary for the teachers to understand the forces of contextual interactions in terms of constitutional commitments, government policies, resultant programmes and causes for their success and failure. They need to become aware of the changes around them and the role in bringing about desired changes in the society. For example the items were

1. I give importance to the goals and purposes of individual children while teaching.
2. I understand the importance of education at national level.

iv) Communication based competencies

The teaching process has two major components content and communication. The content of teaching determines method and communication decides the media in organizing teaching. Teacher's communication will be fruitful only when students receive, understand it and learn from it. If learning is to be effective it should be ensured that the communication should be effective. Good communication leads to true learning. Communication based competencies include an ability to sustain dialogue with others and with oneself, which is not limited merely to discussion skills. It is rather a capacity for an empathetic understanding and unconditional acceptance of another person; an ability to offer criticism which is not disparaging but exploratory. Communication competencies include a teacher's capacity to:

- think dialogically and foster the development of dialogic thinking in students;
- use various discursive techniques and non-verbal language in communication in educational contexts;

- understand and accept students' language codes and use them to promote their development
- adjust his/her instructional style and management of students' activities to their level of development and maturity. For example the items such as

1. I use appropriate body movements and gesture while teaching.
2. I think questioning makes the lesson active.

v) Consequence Based Competencies

To demonstrate this competency a person is required to bring change in others. The level of success in not measured by what one knows or does but by what one accomplishes. The achievement of pupils is a standard measure of consequence based competency. For example the items such as

1. I consider language as a set of terms and symbols.
2. I make appropriate change in the interaction pattern.

Construction and validation of Teaching Competency scale

iii) Item Editing

For the feasibility of the administration of the test the items were given to expert evaluation. Finally a total of 82 statements were prepared on the basis of the dimensions of teaching competency. For each statement the five point Likert scale is used. Each statement has five alternatives for responding. They are strongly agree, agree, undecided, disagree and strongly disagree.

iv) Preliminary Try Out

The preliminary try out was carried out on ten teachers to find the relevancy of the items. After some changes were made in the sentence construction and vocabulary only 82 statements were used for pilot study. They are Performance based

competency (16 items), Affective based competency (15 items), Contextual based competency (18 items), Communication based competency (18 items) and Consequence based competency (15 items).

v) Try-out/ Pilot Study

The investigator personally approached 60 high school Mathematics teachers from the three educational districts of Kanniyakumari district to collect the data. A copy of draft form of Teaching Competency scale is given in the Appendix-1C

vi) Item Analysis

Analysis was done as per the instruction given in Anne Anastasia item analysis Table (Anastasi & Urbina 2012) as explained earlier under the development of Self-efficacy scale.

A copy of item analysis of the variable teaching competency is given in the Appendix-2C

vii) Item Selection

The final Teaching Competency scale consisted of 66 items. A copy of final form of Teaching Competency scale is given in the Appendix-3C.

ix) Scoring

The scale consisting of 66 items are rated on five point scale. A score of five marks is given to strongly agree, four marks to agree,, three to undecided, two to disagree and one to strongly disagree.

Reliability

For this scale, the researcher decided to use the test-retest method and split-half method of estimating the reliability and the consistency of the measurement. The reliability by test-retest method is the simplest obvious method of obtaining repeated measures for the same individuals of the same ability.

For this, the draft tool was administered to 60 high school Mathematics teachers. After three weeks, the same scale was given to the same set of sample. The test retest method of reliability was calculated both dimension wise and in total for the Teaching Competency scale. The reliability co-efficient calculated in total was found to be 0.801. Then by split-half method, the co-efficient of correlation between odd half and even half was calculated both dimension wise and in total and the reliability coefficient in total was found to be 0.820.

Table 3.14

Test-retest Reliability of Teaching Competency Scale

S. No.	Dimension of Teaching Competency	Test-retest co-efficient
1	Performance Based Competency	0.820
2	Affective Based Competency	0.712
3	Contextual Based Competency	0.840
4	Communication Based Competency	0.681
5	Consequence Based competency	0.819
	Teaching Competency	0.801

Table 3.15

Split -half Reliability of Teaching Competency Scale

S. No.	Dimension of Teaching Competency	Reliability co-efficient
1	Performance Based Competency	0.883
2	Affective Based Competency	0.811
3	Contextual Based Competency	0.867
4	Communication Based Competency	0.829
5	Consequence Based competency	0.892
	Teaching Competency	0.820

Validity

Content validity

Expert judgment is the preliminary method used to determine whether the test has content validity. The tool was submitted to a group of experts. Based on the suggestions given by experts necessary modifications were carried out.

Concurrent validity

Concurrent validity indicates the extend of its agreement with other available criterion. The present scale was validated by correlating it with teacher competency questionnaire (Shrivastava, 2014). The validity co-efficient of the scale was found to be 0.64

Procedure of Data Collection

The investigator collected data from the three southern districts of Tamil Nadu namely Kanniyakumari, Tirunelveli and Thoothukudi by administering the tools.. The investigator personally met the Mathematics teachers at schools and distributed the three tools along with the personal data sheet. Finally 122 data from Kanniyakumari, 114 from Tirunelveli and 67 from Thoothukudi districts were collected.

Statistical techniques employed

The collected filled in response sheets were scored and the data was tabulated. The tabulated data were subjected to analysis using the following statistical techniques.

The major statistical techniques were selected with respect to the objectives of the study. They are

1. Percentage analysis

Mean is the most common measure of central tendency and may be defined as the value which we get by dividing the total values of given items in a series by the

total number of items. The mean gives us information regarding what the group is and where it stands.(Kothari, 2013).

2. *t* test

SPSS software package was used for analysis. The investigator used an a level of 0.05 for all statistical tests.

In this study t value is interpreted in terms of *p*

If p ≤ 0.05, t is significant at 0.05 level.

P > 0.05, . t is not significant at any level

3. *F* test (ANOVA)

In educational research we may wish to investigate differences between more than two groups. In such case analysis of variance (ANOVA) is used. F-test examines both between or among variance as well as within variance.

For the present study, ANOVA (*F* test) is used to compare the groups formed on the bases of type of management, nature of school, medium of instruction, socio economic status (income), community, age and year of experience of teachers. If the *F* ratio is found to be significant, Scheffe's pair wise analysis test is used for further testing to evaluate mean differences.

4. Correlation

Correlation between sets of data is a measure of how well they are related. Pearson '*r*' is used for estimating the extent of relation existing among the variables, taken in pairs (Garrett, 2004). According to Garrett, the interpretation of co-efficient of correlation '*r*' is stated below:

Table-3.16

Interpretation of r in terms of verbal description

The value of *r*	Verbal Description
.00 to ±.20	Indifferent or negligible relationship
±.20 to ±.40	Low correlation; present but high
±.40 to ±.70	Substantial or marked relationship
±.70 to ±1.00	High to Very high relationship

5. Step-wise Regression Analysis

Regression analysis enables the researcher to predict the specific value of one variable when we know or assume values of the other variables. Multiple regression is used to calculate the effect of two or more independent variables on a dependent variable. It enables us to predict and weight the relationship between two or more explanatory-independent-variables and an explained- dependent-variable (Cohen,Manion& Morrison, 2007).

The stepwise multiple regression enters variables one at a time, in a sequence, to see what adds to the explanatory power of a model, by looking at its impact on the R-squared –whether it increases the R-square value.

In regression analysis, the predictor variables are entered one by one on the basis of the size of contribution of each variable in predicting the criterion variable. Hence, as the first step, predictor variable having the highest correlation with the criterion variable is entered. Then the variable having the next highest correlation is entered second and so on. Preceding **l**ike this a stage comes that, further entering of variables will not make significant change either in the percentage variance or in R. It is an indication that the variable entered last and the remaining variables are not significant predictors of the criterion variable.

Stepwise multiple regression enters variables one at a time, in a sequence, to see which adds to the explanatory power of a model, by looking at its impact on the R-squared-whether it increases the R-square value.

Multiple regression equations were derived to predict teaching competency of high school teachers by using the two predictor variables. The contribution of each predictor variable on teaching competency also can be found out. The regression equation which expresses the relationship between criterion variable and the two predictor variables (X_1 and X_2) in the score form is given by

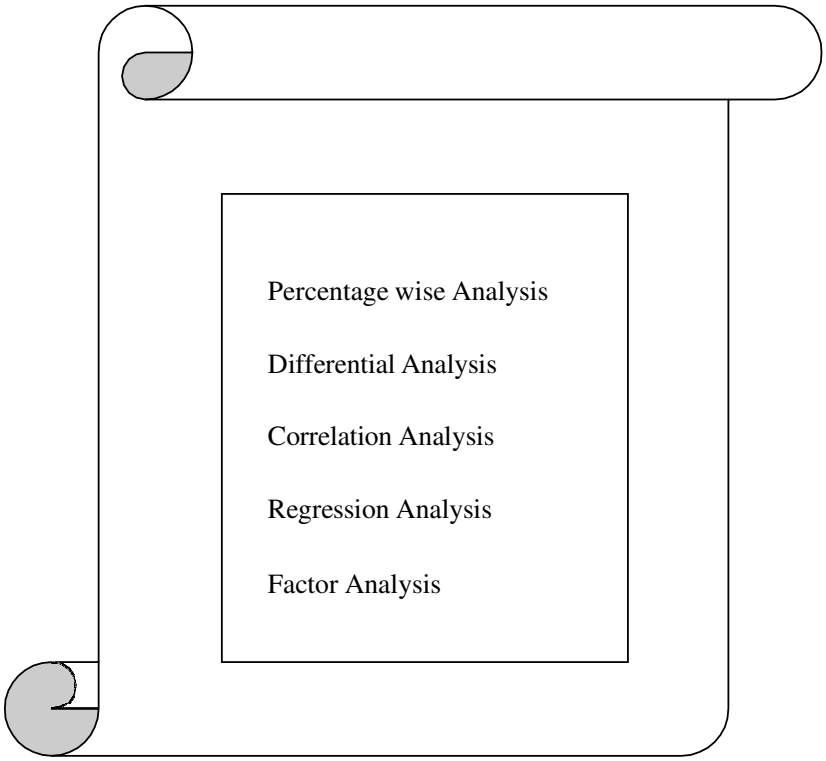
$$Y = B_2X_2 + B_1X_1 + K \text{ (Constant)}.$$

6. Factor analysis

Factor analysis is a method of grouping together variables which have something in common. It is a process which enables the researcher to take a set of variables and reduce them to a smaller number of underlying factors which account for as many variables as possible. It detects structures and commonalities in the relationship between variables. Thus it enables researchers to identify where different variables in fact are addressing the same concept.

CHAPTER-IV

ANALYSIS AND INTERPRETATION OF DATA



"The process of operationalization is critical for effective research" Cohen, Manion and Morison (2007) as research is guided by the drive to find out answers to the questions raised at the point of research germination. In this effort, the analysis of data, that forms the base of interpretations leading to infer conclusions, plays a vital role. "Research data collected through the rich methods may be quantified for analysis purposes" Howitt and Cramer (2011) for reaching this end. Employing appropriate statistical techniques to suit the objectives of research the quantified and tabulated data are statistically treated.

Interpretation of data refers to that important part of the investigation, which is associated with the drawing of inferences from the collected facts after an analytical study. It is the process of establishing relationship between variables. The usefulness of collected data lies in its proper interpretation

The arrived statistical results are presented in this chapter on the following heads:

Percentage Analysis

Differential Analysis

Correlation of Variables.

Regression Analysis

Factor Analysis

Percentage Analysis

The arrived statistical results of percentage analysis of different levels of Metacognition, Self-efficacy, Teaching competency and its dimensions are presented in this section.

a) Percentage analysis of Metacognition and its dimensions.

Table 4.1

Percentage wise distribution of Level of Metacognition and its dimensions of High School Mathematics Teachers

Metacognition and its Dimensions	Low		Moderate		High	
	N	%	*N*	%	*N*	%
Metacognition	33	10.9	243	80.2	27	8.9
Planning	33	10.9	213	70.3	57	18.8
Memory	21	6.9	253	83.5	29	9.6
Monitoring	72	23.8	205	67.7	26	8.6
Evaluation	30	9.9	212	70.0	61	20.1
Achievement	39	12.9	264	87.1	0	0.0

It is inferred from the above table that 10.9% of high school Mathematics teachers have low, 80.2% have moderate and 8.9% have high level of metacognition in total.

10.9% of high school Mathematics teachers have low, 70.3% have moderate and 18.8% have high level of planning.

6.9% of high school Mathematics teachers have low, 83.5% have moderate and 9.6% have high level of memory.

23.8% of high school Mathematics teachers have low, 67.7% have moderate and 8.6% have high level of monitoring.

9.9% of high school Mathematics teachers have low, 70.0% have moderate and 20.1% have high level of evaluation.

12.9% of high school Mathematics teachers have low, 87.1% have moderate and none have high level of achievement.

b) Percentage analysis of Self-efficacy and its dimensions.

Table 4.2

Percentage wise distribution of Level of Self-efficacy and its Dimensions of High School Mathematics Teachers

Self-efficacy and its Dimensions	Low		Moderate		High	
	N	*%*	*N*	*%*	*N*	*%*
Self-efficacy	31	10.2	235	77.6	37	12.2
Instructional self-efficacy	26	8.6	237	78.2	40	13.2
Behavioural self-efficacy	27	8.9	238	78.5	38	12.5
Cultural self-efficacy	146	48.18	94	31.02	63	20.79
Decision making self-efficacy	36	11.9	235	77.6	32	10.5

It is inferred from the above table that10.2% of high school Mathematics teachers have low, 77.6% have moderate and 12.2% have high level of self-efficacy.

8.6% of high school Mathematics teachers have low, 78.2% have moderate and 13.2% have high level of instructional self-efficacy.

8.9% of high school Mathematics teachers have low, 78.5% have moderate and 12.5% have high level of behvioural self-efficacy.

48.18% of high school Mathematics teachers have low, 31.02% have moderate and 20.79% have high level of cultural self-efficacy.

11.9% of high school Mathematics teachers have low, 77.6% have moderate and 10.5% have high level of decision making self-efficacy.

c) Percentage analysis of Teaching competency and its dimensions.

Table 4.3

Percentage wise distribution of level of Teaching Competency and its Dimensions of High School Mathematics Teachers

Teaching Competency and its Dimensions	Low		Moderate		High	
	N	%	*N*	%	*N*	%
Teaching Competency	38	12.5	233	76.9	32	10.6
Performance Based Competency	53	17.5	209	69.0	41	13.5
Affective Based Competency	46	15.2	215	71.0	42	13.8
Contextual Based Competency	43	14.2	225	74.3	35	11.6
Communicative Based Competency	30	9.9	239	78.9	34	11.2
Consequence based competency	32	10.6	230	75.9	41	13.5

It is inferred from the above table that 12.5% of high school Mathematics teachers have low, 76.9% have moderate and 10.6% have high level of teaching competency.

17.5% of high school Mathematics teachers have low, 69.0% have moderate and 13.5% have high level of performance based competency.

15.2% of high school Mathematics teachers have low, 71.0% have moderate and 13.8% have high level of affective based competency.

14.2% of high school Mathematics teachers have low, 74.3% have moderate and 11.6% have high level of contextual based competency.

9.9% of high school Mathematics teachers have low, 78.9% have moderate and 11.2% have high level of communicative based competency.

10.6% of high school Mathematics teachers have low, 75.9% have moderate and 13.5% have high level of consequence based competency.

Differential Analysis

i) Comparison of Metacognition.

a) Comparison of Metacognition based on sex.

The total sample of 303 mathematics teachers comprised of 96 males and 207 females. The *t* test was conducted to compare the metacognition among them. The result of the test of significance of means is shown in table 4.4

Table 4.4

Summary of mean, standard deviation and t value of Metacognition and its dimensions of male and female High School Mathematics Teachers

Metacognition and Dimensions	Sex	Mean	*SD*	*N*	*t*	*p*
Metacognition	Male	43.07	1.74	97	5.36*	0.00
	Female	41.74	2.50	206		
Planning	Male	8.18	0.54	97	2.26*	0.02
	Female	8.02	0.64	206		
Memory	Male	8.84	0.70	97	1.91	0.06
	Female	8.66	0.89	206		
Monitoring	Male	7.66	0.96	97	4.78*	0.00
	Female	7.10	0.93	206		
Evaluation	Male	8.89	0.92	97	2.33*	0.02
	Female	8.62	0.99	206		
Achievement	Male	9.52	0.77	97	1.81	0.07
	Female	9.33	1.00	206		

*Significant at 0.05 level

From the above table 4.4, it is known that the calculated *t* value is 5.36 and $p<0.05$, which is significant at 0.05 level. Hence there exists significant difference in the mean scores of metacognition of male and female teachers. The mean scores of male teachers on metacognition is 43.07 which is higher than that of female teachers whose mean score is 41.74. It may therefore be concluded that the male teachers have significantly higher metacognition than female teachers.

For the dimension planning of metacognition, the *t* value obtained is 2.26 and $p<0.05$, which is significant at 0.05 level. Hence there exists significant difference in the mean scores of male and female teachers in planning. It is also evident that the mean scores of male is 8.18 which is significantly higher than that of female teachers whose mean scores is 8.02. It may therefore be said that male teachers do more planning than female teachers.

For the dimension memory, the *t* value obtained is 1.91 and $p>0.05$, which is not significant at 0.05 level. Hence there exists no significant difference in the mean scores of male and female teachers in their memory level. It may therefore be concluded that memory level of the male and female teachers are to the same extent.

For the dimension Monitoring, the *t* value obtained is 4.78 and $p<0.05$ which is significant at 0.05 level. Hence there exists significant difference in the mean scores of male and female teachers in monitoring. It is also evident that the mean scores of male teachers on monitoring is 7.66 which is higher than that of female students whose mean score is 7.10.

For the dimension Evaluation, the *t* value obtained is 2.33 and $p<0.05$ which is significant at 0.05 level. Hence there exists significant difference in the mean scores of male and female teachers in evaluation. The mean scores of male teachers on evaluation is 8.89 which is higher than that of female teachers whose mean score is 8.62.

For the dimension achievement, the *t* value obtained is 1.81 and $p>0.05$ which is not significant at 0.05 level. Hence there exists no significant difference in the mean scores of male and female teachers in achievement. It may therefore be concluded that achievement level of the male and female teachers are to the same extent.

b) Comparison of Metacognition based on locality.

The *t* test was conducted to compare the metacognition of Mathematics teachers from rural and urban locality. The result of the test of significance of means is shown in table 4.5

Table 4.5

Summary of mean, standard deviation and t value of Metacognition and its dimensions of High School Mathematics Teachers from Rural and Urban locality

Metacognition and Dimensions	Locality	Mean	*SD*	*N*	*t*	*p*
Metacognition	Rural	42.53	1.99	197	3.39*	0.00
	Urban	41.48	2.83	106		
Planning	Rural	8.13	0.57	197	2.17*	0.03
	Urban	7.96	0.69	106		
Memory	Rural	8.74	0.79	197	0.57	0.57
	Urban	8.68	0.92	106		
Monitoring	Rural	7.43	0.97	197	3.72*	0.00
	Urban	7.01	0.92	106		
Evaluation	Rural	8.79	0.95	197	2.00*	0.05
	Urban	8.55	1.02	106		
Achievement	Rural	9.45	0.82	197	1.39	*0.17*
	Urban	9.28	1.11	106		

*Significant at 0.05 level

From the above table 4.5, it is inferred that the calculated *t* value is 3.39 and $p>0.05$, which is significant at 0.05 level. Hence there exists significant difference in the mean scores of teachers from rural and urban locality in metacognition. It is also evident that the mean scores of metacognition of teachers from rural locality is 42.53 which is significantly higher than that of teachers from urban locality whose mean

scores is 41.48. High mean scores associated with rural teachers suggest the superiority of teachers from rural locality over teachers from urban locality in their metacognition.

For the dimension planning the *t* value obtained is 2.17 and $p<0.05$ which is significant at 0.05 level. Hence there exists significant difference in the mean scores of teachers from rural and urban locality in planning. It is also evident that the mean scores of planning of teachers from rural locality is 8.13 which is significantly higher than that of teachers from urban locality whose mean scores is 7.96.

For the dimension memory the obtained value for *t* is 0.57and $p>0.05$, which is not significant at 0.05 level. Hence there exists no significant difference in the mean scores teachers from rural and urban locality in memory.

For the dimension monitoring the *t* value obtained is 3.72 and $p<0.05$, which is significant at 0.05 level. Hence there exists significant difference in the mean scores of teachers from rural and urban locality in monitoring. It is also evident that the mean scores of monitoring of teachers from rural locality is 7.43 which is significantly higher than that of teachers from urban locality whose mean scores is 7.01..

For the dimension evaluation the *t* value obtained is 2.00 and $p<0.05$, which is significant at 0.05 level. Hence there exists significant difference in the mean scores of teachers from rural and urban locality in evaluation. It is also seen that the mean scores of teachers from rural locality on evaluation is 8.79 which is higher than that of teachers from urban locality whose mean score is 8.55.

For achievement the *t* value obtained is 1.39 and $p>0.05$, which is not significant at 0.05 level. Hence there exists no significant difference in the mean scores of teachers from rural and urban locality in achievement.

c) Comparison of Metacognition based on marital status.

The *t* test was conducted to compare the metacognition of 256 married and 47 unmarried teachers. The result of the test of significance of means is shown in table4.6

Table 4.6

Summary of mean, standard deviation and t value of metacognition and its dimensions of married and unmarried High School Mathematics Teachers

Metacognition and Dimensions	Marital status	Mean	*SD*	*N*	*t*	*p*
Metacognition	Married	42.42	2.10	256	3.44*	0.00
	Unmarried	40.77	3.16	47		
Planning	Married	8.13	0.57	256	3.43*	0.00
	Unmarried	7.74	0.74	47		
Memory	Married	8.74	0.83	256	1.27	0.21
	Unmarried	8.57	0.85	47		
Monitoring	Married	7.33	0.98	256	2.10*	0.04
	Unmarried	7.02	0.92	47		
Evaluation	Married	8.82	0.86	256	4.04*	0.00
	Unmarried	8.04	1.27	47		
Achievement	Married	9.39	0.91	256	0.06	*0.95*
	Unmarried	9.38	1.05	47		

*Significant at 0.05 level

From the table 4.6, it is evident that the *t* value obtained for metacognition is 3.44 and $p<0.05$ which is significant at 0.05 level. Hence there exists significant difference in the mean scores of married and unmarried teachers in metacognition. It is also evident that the mean scores of metacognition of married teachers is 42.42 which is significantly higher than that of unmarried teachers whose mean scores is 40.77.

For the dimension planning the calculated *t* value is 3.43 and $p<0.05$ is significant at 0.05 level. Hence there exists significant difference in the mean scores of planning of married and unmarried teachers. It is also evident that the mean scores of planning of married teachers is 8.13 which is significantly higher than that of unmarried teachers whose mean scores is 7.74.

For the dimension memory the *t* value obtained for married and unmarried teachers is 1.27and $p>0.05$ which is not significant at 0.05 level. Hence there exists no significant difference in the mean scores of married and unmarried teachers in memory.

For the dimension monitoring the *t* value obtained is 2.10 and $p<0.05$ which is significant at 0.05 level. Hence there exists significant difference in the mean scores of married and unmarried teachers in monitoring. The mean scores of married teachers on monitoring is 7.33 which is higher than that of unmarried teachers whose mean score is 7.02.

For the dimension evaluation the *t* value obtained for evaluation is 4.04 and $p<0.05$ which is significant at 0.05 level. Hence there exists significant difference in the mean scores in evaluation of married and unmarried teachers. It is also evident that the mean scores of married teachers on evaluation is 8.82 which is higher than that of unmarried teachers whose mean scores is 8.04.

For the dimension achievement the *t* value obtained is 0.06 and $p>0.05$ which is not significant at 0.05 level. Hence there exists no significant difference in the mean scores of married and unmarried teachers in their achievement level.

d) Comparison of Metacognition based on educational qualification.

The *t* test was conducted to compare the metacognition of 106 graduate teachers and 197 post graduate teachers. The result of the test of significance of means is shown in table 4.7

Table 4.7

Summary of mean, standard deviation and t value of Metacognition and its dimensions of Graduate and Post Graduate High School Mathematics Teachers

Dimension	Qualification	Mean	*SD*	*N*	*t*	*p*
Metacognition	Graduation	41.24	3.00	106	4.47*	0.00
	Post Graduation	42.66	1.76	197		
Planning	Graduation	7.89	0.71	106	3.55*	0.00
	Post Graduation	8.17	0.54	197		
Memory	Graduation	8.46	1.05	106	3.47*	0.00
	Post Graduation	8.85	0.66	197		
Monitoring	Graduation	7.09	0.87	106	2.61*	0.01
	Post Graduation	7.38	1.01	197		
Evaluation	Graduation	8.54	1.08	106	2.03*	0.04
	Post Graduation	8.79	0.90	197		
Achievement	Graduation	9.25	1.08	106	1.82	0.07
	Post Graduation	9.47	0.84	197		

*Significant at 0.05 level

The above table 4.7 reveals that the *t* value obtained for metacognition is 4.47 and $p<0.05$ which is significant at 0.05 level. Hence there exists significant difference in the mean scores of graduate and post graduate teachers in their metacognition. It is also seen that the mean scores of metacognition of graduate teachers is 41.24 which is lower than that of post graduate teachers whose mean scores is 42.66. It may therefore be concluded that post graduate teachers have significantly high metacognition than graduate teachers.

For the dimension planning the *t* value obtained for graduate and postgraduate teachers is 3.55 and $p<0.05$ which is significant at 0.05 level. Hence there exists significant difference in the mean scores of graduate and post graduate teachers in planning. It is also seen that the mean scores in planning of graduate teachers is 7.89 which is significantly lower than that of post graduate teachers whose mean scores is 8.17. Therefore, the post graduate teachers have higher level of planning than graduate teachers.

For the dimension memory the calculated *t* value is 3.47 and $p<0.05$ is significant at 0.05 level. Hence there exists significant difference in the mean scores of memory of graduate and post graduate teachers. It is also evident that the mean scores of graduate teachers in memory is 8.46 which is significantly lower than that of post graduate teachers whose mean score is 8.85.

For monitoring the *t* value obtained is 2.613 and $p<0.05$, which is significant at 0.05 level. Hence there exists significant difference in the mean scores of graduate and post graduate teachers in monitoring. It is also evident that the mean scores of graduate teachers in monitoring is 7.09 which is significantly lower than that of post graduate teachers whose mean score is 7.38.

For the dimension evaluation the *t* value obtained is 2.03 and $p<0.05$, which is significant at 0.05 level. Hence there exists significant difference in the mean scores of graduate and post graduate teachers in evaluation. It is also evident that the mean scores of graduate teachers in evaluation is 8.54 which is significantly lower than that of post graduate teachers whose mean score is 8.79.

The t value obtained for the dimension achievement is 1.822 and $p>0.05$, which is not significant at 0.05 level. Hence there exists no significant difference in the mean scores of graduate and post graduate teachers in their achievement.

e) Comparison of Metacognition based on districts.

The *F* test was conducted to compare the metacognition of mathematics teachers from Kanniyakumari, Tirunelveli and Thoothukudi districts. The result of the test of ANOVA is shown in table 4.8

Table 4.8

Summary of F value and Scheffe's values of High School Mathematics Teachers from Kanniyakumari, Tirunelveli and Thoothukudi Districts in their metacognition and its dimensions

Dimension	District	Mean	*SD*	Source	Sum of Squares	df	Mean Square	*F*	*p*
	Kanniyakumari	41.77	2.38	Between Gp	73.84	2	36.92		
Metacognition	Tirunelveli	42.06	2.56	Within Gp	1619.91	300	5.40	6.84*	.001
	Thoothukudi	43.06	1.70	Total	1693.75	302	0.00		
	Kanniyakumari	7.89	0.53	Between Gp	9.39	2	4.69		
Planning	Tirunelveli	8.11	0.68	Within Gp	105.02	300	0.35	13.41*	.000
	Thoothukudi	8.34	0.54	Total	114.40	302	0.00		
	Kanniyakumari	8.54	0.89	Between Gp	7.15	2	3.58		
Memory	Tirunelveli	8.78	0.90	Within Gp	204.44	300	0.68	5.25*	.006
	Thoothukudi	8.93	0.50	Total	211.59	302	0.00		
	Kanniyakumari	7.16	0.94	Between Gp	3.23	2	1.61		
Monitoring	Tirunelveli	7.38	1.03	Within Gp	281.93	300	0.94	1.72	.181
	Thoothukudi	7.34	0.91	Total	285.16	302	0.00		
	Kanniyakumari	8.83	0.94	Between Gp	15.23	2	7.61		
Evaluation	Tirunelveli	8.42	1.00	Within Gp	272.04	300	0.91	2.40	.090
	Thoothukudi	8.96	0.88	Total	287.27	302	0.00		
	Kanniyakumari	9.36	0.98	Between Gp	0.86	2	0.43		
Achievement	Tirunelveli	9.37	0.98	Within Gp	263.40	300	0.88	0.49	.613
	Thoothukudi	9.49	0.77	Total	264.26	302	0.00		

*Significant at 0.05 level

From the table 4.8, it is apparent that the calculated *F* value for metacognition is 6.838 and $p<0.05$, which is significant at 0.05 level. Hence it can be stated that significant difference exists among teachers from Kanniyakumari, Tirunelveli and Thoothukudi districts in their metacognition.

Table 4.9

Summary of Scheffe's values for Metacognition with respect to Districts

District	*N*	Pair	*p* (Scheffe)
Kanniyakumari (A)	122	A Vs B	0.632
Tirunelveli (B)	114	B Vs C	0.021
Thoothukudi (C)	67	A Vs C	0.001

To know the exact significant difference, Scheffe's pair wise comparison (post hoc test) is used. From the table 4.9, high school teachers from the Kanniyakumari and Tirunelveli districts do not differ significantly in their metacognition. But high school teachers from Tirunelveli and Thoothukudi districts and Kanniyakumari and Thoothukudi districts differ significantly in their metacognition. From the mean scores it can be said that the metacognition is higher for the teachers from Thoothukudi district than the teachers from Tirunelveli and Kanniyakumari districts.

For the dimension planning, the calculated *F* value is 13.408 and $p<0.05$, and which is significant at 0.05 level. Hence it can be stated that significant difference exists among teachers from different districts in planning.

Table 4.10

Summary of Scheffe's values for the dimension Planning with respect to districts

District	*N*	Pair	*p* (Scheffe)
Kanniyakumari (A)	122	A Vs B	0.02
Tirunelveli (B)	114	B Vs C	0.04
Thoothukudi (C)	67	A Vs C	0.10

From the table 4.10 high school teachers from the Kanniyakumari and Thoothukudi districts do not differ significantly in their metacognition with respect to planning. But

high school teachers from Kanniyakumari and Tirunelveli and Tirunelveli and Thoothukudi districts differ significantly in their metacognition with respect to planning. From the mean scores it can be said that the metacognition with respect to planning is higher for the teachers from Thoothukudi district than the teachers from Kanniyakumari and Tirunelveli districts.

For the dimension memory, the calculated *F* value is 5.247 and $p<0.05$, and which is significant at 0.05 level. Hence it can be stated that significant difference exist among teachers from different districts in memory.

Table 4.11

Summary of Scheffe's values for the dimension memory with respect to districts

District	*N*	Pair	*p* (Scheffe)
Kanniyakumari (A)	122	A Vs B	0.09
Tirunelveli (B)	114	B Vs C	0.49
Thoothukudi (C)	67	A Vs C	0.01

From the table 4.11 high school Mathematics teachers from Kanniyakumari and Tirunelveli and Tirunelveli and Thoothukudi districts do not differ significantly in their metacognition with respect to memory. But high school teachers from Kanniyakumari and Thoothukudi districts differ significantly in their metacognition with respect to memory. From the mean scores it can be said that the metacognition with respect to memory is higher for the teachers from Thoothukudi district than their counterparts from Kanniyakumari districts.

For the dimensions monitoring, evaluation and achievement the *F* values are 1.72, 2.39and 0.49 and $p> 0.05$. Hence they are not significant at any level. Therefore teachers from Kanniyakumari, Tirunelveli and Thoothukudi districts do not differ

significantly in their metacognition with respect to the dimensions monitoring, evaluation and achievement

f) Comparison of Metacognition based on type of Management.

The *F* test was conducted to compare the metacognition of mathematics teachers from government, aided and self-financing schools. The result of the test of ANOVA is shown in table 4.12

Table 4.12

Summary of F value of High School Mathematics Teachers of Government, Aided and Self-financing institutions in their metacognition and its dimensions

Dimension	Management	Mean	SD	Source	Sum of Squares	df	Mean Square	*F*	*p*
	Government	42.27	2.42	Between Gp	58.64	2	29.32		
Metacognition	Aided	41.75	2.62	Within Gp	1635.11	300	5.45	5.38*	*0.01*
	Self-financing	42.38	1.99	Total	1693.75	302	0.00		
	Government	8.09	0.65	Between Gp	2.36	2	1.18		
Planning	Aided	7.94	0.56	Within Gp	112.04	300	0.37	3.16*	*0.04*
	Self-financing	8.17	0.59	Total	114.40	302	0.00		
	Government	8.68	0.91	Between Gp	5.95	2	2.97		
Memory	Aided	8.55	0.91	Within Gp	205.64	300	0.69	1.07	0.35
	Self-financing	8.92	0.58	Total	211.59	302	0.00		
	Government	7.43	0.96	Between Gp	6.54	2	3.27		
Monitoring	Aided	7.23	0.91	Within Gp	278.62	300	0.93	3.52*	*0.03*
	Self-financing	7.09	1.01	Total	285.16	302	0.00		
	Government	8.76	0.90	Between Gp	1.13	2	0.56		
Evaluation	Aided	8.69	0.88	Within Gp	286.14	300	0.95	0.59	*0.56*
	Self-financing	8.62	1.16	Total	287.27	302	0.00		
	Government	9.30	0.93	Between Gp	4.16	2	2.08		
Achievement	Aided	9.35	1.09	Within Gp	260.10	300	0.87	2.39	*0.09*
	Self-financing	9.57	0.76	Total	264.26	302	0.00		

*Significant at 0.05 level

It is evident that the calculated *F* value for Metacognition is 5.38 and $p<0.05$ and is significant at 0.05 level. Therefore teachers from self-financing, aided and

government schools differ in their metacognition. Hence it can be stated that significant difference exists among teachers from government, aided and self-financing schools in their metacognition.

Table 4.13

Summary of Scheffe's values for Metacognition with respect to Type of management

Management	*N*	Pair	*p* (Scheffe)
Government (A)	136	A Vs B	0.06
Aided (B)	80	B Vs C	0.01
Self-financing (C)	87	A Vs C	0.53

From the table 4.13, teachers from the government and aided and government and self-financing institution do not differ significantly in their metacognition with respect to planning. But high school teachers from aided and self- financing sectors differ significantly in their metacognition.

For the dimension planning, the calculated F value is 3.16 and $p<0.05$ and therefore it is significant at 0.05 level. Hence it can be stated that significant difference exists among teachers from government, aided and self-financing schools in planning.

Table 4.14

Summary of Scheffe's values for the dimension planning with respect to Type of management

Management	*N*	Pair	*p* (Scheffe)
Government (A)	136	A Vs B	0.22
Aided (B)	80	B Vs C	0.05
Self-financing (C)	87	A Vs C	0.64

From the table 4.14, high school teachers from the government and aided and government and self-financing institutions do not differ significantly in their

metacognition with respect to planning. But high school teachers from aided and self-financing sectors differ significantly in their metacognition with respect to planning.

For the dimension memory, the calculated *F* value is 1.066 and $p>0.05$ and hence is not significant at 0.05 level. Hence it can be stated that significant difference does not exist among teachers from different types of management in their metacognition with respect to memory.

For the dimension monitoring, the calculated *F* value is 3.519 and $p<0.05$and which is significant at 0.05 level. Hence it can be stated that significant difference exist among teachers from different types of management in their metacognition with respect to monitoring.

Table 4.15

Summary of Scheffe's values for the dimension monitoring with respect to Type of management

Management	*N*	Pair	*p* (Scheffe)
Government (A)	136	A Vs B	0.34
Aided (B)	80	B Vs C	0.65
Self-financing(C)	87	A Vs C	0.04

From the table, 4.15 high school teachers from the government and self-financing institutions differ significantly in their metacognition with respect to monitoring. From the mean scores it can be said that the metacognition with respect to monitoring is higher for the teachers from government schools than the teachers from self-financing schools.

For the dimension, evaluation and achievement the calculated *F* values are 0.059 and 2.399 and $p>0.05$. Hence it is not significant at any level. Therefore it can be said teachers from schools with different types of management do not differ

significantly in their metacognition with respect to the dimensions evaluation and achievement.

g) Comparison of Metacognition based on nature of school.

The *F* test was conducted to compare the metacognition of Mathematics teachers from boys, girls and co-education schools. The result of the test of significance of ANOVA is shown in table 4.16

Table 4.16

Summary of F value and Scheffe's values of High School Mathematics Teachers of Boys, Girls and Co-education schools in their metacognition and its dimensions

Dimension	Nature of school	Mean	SD	Source	Sum of Squares	df	Mean Square	*F*	*p*
	Boys	41.74	2.52	Between Gp	10.27	2	5.13		
Metacognition	Girls	42.51	1.99	Within Gp	1683.48	300	5.61	0.915	0.402
	Co-education	42.16	2.41	Total	1693.75	302	0.00		
	Boys	7.90	0.65	Between Gp	2.22	2	1.11		
Planning	Girls	8.26	0.64	Within Gp	112.18	300	0.37	2.972	0.053
	Co-education	8.06	0.60	Total	114.40	302	0.00		
	Boys	8.55	0.72	Between Gp	1.53	2	0.77		
Memory	Girls	8.85	0.87	Within Gp	210.06	300	0.70	1.094	0.336
	Co-education	8.72	0.84	Total	211.59	302	0.00		
	Boys	7.48	0.93	Between Gp	1.70	2	0.85		
Monitoring	Girls	7.18	0.79	Within Gp	283.45	300	0.94	0.902	0.407
	Co-education	7.27	1.00	Total	285.16	302	0.00		
	Boys	8.71	0.97	Between Gp	0.06	2	0.03		
Evaluation	Girls	8.67	0.96	Within Gp	287.21	300	0.96	0.031	0.970
	Co-education	8.71	0.98	Total	287.27	302	0.00		
	Boys	9.10	1.22	Between Gp	3.89	2	1.94		
Achievement	Girls	9.56	0.64	Within Gp	260.38	300	0.87	2.239	0.108
	Co-education	9.40	0.93	Total	264.26	302	0.00		

From the table 4.16 it is apparent that the *F* value for metacognition is 0.915 and $p>0.05$ which is not significant at 0.05 level. Therefore it can be stated that

teachers from boys, girls and co-education schools do not differ significantly in their metacognition

For the dimensions of metacognition namely planning, memory, monitoring, evaluation and achievement the corresponding *F* values are 0.91, 2.972, 1.094, 0.902, 0.031 and 2.239 and $p>0.05$. Hence the high school teachers from boys, girls and co-education schools do not differ significantly in their metacognition with respect to its dimensions.

h) Comparison of Metacognition based on income

The *F* test was used to compare the metacognition of teachers based on their income Rs.5,000-10,000, Rs.11,000- 15,000, 16,000-20,000 ,Rs.21,000- 25,000 and Rs.26000 & above. The result of the test of ANOVA is shown in table 4.17

Table 4.17

Summary of F value and Scheffe's values of High School Mathematics Teachers of various levels of income in their metacognition and its dimensions

Metacognition	Income	Mean	*SD*	Source	Sum of Squares	df	Mean Square	*F*	*p*
	Rs.5,000-10,000	41.76	2.28	Between Gp	20.62	4	5.15576		
	Rs.11,000-15000	42.06	2.79	Within Gp	1673.13	298	5.61452		
Metacognition	Rs.16000-20000	42.73	1.95	Total	1693.75	302		0.92	0.453
	Rs.21000- 25000	41.44	3.71						
	Rs.26000 & above	42.29	2.27						
	Rs.5,000-10,000	8.18	0.55	Between Gp	1.55539	4	0.38885		
	Rs.11,000-15000	8.03	0.6	Within Gp	112.847	298	0.37868		
Planning	Rs.16000-20000	8.00	0.77	Total	114.403	302		1.03	0.393
	Rs.21000- 25000	7.78	1.09						
	Rs.26000 & above	8.07	0.6						
	Rs.5,000-10,000	8.71	0.76	Between Gp	1.0822047	4	0.270551		
	Rs.11,000-15000	8.87	0.96	Within Gp	210.50855	298	0.706405		
Memory	Rs.16000-20000	8.82	0.75	Total	211.59076	302		0.39	0.821
	Rs.21000- 25000	8.78	0.67						
	Rs.26000 & above	8.69	0.85						
	Rs.5,000-10,000	6.82	0.88	Between Gp	16.827	4	4.20675		
	Rs.11,000-15000	7.19	1.11	Within Gp	268.328	298	0.90043		
Monitoring	Rs.16000-20000	7.73	0.65	Total	285.155	302		4.67*	0.001
	Rs.21000- 25000	7.44	0.73						
	Rs.26000 & above	7.39	0.96						
	Rs.5,000-10,000	8.62	1.16	Between Gp	4.7706151	4	1.192654		
	Rs.11,000-15000	8.52	1.39	Within Gp	282.49671	298	0.947976		
Evaluation	Rs.16000-20000	8.45	0.69	Total	287.26733	302		1.26	0.287
	Rs.21000- 25000	8.33	1						
	Rs.26000 & above	8.79	0.84						
	Rs.5,000-10,000	9.44	1.05	Between Gp	2.30335	4	0.57584		
	Rs.11,000-15000	9.45	0.81	Within Gp	261.961	298	0.87906		
Achievement	Rs.16000-20000	9.73	0.65	Total	264.264	302		0.66	0.623
	Rs.21000- 25000	9.11	1.17						
	Rs.26000 & above	9.37	0.92						

*Significant at 0.05 level

From the above table 4.17, it is clear that *F* value for metacognition is 0.92 and $p>0.05$ and is not significant statistically. It may therefore be said that the teachers based on their income do not differ significantly in their metacognition.

For the dimensions of metacognition namely planning and memory the corresponding *F* values are 1.03 and 0.39 and $p>0.05$. Hence the high school teachers based on their income do not differ significantly in their metacognition with respect to its dimensions planning and memory.

For the dimension monitoring the *F* value is 4.67 and $p<0.05$ and is significant at 0.05 level. Hence it can be stated that significant difference exists among teachers based on their income in their metacognition with respect to monitoring.

Table 4.18

Summary of Scheffe's values for the dimension monitoring with respect to income

Income	*N*	Pair	*p* (Scheffe)
Rs.5,000-10,000 (A)	55	A Vs B	0.556
Rs.11,000-15000 (B)	31	B Vs C	0.622
Rs.16000-20000 (C)	11	A Vs C	0.080
Rs.21000- 25000 (D)	9	A Vs D	0.510
Rs.26000 & above (E)	197	B Vs D	0.975
		C Vs D	0.977
		A Vs E	0.004
		B Vs E	0.879
		C Vs E	0.855
		D Vs E	1.000

To know the exact significant difference, Scheffe's pair wise comparison (post hoc test) was used. From the table 4.18 difference between pairs (A Vs B) (B Vs C) (A Vs C) (A Vs D) (B Vs D) (C Vs D) (B Vs E) (C Vs E) (D Vs E) are found to be not significant. But difference between pairs (A Vs E) is statistically found to be significant. The mean scores A (6.82) is lower than that of E (7.39). Hence it can be said that teachers in the income level Rs. 5000-10,000 is found to be lower in monitoring than teachers with income Rs.26000 and above.

For the dimensions of metacognition namely evaluation and achievement the corresponding *F* values are 1.258 and 0.655 and p>0.05. Hence the high school teachers do not differ significantly in their metacognition with respect to its dimensions evaluation and achievement based on their income.

i) Comparison of Metacognition based on years of experience

The *F* test was used to compare the metacognition based on year of experience among 1-5 years, 6-10 years, 11-15 years, 16-20 years and 21 and above. The result of the test of ANOVA is shown in table 4.19

The *F* test was conducted to compare the metacognition of Mathematics teachers with different years of experience. The result of the test of significance of means is shown in table 4.19

Table: 4.19

Summary of F value and Scheffe's values of High School Mathematics Teachers with different years of experience in their metacognition and its dimensions

Dimension	Year of Experience	Mean	*SD*	Source	Sum of Squares	df	Mean Square	*F*	*p*
	1-5 Years	41.41	2.37	Between Gp	113.86	4	28.47		
	6-10 Years	42.21	2.48	Within Gp	1579.89	298	5.30		
Metacognition	11-15 Years	42.43	2.32	Total	1693.75	302	0.00	5.37*	0.00
	16-20 Years	42.05	1.87						
	21 & above Years	43.73	1.19						
	1-5 Years	7.93	0.59	Between Gp	5.38	4	1.34		
	6-10 Years	8.10	0.59	Within Gp	109.02	298	0.37		
Planning	11-15 Years	8.10	0.68	Total	114.40	302	0.00	3.68*	0.006
	16-20 Years	7.95	0.52						
	21 & above Years	8.42	0.58						
	1-5 Years	8.66	0.65	Between Gp	2.07	4	0.52		
	6-10 Years	8.69	0.88	Within Gp	209.52	298	0.70		
Memory	11-15 Years	8.68	1.03	Total	211.59	302	0.00	0.74	0.569
	16-20 Years	8.89	0.66						
	21 & above Years	8.92	0.74						
	1-5 Years	6.95	0.81	Between Gp	22.82	4	5.71		
	6-10 Years	7.34	1.08	Within Gp	262.33	298	0.88		
Monitoring	11-15 Years	7.38	0.90	Total	285.16	302	0.00	6.48*	0.000
	16-20 Years	7.05	0.85						
	21 & above Years	7.96	0.72						
	1-5 Years	8.56	1.17	Between Gp	4.54	4	1.14		
	6-10 Years	8.74	0.91	Within Gp	282.73	298	0.95		
Evaluation	11-15 Years	8.80	0.73	Total	287.27	302	0.00	1.20	0.312
	16-20 Years	8.47	1.26						
	21 & above Years	8.92	0.84						
	1-5 Years	9.31	1.16	Between Gp	3.10	4	0.77		
	6-10 Years	9.34	0.92	Within Gp	261.17	298	0.88		
Achievement	11-15 Years	9.47	0.79	Total	264.26	302	0.00	0.88	0.474
	16-20 Years	9.68	0.58						
	21 & above Years	9.50	0.71						

*Significant at 0.05 level

From the above table, 4.19, it is clear that *F* value for metacognition is 5.369, and $p<0.05$ and is significant statistically at 0.05 level. It may therefore be said that there exist significant difference among teachers with different years of experience in metacognition.

Table 4.20

Summary of Scheffe's values for Metacognition with respect to years of experience

Year of Experience	*N*	Pair	*p* (Scheffe)
1-5 Years (A)	80	A Vs B	0.221
6-10 Years (B)	118	B Vs C	0.985
11-15 Years (C)	60	A Vs C	0.154
16-20 Years (D)	19	A Vs D	0.880
21 & above Years (E)	26	B Vs D	0.999
		C Vs D	0.983
		A Vs E	0.001
		B Vs E	0.057
		C Vs E	0.219
		D Vs E	0.214

From the table difference between pairs (A Vs B) (B Vs C) (A Vs C) (A Vs D) (B Vs D) (C Vs D) (B Vs E) (C Vs E) (D Vs E) are found to be not significant. But difference between pairs (A Vs E) is statistically found to be significant at 0.05 level. The mean scores A (41.41) is lower than that of E (43.73). Hence it can be said that metacognition of teachers with 1-5 years of experience is lower than that of teachers with 21 and more years of experience. .

F value for planning is 3.68, and $p<0.05$ and is significant at 0.05 level. It may therefore be said that there exists significant difference among teachers with different years of experience in planning.

Table 4.21

Summary of Scheffe's values for the dimension planning with respect to years of experience

Year of Experience	*N*	Pair	*p* (Scheffe)
1-5 Years (A)	80	A Vs B	0.440
6-10 Years (B)	118	B Vs C	1.000
11-15 Years (C)	60	A Vs C	0.608
16-20 Years (D)	19	A Vs D	1.000
21 & above Years (E)	26	B Vs D	0.909
		C Vs D	0.926
		A Vs E	0.013
		B Vs E	0.205
		C Vs E	0.282
		D Vs E	0.160

From the table 4.21 difference between pairs (A Vs B) (B Vs C) (A Vs C) (A Vs D) (B Vs D) (C Vs D) (B Vs E) (C Vs E) (D Vs E) are found to be not significant. But difference between pairs (A Vs E) is statistically found to be significant at 0.05 level. The mean scores A (7.93) is lower than that of E (8.42). Hence it can be said with respect to planning teachers with 1-5 years of experience are at lower level than teachers with 21 and above years of experience. .

F value for memory is 0.74 and $p>0.05$ and is not significant statistically. It may therefore be said that the teachers with different years of experience have more or less same level of metacognition with respect to memory.

F value for monitoring is 6.48 $p<0.05$ and is significant statistically at 0.05 level. It may therefore be said that there exists significant difference among teachers with different years of experience in monitoring.

Table 4.22

Summary of Scheffe's values for the dimension Monitoring with respect to years of experience

Year of Experience	*N*	Pair	*p* (Scheffe)
1-5 Years (A)	80	A Vs B	0.086
6-10 Years (B)	118	B Vs C	0.999
11-15 Years (C)	60	A Vs C	0.129
16-20 Years (D)	19	A Vs D	0.996
21 & above Years (E)	26	B Vs D	0.815
		C Vs D	0.775
		A Vs E	0.000
		B Vs E	0.056
		C Vs E	0.143
		D Vs E	0.037

From the table 4.22, difference between pairs (A Vs B) (B Vs C) (A Vs C) (A Vs D) (B Vs D) (C Vs D) (B Vs E) (C Vs E) are found to be not significant. But difference between pairs (A Vs E) and (D Vs E) is statistically found to be significant at 0.05 level. The mean scores A (6.95) is lower than that of E (7.96). Hence it can be said that with respect to monitoring teachers with 1-5 years of experience are at lower level than teachers with 21 and above years of experience. The mean scores D (7.05) is lower than that of E (7.96). Hence it can be said that monitoring of teachers with 16-20 Years of experience is lower than that of teachers with 21 and above years of experience.

For the dimensions evaluation and achievement the *F* values are 1.20 and 0.88 and $p>0.05$ which is not significant statistically. It may therefore be said that significant difference exists among teachers with different years of experience with respect to the dimension evaluation in metacognition.

ii) Self-efficacy

a) Comparison of Self-efficacy based on sex

The total sample of 303 mathematics teachers comprised of 96 males and 207 females. The *t* test was conducted to compare the self-efficacy among them. The result of the test of significance of means is shown in table 4.23

Table 4.23

Summary *of mean, standard deviation and t value of Self-efficacy and its dimensions of male and female High School Mathematics Teachers*

Dimensions	Sex	Mean	*S.D.*	*N*	Calculated '*t*' value	*p* value
Self-efficacy	Male	191.83	14.704	96	2.40*	0.017
	Female	187	19.349	207		
Instructional Self-efficacy	Male	39.8	3.463	96	0.65	0.514
	Female	39.51	4.043	207		
Behavioural Self-efficacy	Male	48.51	4.106	96	2.20*	0.029
	Female	47.3	5.097	207		
Cultural Self-efficacy	Male	42.81	4.158	96	2.43*	0.016
	Female	41.43	5.485	207		
Decision making Self-efficacy	Male	60.71	5.789	96	2.54*	0.012
	Female	58.76	7.039	207		

*Significant at 0.05 level

From the above table 4.23, it is known that the calculated *t* value obtained for self-efficacy is 2.40 and $p<0.05$ which is significant at 0.05 level. Hence there exists significant difference in the mean scores of self-efficacy of male and female teachers. The mean scores of male teachers on self-efficacy is 191.83 which is higher than that of female teachers whose mean score is 187.00. It may therefore be concluded that the male teachers have significantly higher self-efficacy than female teachers.

For instructional self-efficacy the *t* value obtained is 0.65 and $p>0.05$, which is not significant at 0.05 level. Hence there exists no significant difference in the mean scores of male and female teachers in instructional self-efficacy.

For behavioural self-efficacy the *t* value obtained is 2.20 and $p<0.05$ which is significant at 0.05 level. Hence there exists significant difference in the mean scores of male and female teachers in behavioural self-efficacy. It is also seen that the mean scores of male teachers on behavioural self-efficacy is 48.51 which is higher than that of female teachers whose mean score is 47.30. It may therefore be said that the male teachers have significantly higher level of behavioural self-efficacy than female teachers.

For cultural self-efficacy the *t* value obtained is 2.43 and $p<0.05$, which is significant at 0.05 level. Hence there exists significant difference in the mean scores of male and female teachers in cultural self-efficacy. It is also evident that the mean scores of male teachers on cultural self-efficacy is 42.81 which is higher than that of female students whose mean score is 41.43. It may therefore be said that the male teachers have significantly higher level of cultural self-efficacy than female teachers

For decision making self-efficacy the *t* value obtained is 2.54 and $p<0.05$ which is significant at 0.05 level. Hence there exists significant difference in the mean scores of male and female teachers in decision making self-efficacy. The mean scores of male teachers on decision making self-efficacy is 60.71 which is higher than that of female teachers whose mean score is 58.76. It may therefore be said that the male teachers have significantly higher level of decision making self-efficacy than female teachers

b) Comparison of self-efficacy based on locality of teachers

The *t* test was conducted to compare the self-efficacy of Mathematics teachers from rural and urban locality. The result of the test of significance of means is shown in table 4.24

Table 4.24

Summary of mean, standard deviation and t value of self-efficacy and its dimensions of Rural and Urban High School Mathematics Teachers

Dimensions	Locality	Mean	*S.D.*	*N*	Calculated '*t*' value	*p* value
Self-efficacy	Rural	188.89	19.029	197	3.56*	0.000
	Urban	187.86	16.373	106		
Instructional self-efficacy	Rural	39.86	3.932	197	1.61	0.108
	Urban	39.12	3.71	106		
Behavioural self-efficacy	Rural	47.85	5.13	197	0.87	0.388
	Urban	47.38	4.226	106		
Cultural self-efficacy	Rural	58.56	7.425	197	2.56*	0.011
	Urban	63.46	5.507	106		
Decision making self-efficacy	Rural	59.24	6.933	197	0.51	0.61
	Urban	59.64	6.329	106		

*Significant at 0.05 level

From the above table 4.24, it is inferred that the obtained value of *t* for self-efficacy is 3.56 and $p < 0.05$ which is significant at 0.05 level. Hence there exists significant difference in the mean scores of teachers from rural and urban locality in self-efficacy. It may therefore be said that teachers from rural locality have more or less same level of self-efficacy than teachers from rural locality .

For instructional self-efficacy the obtained *t* value is 1.61 and $p > 0.05$, which is not significant at 0.05 level. Hence there exists no significant difference in the mean scores of rural and urban teachers in instructional self-efficacy. It may therefore be concluded that instructional self-efficacy of the teachers from rural and urban locality are more or less of same extent.

For behavioural self-efficacy the *t* value obtained is 0.87 and $p > 0.05$ which is not significant at 0.05 level. Hence there exists no significant difference in the mean scores of rural and urban teachers in behavioural self-efficacy. It may therefore said

that teachers from rural and urban area show more or less same level of behavioural self-efficacy.

For cultural self-efficacy the *t* value obtained is 2.56 and $p<0.05$, which is significant at 0.05 level. Hence there exists significant difference in the mean scores of cultural self-efficacy of rural and urban teachers. It is also evident that the mean scores of rural teachers are 58.56 which is significantly lower than that of urban teachers whose mean score is 63.46. It may therefore be said that the teachers from rural area show significantly lower cultural self-efficacy than teachers from urban locality.

For decision making self-efficacy the *t* value obtained is 0.51 and $p>0.05$, which is not significant at 0.05 level. Hence there exists no significant difference in the mean scores of rural and urban teachers in decision making self-efficacy. It may therefore be concluded that decision making self-efficacy of the rural and urban teachers are to the same extent.

c) Comparison of Self-efficacy based on marital status

The *t* test was conducted to compare the metacognition of 256 married and 47 unmarried teachers. The result of the test of significance of means is shown in table 4.25

Table 4.25

Summary of mean, standard deviation and t value of Self-efficacy and its dimensions of Married and Unmarried High School Mathematics Teachers

Self-efficacy and its Dimensions	Marital Status	Mean	*S.D.*	*N*	Calculated '*t*' value	*p* value
Self-efficacy	Married	187.69	18.80	256	2.42*	0.016
	Unmarried	193.13	13.12	47		
Instructional self-efficacy	Married	39.49	4.01	256	1.40	0.162
	Unmarried	40.19	2.95	47		
Behavioural self-efficacy	Married	47.52	4.99	256	1.72	0.087
	Unmarried	48.6	3.72	47		
Cultural self-efficacy	Married	41.68	5.26	256	1.63	0.103
	Unmarried	42.85	4.35	47		
Decision Making self-efficacy	Married	58.99	6.89	256	2.84*	0.005
	Unmarried	61.49	5.25	47		

From the table 4.25, it is evident that the *t* value obtained for self-efficacy is 2.42 and $p<0.05$ which is significant at 0.05 level. Hence there exists significant difference in the mean scores of married and unmarried teachers in self-efficacy. It is also evident that the mean scores of self-efficacy of married teachers is 187.69 which is significantly lower than that of unmarried teachers whose mean scores is 193.13. It may therefore be said that married teachers have lower self-efficacy than that of unmarried teachers.

For instructional self-efficacy the *t* value obtained for married and unmarried teachers is 1.40 and $p>0.05$, which is not significant at 0.05 level. Hence there exists no significant difference in the mean scores of married and unmarried teachers in their instructional self-efficacy.

For behavioural self-efficacy the *t* value obtained is 1.72 and $p>0.05$, which is not significant at 0.05 level. Hence there exists no significant difference in the mean scores of married and unmarried teachers in behavioural self-efficacy.

For cultural self-efficacy the t value obtained is 1.634 and $p>0.05$, which is not significant at 0.05 level. Hence there exists no significant difference in the mean scores of married and unmarried teachers in their cultural self-efficacy.

For decision making self-efficacy the calculated t value is 2.84 and $p<0.05$ is significant at 0.05 level. Hence there exists significant difference in the mean scores of decision making self-efficacy. It is also evident that the mean scores of decision mking self-efficacy of married teachers is 58.99 which is significantly lower than that of unmarried teachers whose mean scores is 61.49. Therefore, the unmarried teachers have shown higher level decision making self-efficacy than that of married teachers.

d) Comparison of Self-efficacy based on educational qualification

The t test was conducted to compare the metacognition of 106 graduate teachers and 197 post graduate teachers. The result of the test of significance of means is shown in table 4.26

Table 4.26

Summary of mean, standard deviation and t value of Self-efficacy of Graduate and Post Graduate High School Mathematics Teachers

Dimension	Qualification	Mean	*SD*	*N*	*t*	*p*
Self-efficacy	Graduation	183.37	22.16	106	3.31*	0.001
	Post Graduation	191.31	14.86	197		
Instructional self-efficacy	Graduation	38.45	4.53	106	3.56*	0.000
	Post Graduation	40.22	3.31	197		
Behavioural self-efficacy	Graduation	46.43	6.00	106	2.99*	0.003
	Post Graduation	48.36	3.92	197		
Cultural self-efficacy	Graduation	40.73	6.09	106	2.61*	0.010
	Post Graduation	42.48	4.44	197		
Decision making self-efficacy	Graduation	57.75	7.86	106	2.87*	0.004
	Post Graduation	60.25	5.85	197		

*-Significant at 0.05 level

The above table 4.26 that the *t* value obtained for self-efficacy is 3.31and p<0.05, which is significant at 0.05 level. Hence there exists significant difference in the mean scores of self-efficacy of graduate and post graduate teachers. It is also evident that the mean scores of self-efficacy of graduate teachers is 183.37 which is significantly lower than that of post graduate teachers whose mean scores is 191.31. It may therefore be said that post graduate teachers have significantly higher self-efficacy than graduate teachers.

For instructional self-efficacy the *t* value obtained for graduate and post graduate teachers is 3.56 and *p*<0.05, which is significant at 0.05 level. Hence there exists significant difference in the mean scores of graduate and post graduate teachers in instructional self-efficacy. It is also evident that the mean scores of instructional self-efficacy of graduate teachers is 38.45 which is significantly lower than that of post graduate teachers whose mean scores is 40.22. It may therefore be said that instructional self-efficacy of the graduate teachers is less than that of the post graduate teachers.

For behavioural self-efficacy the calculated *t* value is 2.99 and *p*<0.05, which is significant at 0.05 level. Hence there exists significant difference in the mean scores of behavioural self-efficacy of graduate and post graduate teachers. It is also evident that the mean scores of behavioural self-efficacy of graduate teachers is 46.43 which is significantly lower than that of post graduate teachers whose mean scores is 48.36. Therefore it is evident that graduate teachers have low behavioural self-efficacy than that of post graduate teachers.

For cultural self-efficacy the *t* value obtained is 2.61 and *p*<0.05, which is significant at 0.05 level. Hence there exists significant difference in the mean scores of graduate and post graduate teachers in cultural self-efficacy. It is also seen that the

mean scores of graduate teachers on cultural self-efficacy is 40.73 which is lower than that of post graduate teachers whose mean score is 42.48. Therefore it is evident that graduate teachers have low behavioural self-efficacy than post graduate teachers.

For decision making self-efficacy the *t* value obtained is 2.87 and $p<0.05$ which is significant at 0.05 level. Hence there exists significant difference in the mean scores of graduate and post graduate teachers in decision making self-efficacy. It is also evident that the mean scores of decision making self-efficacy of graduate teachers is 57.75 which is significantly lower than that of post graduate teachers whose mean scores is 60.25. Therefore, the post graduate teachers have higher level of decision making self-efficacy than graduate teachers.

e) Comparison of Self-efficacy based on districts

The *F* test was conducted to compare the self-efficacy of mathematics teachers from Kanniyakumari, Tirunelveli and Thoothukudi districts. The result of the test of ANOVA is shown in table 4.27

Table 4.27

Summary of F value and Scheffe's values of High School Mathematics Teachers from Kanniyakumari, Tirunelveli and Thoothukudi Districts in their metacognition and its dimensions

Dimension	District	Mean	SD	Source	Sum of Squares	df	Mean Square	*F*	*p*
Self-efficacy	Kanniyakumari	189.12	22.67	Between Gp	2828.90	2	1414.45	4.40*	*0.013*
	Tirunelveli	185.14	13.87	Within Gp	96362.55	300	321.21		
	Thoothukudi	193.22	13.73	Total	99191.45	302	0.00		
Instructional self-efficacy	Kanniyakumari	40.07	4.40	Between Gp	128.75	2	64.37	4.41*	*0.013*
	Tirunelveli	38.76	3.43	Within Gp	4383.93	300	14.61		
	Thoothukudi	40.18	3.29	Total	4512.68	302	0.00		
Behavioural self-efficacy	Kanniyakumari	47.96	5.92	Between Gp	195.84	2	97.92	4.29*	*0.015*
	Tirunelveli	46.74	3.88	Within Gp	6853.38	300	22.84		
	Thoothukudi	48.81	3.73	Total	7049.21	302	0.00		
Cultural self-efficacy	Kanniyakumari	41.52	6.41	Between Gp	119.84	2	59.92	2.29	*0.103*
	Tirunelveli	41.54	4.03	Within Gp	7847.61	300	26.16		
	Thoothukudi	43.04	3.97	Total	7967.45	302	0.00		
Decision . making self-efficacy	Kanniyakumari	59.58	7.98	Between Gp	413.26	2	206.63	4.69*	*0.010*
	Tirunelveli	58.10	5.66	Within Gp	13224.10	300	44.08		
	Thoothukudi	61.19	5.37	Total	13637.35	302	0.00		

*Significant at 0.05 level

From the table 4.27 it is apparent that the *F* value for self-efficacy is 4.40 and $p<0.05$, which is significant at 0.05 level. Hence it can be stated that significant difference exists among teachers from different districts in their self-efficacy.

Table 4.28

Summary of Scheffe's values for Self-efficacy with respect to Districts

District	*N*	Pair	*p* (Scheffe)
Kanniyakumari (A)	122	A Vs B	0.235
Tirunelveli (B)	114	B Vs C	0.015
Thoothukudi (C)	67	A Vs C	0.324

To know the exact significant difference, Scheffe's pair wise comparison (post hoc test) was used. From the table 4.28 high school teachers from the Kanniyakumari and Tirunelveli districts and Kanniyakumari and Thoothukudi districts do not differ significantly in their self-efficacy. But high school teachers from Tirunelveli and Thoothukudi districts differ significantly in their self-efficacy. From the mean scores it can be said that the self-efficacy is higher for the teachers from Thoothukudi district than the Tirunelveli and Kanniyakumari districts.

For the dimension instructional self-efficacy, the calculated *F* value is 4.41and $p<0.05$, and which is significant at 0.05 level. Hence it can be stated that significant difference exists among teachers from different districts in their instructional self-efficacy.

Table 4.29

Summary of Scheffe's values for the dimension Instructional Self-efficacy with respect to Districts

District	*N*	Pair	*p* (Scheffe)
Kanniyakumari (A)	122	A Vs B	0.033
Tirunelveli (B)	114	B Vs C	0.056
Thoothukudi (C)	67	A Vs C	0.982

From the table 4.29 high school teachers from Tirunelveli and Thoothukudi districts and Kanniyakumari and Thoothukudi districts do not differ significantly in their instructional self-efficacy. But high school teachers from Kanniyakumari and Tirunelveli districts differ significantly in their instructional self-efficacy. From the mean scores it can be said that the instructional self-efficacy is higher for the teachers from Thoothukudi district than the Kanniyakumari and Tirunelveli districts.

For the dimension behavioural self-efficacy, the calculated *F* value is 4.29 and p<0.05, and which is significant at 0.05 level. Hence it can be stated that significant difference exists among teachers from different districts in their behavioural self-efficacy.

Table 4.30

Summary of Scheffe's values for the dimension behavioural self-efficacy with respect to Districts

District	***N***	**Pair**	***p* (Scheffe)**
Kanniyakumari (A)	122	A Vs B	0.148
Tirunelveli (B)	114	B Vs C	0.020
Thoothukudi (C)	67	A Vs C	0.505

From the table 4.30 high school teachers from the Kanniyakumari and Tirunelveli districts and Kanniyakumari and Thoothukudi districts do not differ significantly in their behavioural self-efficacy. But high school teachers from Tirunelveli and Thoothukudi districts differ significantly in their behavioural self-efficacy. From the mean scores it can be said that the behavioural self-efficacy is higher for the teachers from Thoothukudi district than the Kanniyakumari and Tirunelveli districts.

For the dimensions cultural self-efficacy the *F* value is 2.29 and *p*> 0.05. Hence it is not significant at any level. Therefore teachers from different districts do not differ significantly in their cultural self-efficacy.

For the dimension decision making self-efficacy, the calculated *F* value is 4.69 and *p*<0.05, and which is significant at 0.05 level. Hence it can be stated that significant difference exists among teachers from decision making self-efficacy.

Table 4.31

Summary of Scheffe's values for the dimension decision making self-efficacy with respect to Districts

District	*N*	Pair	*p* (Scheffe)
Kanniyakumari (A)	122	A Vs B	0.233
Tirunelveli (B)	114	B Vs C	0.011
Thoothukudi (C)	67	A Vs C	0.282

From the table 4.31 high school teachers from the Kanniyakumari and Tirunelveli and districts and Kanniyakumari and Thoothukudi districts do not differ significantly in their decision making self-efficacy. But high school teachers from Tirunelveli and Thoothukudi districts differ significantly in their decision making self-efficacy. From the mean scores it can be said that the decision making self-efficacy is higher for the teachers from Thoothukudi district than the Kanniyakumari and Tirunelveli districts.

f) Comparison of Self-efficacy based on type of Management

The *F* test was conducted to compare the self-efficacy among government, aided and self-financed high school teachers. The result of the test of ANOVA is as shown in table. 4.32

Table 4.32

Summary of F value and Scheffe's value of High School Mathematics Teachers of Government, Aided and Self-financing institutions in their self-efficacy and its dimensions

Dimension	Management	Mean	*SD*	Source	Sum of Squares	df	Mean Square	*F*	*p*
Self-efficacy	Government	185.94	14.50	Between Gp	3913.12	2	1956.56	6.16*	*0.002*
	Aided	194.48	21.70	Within Gp	95278.33	300	317.59		
	Self-financing	187.11	18.58	Total	99191.45	302	0.00		
Instructional self-efficacy	Government	38.96	3.39	Between Gp	122.46	2	61.23	4.18*	*0.016*
	Self-financing	40.50	4.42	Within Gp	4390.22	300	14.63		
	Self-financing	39.77	3.88	Total	4512.68	302	0.00		
Behavioural self-efficacy	Government	47.18	3.98	Between Gp	158.98	2	79.49	2.00	*0.133*
	Aided	48.89	5.77	Within Gp	6890.23	300	22.97		
	Self-financing	47.38	4.96	Total	7049.21	302	0.00		
Cultural self-efficacy	Government	41.63	4.16	Between Gp	284.84	2	142.42	1.83	*0.083*
	Aided	43.39	5.71	Within Gp	7682.61	300	25.61		
	Self-financing	40.84	5.68	Total	7967.45	302	0.00		
Decision making self-efficacy	Government	58.18	6.03	Between Gp	633.18	2	316.59	7.30*	*0.001*
	Aided	61.70	7.56	Within Gp	13004.17	300	43.35		
	Self-financing	59.13	6.45	Total	13637.35	302	0.00		

*Significant at 0.05 level

From the table 4.32 it is apparent that the calculated *F* value for Self-efficacy is 6.16 and $p<0.05$, which is significant at 0.05 level. Hence it can be stated that significant difference exist among teachers from different managements in their self-efficacy.

Table 4.33

Summary of Scheffe's values for self-efficacy with respect to Type of Management

Management	*N*	Pair	*p* (Scheffe)
Government (A)	136	A Vs B	0.003
Aided (B)	80	B Vs C	0.030
Self-financing (C)	87	A Vs C	0.892

From the table 4.33 teachers from government and aided and aided and self-financed differ significantly in their self-efficacy. But high school teachers from Government and self-financing do not differ significantly in their self-efficacy. From the mean scores it can be said that the self-efficacy is higher for the teachers from aided schools than teachers from Government and self-financing schools.

For the dimension instructional self-efficacy, the calculated *F* value is 4.18 and $p<0.05$, and which is significant at 0.05 level. Hence it can be stated that significant difference exists among teachers from different managements in their instructional self-efficacy.

Table 4.34

Summary of Scheffe's values for the dimension Instructional self-efficacy with respect to Type of Management

Management	*N*	Pair	*p* (Scheffe)
Government (A)	136	A Vs B	0.018
Aided (B)	80	B Vs C	0.469
Self-financing (C)	87	A Vs C	0.306

From the table 4.34 high school teachers from government and aided schools differ significantly in their instructional self-efficacy. But high school teachers from and aided and self-financing and Government and self-financing do not differ significantly in their instructional self-efficacy. From the mean scores it can be said that the self-efficacy is higher for the teachers from aided schools than teachers from government and self-financing schools.

For the dimensions behavioural self-efficacy and cultural self-efficacy the *F* values are 2.00 and 1.83 and $p>0.05$. Hence it is not significant at any level. Therefore

it can be stated that the teachers from different types of management do not differ significantly in their behavioural self-efficacy and cultural self-efficacy.

For the dimension decision making self-efficacy, the calculated *F* value is 7.30 and $p<0.05$, which is significant at 0.05 level. Hence it can be stated that significant difference exists among teachers from different managements in their decision making self-efficacy.

Table 4.35

Summary of Scheffe's values for the dimension decision making self-efficacy with respect to Type of Management

Management	*N*	Pair	*p* (Scheffe)
Government (A)	136	A Vs B	0.001
Aided (B)	80	B Vs C	0.043
Self-financing (C)	87	A Vs C	0.576

From the table 4.35 teachers from government and aided and aided and self-financing schools differ significantly in their decision making self-efficacy. But high school teachers from government and self-financing institutions do not differ significantly in their decision making self-efficacy. From the mean scores it can be said that decision making self-efficacy is higher for the teachers from aided schools than teachers from government and self-financing schools.

g) Comparison of Self-efficacy based on nature of school

The *F* test was conducted to compare the self-efficacy of teachers from boys, girls and co-education schools. The result of the test of ANOVA is as shown in table. 4.36

Table 4.36

Summary of F value and Scheffe's values of High School Mathematics Teachers of Boys, Girls and Co-education schools in their Self-efficacy and its dimensions

Dimension	Nature of school	Mean	SD	Source	Sum of Squares	df	Mean Square	F	*p*
	Boys	177.03	16.19	Between Gp	7445.90	2	3722.95		
Self-efficacy	Girls	197.79	9.06	Within Gp	91745.55	300	305.82	12.17*	*0.000*
	Co-education	188.51	18.66	Total	99191.45	302	0.00		
	Boys	37.13	3.72	Between Gp	244.73	2	122.37		
Instructional self-efficacy	Girls	40.74	3.02	Within Gp	4267.95	300	14.23	1.21	*0.0296*
	Co-education	39.74	3.89	Total	4512.68	302	0.00		
	Boys	45.03	3.76	Between Gp	356.24	2	178.12		
Behavioural self-efficacy	Girls	49.56	3.08	Within Gp	6692.98	300	22.31	1.31	*0.256*
	Co-education	47.73	5.05	Total	7049.21	302	0.00		
	Boys	38.58	5.09	Between Gp	618.57	2	309.29		
Cultural self-efficacy	Girls	44.56	2.10	Within Gp	7348.88	300	24.50	1.07	*0.347*
	Co-education	41.85	5.25	Total	7967.45	302	0.00		
Decision	Boys	56.29	7.12	Between Gp	793.28	2	396.64		
making	Girls	62.92	3.92	Within Gp	12844.07	300	42.81	9.26*	*0.000*
self-efficacy	Co-education	59.20	6.80	Total	13637.35	302	0.00		

*Significant at 0.05 level

From the table 4.36 it is apparent that the *F* value for self-efficacy is 12.17 and $p<0.05$, which is significant at 0.05 level. Hence it can be stated that significant difference exists among teachers from boys' school, girls' school and co-education schools in their self-efficacy.

Table 4.37

Summary of Scheffe's values for self-efficacy with respect to Nature of Schools

Nature of school	*N*	Pair	*p* (Scheffe)
Boys (A)	31	A Vs B	0.000
Girls (B)	39	B Vs C	0.010
Co-education (C)	233	A Vs C	0.003

From the table 4.37 teachers from boys schools and girls schools and girls schools and co-education schools and boys and co-education schools differ significantly in their self-efficacy. From the mean scores it can be said that the self-efficacy is higher for the teachers from girls' schools than teachers from boys' and co-educations schools.

For dimensions of self-efficacy namely instructional self-efficacy, behavioural self-efficacy and cultural self-efficacy the corresponding F values are 1.21, 1.31and 1.07 and $p>0.05$. Hence the high school teachers from boys, girls and co-educations schools do not differ significantly in their self-efficacy with respect to its dimensions.

For decision making self-efficacy the *F* value is 9.26 and $p<0.05$ which is significant at 0.05 level. Hence it can be stated that significant difference exists among teachers based on the nature of schools in self-efficacy.

Table 4.38

Summary of Scheffe's values for the dimension decision making self-efficacy with respect to Nature of Schools

Nature of school	*N*	Pair	*p* (Scheffe)
Boys (A)	31	A Vs B	0.000
Girls (B)	39	B Vs C	0.005
Co-education (C)	233	A Vs C	0.068

From the table 4.38 high school teachers from boys and girls and girls schoolsand co-education schools differ significantly in their decision making self-efficacy. But high school teachers from boys and co-education schools do not differ significantly in their decision making self-efficacy. From the mean scores it can be said that the self-efficacy is higher for the teachers from girls schools than teachers from boys and co-educations schools.

h) Comparison of Self-efficacy based on income

The *F* test was used to compare the self-efficacy of teachers based on their income Rs.5,000-10,000, Rs.11,000- 15,000, 16,000-20,000 ,Rs.21,000- 25,000 and Rs.26000 & above. The result of the test of ANOVA is shown in table 4.39.

Table 4.39

Summary of F value and Scheffe's values of high school Mathematics teachers with various levels of income in their self-efficacy and its dimensions

Dimension	Income	Mean	*SD*	Source	Sum of Squares	df	Mean Square	*F*	*p*
Self-efficacy	Rs.5,000-10,000	182.15	27.82	Between Gp	3116.45	4	779.11	2.42*	*0.049*
	Rs.11,000-15000	190.00	13.35	Within Gp	96075.00	298	322.40		
	Rs.16000-20000	194.73	15.04	Total	99191.45	302	0.00		
	Rs.21000- 25000	193.11	18.64						
	Rs.26000 & above	189.53	14.96						
Instructional self-efficacy	Rs.5,000-10,000	39.02	5.52	Between Gp	43.29	4	10.82	0.72	*0.578*
	Rs.11,000-15000	39.65	3.62	Within Gp	4469.39	298	15.00		
	Rs.16000-20000	40.73	2.76	Total	4512.68	302	0.00		
	Rs.21000- 25000	40.67	2.55						
	Rs.26000 & above	39.64	3.43						
Behavioural self-efficacy	Rs.5,000-10,000	46.13	7.23	Between Gp	186.14	4	46.54	2.02	*0.092*
	Rs.11,000-15000	47.87	3.80	Within Gp	6863.07	298	23.03		
	Rs.16000-20000	49.00	3.71	Total	7049.21	302	0.00		
	Rs.21000- 25000	49.11	5.44						
	Rs.26000 & above	47.95	4.06						
Cultural self-efficacy	Rs.5,000-10,000	39.64	7.46	Between Gp	355.98	4	88.99	3.48*	*0.008*
	Rs.11,000-15000	42.26	3.71	Within Gp	7611.48	298	25.54		
	Rs.16000-20000	43.55	3.27	Total	7967.45	302	0.00		
	Rs.21000- 25000	43.11	4.14						
	Rs.26000 & above	42.27	4.49						
Decision making self-efficacy	Rs.5,000-10,000	57.36	9.53	Between Gp	314.40	4	78.60	1.76	*0.137*
	Rs.11,000-15000	60.23	4.91	Within Gp	13322.96	298	44.71		
	Rs.16000-20000	61.45	7.99	Total	13637.35	302	0.00		
	Rs.21000- 25000	60.22	8.84						
	Rs.26000 & above	59.65	5.73						

*Significant at 0.05 level

From the table 4.39 it is apparent that the *F* value for self-efficacy of teachers based on different levels of income is 2.42 and $p<0.05$ which is significant at 0.05 level. Hence it can be stated that significant difference exists among teachers having different income levels in their self-efficacy.

Table 4.40

Summary of Scheffe's values for self-efficacy with respect to Income

Income	**N**	**Pair**	**p (Scheffe)**
Rs.5,000-10,000 (A)	55	A Vs B	0.083
Rs.11,000-15000 (B)	31	B Vs C	0.310
Rs.16000-20000 (C)	11	A Vs C	0.080
Rs.21000- 25000 (D)	9	A Vs D	0.847
Rs.26000 & above (E)	197	B Vs D	0.975
		C Vs D	0.977
		A Vs E	0.004
		B Vs E	0.974
		C Vs E	0.855
		D Vs E	0.000

From the table 4.40 difference between pairs (A Vs B) (B Vs C) (A Vs C) (A Vs D) (B Vs D) (C Vs D) (B Vs E) (C Vs E) are found to be not significant. But difference between pairs (A Vs E) and (D Vs E) are found to be statistically significant at 0.05 level. The mean scores A (182.15) is lower than that of E (189.53). Hence it can be said that self-efficacy of teachers in the income level Rs.5,000-10,000 is lower than that of teachers with Rs.26000 and above. The mean scores D (193.1) is higher than that of E (189.53). Hence it can be said that self-efficacy based on income of teachers Rs.21000- 25000 is higher than that of teachers with Rs.26000 & above income.

For the dimensions of self-efficacy namely instructional self-efficacy and behavioural self-efficacy the corresponding *F* values are 0.72 and 2.02 and $p>0.05$. Hence the high school teachers having different income do not differ significantly in their self-efficacy with respect to its dimensions.

For cultural self-efficacy the *F* value is 3.48 and $p<0.05$, which is significant at 0.05 level. Hence it can be stated that significant difference exist among teachers from schools having different income in their self-efficacy with respect to its dimensions.

Table 4.41

Summary of Scheffe's values for cultural self-efficacy with respect to Income

Income	N	Pair	p (Scheffe)
Rs.5,000-10,000 (A)	55	A Vs B	0.258
Rs.11,000-15000 (B)	31	B Vs C	0.970
Rs.16000-20000 (C)	11	A Vs C	0.244
Rs.21000- 25000 (D)	9	A Vs D	0.457
Rs.26000 & above (E)	197	B Vs D	0.995
		C Vs D	1.000
		A Vs E	0.022
		B Vs E	1.000
		C Vs E	0.955
		D Vs E	0.993

From the table 4.41, difference between pairs (A Vs B) (B Vs C) (A Vs C) (A Vs D) (B Vs D) (C Vs D) (B Vs E) (C Vs E) (D Vs E) are found to be not significant. But difference between pair (A Vs E) is found to be statistically significant at 0.05 level. The mean score of A (39.64) is lower than that of E (42.27). Hence it can be said that self-efficacy of teachers in the income group Rs.5,000-10,000 is lower than that of teachers with income Rs.26000 and above.

For decision making self-efficacy it is evident that the F value based on different levels of income of teachers is 1.758 and $p>0.05$ which is not significant. It is also evident that the teachers having different income have more or less same level of decision making self-efficacy.

i) Comparison of Self-efficacy based on years of experience

The *F* test was used to compare the self-efficacy based on Years of experience among 1-5 years, 6-10 years, 11-15 years, 16-20 years and 21 and above. The result of the test of ANOVA is shown in table 4.42

Table 4.42

Summary of F value and Scheffe's value of high school Mathematics teachers with different levels of years of experience in their self-efficacy and its dimensions

Dimension	Year of Experience	Mean	SD	Source	Sum of Squares	df	Mean Square	F	*p*
	1-5 Years	191.19	16.89	Between Gp	6533.23	4	1633.31		
	6-10 Years	184.24	20.60	Within Gp	92658.23	298	310.93		
Self-efficacy	11-15 Years	188.20	13.59	Total	99191.45	302	0.00	5.25*	*0.000*
	16-20 Years	202.47	13.55						
	21 & above Years	190.42	15.85						
	1-5 Years	40.25	3.12	Between Gp	313.14	4	78.28		
	6-10 Years	38.72	4.55	Within Gp	4199.54	298	14.09		
Instructional self-efficacy	11-15 Years	39.47	3.52	Total	4512.68	302	0.00	5.56*	*0.000*
	16-20 Years	42.74	2.66						
	21 & above Years	39.62	2.43						
	1-5 Years	48.24	4.49	Between Gp	421.29	4	105.32		
	6-10 Years	46.55	5.34	Within Gp	6627.92	298	22.24		
Behavioural self-efficacy	11-15 Years	47.75	4.17	Total	7049.21	302	0.00	4.74*	*0.001*
	16-20 Years	51.16	3.48						
	21 & above Years	48.46	4.26						
	1-5 Years	42.29	5.30	Between Gp	158.41	4	39.60		
	6-10 Years	41.32	5.31	Within Gp	7809.04	298	26.20		
Cultural self-efficacy	11-15 Years	41.52	4.64	Total	7967.45	302	0.00	1.51	*0.199*
	16-20 Years	44.16	5.17						
	21 & above Years	42.15	4.64						
	1-5 Years	60.41	6.24	Between Gp	941.31	4	235.33		
	6-10 Years	57.64	7.57	Within Gp	12696.04	298	42.60		
Decision making self-efficacy	11-15 Years	59.47	4.76	Total	13637.35	302	0.00	5.52*	*0.000*
	16-20 Years	64.42	4.94						
	21 & above Years	60.19	6.74						

*Significant at 0.05 level

From the above table 4.42 it is clear that *F* value for Self-efficacy (total) is 5.25, and $p<0.05$ and is significant statistically at 0.05 level. It may therefore be said that there exists significant difference among teachers with different years of experience in self-efficacy.

Table 4.43

Summary of Scheffe's values for self-efficacy with respect to Years of experience

Year of Experience	*N*	Pair	*p* (Scheffe)
1-5 Years (A)	80	A Vs B	0.119
6-10 Years (B)	118	B Vs C	0.735
11-15 Years (C)	60	A Vs C	0.912
16-20 Years (D)	19	A Vs D	0.182
21 & above Years (E)	26	B Vs D	0.002
		C Vs D	0.053
		A Vs E	1.000
		B Vs E	0.624
		C Vs E	0.991
		D Vs E	0.277

From the table 4.43 difference between pairs (A Vs B) (B Vs C) (A Vs C) (A Vs D) (C Vs D) (A Vs E) (B Vs E) (C Vs E) (D Vs E) are found to be not significant .But difference between pairs (B Vs D) is statistically found to be significant. The mean scores B of self-efficacy of teachers (184.24) is lower than that of E (190.42). Hence it can be said that self-efficacy of teachers with 6-10 years experience is lower than that of teachers with 21 & above years of experience.

From the above table, it is clear that *F* value for instructional self-efficacy is 5.56, $p<0.05$ and is significant statistically at 0.05 level. It may therefore be said that there exists significant difference among teachers with different years of experience in self-efficacy.

Table 4.44

Summary of Scheffe's values for the dimension Instructional self-efficacy with respect to Years of experience

Year of Experience	*N*	Pair	*p* (Scheffe)
1-5 Years (A)	80	A Vs B	0.098
6-10 Years (B)	118	B Vs C	0.811
11-15 Years (C)	60	A Vs C	0.830
16-20 Years (D)	19	A Vs D	0.153
21 & above Years (E)	26	B Vs D	0.250
		C Vs D	0.029
		A Vs E	0.001
		B Vs E	0.874
		C Vs E	1.000
		D Vs E	0.111

From the table 4.44 difference between pairs (A Vs B) (B Vs C) (A Vs C) (A Vs D) (B Vs D) (A Vs E) (B Vs E) (C Vs E) (D Vs E) are found to be not significant .But difference between pairs (C Vs D) (A Vs E)is statistically found to be significant. The mean scores C (39.47) is lower than that of D(42.74). Hence it can be said that self-efficacy of teachers with 11-15 years of experience is lower than that of teachers with 16-20 years of experience. The mean scores A (40.25) is lower than that of E (39.62). Hence it can be said that self-efficacy of teachers with 1-5 years of experience is lower than that of teachers with 21 & above years of experience.

F value for behavioural self-efficacy is 4.735, and $p<0.05$ and is significant statistically at 0.05 level. It may therefore be said that there exists significant difference among teachers with different years of experience in behavioural self-efficacy.

Table 4.45

Summary of Scheffe's values for the dimension Behavioural self-efficacy with respect to Years of experience

Year of Experience	N	Pair	p (Scheffe)
1-5 Years (A)	80	A Vs B	0.193
6-10 Years (B)	118	B Vs C	0.632
11-15 Years (C)	60	A Vs C	0.985
16-20 Years (D)	19	A Vs D	0.211
21 & above Years (E)	26	B Vs D	0.004
		C Vs D	0.113
		B Vs E	0.480
		C Vs E	0.981
		D Vs E	0.465

From the table 4.45 difference between pairs (A Vs B) (B Vs C) (A Vs C) (A Vs D) (C Vs D) (A Vs E) (B Vs E) (C Vs E) (D Vs E) are found to be not significant .But difference between pairs (B Vs D) is found to be statistically significant. The mean score of B (46.55) is lower than that of D(51.16). Hence it can be said that self-efficacy of teachers with 6-10 years of experience is lower than that of teachers with 16-20 years of experience.

For cultural self-efficacy it is evident that the *F* value based on various years of experience is 1.51, and $p>0.05$ which is not significant. It is also evident that the teachers having various years of experience have more or less same Cultural Self-efficacy.

F value for decision making self-efficacy is 5.52, and $p<0.05$and is significant statistically at 0.05 level. It may therefore be said that there exists significant difference among teachers with different years of experience in self-efficacy.

Table 4.46

Summary of Scheffe's values for the dimension Decision making self-efficacy with respect to Years of experience

Year of Experience	N	Pair	p (Scheffe)
1-5 Years (A)	80	A Vs B	0.075
6-10 Years (B)	118	B Vs C	0.538
11-15 Years (C)	60	A Vs C	0.950
16-20 Years (D)	19	A Vs D	0.218
21 & above Years (E)	26	B Vs D	0.002
		C Vs D	0.084
		A Vs E	1.000
		B Vs E	0.518
		C Vs E	0.994
		D Vs E	0.332

From the table 4.46 difference between pairs (A Vs B) (B Vs C) (A Vs C) (A Vs D) (C Vs D) (A Vs E) (B Vs E) (C Vs E) (D Vs E) are found to be not significant. But difference between pairs (B Vs D) is found to be significant statistically. The mean score of B (57.64) is lower than that of D (64.42). Hence it can be said that self-efficacy of teachers with 6-10 years of experience is lower than that of teachers with 16-20 years of experience.

iii) Teaching Competency

a) Comparison of Teaching Competency based on sex

The total sample of 303 mathematics teachers comprised of 96 males and 207 females. The t test was conducted to compare the teaching competency among them. The result of the test of significance of means is shown in table 4.47

Table 4.47

Summary of mean, standard deviation and t value of Teaching Competency of male and female High School Mathematics Teachers

Dimension	Sex	Mean	*SD*	*N*	*t*	*p*
Teaching Competency	Male	291.58	16.69	97	3.23*	0.001
	Female	283.95	23.58	206		
Performance Based Competency	Male	62.64	4.30	97	2.97*	0.003
	Female	60.89	5.67	206		
Affective Based Competency	Male	39.53	3.02	97	2.70*	0.007
	Female	38.45	3.70	206		
Contextual based Competency	Male	61.57	4.89	97	2.21*	0.028
	Female	60.17	5.67	206		
Communication Based Competency	Male	74.97	5.01	97	1.88	0.061
	Female	73.65	6.95	206		
Consequence Based Competency	Male	52.88	3.94	97	3.60*	0.000
	Female	50.80	5.07	206		

*Significant at 0.05 level

From the above table 4.47, it is known that the calculated *t* value obtained for teaching competency is 3.23 and $p<0.05$, which is significant at 0.05 level. Hence there exists significant difference in the mean scores of teaching competency of male and female teachers. The mean scores of male teachers on teaching competency is 291.58 which is higher than that of female teachers whose mean score is 283.95. It may therefore be concluded that the male teachers have significantly higher teaching competency than females.

The *t* value obtained for performance based competency is 2.97 and $p<0.05$ which is significant at 0.05 level. Hence there exists significant difference in the mean scores of male and female teachers in performance based competency. It is also evident that the mean scores of male is 62.64 which is significantly higher than that of female teachers whose mean scores is 60.89. It may therefore be said that male teachers have more performance based competency than female teachers.

The *t* value obtained for affective based competency is 2.70 $p<0.05$ which is significant at 0.05 level. Hence there exists significant difference in the mean scores of male and female teachers in affective based competency. It also seen that the mean scores of male teachers on affective based competency is 39.53 which is higher than that of female teachers whose mean score is 38.45. It may therefore be said that the male teachers have significantly higher level of affective based competency than female teachers.

The *t* value obtained for contextual based competency is 2.21and $p<0.05$ which is significant at 0.05 level. Hence there exists significant difference in the mean scores of male and female teachers in contextual based competency. It is also evident that the mean scores of male teachers on contextual based competency is 61.71 which is higher than that of female students whose mean score is 56.76. It may therefore be said that the male teachers have significantly higher level of contextual based competency than female teachers.

The *t* value obtained for communicative based competency is 1.88 and $p>0.05$ which is not significant at 0.05 level. Hence there exists no significant difference in the mean scores of male and female teachers in communicative based competency. It may therefore be concluded that communicative based competency level of the male and female teachers are to the same extent.

The *t* value obtained for consequence based competency is 3.90 and $p<0.05$ which is significant at 0.05 level. Hence there exists significant difference in the mean scores of male and female teachers in consequence based competency. It is also evident that the mean scores of male teachers on consequence based competency is 52.88 which is higher than that of female teachers whose mean score is 50.80. It may therefore be concluded that consequence based competency level of the male teachers are higher than that of female teachers.

b) Comparison of Teaching Competency based on locality.

The *t* test was conducted to compare the teaching competency of teachers from rural and urban locality. The result of the test of significance of means is shown in table 4.48

Table 4.48

Summary of mean, standard deviation and t value of Teaching Competency of High School Mathematics Teachers from Rural and Urban locality

Dimensions	Locality	*N*	Mean	*S.D.*	Calculated '*t*' value	*p* value
Teaching Competency in Total	Rural	197	287.88	18.664	1.46	0.146
	Urban	106	283.63	26.737		
1.Performance Based Competency	Rural	197	61.5	4.687	0.20	0.844
	Urban	106	61.36	6.38		
2.Affective Based Competency	Rural	197	38.96	3.182	1.08	0.283
	Urban	106	38.47	4.095		
3.Contextual Based Competency	Rural	197	61.25	4.809	2.54*	0.011
	Urban	106	59.45	6.353		
4.Communication Based Competency	Rural	197	74.35	5.709	0.96	0.339
	Urban	106	73.55	7.559		
5.Consequence Based Competency	Rural	197	51.82	4.352	1.64	0.103
	Urban	106	50.8	5.566		

*Significant at 0.05 level

From the above table 4.48, it is known that the calculated *t* value obtained for teaching competency is 1.457 and $p>0.05$ which is not significant at 0.05 level. Hence there exists no significant difference in the mean scores of teaching competency of teachers from rural and urban locality.

The *t* value obtained for performance based competency is 0.20 and $p>0.05$ which is not significant at 0.05 level. Hence there exists no significant difference in the mean scores of teachers from rural and urban locality in performance based competency.

The *t* value obtained for affective based competency is 1.08 and $p>0.05$ which is not significant at 0.05 level. Hence there exists no significant difference in the mean scores of teachers from rural and urban locality in affective based competency.

The *t* value obtained for contextual based competency is 2.54 and $p<0.05$ which is significant at 0.05 level. Hence there exists significant difference in the mean scores of rural and urban teachers in contextual based competency. It is also evident that the mean scores of rural teachers on contextual based competency is 61.25 which is higher than that of female students whose mean score is 59.45. It may therefore be said that the rural teachers have significantly higher level of contextual based competency than urban teachers.

The *t* value obtained for communication based competency is 0.96 and $p>0.05$ which is not significant at 0.05 level. Hence there exists no significant difference in the mean scores of rural and urban teachers in communication based competency.

The *t* value obtained for consequence based competency *t* is 1.64and $p>0.05$ which is not significant at 0.05 level. Hence there exists no significant difference in the mean scores of rural and urban teachers in consequence based competency.

c) Comparison of Teaching Competency based on marital status

The *t* test was conducted to compare the teaching competency of 26 married and 47 unmarried teachers. The result of the test of significance of means is shown in table 4.49

Table 4.49

Summary of mean, standard deviation and t value of teaching competency of married and unmarried High School Mathematics Teachers

Teaching Competency and its Dimensions	Marital Status	*N*	Mean	*S.D.*	Calculated '*t*' value	*p* value
Teaching Competency in Total	Married	256	285.61	22.919	2.00*	0.046
	Unmarried	47	290.7	14.449		
. Performance Based Competency	Married	256	61.39	5.492	0.552	0.581
	Unmarried	47	61.79	4.383		
. Affective Based Competency	Married	256	38.64	3.638	2.175*	0.03
	Unmarried	47	39.64	2.746		
. Contextual based Competency	Married	256	60.48	5.627	1.27	0.205
	Unmarried	47	61.4	4.387		
. Communication Based Competency	Married	256	73.88	6.62	1.44	0.151
	Unmarried	47	75.11	5.104		
. Consequence Based Competency	Married	256	51.23	5.003	2.58*	0.01
	Unmarried	47	52.77	3.49		

*Significant at 0.05 level

From the table 4.49, it is evident that the *t* value obtained for teaching competency is 2.00 and $p<0.05$ which is significant at 0.05 level. Hence there exists significant difference in the mean scores of married and unmarried teachers in their teaching competency. It is also evident that the mean score of teaching competency of married teachers is 285.61 which is significantly higher than that of unmarried teachers whose mean scores is 290.7. Therefore, the unmarried teachers have higher level of teaching competency than married teachers.

For performance based competency the calculated *t* value is 0.552 and $p>0.05$ is not significant at 0.05 level. Hence there exists no significant difference in the mean scores of performance based competency of married and unmarried teachers.

For affective based competency the *t* value obtained for married and unmarried teachers is 2.175 and $p<0.05$ which is significant at 0.05 level. Hence there exists significant difference in the mean scores of married and unmarried teachers in

their affective based competency. It is also evident that the mean scores of affective based competency of married teachers is 38.64 which is significantly higher than that of unmarried teachers whose mean scores is 39.64. Therefore, the unmarried teachers have shown higher level teaching competency than that of married teachers.

For contextual based competency the *t* value obtained is 1.27 and $p>0.05$ which is not significant at 0.05 level. Hence there exists no significant difference in the mean scores between married and unmarried teachers in contextual based competency.

For communication based competency the *t* value obtained is 1.44 and $p>0.05$ which is not significant at 0.05 level. Hence there exists no significant difference in the mean scores between married and unmarried teachers in their communication based competency.

For consequence based competency the *t* value obtained is 2.58 and $p<0.05$ which is significant at 0.05 level. Hence there exists significant difference in the mean score of married and unmarried teachers in their consequence based competency. It is also evident that the mean scores of married teachers on consequence based competency is 51.23 which is lower than that of unmarried teachers whose mean score is 52.77.

d) Comparison of Teaching Competency based on educational qualification

The *t* test was conducted to compare the teaching competency of 106 graduate teachers and 197 post graduate teachers. The result of the test of significance of means is shown in table 4.50

Table 4.50

Summary of mean, standard deviation and t value of Teaching Competency of Graduate and Post Graduate High School Mathematics Teachers

Dimension	Qualification	Mean	*SD*	*N*	*t*	*p*
Teaching Competency	Graduation	280.35	26.53	106	3.22*	0.001
	Post Graduation	289.64	18.17	197		
Performance Based Competency	Graduation	60.75	6.41	106	1.52	0.130
	Post Graduation	61.82	4.62	197		
Affective Based Competency	Graduation	39.08	3.606	106	1.02	0.311
	Post Graduation	38.64	3.487	197		
Contextual based Competency	Graduation	59.28	6.36	106	2.92*	0.004
	Post Graduation	61.34	4.77	197		
CommunicationBased Competency	Graduation	72.30	7.46	106	3.29*	0.001
	Post Graduation	75.02	5.57	197		
Consequence Based Competency	Graduation	51.21	4.867	106	0.68	0.498
	Post Graduation	51.6	4.812	197		

*Significant at 0.05 level

From the table 4.50, it is evident that the *t* value obtained for teaching competency is 3.22 and $p<0.05$ which is significant at 0.05 level. Hence there exists significant difference in the mean scores of graduates and post graduate teachers in their teaching competency. It is also evident that the mean score of teaching competency of graduate teachers is 280.35 which is significantly lower than that of post graduate teachers whose mean score is 289.64. Therefore, post graduate teachers have higher level of teaching competency than graduate teachers.

For performance based competency the calculated *t* value is 1.52 and $p>0.05$ is not significant at 0.05 level. Hence there exists no significant difference in the mean scores between graduate teachers and post graduate teachers in their performance based competency.

For affective based competency the *t* value obtained for graduate and post graduate teachers is 1.06 and $p>0.05$ which is not significant at 0.05 level. Hence

there exists no significant difference in the mean scores of graduate and post graduate teachers in their affective based competency.

For contextual based competency the *t* value obtained is 2.92 and $p<0.05$ which is significant at 0.05 level. Hence there exists significant difference in the mean scores of contextual based competency of graduate and post graduate teachers. The mean score of graduate teachers is 59.28 which is lower than that of post graduate teachers whose mean score is 61.34. Therefore the post graduate teachers are significantly higher than that of graduate teachers on contextual based competency

For communication based competency the t value obtained is 3.29 and $p<0.05$ which is significant at 0.05 level. Hence there exists significant difference in the mean scores in evaluation of graduate and post graduate teachers. It is also evident that the mean score of graduate teachers on communication based competency is 72.30 which is lower than that of post graduate teachers whose mean scores is 75.02.

For consequence based competency the *t* value obtained is 0.68 and $p>0.05$ which is not significant at 0.05 level. Hence there exists no significant difference in the mean scores of graduate and post graduate teachers in their consequence based competency level.

e) Comparison of Teaching Competency based on districts

The *F* test was conducted to compare the self-efficacy of Mathematics teachers from Kanniyakumari, Tirunelveli and Thoothukudi districts. The result of the test of ANOVA is shown in table 4.51

Table 4.51

Summary of F value and Scheffe's values of High School Mathematics Teachers from Kanniyakumari, Tirunelveli and Thoothukudi Districts in their Teaching Competency and its dimensions

Dimension	District	Mean	*SD*	Source	Sum of Squares	df	Mean Square	*F*	*p*
Teaching Competency	Kanniyakumari	290.66	18.82	Between Gp	9336.28	2	4668.14	10.36*	*0.000*
	Tirunelveli	279.25	26.03	Within Gp	135235.99	300	450.79		
	Thoothukudi	290.78	15.47	Total	144572.26	302	0.00		
Performance Based Competency	Kanniyakumari	62.08	4.85	Between Gp	321.31	2	160.65	5.84*	*0.003*
	Tirunelveli	60.14	6.08	Within Gp	8259.65	300	27.53		
	Thoothukudi	62.52	4.32	Total	8580.96	302	0.00		
Affective Based Competency	Kanniyakumari	39.36	3.26	Between Gp	129.14	2	64.57	5.33*	*0.005*
	Tirunelveli	37.96	3.86	Within Gp	3632.76	300	12.11		
	Thoothukudi	39.18	3.17	Total	3761.90	302	0.00		
Contextual based Competency	Kanniyakumari	61.91	4.61	Between Gp	512.60	2	256.30	7.28	*0.172*
	Tirunelveli	59.00	6.48	Within Gp	8488.99	300	28.30		
	Thoothukudi	61.01	4.22	Total	9001.59	302	0.00		
Communication Based Competency	Kanniyakumari	75.28	5.34	Between Gp	705.21	2	352.60	9.02*	*0.000*
	Tirunelveli	72.11	7.39	Within Gp	11728.34	300	39.09		
	Thoothukudi	75.21	5.64	Total	12433.54	302	0.00		
Consequence Based Competency	Kanniyakumari	52.03	4.59	Between Gp	398.23	2	199.11	2.64	*0.073*
	Tirunelveli	50.04	5.36	Within Gp	6653.16	300	22.18		
	Thoothukudi	52.85	3.61	Total	7051.39	302	0.00		

From the table 4.51, it is apparent that the calculated *F* value for teaching competency is 10.36 and $p<0.05$, which is significant at 0.05 level. Hence it can be stated that significant difference exists among teachers from Kanniyakumari, Tirunelveli and Thoothukudi districts in their teaching competency

Table 4.52

Summary of Scheffe's values for Teaching Competency with respect to Districts

District	*N*	Pair	*p* (Scheffe)
Kanniyakumari (A)	122	A Vs B	0.000
Tirunelveli (B)	114	B Vs C	0.002
Thoothukudi (C)	67	A Vs C	0.999

To know the exact significant difference, Scheffe's pair wise comparison (post hoc test) is used. From the table 4.52, high school teachers from Kanniyakumari and Tirunelveli and Tirunelveli and Thoothukudi districts differ significantly in their teaching competency. But high school teachers from Kanniyakumari and Thoothukudi districts do not differ significantly in their teaching competency. From the mean scores it can be said that the teaching competency is higher for the teachers from Thoothukudi district than the Tirunelveli and Kanniyakumari districts.

For the dimension performance based competency, the calculated *F* value is 5.84 and $p<0.05$, and which is significant at 0.05 level. Hence it can be stated that significant difference exists among teachers from different districts with respect to performance based competency.

Table 4.53

Summary of Scheffe's values for the dimension performance based competency with respect to Districts

District	*N*	Pair	*p* (Scheffe)
Kanniyakumari (A)	122	A Vs B	0.019
Tirunelveli (B)	114	B Vs C	0.014
Thoothukudi (C)	67	A Vs C	0.859

From the table 4.2.49 high school teachers from Kanniyakumari and Tirunelveli and Tirunelveli and Thoothukudi districts differ significantly in their teaching competency with respect to performance based competency. But high school teachers from Kanniyakumari and Thoothukudi districts do not differ significantly in performance based competency. Hence it can be said that the teaching competency with respect to performance based competency of teachers from Thoothukudi district are found to be better than their counterparts in Tirunelveli and Kanniyakumari districts.

For the dimension affective based competency, the calculated *F* value is 5.332and $p<0.05$, and which is significant at 0.05 level. Hence it can be stated that significant difference exists among teachers from different districts in their affective based competency.

Table 4.54

Summary of Scheffe's values for the dimension affective based competency with respect to Districts

District	*N*	Pair	*p* (Scheffe)
Kanniyakumari (A)	122	A Vs B	0.009
Tirunelveli (B)	114	B Vs C	0.076
Thoothukudi (C)	67	A Vs C	0.944

From the table 4.2.50 high school teachers from Kanniyakumari and Tirunelveli and districts differ significantly in their teaching competency with respect to affective based competency. But high school teachers from Tirunelveli and Thoothukudi and Kanniyakumari and Thoothukudi districts do not differ significantly in their affective based competency. Hence it can be said that the teaching competency with respect to affective based competency of teachers from

Kanniyakumari district are found to be better than their counterparts in Tirunelveli and Thoothukudi districts.

. For the dimension contextual based competency, the calculated *F* value is 7.276 and $p>0.05$, and which is not significant at 0.05 level. Hence it can be stated that no significant difference exists among teachers from different districts in their contextual based competency.

For the dimension communication based competency, the calculated *F* value is 9.019 and $p<0.05$, and which is significant at 0.05 level. Hence it can be stated that significant difference exists among teachers from different districts in their communication based competency.

Table 4.55

Summary of Scheffe's values for the dimension communication based competency with respect to Districts

District	*N*	Pair	*p* (Scheffe)
Kanniyakumari (A)	122	A Vs B	0.001
Tirunelveli (B)	114	B Vs C	0.006
Thoothukudi (C)	67	A Vs C	0.997

From the table 4.55 high school teachers from Kanniyakumari and Tirunelveli districts and Tirunelveli and Thoothukudi districts differ significantly in their teaching competency with respect to communication based competency. But high school teachers from Kanniyakumari and Thoothukudi districts do not differ in their communication based competency. Hence it can be said that the teaching competency with respect to communication based competency of teachers from Kanniyakumari district are found to be better than their counterparts in Tirunelveli and Thoothukudi districts.

For the dimension consequence based competency, the calculated *F* value is 2.635 and $p>0.05$, which is not significant at 0.05 level. Hence high school teachers from different districts do not differ significantly in their consequence based competency.

f) Comparison of Teaching Competency based on management

The *F* test was conducted to compare the teaching competency of Mathematics teachers from Government, Aided and Self-financing schools. The result of the test of ANOVA is shown in table 4.56

Table 4.56

Summary of F value and Scheffe's value of High School Mathematics Teachers of Government, Aided and Self-financing institutions in their self-efficacy and its dimensions

Dimension	Management	Mean	*SD*	Source	Sum of Squares	df	Mean Square	*F*	*p*
Teaching Competency	Government	280.26	23.74	Between Gp	11445.16	2	5722.58	2.90*	*0.000*
	Aided	295.15	17.61	Within Gp	133127.11	300	443.76		
	Self-financing	287.92	19.47	Total	144572.26	302	0.00		
Performance Based Competency	Government	60.11	5.68	Between Gp	559.30	2	279.65	0.14	0.961
	Aided	63.41	4.75	Within Gp	8021.65	300	26.74		
	Self-financing	61.74	4.69	Total	8580.96	302	0.00		
Affective Based Competency	Government	38.07	3.62	Between Gp	199.51	2	99.76	0.37	0.693
	Aided	40.06	3.14	Within Gp	3562.39	300	11.87		
	Self-financing	38.75	3.43	Total	3761.90	302	0.00		
Contextual based Competency	Government	59.24	5.82	Between Gp	590.78	2	295.39	0.29	0.746
	Aided	62.63	4.73	Within Gp	8410.81	300	28.04		
	Self-financing	60.93	4.90	Total	9001.59	302	0.00		
Communicative Based Competency	Government	72.11	7.18	Between Gp	1041.69	2	520.84	3.72*	*0.000*
	Aided	76.45	4.80	Within Gp	11391.86	300	37.97		
	Self-financing	74.94	5.51	Total	12433.54	302	0.00		
Consequence Based Competency	Government	50.74	5.11	Between Gp	176.31	2	88.16	0.93	0.398
	Aided	52.60	4.42	Within Gp	6875.07	300	22.92		
	Self-financing	51.56	4.58	Total	7051.39	302	0.00		

From the table 4.56, it is apparent that the calculated *F* value for teaching competency is 2.90 and $p<0.05$, which is significant at 0.05 level. Hence it can be stated that significant difference exist among teachers from government, aided and self-financing schools in their teaching competency.

Table 4.57

Summary of Scheffe's values for Teaching competency with respect to Type of Management

Management	*N*	Pair	*p* (Scheffe)
Government (A)	136	A Vs B	0.000
Aided (B)	80	B Vs C	0.088
Self-financing (C)	87	A Vs C	0.031

To know the exact significant difference, Scheffe's pair wise comparison (post hoc test) is used. From the table 4.57, high school teachers from government and aided schools and government and self-finance schools differ significantly in their teaching competency. But high school teachers from aided and self-finance schools do not differ significantly in their teaching competency. From the mean scores it can be said that the teaching competency is higher for the teachers from aided schools than the government and self-finance schools.

For the dimensions performance based competency, affective based competency and contextual based competency the calculated *F* values are 0.14, 0.37, 0.29 and $p>0.05$, and which is not significant at 0.05 level. Hence it can be stated that teachers from schools with different types of management do not differ significantly in their performance based competency, affective based competency and contextual based competency.

For the dimension communication based competency the *F* value is 3.72 and p<0.05 level. Hence it can be stated that significant difference exists among teachers from government, aided and self-financing schools in communication based competency.

Table 4.58

Summary of Scheffe's values for the dimension communication based competency with respect to Type of Management

Management	*N*	Pair	*p* (Scheffe)
Government (A)	136	A Vs B	0.000
Aided (B)	80	B Vs C	0.288
Self-financing(C)	87	A Vs C	0.004

From the table 4.58, high school teachers from government and aided schools and government and self-financing schools differ significantly in their communication based competency. But high school teachers from aided and self-financing schools do not differ significantly in their teaching competency. From the mean scores it can be said that the communication based competency is higher for the teachers from aided schools than the government and self-financing schools.

For the dimension consequence based competency the *F* value is 0.93 and *p*>0.05. Hence the high school teachers from schools with different types of managements do not differ significantly in their consequence based competency

g) Comparison of Teaching Competency based on nature of schools

The *F* test was conducted to compare the teaching competency of Mathematics teachers from boys, girls and co-education schools. The result of the test of ANOVA is shown in table 4.59

Table 4.59

Summary of F value and Scheffe's value of High School Mathematics Teachers of Boys, Girls and Co-education institutions in their self-efficacy and its dimensions

Dimension	Nature of school	Mean	*SD*	Source	Sum of Squares	df	Mean Square	*F*	*p*
Teaching Competency	Boys	273.26	25.51	Between Gp	7111.08	2	3555.54	3.76	*0.*001*
	Girls	292.92	11.54	Within Gp	137461.19	300	458.20		
	Co-education	287.05	22.06	Total	144572.26	302	0.00		
Performance based Competency	Boys	59.39	6.12	Between Gp	274.55	2	137.28	1.10	0.905
	Girls	63.36	4.22	Within Gp	8306.41	300	27.69		
	Co-education	61.40	5.29	Total	8580.96	302	0.00		
Affective based Competency	Boys	38.13	3.48	Between Gp	23.00	2	11.50	0.92	*0.399*
	Girls	39.28	2.82	Within Gp	3738.90	300	12.46		
	Co-education	38.80	3.64	Total	3761.90	302	0.00		
Contextual based Competency	Boys	57.39	6.29	Between Gp	365.03	2	182.51	1.82	0.164
	Girls	61.31	3.28	Within Gp	8636.56	300	28.79		
	Co-education	60.93	5.51	Total	9001.59	302	0.00		
Communication based Competency	Boys	69.74	8.26	Between Gp	740.75	2	370.38	4.50*	*0.000*
	Girls	76.00	4.30	Within Gp	11692.79	300	38.98		
	Co-education	74.32	6.21	Total	12433.54	302	0.00		
Consequence based Competency	Boys	48.61	5.83	Between Gp	344.79	2	172.40	0.96	0.383
	Girls	52.97	2.77	Within Gp	6706.60	300	22.36		
	Co-education	51.59	4.82	Total	7051.39	302	0.00		

*Significant at 0.05 level

From the table 4.59 it is evident that the calculated *F* value for teaching competency is 3.76 and $p<0.05$, which is significant at 0.05 level. Hence it can be stated that significant difference exists among teachers from boys, girls and co-education schools in their teaching competency.

Table 4.60

Summary of Scheffe's values for Teaching competency with respect to Nature of Schools

Nature of school	*N*	Pair	*p* (Scheffe)	Level of Significance
Boys (A)	31	A Vs B	0.001	*0.05*
Girls (B)	39	B Vs C	0.243	*NS*
Co-education (C)	233	A Vs C	0.005	*0.05*

To know the exact significant difference, Scheffe's pair wise comparison (post hoc test) is used. From the table 4.60, high school teachers from boys and girls schools and girls and co-education schools differ significantly in their teaching competency. But high school teachers from boys and co-education schools do not differ significantly in their teaching competency. From the mean scores it can be said that the teaching competency is higher for the teachers from girls schools than the boys and co-education schools.

For the dimensions performance based competency, affective based competency and contextual based competency the calculated *F* values are 1.10, 0.92, 1.82 and $p>0.05$, and which is not significant at 0.05 level. Hence it can be stated that teachers from different nature of schools do not differ significantly in performance based competency, affective based competency and contextual based competency.

For the dimension communication based competency the *F* value is 4.50 and $p<0.05$ level. Hence it can be stated that significant difference exists among teachers from boys and girls and co-education schools in communication based competency.

Table 4.61

Summary of Scheffe's values for the dimension communication based competency with respect to Nature of Schools

Nature of school	*N*	Pair	*p* (Scheffe)
Boys (A)	31	A Vs B	0.000
Girls (B)	39	B Vs C	0.300
Co-education (C)	233	A Vs C	0.001

From the table 4.61, high school teachers from boys and girls and boys and co-education schools differ significantly in their communication based competency. But high school teachers from girls and co-education schools do not differ significantly in their teaching competency. From the mean scores it can be said that the communication based competency is higher for the teachers from girls schools than the boys and co-education schools.

For the dimension consequence based competency the *F* value is 0.96 and $p>0.05$. Hence the teachers from different nature of schools do not differ significantly in their consequence based competency.

h) Comparison of Teaching Competency based on income

The *F* test was used to compare the teaching competency of teachers based on their income Rs.5,000-10,000, Rs.11,000- 15,000, 16,000-20,000 ,Rs.21,000- 25,000 and Rs.26000 & above. The result of the test of ANOVA is shown in table 4.62.

Table 4.62

Summary of F value and Scheffe's value of High School Mathematics Teachers with various levels of income in their Teaching Competency and its dimensions

Dimension	Income	Mean	*SD*	Source	Sum of Squares	df	Mean Square	*F*	*p*
Teaching Competency	Rs.5,000-10,000	286.78	19.21	Between Gp	2766.27	4	691.57	1.45	*0.22*
	Rs.11,000-15000	286.55	18.02	Within Gp	141806.00	298	475.86		
	Rs.16000-20000	295.55	12.28	Total	144572.26	302	0.00		
	Rs.21000- 25000	272.11	61.83						
	Rs.26000 & above	286.40	20.21						
Performance Based Competency	Rs.5,000-10,000	61.09	4.49	Between Gp	225.29	4	56.32	2.01	*0.09*
	Rs.11,000-15000	61.81	4.56	Within Gp	8355.66	298	28.04		
	Rs.16000-20000	64.09	2.91	Total	8580.96	302	0.00		
	Rs.21000- 25000	57.56	13.98						
	Rs.26000 & above	61.52	5.05						
Affective Based Competency	Rs.5,000-10,000	38.76	3.08	Between Gp	77.22	4	19.31	1.56	*0.19*
	Rs.11,000-15000	38.65	3.57	Within Gp	3684.68	298	12.36		
	Rs.16000-20000	40.18	4.26	Total	3761.90	302	0.00		
	Rs.21000- 25000	36.33	8.15						
	Rs.26000 & above	38.86	3.25						
Contextual based Competency	Rs.5,000-10,000	60.87	5.34	Between Gp	224.98	4	56.24	1.91	*0.11*
	Rs.11,000-15000	60.45	4.62	Within Gp	8776.61	298	29.45		
	Rs.16000-20000	62.45	2.84	Total	9001.59	302	0.00		
	Rs.21000- 25000	56.11	13.30						
	Rs.26000 & above	60.68	5.10						
Communicativ e Based Competency	Rs.5,000-10,000	74.82	5.73	Between Gp	143.55	4	35.89	0.87	*0.48*
	Rs.11,000-15000	74.45	5.49	Within Gp	12290.00	298	41.24		
	Rs.16000-20000	76.18	4.05	Total	12433.54	302	0.00		
	Rs.21000- 25000	71.89	16.68						
	Rs.26000 & above	73.78	6.07						
Consequence Based Competency	Rs.5,000-10,000	51.24	4.97	Between Gp	36.06	4	9.02	0.38	*0.82*
	Rs.11,000-15000	51.19	4.04	Within Gp	7015.32	298	23.54		
	Rs.16000-20000	52.64	3.32	Total	7051.39	302	0.00		
	Rs.21000- 25000	50.22	11.39						
	Rs.26000 & above	51.56	4.54						

From the table 4.62, the *F* value for teaching competency is 1.45 and *p >0.05,* which is not significant at 0.05 level. Hence the high school teachers having different income do not differ significantly in their teaching competency.

For the dimensions of teaching competency namely performance based competency, affective based competency, contextual based competency, communication based competency and consequence based competency the corresponding *F* values is 2.01, 1.56, 1.91, 0.87 and 0.38 and p> 0.05, Hence the high school teachers having different income do not differ significantly at 0.05 level. Hence it can be stated that significant difference does not exist in teaching competency and its dimensions among teachers based on their income.

i) Comparison of Teaching Competency based on experience

The *F* test was used to compare the teaching competency based on year of experience among 1-5 years, 6-10 years, 11-15 years, 16-20 years and 21 and above. The result of the test of ANOVA is shown in table 4.63

The *F* test was conducted to compare the teaching competency of Mathematics teachers with different years of experience. The result of the test of significance of means is shown in table 4.63

Table 4.63

Summary of F value and Scheffe's value of High School Mathematics Teachers with different years of experience in their Teaching Competency and its dimensions

Dimension	Year of Experience	Mean	SD	Source	Sum of Squares	df	Mean Square	F	*p*
Teaching Competency	1-5 Years	287.61	29.18	Between Gp	9328.09	4	2332.02	5.14*	*0.001*
	6-10 Years	282.47	17.80	Within Gp	135244.18	298	453.84		
	11-15 Years	285.12	18.19	Total	144572.26	302	0.00		
	16-20 Years	305.68	18.25						
	21 & above Years	289.31	14.67						
Performance Based Competency	1-5 Years	61.43	6.70	Between Gp	317.94	4	79.48	2.87*	*0.024*
	6-10 Years	60.91	4.58	Within Gp	8263.02	298	27.73		
	11-15 Years	61.55	4.93	Total	8580.96	302	0.00		
	16-20 Years	65.26	4.56						
	21 & above Years	60.96	4.25						
Affective Based Competency	1-5 Years	39.19	4.07	Between Gp	244.87	4	61.22	5.19*	*0.000*
	6-10 Years	38.03	3.39	Within Gp	3517.03	298	11.80		
	11-15 Years	38.60	3.00	Total	3761.90	302	0.00		
	16-20 Years	41.63	3.34						
	21 & above Years	39.38	2.33						
Contextual based Competency	1-5 Years	61.08	6.84	Between Gp	427.69	4	106.92	3.72*	*0.006*
	6-10 Years	59.79	4.79	Within Gp	8573.90	298	28.77		
	11-15 Years	60.12	4.82	Total	9001.59	302	0.00		
	16-20 Years	64.63	4.47						
	21 & above Years	61.19	4.33						
Communication Based Competency	1-5 Years	74.84	8.12	Between Gp	733.22	4	183.30	2.73	*0.065*
	6-10 Years	73.05	5.33	Within Gp	11700.33	298	39.26		
	11-15 Years	73.20	6.28	Total	12433.54	302	0.00		
	16-20 Years	79.26	4.00						
	21 & above Years	74.54	4.72						
Consequence Based Competency	1-5 Years	51.09	6.41	Between Gp	389.55	4	97.39	2.61	*0.074*
	6-10 Years	50.69	3.98	Within Gp	6661.84	298	22.36		
	11-15 Years	51.65	4.05	Total	7051.39	302	0.00		
	16-20 Years	54.89	4.12						
	21 & above Years	53.23	3.42						
Teaching Competency	1-5 Years	287.61	29.18	Between Gp	9328.09	4	2332.02	5.14*	*0.001*
	6-10 Years	282.47	17.80	Within Gp	135244.18	298	453.84		
	11-15 Years	285.12	18.19	Total	144572.26	302	0.00		
	16-20 Years	305.68	18.25						
	21 & above Years	289.31	14.67						

*Significant at 0.05 level

From the table 4.63 it is evident that the calculated *F* value for teaching competency is 5.14 and $p<0.05$, which is significant at 0.05 level. Hence it can be stated that significant difference exists among teachers with different years of experience in their teaching competency.

Table 4.64

Summary of Scheffe's values for Teaching competency with respect to Years of Experience

Year of Experience	*N*	Pair	*p* (Scheffe)
1-5 Years (A)	80	A Vs B	0.597
6-10 Years (B)	118	B Vs C	0.961
11-15 Years (C)	60	A Vs C	0.976
16-20 Years (D)	19	A Vs D	0.028
21 & above Years (E)	26	B Vs D	0.001
		C Vs D	0.010
		A Vs E	*0.998*
		B Vs E	*0.700*
		C Vs E	*0.951*
		D Vs E	*0.169*

From the table 4.64 difference between pairs (A Vs B) (B Vs C) (A Vs C) (A Vs E) (B Vs E) (C Vs E) (D Vs E) are found to be not significant. But difference between pairs (A Vs D) (B Vs D) (C Vs D) are statistically found to be significant at 0.05 level. The mean scores A (287.61) is lower than that of D(305.68). Hence it can be said that teaching competency of teachers with 1-5 years of experience is lower than that of teachers with 16-20 years of experience. The mean scores B (282.47) is lower than that of D(305.6). Hence it can be said that teaching competency of teachers with 6-10 Years of experience is lower than that of teachers with 16-20 years of experience. The mean scores C (285.12) is lower than that of D(305.68). Hence it can

be said that teaching competency of teachers with 11-15 Years of experience is lower than that of teachers with 16-20 years of experience.

F value for performance based competency is 2.87 and p<0.05) and is significant at 0.05 level. Hence it can be stated that significant difference exists in performance based competency.

Table 4.65

Summary of Scheffe's values for *performance based competency with respect to Years of Experience*

Year of Experience	*N*	Pair	*p* (Scheffe)
1-5 Years (A)	80	A Vs B	0.977
6-10 Years (B)	118	B Vs C	0.964
11-15 Years (C)	60	A Vs C	1.000
16-20 Years (D)	19	A Vs D	0.090
21 & above Years (E)	26	B Vs D	0.027
		C Vs D	0.131
		A Vs E	0.997
		B Vs E	1.000
		C Vs E	0.994
		D Vs E	0.123

From the table 4.65 differences between pairs (A Vs B) (B Vs C) (A Vs C) (A Vs D) (C Vs D) (A Vs E) (B Vs E) (C Vs E) (D Vs E) are found to be not significant. But difference between pairs (B Vs D) is statistically found to be significant at 0.05 level. The mean score of B (60.91) is lower than that of D(65.26). Hence it can be said that performance based competency of teachers with 6-10 years of experience is lower than that of teachers with 16-20 years of experience.

F value for affective based competency is 5.19 and p<0.05 and is significant at 0.05 level. Hence it can be stated that significant difference exists in affective based competency

Table 4.66

Summary of Scheffe's values for affective based competency with respect to Years of Experience

Year of Experience	*N*	Pair	*p* (Scheffe)
1-5 Years (A)	80	A Vs B	0.248
6-10 Years (B)	118	B Vs C	0.895
11-15 Years (C)	60	A Vs C	0.908
16-20 Years (D)	19	A Vs D	0.104
21 & above Years (E)	26	B Vs D	0.002
		C Vs D	0.026
		A Vs E	1.000
		B Vs E	0.512
		C Vs E	0.919
		D Vs E	0.321

From the table 4.66 difference between pairs (A Vs B) (B Vs C) (A Vs C) (A Vs D) (A Vs E) (B Vs E) (C Vs E) (D Vs E) are found to be not significant. But difference between pairs (B Vs D) (C Vs D) are statistically found to be significant at 0.05 level. The mean score of B (38.03) is lower than that of D (41.63). Hence it can be said that affective based competency of teachers with 6-10 Years of experience is lower than that of teachers with 16-20 years of experience. The mean score of C (38.60) is lower than that of D (41.63). Hence it can be said that affective based competency of teachers with 11-15 years of experience is lower than that of teachers with 16-20 years of experience.

F value for contextual based competency is 3.72 and p<0.05 and is significant at 0.05 level. Hence it can be stated that significant difference exists in contextual based competency.

Table 4.67

Summary of Scheffe's values for contextual based competency with respect to Years of Experience

Year of Experience	N	Pair	p (Scheffe)
1-5 Years (A)	80	A Vs B	0.600
6-10 Years (B)	118	B Vs C	0.997
11-15 Years (C)	60	A Vs C	0.894
16-20 Years (D)	19	A Vs D	0.154
21 & above Years (E)	26	B Vs D	0.011
		C Vs D	0.039
		A Vs E	1.000
		B Vs E	0.835
		C Vs E	0.948
		D Vs E	0.343

From the table 4.67 difference between pairs (A Vs B) (B Vs C) (A Vs C) (A Vs D) (A Vs E) (B Vs E) (C Vs E) (D Vs E) are found to be not significant. But difference between pairs (B Vs D) (C Vs D) are statistically found to be significant at 0.05 level. The mean score of B (59.79) is lower than that of D(64.63). Hence it can be said that contextual based competency of teachers with 6-10 Years of experience is lower than that of teachers with 16-20 years of experience. The mean score of C(60.12) is lower than that of D(64.63). Hence it can be said that contextual based competency of teachers with 11-15 years of experience is lower than that of teachers with 16-20 years of experience.

F value for communication based competency and consequence based competency is 2.73 and 2.61 and *p*<0.05 which is not significant at 0.05 level. Hence

it can be stated that significant difference does not exists in communication based competency and consequence based competency.

Correlation of variables

i) Correlation of Metacognition and Teaching Competency

Table 4.68

Significance of correlation between Metacognition and Teaching Competency (in total and dimension wise)

		Teaching Competency	Performance Based Competency	Affective Based Competency	Contextual Based Competency	Communication Based Competency	Consequence Based Competency
Metacognition	Pearson Correlation	.201*	.213*	.160*	.176*	.135*	.180*
	p	.000	.000	.005	.002	.018	.002
Planning	Pearson Correlation	.153*	.141*	.115*	.130*	.133*	.130*
	p	.008	.014	.045	.024	.021	.024
Memory	Pearson Correlation	.119*	.081	.075	.126*	.086	.138*
	p	.038	.162	.192	.028	.134	.016
Monitoring	Pearson Correlation	.027	.079	.111	-.023	-.013	.000
	p	.637	.173	.054	.685	.819	.995
Evaluation	Pearson Correlation	.048	.067	-.021	.076	.036	.027
	p	.402	.244	.717	.189	.537	.636
Achievement	Pearson Correlation	.223*	.222*	.169*	.194*	.155*	.217*
	p	.000	.000	.003	.001	.007	.000

*. Correlation is significant at the 0.05 level

From the table 4.68, the co-efficient of correlation between metacognition and teaching competency of high school Mathematics teachers r=0.201 is significant at 0.05 level. So it can be said that there exists positive low correlation between metacognition and teaching competency of high school teachers.

The co-efficient of correlation between metacognition and performance based competency of high school Mathematics teachers r=0.213 is significant at 0.05 level. So it can be said that there exists positive low correlation between metacognition and performance based competency of high school teachers.

The co-efficient of correlation between metacognition and affective based competency of high school Mathematics teachers r=0.160 is significant at 0.05 level. Hence there is positive negligible correlation between metacognition and affective based competency of high school Mathematics teachers.

The co-efficient of correlation between metacognition and contextual based competency of Mathematics teachers r=0.176 is significant at 0.05 level. Hence there is positive negligible correlation between metacognition and contextual based competency of high school Mathematics teachers.

The co-efficient of correlation between metacognition and communication based competency of Mathematics teachers r=0.135 is significant at 0.05 level. This indicates that there is positive negligible correlation between metacognition and communication based competency of high school Mathematics teachers.

The co-efficient of correlation between metacognition and consequence based competency of Mathematics teachers r=0.180 is significant at 0.05 level. The value 'r' showed that there is positive negligible correlation between metacognition and consequence based competency of high school Mathematics teachers.

The co-efficient of correlation between planning and teaching competency of Mathematics teachers r=0.153 is significant at 0.05 level. The value 'r' showed that there is positive negligible correlation between planning and teaching competency of high school Mathematics teachers.

The co-efficient of correlation between planning and performance based competency of Mathematics teachers r=0.141 is significant at 0.05 level. there is positive negligible correlation between planning and performance based competency of high school Mathematics teachers.

The co-efficient of correlation between planning and affective based competency of high school Mathematics teachers r=0.115 is significant at 0.05 level. There is positive negligible correlation between planning and affective based competency of high school Mathematics teachers.

The co-efficient of correlation between planning and contextual based competency of high school Mathematics teachers r=0.130 is significant at 0.05 level. Hence there is positive negligible correlation between planning and contextual based competency of high school Mathematics teachers.

The co-efficient of correlation between planning and communication based competency of high school Mathematics teachers r=0.135 is significant at 0.05 level. Hence there is positive negligible correlation between planning and communication based competency of high school Mathematics teachers.

The co-efficient of correlation between memory and teaching competency of high school Mathematics teachers r=0.119 is significant at 0.05 level. Hence there is positive negligible correlation between memory and teaching competency of high school Mathematics teachers.

The co-efficient of correlation between memory and performance based competency of high school Mathematics teachers r=0.081 is not significant at any level.

The co-efficient of correlation between memory and affective based competency of high school Mathematics teachers r=0.075 is not significant at any level.

The co-efficient of correlation between memory and contextual based competency of high school Mathematics teachers r=0.126 is significant at 0.05 level.

Hence there is positive negligible correlation between memory and contextual based competency of high school Mathematics teachers.

The co-efficient of correlation between memory and communication based competency of high school Mathematics teachers r=0.086 is not significant at 0.05 level.

The co-efficient of correlation between memory and consequence based competency of high school Mathematics teachers r=0.138 is significant at 0.05 level. Hence there is positive negligible correlation between memory and consequence based competency of high school Mathematics teachers.

The co-efficient of correlation between monitoring and teaching competency of high school Mathematics teachers r=0.027 is significant at 0.05 level. There is positive negligible correlation between monitoring and teaching competency of high school Mathematics teachers.

The co-efficient of correlation between monitoring and performance based competency of high school Mathematics teachers r=0.079 is not significant at any level.

The co-efficient of correlation between monitoring and affective based competency of high school Mathematics teachers r=0.111 is not significant at any level.

The co-efficient of correlation between monitoring and contextual based competency of high school Mathematics teachers r=-0.023is not significant at 0.05 level.

The co-efficient of correlation between monitoring and communication based competency of high school Mathematics teachers r=-0.013 is not significant at 0.05 level.

The co-efficient of correlation between monitoring and consequence based competency of high school Mathematics teachers r=0.138 is significant at 0.05 level. There is positive negligible correlation between monitoring and consequence based competency of high school Mathematics teachers.

The co-efficient of correlation between evaluation and teaching competency of high school Mathematics teachers r=0.148 is significant at 0.05 level. This indicates that there is positive negligible correlation between evaluation and teaching competency of high school Mathematics teachers.

The co-efficient of correlation between evaluation and performance based competency of high school Mathematics teachers r=0.067 is not significant at any level.

The co-efficient of correlation between evaluation and affective based competency of high school Mathematics teachers r=-0.021 is not significant at any level.

The co-efficient of correlation between evaluation and contextual based competency of high school Mathematics teachers r=0.076 is not significant at 0.05 level.

The co-efficient of correlation between evaluation and communication based competency of high school Mathematics teachers r=0.036 is not significant at 0.05 level.

The co-efficient of correlation between evaluation and consequence based competency of high school Mathematics teachers r=0.027 is not significant at 0.05 level.

The co-efficient of correlation between achievement and teaching competency of high school Mathematics teachers r=0.223 is significant at 0.05 level.

This shows that the correlation between achievement and teaching competency of high school teachers is found to be positive and low.

The co-efficient of correlation between achievement and performance based competency of high school Mathematics teachers r=0.222 is significant at 0.05 level. The correlation between achievement and performance based competency of high school teachers is found to be positive and low.

The co-efficient of correlation between achievement and affective based competency of high school Mathematics teachers r=0.169 is significant at 0.05 level. Hence there is positive negligible correlation between achievement and affective based competency of high school Mathematics teachers.

The co-efficient of correlation between achievement and contextual based competency of Mathematics teachers r=0.194 is significant at 0.05 level. The value 'r' showed that there is positive negligible correlation between achievement and contextual based competency of high school Mathematics teachers.

The co-efficient of correlation between achievement and communication based competency of Mathematics teachers r=0.155 is significant at 0.05 level. This indicates that there is positive negligible correlation between achievement and communication based competency of high school Mathematics teachers.

The co-efficient of correlation between metacognition and consequence based teaching competency of Mathematics teachers r=0.217 is significant at 0.05 level. Hence there is a positive low correlation between achievement and consequence based competency of high school Mathematics teachers.

ii) **i) Correlation of Self Efficacy and Teaching Competency**

Table 4.69

Significance of correlation between Metacognition and Teaching Competency (in total and dimension wise)

		Teaching Competency	Performance Based Competency	Affective Based Competency	Contextual Based Competency	Communication Based Competency	Consequence Based Competency
Self Efficacy	Pearson Correlation	.547*	.423*	.424*	.457*	.489*	.535*
	p	.000	.000	.000	.000	.000	.000
Instructional Self efficacy	Pearson Correlation	.517*	.410*	.452*	.457*	.459*	.434*
	p	.000	.000	.000	.000	.000	.000
Behavioural Self efficacy	Pearson Correlation	.500*	.384*	.361*	.418*	.471*	.479*
	p	.000	.000	.000	.000	.000	.000
Cultural Self efficacy	Pearson Correlation	.454*	.345*	.301*	.394*	.391*	.491*
	p	.000	.000	.000	.000	.000	.000
Decision Making Self efficacy	Pearson Correlation	.472*	.365*	.395*	.368*	.418*	.474*
	p	.000	.000	.000	.000	.000	.000

*Significant at 0.05 level

From the table 4.69, the co-efficient of correlation between self efficacy and teaching competency of high school Mathematics teachers r=0.547 is significant at 0.05 level. So it can be said that there exists positive substantial correlation between self efficacy and teaching competency of high school teachers.

The co-efficient of correlation between self efficacy and performance based competency of high school Mathematics teachers r=0.423 is significant at 0.05 level. So it can be said that there exists positive substantial correlation between self efficacy and performance based competency of high school teachers.

The co-efficient of correlation between self efficacy and affective based competency of high school Mathematics teachers r=0.424 is significant at 0.05 level. There is positive substantial correlation between self efficacy and affective based competency of high school Mathematics teachers.

The co-efficient of correlation between self efficacy and contextual based competency of Mathematics teachers r=0.457 is significant at 0.05 level. There is positive substantial correlation between self efficacy and contextual based competency of high school Mathematics teachers.

The co-efficient of correlation between self efficacy and communication based competency of Mathematics teachers r=0.489 is significant at 0.05 level. This indicates that there is positive substantial correlation between self efficacy and communication based competency of high school Mathematics teachers.

The co-efficient of correlation between self efficacy and consequence based competency of Mathematics teachers r=0.535 is significant at 0.05 level. The value 'r' showed that there is positive substantial correlation between self efficacy and consequence based competency of high school Mathematics teachers.

The co-efficient of correlation between instructional self-efficacy and teaching competency of Mathematics teachers r=0.517 is significant at 0.05 level. The value 'r' showed that there is positive substantial correlation between instructional self-efficacy and teaching competency of high school Mathematics teachers.

The co-efficient of correlation between instructional self-efficacy and performance based competency of Mathematics teachers r=0.410 is significant at 0.05 level. This indicates that there is positive substantial correlation between instructional self-efficacy and performance based competency of high school Mathematics teachers.

The co-efficient of correlation between instructional self-efficacy and affective based competency of high school Mathematics teachers r=0.452 is significant at 0.05 level. Hence there is positive substantial correlation between

instructional self-efficacy and affective based competency of high school Mathematics teachers.

The co-efficient of correlation between instructional self-efficacy and contextual based competency of high school Mathematics teachers r=0.457 is significant at 0.05 level. Hence there is positive substantial correlation between instructional self-efficacy and contextual based competency of high school Mathematics teachers.

The co-efficient of correlation between instructional self-efficacy and communication based competency of high school Mathematics teachers r=0.459 is significant at 0.05 level. Hence there is positive substantial correlation between instructional self-efficacy and communication based competency of high school Mathematics teachers.

The co-efficient of correlation between behavioural self-efficacy and teaching competency of high school Mathematics teachers r=0.500 is significant at 0.05 level. Hence there is positive substantial correlation between behavioural self-efficacy and teaching competency of high school Mathematics teachers.

The co-efficient of correlation between behavioural self-efficacy and performance based competency of high school Mathematics teachers r=0.384 is significant at 0.05 level. Hence there is positive low correlation between behavioural self-efficacy and performance based competency of high school teachers

The co-efficient of correlation between behavioural self-efficacy and affective based competency of high school Mathematics teachers r=0.361 is is significant at 0.05 level. Hence there is positive low correlation between behavioural self-efficacy and affective based competency of high school teachers

The co-efficient of correlation between behavioural self-efficacy and contextual based competency of high school Mathematics teachers r=0.418 is significant at 0.05 level. there is positive substantial correlation between behavioural self-efficacy and contextual based competency of high school teachers.

The co-efficient of correlation between behavioural self-efficacy and communication based competency of high school Mathematics teachers r=0.471 is significant at 0.05 level. Hence there is positive substantial correlation between behavioural self-efficacy and communication based competency of high school teachers

The co-efficient of correlation between behavioural self-efficacy and consequence based competency of high school Mathematics teachers r=0.479 is significant at 0.05 level. There is positive substantial correlation between behavioural self-efficacy and consequence based competency of high school teachers.

The co-efficient of correlation between cultural self-efficacy and teaching competency of high school Mathematics teachers r=0.454 is significant at 0.05 level. Hence there is positive substantial correlation between cultural self-efficacy and teaching competency of high school teachers.

The co-efficient of correlation between cultural self-efficacy and performance based competency of high school Mathematics teachers r=0.345 is significant at any 0.05 level. Hence there is positive low correlation between cultural self-efficacy and performance based competency of high school teachers.

The co-efficient of correlation between cultural self-efficacy and affective based competency of high school Mathematics teachers r=0.301 is significant at any 0.05 level. Hence there is positive low correlation between cultural self-efficacy and affective based competency of high school teachers.

The co-efficient of correlation between cultural self-efficacy and contextual based competency of high school Mathematics teachers r=-0.394 is significant at 0.05 level. Hence there is positive low correlation between cultural self-efficacy and contxtual based competency of high school teachers.

The co-efficient of correlation between cultural self-efficacy and communication based competency of high school Mathematics teachers r=-0.391 is significant at 0.05 level. Hence there is positive low correlation between cultural self-efficacy and communication based competency of high school teachers.

The co-efficient of correlation between cultural self-efficacy and consequence based competency of high school Mathematics teachers r=0.491 is significant at 0.05 level. There is positive substantial correlation between cultural self-efficacy and consequence based competency of high school Mathematics teachers.

The co-efficient of correlation between decision making self-efficacy and teaching competency of high school Mathematics teachers r=0.472 is significant at 0.05 level. This indicates that there is positive substantial correlation between decision making self-efficacy and teaching competency of high school teachers.

The co-efficient of correlation between decision making self-efficacy and performance based competency of high school Mathematics teachers r=0.365 is significant at 0.05 level. Hence there is positive low correlation between decision making self-efficacy and performance based competency of high school teachers.

The co-efficient of correlation between decision making self-efficacy and affective based competency of high school Mathematics teachers r=-0.395 is significant at 0.05 level. Hence there is positive low correlation between decision making self-efficacy and affective based competency of high school teachers.

The co-efficient of correlation between decision making self-efficacy and contextual based competency of high school Mathematics teachers r=0.368 is significant at 0.05 level. Hence there is positive low correlation between decision making self-efficacy and contextual based competency of high school teachers

The co-efficient of correlation between decision making self-efficacy and communication based competency of high school Mathematics teachers r=0.418 is significant at 0.05 level. Hence there is positive substantial correlation between decision making self-efficacy and communication based competency of high school teachers.

The co-efficient of correlation between decision making self-efficacy and consequence based competency of high school Mathematics teachers r=0.474 is significant at 0.05 level. Hence there is positive substantial correlation between decision making self-efficacy and consequence based competency of high school teachers.

iii) Correlation of metacognition with teaching competency based on demographical variables

The present study intends to establish relationship between metacognition and teaching competency of high school mathematics teachers. The data pertaining to these variables were statistically analysed using Karl Pearson's correlation coefficient. The results of the correlation analysis are as shown in the table 4.70

Table 4.70

Significance of Correlation between Metacognition and Teaching Competency based on demographical variables

Background characteristics		Pearson Correlation	*p*	*Level of significance*
Sex	Male	0.297	*0.003*	*0.05*
	Female	0.169	*0.015*	*0.05*
Locality	Rural	0.097	*0.175*	*NS*
	Urban	0.342	*0.000*	*0.05*
Martial status	Married	0.208	*0.001*	*0.05*
	Unmarried	0.217	*0.002*	*0.05*
Qualification	Graduation	0.342	*0.000*	*0.05*
	Post Graduation	0.382	*0.003*	*0.05*
District	Kanyakumari	0.366	*0.040*	*0.05*
	Tirunelveli	0.338	*0.000*	*0.05*
	Thoothukudi	0.427	*0.017*	*0.05*
Management	Government	0.244	*0.004*	*0.05*
	Aided	0.296	*0.008*	*0.05*
	Self-financing	0.074	*0.496*	*NS*
Nature of school	Boys	0.343	*0.003*	*0.05*
	Girls	0.364	*0.023*	*0.05*
	Co-education	0.182	*0.005*	*0.05*
Income	Rs.5,000-10,000	-0.025	*0.856*	*NS*
	Rs.11,000-15000	0.209	*0.019*	*0.05*
	Rs.16000-20000	0.202	*0.001*	*0.05*
	Rs.21000- 25000	0.735	*0.024*	*0.05*
	Rs.26000 & above	0.161	*0.024*	*0.05*
Years of Experience	1-5 Years	0.356	*0.001*	*0.05*
	6-10 Years	0.211	*0.022*	*0.05*
	11-15 Years	-0.234	*0.796*	*0.05*
	16-20 Years	0.341	*0.018*	*0.05*
	21 & above Years	0.209	*0.023*	*0.05*

From the table it is clear that the coefficient of correlation between Metacognition and Teaching Competency of male teachers is 0.297 and female teachers are 0.169 which are significant at 0.05 level. The correlation may be described as low for male high school Mathematics teachers and negligible for female high school Mathematics teachers.

The coefficient of correlation between metacognition and teaching competency of rural teachers is 0.097, which is not significant and urban teachers is 0.342, which is significant at 0.05 level.

The coefficient of correlation between metacognition and teaching competency of married teachers is 0.208 and unmarried teachers is 0.217 which are significant at 0.05 level. This shows that the correlation between metacognition and teaching competency of high school Mathematics teachers are positive and low based on their sex.

The coefficient of correlation between metacognition and teaching competency of graduate teachers is 0.342 and post graduate teachers is 0.382, which are significant at 0.05 level. This shows that there is positive and low correlation between metacognition and teaching competency of high school teachers based on their educational qualification

The coefficient of correlation between metacognition and teaching competency of teachers from Kanniyakumari 0.366 and Tirunelveli districts.338 are significant at 0.05 level. The correlation is found to be positive and low correlation. But the teachers from Thoothukudi district, correlation is found to be substantial correlation.

The coefficient of correlation between metacognition and teaching competency of Government school teachers 0.244 and aided school teachers.296 are significant at 0.05 level. But from self-financing schools 0.074 is not significant. So it can be said that there exist positive and low correlation between metacognition and teaching competency of Government school teachers and aided school teachers. But there is no correlation between metacognition and teaching competency of self-financing school teachers.

The coefficient of correlation between metacognition and teaching competency of teachers from boys schools 0.343, girls schools 0.364 and co-education schools 0.182 are significant at 0.05 level. So it can be said that there exists positive and low correlation between metacognition and teaching competency of teachers from boys and girls schools. But there exists negligible correlation between metacognition and Teaching competency for teachers from co-education schools.

The coefficient of correlation between metacognition and teaching competency of teachers in the income group Rs.5,000-10,000 is -0.025, which is not significant at 0.05 level and for teachers in the group Rs.11,000-15000, Rs.16000-20000, Rs.21000- 25000 and Rs.26000 & above are significant at 0.05 level. So it can be said that there exists positive and low correlation between teachers having Rs.11,000-15000 income and Rs.16000-20000 income and there exists positive and negligible correlation between teachers having Rs.26000 & above income and there exists positive and high correlation between teachers having Rs.21000- 25000 income.

The coefficient of correlation between Metacognition and Teaching Competency of teachers having 1-5 years of experience is 0.356, 6-10 years is 0.211, 11-15 years is 0.234 16-20 years is 0.341 and 21 and above years is 0.209, which are

significant at 0.05 level. So it can be said that there is positive low correlation between metacognition and teaching competency of high school Mathematics teachers based on their income.

iv) Correlation of self-efficacy with teaching competency based on demographical variables

Table 4.71

Significance of Correlation between Self-efficacy and Teaching Competency based on demographical variables

Background characteristics		Pearson Correlation	*p*	*Level of significance*
Sex	Male	0.716	*0.000*	*.05*
	Female	0.500	*0.000*	*.05*
Locality	Rural	0.591	*0.000*	*.05*
	Urban	0.524	*0.000*	*.05*
Marital status	Married	0.542	*0.000*	*.05*
	Unmarried	0.56	*0.000*	*.05*
Qualification	Graduation	0.402	*0.000*	*.05*
	Post Graduation	0.628	*0.000*	*.05*
District	Kanniyakumari	0.567	*0.000*	*.05*
	Tirunelveli	0.565	*0.000*	*.05*
	Thoothukudi	0.698	*0.000*	*.05*
Management	Government	0.579	*0.000*	*.05*
	Aided	0.665	*0.000*	*.05*
	Self-financing	0.544	*0.000*	*.05*
Nature of school	Boys	0.573	*0.001*	*.05*
	Girls	0.757	*0.000*	*.05*
	Co-education	0.525	*0.000*	*.05*
Income	Rs.5,000-10,000	0.482	*0.000*	*.05*
	Rs.11,000-15000	0.713	*0.000*	*.05*
	Rs.16000-20000	0.5	*0.117*	*NS*
	Rs.21000- 25000	0.324	*0.395*	*NS*
	Rs.26000 & above	0.719	*0.000*	*.05*
Years of Experience	1-5 Years	0.424	*0.000*	*.05*
	6-10 Years	0.596	*0.000*	*.05*
	11-15 Years	0.689	*0.000*	*.05*
	16-20 Years	0.202	*0.407*	*NS*
	21 & above Years	0.885	*0.000*	*.05*

From the table 4.71, coefficient of correlation between self-efficacy and teaching competency of male teachers is 0.716 and female teachers is 0.500 which are significant at 0.05 level. This shows that the correlation between self-efficacy and teaching competency of male teachers is high and female teachers is positive and substantial.

The coefficient of correlation between self-efficacy and teaching competency of rural teachers is 0.591 and urban teachers is 0.524, which are significant at 0.05 level. This shows that there is positive substantial correlation between self-efficacy and teaching competency of rural and urban high school Mathematics teachers.

The coefficient of correlation between self-efficacy and teaching competency of married teachers is 0.542 and unmarried teachers is 0.560 which are significant at 0.05 level. This shows that there is positive substantial correlation between self-efficacy and teaching competency of married and unmarried high school Mathematics teachers.

The coefficient of correlation between self-efficacy and Teaching Competency of graduate teachers is 0.402 and post graduate teachers is 0.628, which are significant at 0.05 level. This shows that there exists positive substantial correlation between self-efficacy and Teaching Competency of graduate and post graduate high school Mathematics teachers.

The coefficient of correlation between self-efficacy and teaching competency of Kanniyakumari district teachers 0.567, Tirunelveli district teachers 0.565 and Thoothukudi district teachers 0.698 are significant at 0.05 level. This shows that there is positive substantial correlation between self-efficacy and teaching competency of high school Mathematics teachers based on their district.

The coefficient of correlation between self-efficacy and teaching competency of Government school teachers 0.579, aided school teachers 0.665 and self-financing school teachers 0.544 are significant at 0.05 level. So it can be said that there exist positive substantial correlation between self-efficacy and teaching competency of high school Mathematics teachers based on their type of management.

The coefficient of correlation between self-efficacy and teaching competency of boys school teachers 0.573, girls school teachers 0.757 and co-education school teachers 0.525 are significant at 0.05 level. So it can be said that there exists positive and substantial correlation between self-efficacy and teaching competency of high school Mathematics teachers from boys and co-education schools. With respect to teachers from girls schools, the correlation is found to be high.

The coefficient of correlation between self-efficacy and teaching competency of teachers in the income group Rs.5,000-10,000, Rs.11,000-15000 and Rs.26000 & above, are significant at 0.05 level. But teachers in the income group Rs.16,000-20,000 and Rs.21000- 25000 are not significant at 0.05 level. So it can be said that teachers having Rs.5,000-10,000 income have substantial correlation and teachers having Rs.11,000-15000 income and Rs.26000 & above income have high correlation between self-efficacy and Teaching Competency.

The coefficient of correlation between self-efficacy and teaching competency of teachers having.1-5 years of experience 0.424, 6-10 years of experience 0.596, 11-15 years of experience 0.689 and 21 and above years of experience are significant at 0.05 level and teachers having 16-20 years experience is not significant at 0.05 level. So it can be said that there is positive substantial correlation between self-efficacy and teaching competency of teachers having1-5 years experience, 6-10 years experience 0.596 and 11-15 years experience and high correlation for teachers having 21 and

above years experience. But there is no correlation between teachers having 16-20 years experience.

Multiple Regression Analysis

Step-wise Regression Analysis

To find out the influence of metacognition and self-efficacy on teaching competency of high school Mathematics teachers, step-wise regression analysis was done using ANOVA approach. Step-wise regression analysis is an exploratory analytic procedure used to identify sets of variables within pre identified conceptual or cultural domains that predict variance in the dependent variables. Stepwise regression is used to test which variables predict the greatest amount of variance by entering variables into the regression equation in the order of their hypothesized importance, based on researcher experience and prior data analysis.

The analysis was carried out using the software SPSS programme (version 18) for the step wise regression approach. The input data for the step wise regression analysis were the means, standard deviations of the predictor and criterion variables and the correlation matrix of the criterion variable with the predictor variables.

The correlation matrix of the criterion variable teaching competency with the two predictor variables viz., metacognition and self-efficacy is presented in table 4.72

Table 4.72

The correlation matrix of the criterion variable teaching competency with the two predictor variables viz, metacognition and self-efficacy is presented in table

Table 4.73

Correlation matrix of the criterion variable and the predictor variables

Variables	Metacognition	Self-efficacy	Teaching Competency
Metacognition	1.000	0.087	0.201
Self-Efficacy	0.087	1.000	0.547
Teaching Competency	0.201	0.547	1.000

The coefficient of correlation presented in the above table indicates that predictor variable self-efficacy has the highest correlation (r=0.547) with the criterion variable teaching competency (Y). Therefore the predictor variable self-efficacy (X_2) was selected as the first variable to be entered in the regression analysis.

Results of step I regression analysis

The variable selected for step-I analysis is self-efficacy(X_2). The result of step -I analysis is given in table 4.74

Table 4.74

Summary of step I Regression Analysis

Model summary

R	R^2	Adjusted R^2	Standard. error of the estimate
.55	.299	.297	18.35

Predictors: (Constant), Self Efficacy

ANOVA

Model	Sum of Squares	df	Mean Square	*F*	*p*
Regression	43270.40	1	43270.40		
Residual	101301.86	301	336.55	128.57	.000
Total	144572.26	302			

Predictors: (Constant), Self Efficacy

Coefficient of regression

Model	Unstandardized Coefficients		Standardized Coefficients	*t*	*p*
	B	Std. Error	ß		
(Constant)	161.87	11.03		14.67	.000
Self Efficacy	.66	.06	.55	11.34	.000

Dependent Variable: Teaching Competency

The results shown in table 4. suggests that, index of predictability is 0.547 and the percentage variance accounted by the variable self-efficacy in predicting teaching competency is 29.9%. This suggests that 29.9 percent of the variation in the variable teaching competency can be accounted for the variation in the variable self-efficacy and remaining 70.1 percent of the variation is attributable to other factors.

The obtained *F* value (*F*=128.57: *P*□0.05) is significant at 0.05 level. This suggests that the variable self-efficacy is highly significant in predicting teaching competency.

The ß coefficient of the variable self-efficacy in the development of the regression equation is 0.55. The standard error of ß coefficient is 0. .058. The equation for predicting the criterion variable teaching competency using the predictor variable self-efficacy can be written as

$$Y = 0.66\ X_2 + 161.87$$

The results shows that for every unit change in the score of self-efficacy there will be 0.66 unit increase in the score of teaching competency.

Results of step II regression analysis

The second input variable is metacognition (X_1), which has the second highest value (r=0.20) in the correlation matrix with the criterion variable teaching competency (Y).

So the predictor variable metacognition was entered in the second step analysis. The results are presented in table 4. 75

Table 4. 75

Results of step II Regression Analysis

Model Summary

Model	*R*	R^2	Adjusted R Square	Standard Error of the Estimate
1	.57	.32	.32	18.06281

Predictors: (Constant), Self efficacy, Metacognition

ANOVA

Model		Sum of Squares	df	Mean Square	*F*	*p*
1	Regression	46692.78	2	23346.39	71.56	.000
	Residual	97879.49	300	326.27		
	Total	144572.26	302			

Predictors: (Constant), Self efficacy, Metacognition
Dependent Variable: Teaching Competency

Coefficient of regression

Model		Unstandardized Coefficients		Standardized Coefficients	*t*	*p*
		B	Std. Error	Beta		
1	(Constant)	104.78	20.71		5.06	.000
	Metacognition	1.43	.44	.15	3.24	.001
	Self efficacy	.64	.06	.53	11.19	.000

Dependent Variable: Teaching Competency

The results shown in table 4. suggests that, index of predictability (R) is 0.57 and the percentage variance accounted by the variable self-efficacy (X_2) and metacognition (X_1) in predicting teaching competency is 32.3%. This suggests that 32.3% of the

variation in the teaching competency can be accounted for by the variation in the self-efficacy and metacognition.

The obtained *F* value (F=71.58; P<0.05) is significant at 0.05 level. This suggests that the predictor variables metacognition and self-efficacy are highly significant in predicting teaching competency.

The ß coefficient of the variable self-efficacy(X_2) and metacognition (X_1) in the development of the regression equation is 0.15 and .53, so the equation for predicting the criterion variable teaching competency using the predictor variable self-efficacy(X_2) and metacognition(X_1) can be written as

$$Y= 1.43\ X_2 +0.64\ X_1 + 104.78$$

The equation suggests that for unit increase in X_2, Y increases by 0.15 units when the effect of X_1 is held constant and that for unit increase in X_1, Y increases by 0.53 units when the effect of the variable X_2 is nullified.

The increment in the percentage variance after step II analysis was found out and presented in table 4.

Table 4.76

Increment in percentage variance after step II analysis

Variable	Percentage variance (R^2 = 100)	Increment in the percentage of variance
Self-efficacy(X_2)	29.9	2.4
metacognition (X_1)	32.3	

R^2 is found to be 0.323 and accordingly 32.3% of difference in teaching competency of high school Mathematics teachers can be attributed to differences in self-efficacy and metacognition. The total contribution of percent can be further broken down to the independent contribution of self-efficacy and metacognition.

Since $R^2 = 0.299 + 0.024$, the contribution of self-efficacy to the variation of teaching competency is 29.9%. The contribution of metacognition is 2.4.

Factor analysis for metacognition, self-efficacy and teaching competency of high school mathematics teachers

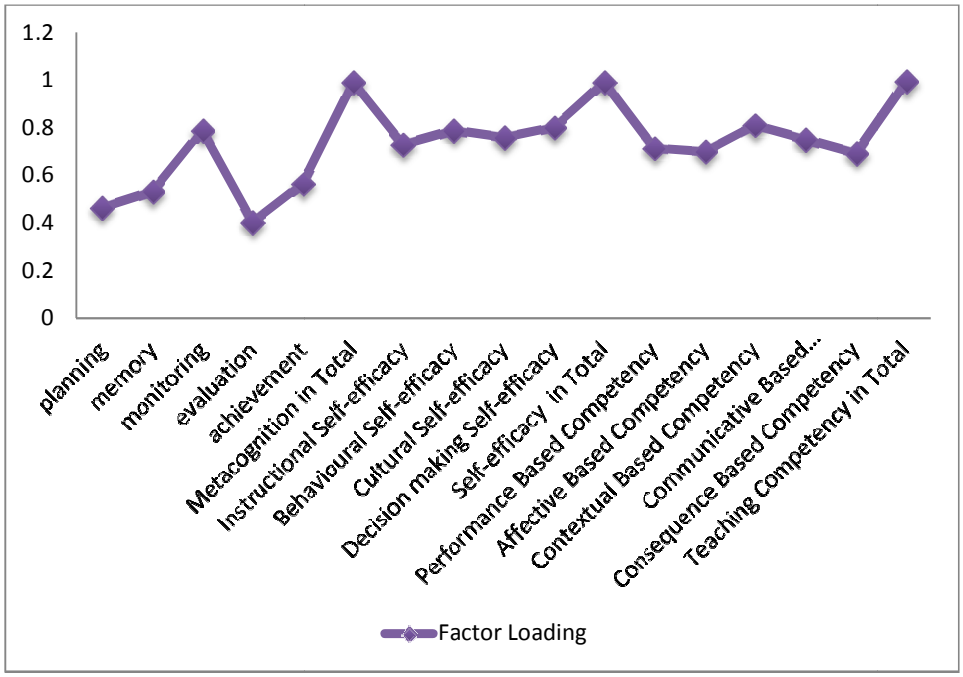
Table 4.76

Factor Loading of Metacognition, Self-efficacy and Teaching Competency of High School Mathematics Teachers

Variables	Factor Loading	Nature of Variables
planning	0.464	Extremely somewhat presence
memory	0.532	Extremely somewhat presence
monitoring	0.790	Very High Presence
evaluation	0.403	Extremely low presence
achievement	0.567	Considerable presence
Metacognition in Total	0.992	Extremely High presence
Instructional Self-efficacy	0.731	Very High Presence
Behavioural Self-efficacy	0.790	Very High Presence
Cultural Self-efficacy	0.761	Very High Presence
Decision making Self-efficacy	0.803	Very High Presence
Self-efficacy in Total	0.993	Extremely High presence
Performance Based Competency	0.714	Very High Presence
Affective Based Competency	0.700	Considerable presence
Contextual Based Competency	0.811	Very High Presence
Communicative Based Competency	0.752	Very High Presence
Consequence Based Competency	0.695	Considerable presence
Teaching Competency in Total	0.995	Extremely High presence

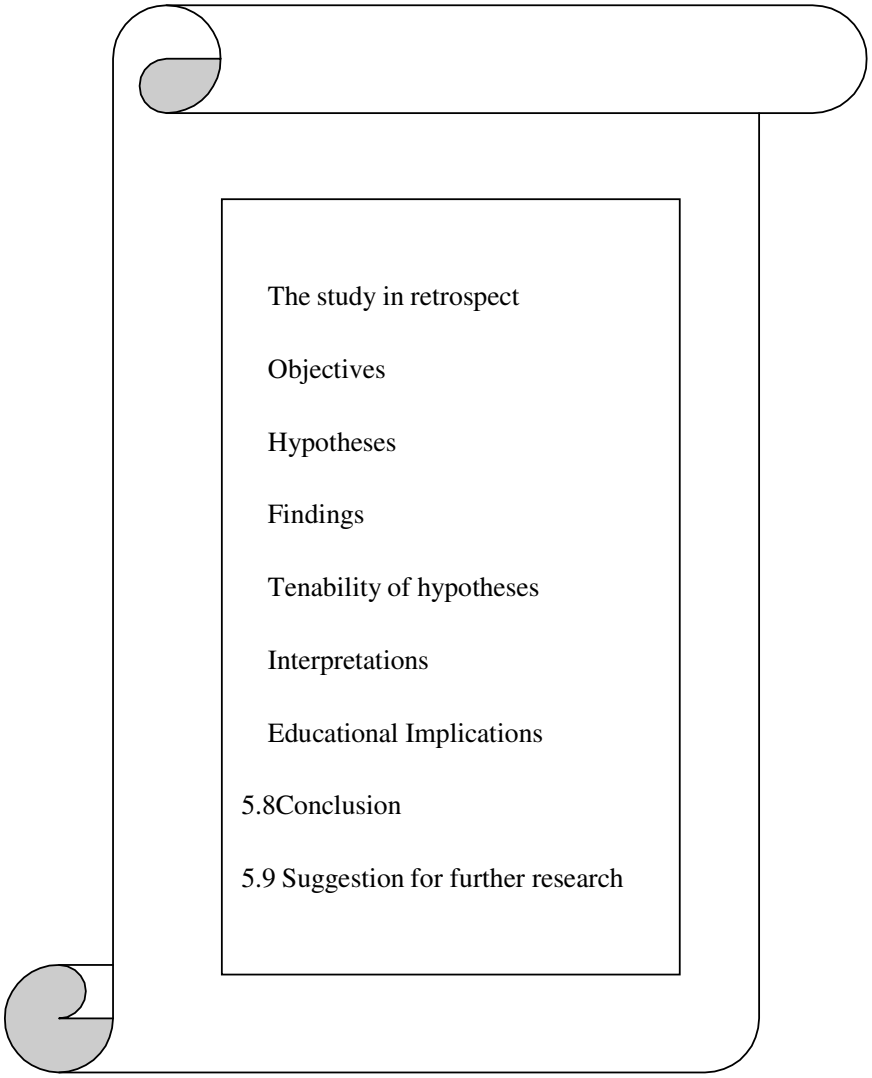
It is inferred from the above table that there is significant factor with positive loading of the variables namely planning, memory, monitoring, evaluation, achievement, metacognition in total, instructional self-efficacy, behavioural self-efficacy, cultural self-efficacy, decision making self-efficacy, Self-efficacy in total, performance based competency, affective based competency, contextual based competency, communicative based competency, consequence based competency and Teaching competency in total. The factor for the study has been identified as **Integral Teaching Pedagogy.** It includes the dimensions Metacognition, Self-efficacy and Teaching Competency

Figure 4. Factor Loading of Metacognition, Self-efficacy and Teaching Competency of High School Mathematics Teachers



CHAPTER-V

ANALYSIS AND INTERPRETATION OF DATA



The study in retrospect

Objectives

Hypotheses

Findings

Tenability of hypotheses

Interpretations

Educational Implications

5.8Conclusion

5.9 Suggestion for further research

This chapter gives a summary of the study under the heads-restatement of the problem, objectives, hypotheses, methodology, major findings of the investigation, interpretation, recommendations and suggestions for further research. The findings of the study are based on the analysis of the collected data and the interpretations are given based on the findings.

The Study in Retrospect

The study under investigation is entitled as ""Metacognition, Self-efficacy and Teaching Competency of High School Mathematics Teachers in the Southern Districts of Tamil Nadu"

A sample of 303 higher Mathematics teachers was selected from different schools from the southern districts of Tamil Nadu viz. Kanniyakumari, Tirunelveli and Thoothukudi. The investigator used normative survey method.

Random sampling technique was used for selecting the sample.

For collecting data, the tools used were Questionnaire on Metacognition, Self-efficacy scale, Teaching Competency scale.

The data were subjected to statistical analysis like mean, standard deviation, test of significance ('t' test and ANOVA), correlation, regression and factor analysis

Objectives

7. To find out the level of metacognition, self efficacy and teaching competency of high school Mathematics teachers in the southern districts of Tamil Nadu.

8. To find out whether there is any significant difference in metacognition, self efficacy and teaching competency of high school Mathematics teachers in the southern districts of Tamil Nadu based on variables: sex, locality, marital status, educational qualification, district, type of management, nature of school, income and year of experience.

9. To find out the relationship between i) metacognition and teaching competency iii) self-efficacy and teaching competency of high school Mathematics teachers in the southern districts of Tamil Nadu with respect to the dimensions.

10. To find out the relationship between i) metacognition and teaching competency iii) self-efficacy and teaching competency of high school Mathematics teachers in the southern districts of Tamil Nadu with respect to the background variables.

11. To find out the significant influence of metacognition and self-efficacy on teaching competency of high school Mathematics teachers

12. To find out the significant factors with positive loadings of the variables namely metacognition, self-efficacy and teaching competency of high school Mathematics teachers.

Hypotheses:

6) There exists significant difference among the high school Mathematics teachers in Tamil Nadu, in their i) metacognition ii) self-efficacy iii) teaching competency with respect to

the back ground variables sex, locality, marital status, educational qualification, district, type of management, nature of school, income and year of experience.

7) There exists significant relationship between i) metacognition and Teaching competency ii) self-efficacy and teaching competency of high school Mathematics teachers with respect to the dimensions.

8) There exists significant relationship between i) metacognition and Teaching competency ii) self-efficacy and teaching competency of high school Mathematics teachers with respect to the background variables.

9) There exists significant influence of metacognition and self-efficacy on teaching competency of high school Mathematics teachers.

10) There exists significant factors with positive loadings of the variables namely Metacognition, Self-efficacy and Teaching Competency among high school Mathematics teachers.

Findings

1. Percentage Analysis

a) Metacognition

80.2% of high school Mathematics teachers is found to be moderate level of metacognition. Its dimensions like planning, memory, monitoring evaluation and achievement also have moderate level of metacognition such as 70.3%, 83.5%, 67.7%, 70.0% and 87.1% respectively.

b) Self-efficacy

77.6% of high school Mathematics teachers is found to be moderate level of self-efficacy. Its dimensions like instructional self-efficacy, behavioural self-efficacy, and decision making self-efficacy also have moderate level of self-efficacy such as 78.2%, 78.5% and 77.6% respectively. But 48.18% of teachers have low level cultural self-efficacy.

c) Teaching Competency

76.9% of high school Mathematics teachers is found to be moderate level of teaching competency. Its dimensions like performance based competency, affective based competency, contextual based competency, communicative based competency and consequence based competency also have moderate level of teaching competency such as 69.0% , 71.0%, 74.3%, 78.9% and 75.9% respectively.

Differential Analysis

a) Metacognition of High School Mathematics Teachers

1. There exists significant difference between male and female high school Mathematics teachers in metacognition and its dimensions planning, monitoring and evaluation. For memory and achievement no significant difference is noted. While comparing the mean scores, male teachers are better than female teachers in metacognition and the dimensions planning, monitoring and evaluation.
2. There exists significant difference between high school Mathematics teachers from rural and urban locality in their metacognition and its dimensions planning, monitoring and evaluation except memory and achievement. The comparison of mean scores reveals that

teachers from rural locality are better than teachers from urban locality in their metacognition and its dimensions planning, monitoring and evaluation.

3. There exists significant difference between married and unmarried high school Mathematics teachers in their metacognition and its dimensions planning, monitoring and evaluation. But no significant difference is noted in memory and achievement. The comparison of mean scores reveals that married teachers are better than unmarried teachers in their metacognition and its dimensions planning, monitoring and evaluation.

4. There exists significant difference between graduate and postgraduate high school Mathematics teachers in their metacognition and its dimensions planning, memory, monitoring and evaluation. For achievement no significant difference is noted. The comparison of mean scores reveals that postgraduate teachers are better than graduate teachers in metacognition and its dimensions planning, memory, monitoring and evaluation.

5. There exists significant difference among high school Mathematics teachers from Kanniyakumari, Tirunelveli and Thoothukudi districts in their metacognition and its dimensions planning and memory but no significant difference in monitoring, evaluation and achievement. The Post ANOVA test reveals that Thoothukudi districts teachers are better than Kanniyakumari and Tirunelveli district teachers in their metacognition and its dimensions planning and memory.

6. There exists significant difference among high school Mathematics teachers from government, aided and self-financed schools in their metacognition and its dimensions planning and monitoring but not in memory, evaluation and achievement. The Post ANOVA test reveals that self-financed school teachers are better than government and aided school teachers in their metacognition and its dimensions planning and monitoring.

7. There exists no significant difference among high school Mathematics teachers from boys, girls and co-education institutions in their metacognition and its dimensions planning, memory, monitoring, evaluation and achievement.
8. There exists significant difference among high school Mathematics teachers with respect to income in the dimension monitoring but not in metacognition and its dimensions planning, memory, evaluation and achievement. The Post ANOVA test reveals that teachers having income of Rs. 16000-20000 are better than their counterparts in the dimension monitoring.
9. There exists significant difference among high school Mathematics teachers with respect to year of experience in their metacognition and its dimensions planning and monitoring but not in memory, evaluation and achievement. The Post ANOVA test reveals that teachers having experience of 21years and above are better than their counterparts in metacognition and its dimensions planning and monitoring.

2. ***Self-Efficacy of High School Mathematics Teachers***

1. There exists significant difference between male and female high school Mathematics teachers in their self-efficacy and its dimensions behavioural self-efficacy, cultural self-efficacy and decision making self-efficacy but not in instructional self-efficacy. While comparing the mean scores of male and female high school Mathematics teachers, male teachers are better than female teachers in their self-efficacy, behavioural self-efficacy, cultural self-efficacy and decision making self-efficacy.
2. There exists significant difference between high school Mathematics teachers from rural and urban locality in their self-efficacy and its dimension cultural self-efficacy. But no significant difference is noted in instructional self-efficacy, behavioural self-efficacy and decision making self-efficacy. While comparing the mean scores, teachers from rural

locality are found to be better than teachers from urban locality in their self-efficacy and its dimension cultural self-efficacy.

3. There exists significant difference between married and unmarried high school Mathematics teachers in their self-efficacy and decision making self-efficacy. But no significant difference is noted in their instructional self-efficacy, behavioural self-efficacy and cultural self-efficacy. While comparing the mean scores of married and unmarried high school Mathematics teachers, unmarried teachers are better than married teachers in their self-efficacy and decision making self-efficacy.
4. There exists significant difference between graduate and post graduate high school Mathematics teachers in their self-efficacy and its dimensions instructional self-efficacy, behavioural self-efficacy, cultural self-efficacy and decision making self-efficacy. While comparing the mean scores, post graduate teachers are better than graduate teachers in their self-efficacy and its dimensions of study.
5. There exists significant difference among high school Mathematics teachers from Kanniyakumari, Tirunelveli and Thoothukudi districts in their self-efficacy, instructional self-efficacy, behavioural self-efficacy and decision making self-efficacy. But no significant difference is noted in cultural self-efficacy. The Post ANOVA test reveals that Thoothudkudi district teachers are better than their counterparts in self-efficacy, instructional self-efficacy, behavioural self-efficacy and decision making self-efficacy.
6. There exists significant difference among high school Mathematics teachers from government, aided and self-financed schools in their self-efficacy and its dimensions instructional self-efficacy, and decision making self-efficacy. But no significant difference is found in behavioural self-efficacy and cultural self-efficacy. The Post ANOVA test reveals that aided school teachers are better than their counterparts in self-efficacy, instructional self-efficacy, and decision making self-efficacy.

7. There exists significant difference among high school Mathematics teachers from boys, girls and co-education schools in their self-efficacy and decision making self-efficacy. But there is no noted difference exists among teachers in their instructional self-efficacy, behavioural self-efficacy and cultural self-efficacy. The Post ANOVA test reveals that girls school teachers are better than their counterparts in their self-efficacy and decision making self-efficacy.
8. There exists significant difference among high school Mathematics teachers with respect to income in their self-efficacy and its dimension cultural self-efficacy but not in instructional self-efficacy, behavioural self-efficacy and decision making self-efficacy. The Post ANOVA test reveals that teachers having income of Rs. 16000-20000 are better than their counterparts in their self-efficacy and its dimension cultural self-efficacy.
9. There exists significant difference among high school Mathematics teachers with respect to year of experience in their self-efficacy and its dimensions behavioural self-efficacy and decision making self-efficacy. But there is no noted difference in instructional self-efficacy and cultural self-efficacy. The Post ANOVA test reveals that teachers having experience of 16-20 years are better than their counterparts in self-efficacy and its dimensions behavioural self-efficacy and decision making self-efficacy.

c) *Teaching Competency of High School Mathematics Teachers*

1. There exists significant difference between male and female high school Mathematics teachers in their teaching competency and its dimensions performance based competency, affective based competency, contextual based competency and consequence based competency. But no significant difference is noted in communication based competency. While comparing, the mean scores of male teachers are found to be higher than female teachers.

2. There exists significant difference between high school Mathematics teachers from rural and urban locality in their in their contextual based competency. No significant difference is noted in teaching competency, performance based competency, affective based competency, communication based competency, and consequence based competency. It is found that teachers from rural locality are better than their counterparts in their contextual based competency.
3. There exists significant difference between married and unmarried high school Mathematics teachers in their teaching competency, affective based competency and consequence based competency. No significant difference is noted in performance based competency, contextual based competency and communication based competency. While comparing the mean scores, unmarried teachers are better than married teachers in their teaching competency, affective based competency, consequence based competency.
4. There exists significant difference between graduate and post graduate high school Mathematics teachers in their teaching competency, contextual based competency and communication based competency. But no significant difference is noted in performance based competency, affective based competency and consequence based competency. It is found that the mean scores of post graduate teachers are higher than graduate teachers in teaching competency and its dimensions contextual based competency and communication based competency.
5. There exists significant difference among high school Mathematics teachers from Kanniyakumari, Tirunelveli and Thoothukudi districst in their teaching competency and its dimensions performance based competency, affective based competency and communication based competency except contextual based competency and consequence based competency. The Post ANOVA test reveals that teachers from Kanniyakumari district are better than their counterparts in affective based competency and

communication based competency but Thoothukudi district teachers are better than their counterparts in teaching competency in total, performance based competency and consequence based competency.

6. There exists significant difference among high school Mathematics teachers from government, aided and self-financed institutions in their teaching competency and communication based competency. But no significant difference is noted in their performance based competency, affective based competency, contextual based competency and consequence based competency, and teaching competency. The Post ANOVA test reveals that aided school teachers are better than their counterparts in teaching competency and communication based competency.
7. There exists significant difference among high school Mathematics teachers from boys, girls and co-education schools in their teaching competency and communication based competency. But no significant difference is noted in performance based competency, affective based competency, contextual based competency, and consequence based competency. The Post ANOVA test reveals that teachers from girls schools are better than their counterparts in teaching competency and communication based competency.
8. There is exists no significant difference among high school Mathematics teachers with respect to income in teaching competency and its dimensions performance based competency, affective based competency, contextual based competency, communication based competency and consequence based competency.
9. There exists significant difference among high school Mathematics teachers with respect to year of experience in teaching competency and its dimensions performance based competency, affective based competency and contextual based competency, except communication based competency and consequence based competency. The Post ANOVA test reveals that teachers having 16-20 years experience are better than thier

counterparts in teaching competency and its dimensions performance based competency, affective based competency and contextual based competency.

3. Significance of correlation between (i) Metacognition and Teaching Competency (ii) Self-efficacy and Teaching Competency of High School Mathematics Teachers

1. There exists significant positive low correlation between metacognition with teaching competency in total and performance based competency and the dimension achievement with teaching competency in total and performance based competency consequence based competency. There exists significant positive negligible correlation between the various dimensions of metacognition and the dimensions of teaching competency except memory with performance based competency, affective based competency and communication based competency, monitoring with all components of study of teaching competency and evaluation with all components of study of teaching competency.

2. There exists significant positive substantial correlation between self-efficacy and teaching competency in total. Significant substantial correlation is also noted between the various dimensions of self-efficacy and the dimensions of teaching competency. But low correlation exists between the dimensions behavioural self-efficacy with performance based competency, affective based competency and cultural self-efficacy with affective based competency, contextual based competency and communication based competency. Decision making self-efficacy with performance based competency affective based competency.

3. There exists significant relationship between teaching competency and self-efficacy in total and in the dimensions instructional self-efficacy, behavioural self-efficacy, cultural self-efficacy and decision making self-efficacy of high school Mathematics teachers.

4. There exists significant positive correlation between Metacognition and teaching competency of high school Mathematics teachers with regard to background variables, with an exception in teachers from rural locality, self-financing schools and having income of Rs. 5000-10000.

5. There exists significant relationship between self-efficacy and teaching competency of high school Mathematics teachers with regard to background variables, with an exception in teachers having income of Rs. 16000-20000,Rs.26000-25000 and 16-20 years experience.

4. Influence of Metacognition and Self-efficacy on Teaching Competency of High School Mathematics Teachers

There exists significant influence of Metacognition and Self-efficacy on teaching competency of high school Mathematics teachers.

5. Factor Analysis for Metacognition, Self-efficacy and Teaching Competency of High School Mathematics Teachers

There is significant factor with positive loading of the variables namely metacognition, planning, memory, monitoring, evaluation, achievement, self-efficacy, instructional self-efficacy, behavioural self-efficacy, cultural self-efficacy, decision making self-efficacy, self-efficacy, performance based competency, affective based competency, contextual based competency, communicative based competency, consequence based competency and Teaching competency. The factor for the study has been identified as **Integral Teaching Pedagogy.** It includes the dimensions metacognition, self-efficacy and teaching competency.

Tenability of hypotheses

Metacognition

i) The hypothesis "There exists significant difference between male and female high school Mathematics teachers in their mean scores on metacognition" is accepted at 0.05 level. For planning, monitoring and evaluation, significant difference exists at 0.05 level.

ii) The hypothesis "There exists significant difference between high school Mathematics teachers from rural and urban locality in their mean scores on metacognition" is accepted at 0.05 level. For planning, monitoring and evaluation, significant difference exists at 0.05 level.

iii) The hypothesis "There exists significant difference between married and unmarried high school Mathematics teachers in their mean scores on metacognition" is accepted at 0.05 level. For planning, monitoring and evaluation, significant difference exists at 0.05 level.

iv) The hypothesis "There exists significant difference between graduate and postgraduate high school Mathematics teachers in their mean scores on metacognition" is accepted at 0.05 level. For the dimensions planning, memory, monitoring and evaluation, significant difference exists at 0.05 level.

v) The hypothesis "There exists significant difference among high school Mathematics teachers from Kanniyakumari, Tirunelveli and Thoothukudi districts in their mean scores on metacognition" is accepted at 0.05 level. For the dimensions planning and memory significant difference exists at 0.05 level.

vi) The hypothesis "There exists significant difference among high school Mathematics teachers from government, aided and Self-financed schools in their mean scores on metacognition" is accepted at 0.05 level. For the dimensions planning and monitoring significant difference exists at 0.05 level.

vii) The hypothesis "There exists significant difference among high school Mathematics teachers from boys, girls and Co-education schools in their mean scores on Metacognition and its dimensions" is rejected.

viii) The hypothesis "There exists significant difference among high school Mathematics teachers with respect to income in their mean scores on metacognition" is accepted at 0.05 level. For the dimension monitoring significant difference exists at 0.05 level.

ix) The hypothesis "There exists significant difference among high school Mathematics teachers with respect to years of experience in their mean scores on metacognition" is accepted at 0.05 level. For the dimension planning and monitoring significant difference exists at 0.05 level.

Self-efficacy

i) The hypothesis "There exists significant difference between male and female high school Mathematics teachers in their mean scores on self-efficacy" is accepted at 0.05 level. For the dimensions behavioural self-efficacy, cultural self-efficacy and decision making self-efficacy significant difference exists at 0.05 level.

ii) The hypothesis "There exists significant difference between high school Mathematics teachers from rural and urban locality in their mean scores on self-

efficacy" is accepted at 0.05 level. For the dimensions cultural self-efficacy significant difference exists at 0.05 level.

iii) The hypotheses "There exists significant difference between married and unmarried high school Mathematics teachers in their mean scores on self-efficacy" is accepted at 0.05 level. For the dimensions decision making self-efficacy significant difference exists at 0.05 level.

iv) The hypothesis "There exists significant difference between graduate and postgraduate high school Mathematics teachers in their mean scores on self-efficacy" is accepted at 0.05 level. For the dimensions instructional self-efficacy, behavioural self-efficacy, cultural self-efficacy and decision making self-efficacy significant difference exists at 0.05 level.

v) The hypothesis "There exists significant difference among high school Mathematics teachers from Kanniyakumari, Tirunelveli and Thoothukudi districts in their mean scores on self-efficacy" is accepted at 0.05 level. For the dimensions instructional self-efficacy, behavioural self-efficacy, and decision making self-efficacy significant difference exists at 0.05 level.

vi) The hypothesis "There exists significant difference among high school Mathematics teachers from government, aided and self-financed schools in their mean scores on self-efficacy" is accepted at 0.05 level. For the dimensions instructional self-efficacy and decision making self-efficacy significant difference exists at 0.05 level

vii) The hypothesis "There exists significant difference among high school Mathematics teachers from boys, girls and co-education institutions in their mean

scores on self-efficacy" is accepted at 0.05 level. For the dimensions decision making self-efficacy significant difference exists at 0.05 level.

viii) The hypothesis "There exists significant difference among high school Mathematics teachers with respect to income in their mean scores on self-efficacy" is accepted at 0.05 level. For the dimension cultural self-efficacy significant difference exists at 0.05 level.

ix) The hypothesis "There exists significant difference among high school Mathematics teachers with respect to years of experience in their mean scores on self-efficacy" is accepted at 0.05 level. For the dimension cultural self-efficacy significant difference exists at 0.05 level. For the dimensions instructional self-efficacy, behavioural self-efficacy, and decision making self-efficacy significant difference exists at 0.05 level.

Teaching competency

i) The hypothesis "There exists significant difference between male and female high school Mathematics teachers in their mean scores on teaching competency" is accepted at 0.05 level. For the dimensions performance based competency, affective based competency, contextual based competency and consequence based competency significant difference exists at 0.05 level.

ii) The hypothesis "There exists significant difference between high school Mathematics teachers from rural and urban locality in their mean scores on teaching competency" is accepted at 0.05 level. For the dimension contextual based competency significant difference exists at 0.05 level.

iii) The hypothesis "There exists significant difference between married and unmarried high school Mathematics teachers in their mean scores on teaching competency" is accepted at 0.05 level. For the dimensions affective based competency and consequence based competency significant difference exists at 0.05 level.

iv) The hypothesis "There exists significant difference between graduate and postgraduate high school Mathematics teachers in their mean scores on teaching competency" is accepted at 0.05 level. For the dimensions affective based competency, contextual based competency, communication based competency and consequence based competency significant difference exists at 0.05 level.

v) The hypothesis "There exists significant difference among high school Mathematics teachers from Kanniyakumari, Tirunelveli and Thoothukudi districts in their mean scores on teaching competency" is accepted at 0.05 level. For the dimensions performance based competency, affective based competency and communication based competency significant difference exists at 0.05 level.

vi) The hypothesis "There exists significant difference among high school Mathematics teachers from government, aided and Self-financed schools in their mean scores on teaching competency" is accepted at 0.05 level. For the dimension communication based competency significant difference exists at 0.05 level.

vii) The hypothesis "There exists significant difference among high school Mathematics teachers from boys, girls and Co-education institutions in their mean scores on teaching competency" is accepted at 0.05 level. For the dimension communication based competency significant difference exists at 0.05 level.

viii) The hypothesis “There exists significant difference among high school Mathematics teachers with respect to income in their mean scores on teaching competency” is rejected at 0.05 level.

ix) The hypothesis “There exists significant difference among high school Mathematics teachers with respect to years of experience in their mean scores on teaching competency” is accepted at 0.05 level. For the dimensions performance based competency, affective based competency and contextual based competency significant difference exists at 0.05 level.

Correlation

i) The hypothesis “There exists significant relationship between teaching competency and metacognition of high school Mathematics teachers with respect to dimension” is accepted at 0.05 level.

ii) The hypothesis “There exists significant relationship between teaching competency and self-efficacy of high school Mathematics teachers with respect to dimension” is accepted at 0.05 level.

iii) The hypothesis “There exists significant relationship between teaching competency and mtacognition of high school Mathematics teachers with respect to back ground variables” is accepted at 0.05 level.

iv) The hypothesis “There exists significant relationship between teaching competency and self-efficacy of high school Mathematics teachers with respect to back ground variables” is accepted at 0.05 level.

Regression

The hypothesis"There exists significant influence of metacognition and self-efficacy on teaching competency of high school Mathematics teachers" is accepted at 0.05 level.

Factor Analysis

The hypothesis"There exists significant factors with positive loadings of the variables namely metacognition, self-efficacy and teaching competency of high school Mathematics teachers" is accepted at 0.05 level.

Interpretations

Percentage

analysis

1. The study revealed that the level of metacognition of high school Mathematics teachers is found to be moderate. This findings is supported by the study of Ushaparvathy (2011) that prospective Mathematics teachers have medium level of metacognition.

2. The study revealed that the level of self-efficacy of high school Mathematics teachers is found to be moderate except for the dimension cultural self efficacy. This findings is supported by the study of Anisha (2007) that female teacher education students have medium level of self-efficacy.

3. The study revealed that the level of teaching competency of high school Mathematics teachers is found to be moderate. This findings is supported by the study of Maheswari (2016) that training college teachers have average level of teaching competency.

Differential Analysis

Metacognition of High School Mathematics Teachers.

The finding revealed that the male teachers have significantly higher metacognition than female teachers. This may be due to the fact that male teachers have more exposure to outside and they get a broad outlook of their profession. Also they have more time to refer books, daily newspapers, magazines etc. The findings supported by the result of Chaudhury and Chaudhury (2015) that there is significant difference between male and female secondary teacher educators in their in their Metacognition awareness. The findings of Ushaparvathy (2009) also supported that there is significant difference in the metacognition of the prospective mathematics teachers in total and in the dimensions 'planning', 'monitoring 'and 'evaluation' with respect to gender.

Results indicated that teachers from rural area are better than teachers from urban area in their metacognition, planning, monitoring and evaluation. This may be due to the fact that rural teachers have less tension regarding competition. Because of the environmental richness that nurtures their self and knowledge, they feel healthy than urban teachers mentally, physically and socially. The findings of Noushad (2012) concluded that there is significant difference between rural and urban secondary teacher educators in their metacognitive awareness.

Result exposed that married teachers are better than unmarried teachers in their metacognition, planning, monitoring and evaluation. The comparison of mean scores also supports that married teachers are better than unmarried high school Mathematics teachers. This may be due to the fact that married teachers have lot of family roles, more commitment and responsibilities than unmarried teachers. So their planning, monitoring and evaluation level is increased. The findings is supported by the study of

Jordan, Alexander & Zitek (2012) that women who held both work and family role reported better job performance than unmarried.

The findings revealed that postgraduate high school Mathematics teachers show better metacognition than graduates in the areas planning, memory, monitoring and evaluation. This may be due to the fact that postgraduate teachers have more subject which makes them more confident in their teaching process. The finding is supported by the study of Ushaparvathy (2009) that postgraduate teachers are better than the graduate teachers in the dimension planning.

There is significant difference among high school Mathematics teachers from Kanniyakumari, Tirunelveli and Thoothukudi districts in their metacognition, planning and memory. The study reveals that techers from Thoothukudi district are better than teachers from Kanniyakumari and Tirunelveli districts. A few years back it was known as Tirunelveli is the best education centre and also called as Oxford of South India. But this is in direct contradiction with the present findings. This may be due to the fact that in Thoothukudi, the Pearl City, many philanthropists started higher educational institutions. It has many premier institutions that produce eminent scholars.

Results indicated high school mathematics teachers from government, aided and self-financing institution show significant difference in their metacognition and its dimension planning, and monitoring. Also it revealed that self-financing school teachers are better than government and aided high school Mathematics teachers in metacognition and planning. This is may be because of the intensive training given by management for teachers as they appoint freshers. Frequent in-service training and skill development training lead them to expose their ability in front of student without any fear. It is also shown that government school teachers are better in monitoring. This is

because government school teachers have job protection and freedom to explore their ideas for the betterment of their students within their limit than aided school teachers.

The research further reveals that teachers having income of Rs. 16000-20000 are better than their counterparts in the dimension monitoring. This may due to the fact that for the development of metacognition there is no need of huge income.

The findings of the study revealed that teachers having experience of 21years and above are better than their counterparts in metacognition and its dimensions planning and monitoring. This may due to the fact that highly experienced teachers are able to identify the important concepts and give key prompts to students to be more aware of their thinking by either questioning, thinking aloud or discussing with others on what they think.

Self-efficacy of High School Mathematics Teachers.

There is significant difference between male and female high school Mathematics teachers in their self-efficacy, behavioural self-efficacy, cultural self-efficacy and decision making self-efficacy. A comparison of mean scores reveals that male teachers are better than female teachers in their behavioural self-efficacy, cultural self-efficacy, decision making self-efficacy and self-efficacy respectively. This may be due to the fact that male teachers are more confident than female teachers and enjoy more freedom than their counterparts. This findings is supported by the study of Rekha & Sobha (2017), which concluded that male teachers are better than female teachers.

Results indicated that high school Mathematics teachers from rural locality is better in their self-efficacy and cultural self-efficacy than teachers from urban locality. This may be due to the fact that in rural areas even though their resources are less, they are conditioned mentally to accept the limitations and challenges.

The findings revealed that unmarried high school Mathematics teachers are better than married teachers in their decision making self-efficacy and self-efficacy in total. This may due to the fact that unmarried teachers have more time to evaluate their own ability. They are free from tensions and other family affairs. So they can concentrate very well in their teaching.

Results indicated that post graduate teachers are better than graduate high school Mathematics teachers in their self-efficacy, instructional self-efficacy, behavioural self-efficacy, cultural self-efficacy and decision making self-efficacy. This may be due to the fact that post graduate teachers are having more subject knowledge.

Teachers from Thoothukudi district are found to be better than their counterparts in Tirunelveli and Kanniyakumari districts in their self-efficacy, instructional self-efficacy, behavioural self-efficacy and decision making self-efficacy.

The findings revealed that aided school teachers are better than government and self-financing school teachers in self-efficacy, instructional self-efficacy and decision making self-efficacy. This may be due to the fact that the work atmosphere of teachers from aided schools is better than government and self-financing schools. They are provided with good facilities and bound to produce good result. Because of their job security teachers can explore innovative methods also.

The study revealed that teachers from girl's schools are better than teachers from boys and co-education schools in their self-efficacy and decision making self-efficacy. This is may be because of the cultural differences as girls are always obedient and not mischievous in the campus. This makes the teachers to feel free.

The Post ANOVA test reveals that teachers having income of Rs. 16000-20000 are better than their counterparts in their self-efficacy and its dimension cultural self-efficacy.

The study also reveals that teachers having experience of 16-20 years are better than their counterparts in self-efficacy and its dimensions behavioural self-efficacy and decision making self-efficacy. This may be due to the fact that the experience they gained and the well versed knowledge in their subject, the feeling of easiness in their profession made them to be self confident. Also their dealing with the school and society helped them to gain more human values.

Teaching Competency of high school Mathematics teachers

There is significant difference between male and female high school Mathematics teachers in their consequence based competency. A comparison of the mean scores reveal that male teachers are better than female teachers in their consequence based competency. This may be due to the fact that in our Indian culture male teachers have more contact and have to interact with the society and also they have more time. So it is possible to bring change in the society. The findings is supported by the study of Suryanarayana (2011) in respect of teaching competency, there was significant difference between male and female teachers. The findings is also supported by the study of Areekuzhiyil (2014) that male teachers have higher level teaching competency than female teachers.

There is significant difference between rural and urban high school Mathematics teachers in their contextual based competency but not in their performance based competency, affective based competency, communication based competency, consequence based competency and teaching competency. A comparison of mean score reveals that rural teachers are better than urban teachers in their contextual based

competency. This may be due to the fact that rural teachers are very much attached to their students and work more for their development. So that they are aware of the changes around them and the role in bringing about desired changes in the society.

The study revealed that unmarried teachers are better than married high school Mathematics teachers in their affective based competency, consequence based competency and teaching competency respectively. This may be due to the fact that unmarried teachers are free from tensions and other family affairs. They can concentrate very well in their teaching learning process. The finding is supported by the study of Krishnapriya (2018) that there exists significant difference between married and unmarried teachers in their teaching competency.

There exists significant difference between graduate and post graduate high school Mathematics teachers in their teaching competency, contextual based competency and communication based competency.. It is found that post graduate teachers are better than graduate teachers in teaching competency and its dimensions contextual based competency and communication based competency. The result is in agreement with the findings of Preeti (2017) that educational qualification is very important factor for teaching competency

There exists significant difference among high school Mathematics teachers from Kanniyakumari, Tirunelveli and Thoothukudi districts in their teaching competency and its dimensions performance based competency, affective based competency and communication based competency except contextual based competency and consequence based competency. The Post ANOVA test reveals that teachers from Kanniyakumari district are better than their counterparts in affective based competency and communication based competency. This may be due to the fact that usually Kanniyakumari district people have a better feasible environment and also a high

literacy rate. Teachers from Thoothukudi district are better than their counterparts in teaching competency in total, performance based competency and consequence based competency. This may be due to the fact that Thoothukudi district has lot of reputed educational institutions.

There exists significant difference among high school Mathematics teachers from government, aided and self-financing institutions in their teaching competency and communication based competency. The Post ANOVA test reveals that aided school teachers are better than their counterparts in teaching competency and communication based competency. This may be due to the fact that. aided school teachers have the pressure in producing good result and they are result oriented. They are also getting the same pay scale as that of government teachers.

There exists significant difference among high school Mathematics teachers from boys, girls and co-education schools in their teaching competency and communication based competency. But no significant difference is noted in performance based competency, affective based competency, contextual based competency, and consequence based competency. The Post ANOVA test reveals that teachers from girls schools are better than their counterparts in teaching competency and communication based competency. Teachers working in Girls school are better than teachers working in co-educational school in their logical-mathematical intelligence. This may be due to the reason that girl students are more attentive than boys in the class. This may create a real interest among their teachers in working with numbers and formula, helping students solve puzzles, making students to solve problems on the chalk board.

There exists no significant difference among high school Mathematics teachers based on their salary. But this study contradict to the study of Preeti (2017) that can be concluded that salary and wages is very important factor affecting the teaching competency as per the respondents who are assistant professors.

There exists significant difference among high school Mathematics teachers with respect to year of experience in teaching competency and its dimensions performance based competency, affective based competency and contextual based competency. The Post ANOVA test reveals that teachers having 16-20 years experience are better than their counterparts in teaching competency and its dimensions performance based competency, affective based competency and contextual based competency. It is fact that above twenty years experience means near to the retirement age. It is evident that in the present situation age has impact on teaching competency. Smith & Kinney (1992) concluded that it appears that uncapping of retirement raises no major concerns for dramatic deterioration in teaching effectiveness in an aging professoriate.

Teachers working in aided schools are better than teachers working in Government school in their verbal-linguistic intelligence. This may be due to the fact that the management pressure made them to use the leisure time by hearing lectures, watching educational programmes, writing lyrics and reading more subject related books made them better in verbal-linguistic intelligence.

Correlational Analysis

There is significant relationship between teaching competency and Metacognition in total, and in the dimensions of high school Mathematics teachers, but not in the dimensions of monitoring and evaluation. This findings is supported by the study of sing and Raza (2012) that there is significant and strong correlation between

metacognition and teaching competency. There is significant relationship between teaching competency and self-efficacy in total and in the dimensions institutional self-efficacy, behavioural self-efficacy, cultural self-efficacy, decision making self-efficacy of high school Mathematics teachers. This may be due to the fact that a teacher who adopts much ideas and innovative techniques in their teaching with more self efficacy will produce good result. This findings is supported by the study of Paula (2010) that the teachers with higher levels of self-efficacy were more committed to teaching in general. The study conducted by Towner and Valmadge (2010) revealed that individual levels of teacher's self-efficacy are correlated with aggregated mean scores of student achievement.

Regression Analysis

There is significant influence of Metacognition and Self-efficacy on teaching competency of high school Mathematics teachers. This may be due to the fact that the past few decades in India, research on teaching focused on teacher or the students. In recent years, there is a shift in the focus to the process of interaction (instruction or learning). The cognitive processes are emphasised through multi-way interaction of content, teacher, students and teaching-learning material and teaching competency. Teachers need to inculcate in their students self-regulation skills and thereby make them help themselves. This findings is supported by the study of Noushad (2012) that metacognition is not influenced by type of management of schools.

Factor Analysis

There is significant factor with positive loading of the variables namely logical Venn diagram, find the odd one, analytical reasoning, verbal analogy, analogy, metacognition, instructional self-efficacy, behavioural self-efficacy, cultural self-efficacy, decision making self-efficacy, self-efficacy, performance based competency,

affective based competency, contextual based competency, communicative based competency, consequence based competency and Teaching competency. The factor for the study has been identified as **Integral Teaching Pedagogy.** It includes the dimensions metacognition, self-efficacy and teaching competency.

Educational Implications

Teachers are an extremely important facet of any society for a number of reasons and their role in society is both significant and valuable. Inorder to develop their metacognition, self-efficacy and teaching competency the following recommendation may suitable to adopt.

- Periodically inservice training should be given to teachers to enrich their content knowledge and refresh them to expose their ability in the field of teaching.
- Stress management training should be given to the teachers.
- The Eastern Scriptures tell that all knowledge is within us. But there is a thin film of ignorance covering the knowledge. The teacher does not teach, but removes the thin ;layer and brings out the knowledge. Hence, the teacher should be trained to 'unveil, or discover the knowledge her fellow pupils possess.
- Communication skill training is essential to a teacher for an effective interaction with students.
- Teachers should have freedom to adopt innovative practices in teaching based on local needs.
- A teacher should be an all-rounder. The teacher must be multi skilled.
- The teacher should know the various culture and belief of the locality.
- Arrange educational exposure visits to other state schools to learn new techniques and methods for the development of teaching competency.

- Teachers from different schools of different locality or nationality can be made to camp in the school for days together so that the teachers of the particular school as well as the visiting faculties will get to interact each other thereby upgrading their respective skills and way of teaching.
- Create a separate library/ digital library for school teachers. So as to easily access educational texts, magazines and research articles. Providing library facilities also to facilitate the teachers to make text deeper and in more elaborate ways.
- Arrange personality development programmes to develop self-efficacy of teachers.
- Apart from basic computer training, government school teachers should be given orientation pogrammes regarding the usage of various Apps, Smart phones, LCD projectors, video conferencing etc to develop their teaching competency and self-efficacy.
- Create awareness among the teachers to stay fit in health both mentally and physically for the development of self-efficacy.

5.10 Conclusion

Competencies of different levels required by different roles, can be considered essential for the development of society. A Mathematics teacher is someone who inspires their students to look beyond the pages of the textbook to become problem solvers and critical thinkers.

Mathematics is considered the mother of all sciences and mathematical skills have become an ineluctable part of one's life and one cannot simply imagine a life without mathematics. Basically mathematics is "the science of structure, order and relation" (Encyclopedia of Britannica, 2003). Its indispensable need has made the globe around to include it as a compulsory subject of teaching at all school levels and

"learning in schools is a matter of immense significance to students, parents, teachers, educationalists and policy makers" (NCERT, 2015, [preface]).

Teaching is a complex skill and to be successful it demands "professional knowledge, skills, and attributes essential for all classroom teachers" (Department of Education and Training, 2004) that demands metacognitive thinking. It all depends on the attitude and perception of teachers including self-efficacy. The results of the research investigation on "Metacognition, self-efficacy and Teaching competency of High School Mathematics Teachers in the Southern Districts of Tamil Nadu" confirms the relationship that exists among the study variables. Further it reveals the significant influence of Metacognition and Self-efficacy on teaching competency of high school Mathematics teachers. In the light of these findings, the inferential analysis detects the development of metacognitive skills and self-efficacy perceptions that needs to be applied for effective teaching of Mathematics teachers at the high schools in Tamil Nadu region in specific and other regions.

From the present study, the investigator comes to the conclusion that metacognition and self-efficacy are essential for Mathematics teachers for efficient teaching. Teachers having high metacognition performed well in their teaching. Metacognition exercises some considerable influence over all sub variables. Metacognition and self-efficacy are thus proved to be consequential elements for an efficacious teaching.

Therefore, as evident from the above findings it is crucial to create a metacognitive learning environment in the classroom. Organizing orientation and training programmes for all the students make them aware about the use of metacognition in learning process to achieve better academic outcomes. Thus, the development of metacognitive strategies helps in resolving the upcoming challenges

and complexities to achieve success in learning. The role of teachers is very important in this regard. With the metacognitive awareness, learners can better construct their knowledge through experiences. Parents and the family environment play a vital role in enhancing the metacognitive level of the students. In this way, development of metacognition skills is the core foundation for learning. To promote critical thinking, metacognition should be explicitly be addressed in a curriculum. Emphasizing metacognitive strategies within an environment intended to foster critical thinking not only increases students' thinking skills but also prepares learners with a lifelong ability to help them productively manage new situations in our fast changing world.

Suggestions for further research

In the light of the research conducted above the investigator suggests the following topics for further research.

1. A comparative study of teaching competency among Mathematics teachers from regular schools and special schools can be conducted.

2. In addition to the variables included in the present investigation there are many other factors that influence the teaching competency. Studies focus on school environment and ICT awareness areas can be conducted.

3. The present study was carried out to find the effectiveness of metacognition on Mathematics teachers. It is suggested to carry out the study in other subjects like Physics, Chemistry and Biology.

4. This study is done with the Mathematics teachers at high school level. The same study can be extended to the teachers at various subjects and at different levels.

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APPENDICES

N.V.K.S.D. College of Education, Attoor, K.K.District

Padma Rekha & Sobha- 2015

(Draft Form)

PERSONAL DATA

Name of the teacher	:	
Name of the school	:	
Sex	:	Male/Female
Locality of school	:	Rural/Urban
Religion	:	Hindu/Christian/Muslim
Type of management	:	Government/Aided/Self-finance
Nature of the school	:	Boys/Girls/Co-education
Medium of instruction	:	Tamil/English/both
Educational Qualification Degree	:	Graduation/Post Graduation/Research
Income	:	50000-10,000/11,000-15000/16000-20000/ 21000- 25000/26000 &above
Marital Status	:	Married / Unmarried
Community	:	FC / BC / MBC / SC
Age	:	21-25/26-30/31-35/36-40/41&above
Place of residence	:	
Year of Experience	:	1-5/6-10/11-15/16-20/21&above
Type of Family	:	Nuclear/ Joint

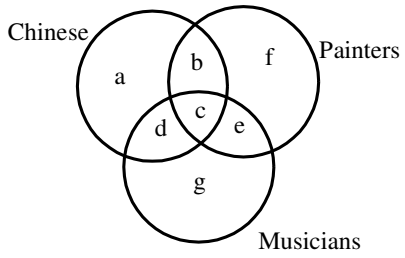
APPENDIX- IA

TOOL TO ASSESS METACOGNITION

Certain Questions are given here. Please answer with a tick mark (✓) in the appropriate answer

I. Logical Venn Diagram

The following questions are based on the diagram given below



1. Painters who are neither Chinese nor musicians

a) b b) c c) f d) g

2. Chinese who are painters

a) b b) c c) d d) g

3. Chinese who are musicians but not painters

a) d b) c c) b d) a

4. Chinese who are painters as well as musicians

a) a b) b c) c d) d

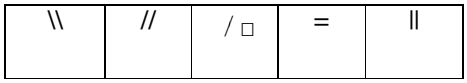
5. Musicians who are Chinese not painters

a) a b) e c) d d) c

II Out of the five figures (a), (b), (c), (d) and (e) given in each problem, four are similar in certain way. However one figure is not like the other four. Choose the figure which is different from the rest.

6.

D	H	L	O	T
(a)	(b)	(c)	(d)	(e)

7. 

(a) (b) (c) (d) (e)

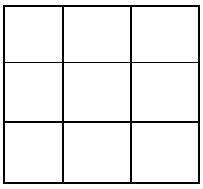
8. 
(a) (b) (c) (d) (e)

9. 
(a) (b) (c) (d) (e)

10. 
(a) (b) (c) (d) (e)

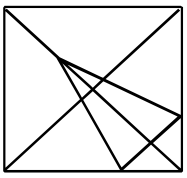
III Analytical Reasoning

11. The maximum number of squares in the figure given below



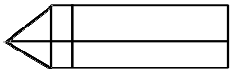
a) 14 b) 13 c) 10 d) 9

12. How many triangles are there in the figure given below



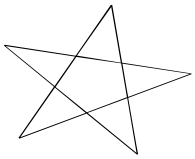
a) 16 b) 18 c) 19 d) 20

13. How many rectangles are there in the figure given below



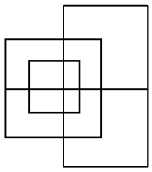
a) 6 b) 7 c) 8 d) 9

14. How many triangles are there in the figure given below



a) 5 b) 6 c) 8 d) 10

15. How many straight lines in the figure given below



a) 13 b) 15 c) 17 d) 19

IV Verbal Analogy

16. Reading : knowledge : : Work : ?

a) Experience b) Engagement c) Employment d) Experiment

17. Conscience : Wrong : : Police : ?

a) Thief b) Law c) Discipline d) Crime

18. Cricket : Bat : : Hockey : ?

a) Field b) Stick c) Player d) Ball

19. Ship : Sea : : Camel : ?

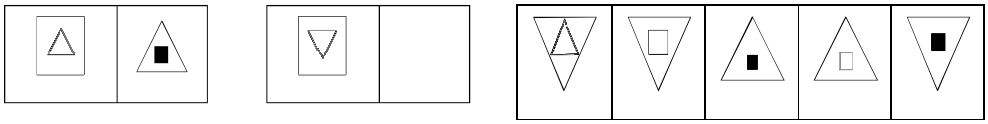
a) Forest b) Land c) Mountain d) Desert

20. Circle : Circumference : : Square : ?

a) Volume b) Area c) Diagonal d) Perimeter

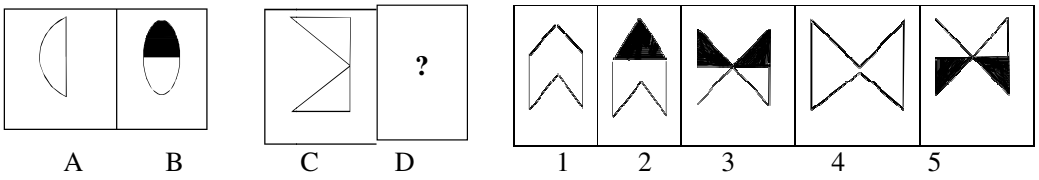
V. Analogy

21.21.



A B C D 1 2 3 4 5

22.



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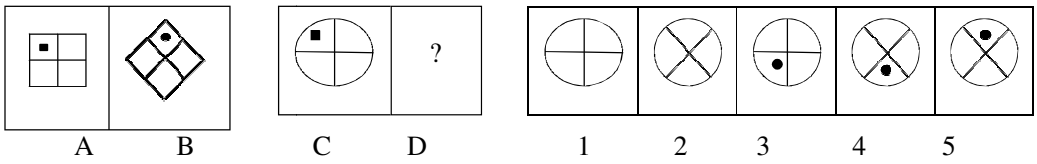

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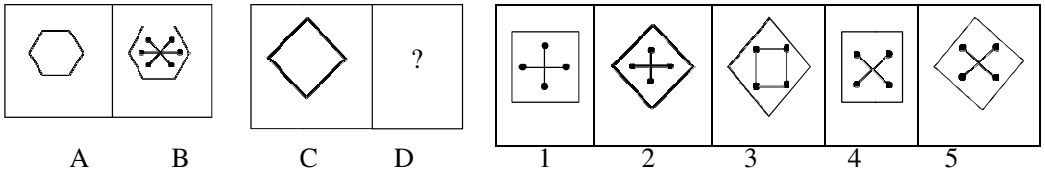
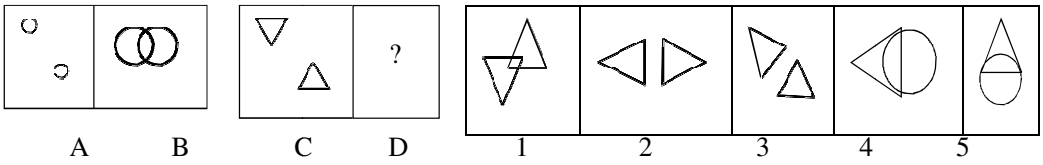


25.



APPENDIX 2A

SCORING KEY FOR TOOL TO ASSESS METACOGNITION

Item No.	Answer
1.Logical Venn Diagram	
1.	b
2.	b
3.	a
4.	C
5.	C
II. Choose the figure	
1.	D
2.	C
3.	C
4.	D
5.	B
III. Analytical Reasoning	
1.	C
2.	A
3.	A
4.	D
5.	A
IV.Verbal Analogy	
1.	A
2.	D
3.	B
4.	D
5.	D
V.Analogy	
1.	5
2.	3
3.	5
4.	2
5.	1

APPENDIX 1B

Self Efficacy Scale

Padma Rekha & Sobha- 2015

N.V.K.S.D. College of Education, Attoor, K.K.District

(Draft Form)

Instruction:

Certain information related to you are required for my research purpose. It is assured that information collected from you will remain confidential and will be used only for the academic purpose. Please answer with a tick mark (✓) in the appropriate box. [A-Very true of me / B- true of me /C-neutral/D- untrue of me / E- Very untrue of me].

Sl. No.	Statement	A	B	C	D	E
Section: A						
1.	I have full confidence in the subject I teach.					
2.	I dedicate myself for acquiring more knowledge in the subject I teach.					
3.	I have the capacity to update knowledge in the course subject.					
4.	I can create interest in course material.					
5.	I can explain concepts and principles effectively.					
6.	I can use examples that are relevant to the topic.					
7.	I can respond to the difficult questions from the students.					
8.	I can provide useful feedback to the learners.					
9.	I am always ready to work for the benefit of the students.					
10.	I always accept students' ideas and proposals.					
11.	I motivate the students who do not show much interest in schoolwork.					

Sl. No.	Statement	A	B	C	D	E
12.	I generally relate the content to the life situation.					
13.	I try to promote learning when there is a lack of support from home.					
14.	I make the students recollect what have been taught in the previous lessons in all classes.					
15.	I make effective use of non-verbal communication.					
16.	I accept my errors in front of students.					
Section: B						
17.	I generally agree with my supervisor's evaluation of my report.					
18.	I can respond to the difficult questions from the students.					
19.	I build positive relationships with my students.					
20.	I feel that students respond positively to my requests.					
21.	I am aware of student behaviour when teaching.					
22.	I spend enough time and effort to finish my course work.					
23.	I find time to interact with students even beyond class hours.					
24.	I actively cooperate in the school activities.					
25.	I able to organize guidance centre in the school.					
26.	I am committed for the development of positive attitudes among students.					
27.	I maintain discipline in my class students.					
28.	I control even the most aggressive students.					
29.	I contribute significantly to the fact that my students come to school willingly,					
30.	I monitor all my students' individual improvement in valid and reliable ways.					
31.	I give appropriate reinforcements so as to my students sustain positive behaviours.					
32.	I can lead my students to be productive and creative through the activities I organise.					

Sl. No.	Statement	A	B	C	D	E
Section: C						
33.	I can communicate with parents effectively when necessary					
34.	I get community groups involved in working with the school					
35.	I can have the ability to maintain a link between school and society					
36.	I am capable of developing a rapport between school and community					
37.	I develop good impression about the impact of school on community					
38.	I involve community in the enrolment drive					
39.	I solve the problems of the school with the cooperation of the community					
40.	I believe in good interpersonal relationship with community					
41.	I can identify the right people for the village education committee.					
42.	As a teacher I can make meaningful contribution to the society.					
43.	I can confidently do the community services for promoting social justice					
44.	I actively participate in the school extension activities					
45.	I am able to organize club activities in school to develop social involvement of my students					
46.	I arrange interschool exhibitions to develop the group work among students.					
47.	By participating in community service, I help people to work in groups					
48.	Through community service, I can apply knowledge to solve "real-life" problems					
Section: D						
49.	I can influence the decisions that are made in the school					
50.	I can express my views freely on important school matters					
51.	I get the instructional materials and equipment I need					

Sl. No.	Statement	A	B	C	D	E
52.	I maintain high attendance in my class.					
53.	It is easy for me to stick to my aims and accomplish my goals					
54.	I can solve difficult problems if I try hard enough					
55.	If someone opposes me, I find means and ways to get what I want					
56.	I am confident that I could manage with unexpected events.					
57.	I can solve most problems if I invest the necessary effort					
58.	I remain calm when facing difficulties as I am of confident my coping abilities					
59.	When I am confronted with a problem, I usually find several solutions.					
60.	No matter what comes my way, I am able to handle it					
61.	I can decide the method of presentations of content.					
62.	I can organize fieldtrips					
63.	I insist on my students to maintain discipline always					

APPENDIX 2B

Item Analysis –Self-efficacy Scale

Item	Lower	Middle	Upper	Discriminatory power	Difficulty Index	Selected Items
1	88	94	94	6	276	
2	82	88	94	12	264	Y
3	86	87	95	9	268	Y
4	80	88	93	13	261	Y
5	82	92	96	14	270	
6	84	93	94	10	271	
7	82	90	98	16	270	
8	74	92	92	18	258	Y
9	83	93	98	15	274	
10	79	90	94	15	263	Y
11	82	84	90	8	256	Y
12	80	88	93	13	261	Y
13	74	81	89	15	244	Y
14	80	89	92	12	261	Y
15	79	84	85	6	248	
16	77	79	84	7	240	
17	80	80	90	10	250	Y
18	83	90	96	13	269	
19	86	90	98	12	274	
20	73	87	97	24	257	Y
21	79	90	93	14	262	Y
22	75	80	92	17	247	Y
23	73	73	88	15	234	Y
24	78	82	94	16	254	Y
25	70	70	92	22	232	
26	79	81	91	12	251	Y
27	89	92	97	8	278	
28	84	84	91	7	259	
29	76	82	85	9	243	Y
30	74	88	95	21	257	Y

Item	Lower	Middle	Upper	Discriminatory power	Difficulty Index	Selected Items
31	78	89	93	15	260	Y
32	75	87	94	19	256	Y
33	81	87	95	14	263	Y
34	69	76	91	22	236	Y
35	70	74	93	23	237	Y
36	68	72	85	17	225	
37	72	79	92	20	243	Y
38	65	73	89	24	227	
39	68	77	86	18	231	
40	70	78	89	19	237	Y
41	69	77	90	21	236	Y
42	77	84	93	16	254	Y
43	70	75	91	21	236	Y
44	77	79	86	9	242	Y
45	78	82	88	10	248	Y
46	66	79	85	19	230	
47	71	71	84	13	226	
48	69	71	84	15	224	
49	74	84	88	14	246	Y
50	74	76	85	11	235	Y
51	74	89	94	20	257	Y
52	73	92	97	24	262	Y
53	75	81	90	15	246	Y
54	81	88	92	11	261	Y
55	67	92	95	28	254	Y
56	79	89	92	13	260	Y
57	79	89	91	12	259	Y
58	75	82	86	11	243	Y
59	79	85	88	9	252	Y
60	77	85	85	8	247	Y
61	81	90	91	10	262	Y
62	67	79	84	17	230	
63	80	81	88	8	249	Y

Y – Selected Statements

APPENDIX 3B

Self Efficacy Questionnaire

Padma Rekha & Sobha- 2015

(Final Form)

Instruction:

Please answer with a tick mark (✔) in the appropriate box. [A-Very true of me / B- true of me /C-neutral/D- untrue of me / E- Very untrue of me].

Sl. No.	Statement	A	B	C	D	E
1.	I dedicate myself for acquiring more knowledge in the subject I teach.					
2.	I have the capacity to update knowledge in the course subject.					
3.	I can create interest in course material.					
4.	I can provide useful feedback to the learners.					
5.	I always accept students' ideas and proposals.					
6.	I motivate the students who do not show much interest in schoolwork.					
7.	I generally relate the content to the life situation.					
8.	I try to promote learning when there is a lack of support from home.					
9.	I make the students recollect what have been taught in the previous lessons in all classes.					
10.	I generally agree with my supervisor's evaluation of my report.					
11.	I feel that students respond positively to my requests.					
12.	I am aware of student behaviour when teaching.					
13.	I spend enough time and effort to finish my course work.					
14.	I find time to interact with students even beyond class hours.					

Sl. No.	Statement	A	B	C	D	E
15.	I actively cooperate in the school activities.					
16.	I am committed for the development of positive attitudes among students.					
17.	I contribute significantly to the fact that my students come to school willingly,					
18.	I monitor all my students' individual improvement in valid and reliable ways.					
19.	I give appropriate reinforcements so as to my students sustain positive behaviours.					
20.	I can lead my students to be productive and creative through the activities I organise.					
21.	I can communicate with parents effectively when necessary					
22.	I get community groups involved in working with the school					
23.	I can have the ability to maintain a link between school and society					
24.	I develop good impression about the impact of school on community					
25.	I believe in good interpersonal relationship with community					
26.	I can identify the right people for the village education committee.					
27.	As a teacher I can make meaningful contribution to the society.					
28.	I can confidently do the community services for promoting social justice					
29.	I actively participate in the school extension activities					
30.	I am able to organize club activities in school to develop social involvement of my students					
31.	I can influence the decisions that are made in the school					

Sl. No.	Statement	A	B	C	D	E
32.	I can express my views freely on important school matters					
33.	I get the instructional materials and equipment I need					
34.	I maintain high attendance in my class.					
35.	It is easy for me to stick to my aims and accomplish my goals					
36.	I can solve difficult problems if I try hard enough					
37.	If someone opposes me, I find means and ways to get what I want					
38.	I am confident that I could manage with unexpected events.					
39.	I can solve most problems if I invest the necessary effort					
40.	I remain calm when facing difficulties as I am of confident my coping abilities					
41.	When I am confronted with a problem, I usually find several solutions.					
42.	No matter what comes my way, I am able to handle it					
43.	I can decide the method of presentations of content.					
44.	I insist on my students to maintain discipline always					

Appendix 1C

TEACHING COMPETENCY SCALE

Padma Rekha & Sobha- 2015

N.V.K.S.D. College of Education, Attoor, K.K.District

(Draft Form)

Istruction:

Certain information related to you are required for my research purpose. It is assured that information collected from you will remain confidential and will be used only for the academic purpose. Please answer with a tick mark (✓) in the appropriate box [SA-Strongly Agree/ A-Agree/N-Undecided/D-Disagree / SD-Strongly Disagree].

Name of the teacher :

Name of the school :

Sl. No.	Statement	SA	A	U	DA	SD
	Section: A					
1.	I finish the lesson on time.					
2.	I break the content into small bits to enable the students to learn in steps					
3.	I go on improving my knowledge.					
4.	I take sufficient time and care to introduce new concepts.					
5.	I try to provide appropriate examples for clarification.					
6.	I try to educate children according to the law of nature of human development					
7.	I review my teaching from time to time.					
8.	I have strong command over my subjects.					
9.	I take active interest in the activities of my school.					
10	I frequently discuss the performance of my students with their parents.					
11	I manage my class well					
12	I enforce high standards to give my teaching a professional status					
13	I utilize variety of teaching strategies and methods of teaching					
14	I relate my teaching materials with previous knowledge.					
15	I motivate the pupil to collect the models, shapes and objects that are related to the concept.					

Sl. No.	Statement	SA	A	U	DA	SD
16	I am interested in using adequate audio-visual aids.					
Section: B						
17	I accept and encourage student autonomy and initiative.					
18	I behave with the students like my own children.					
19	I show respect for the enlightened individual.					
20	I establish rapport with my class by playing the role of a guide.					
21	I treat all students alike without showing partiality.					
22	I try to know the problems of students.					
23	I am sensitive to students' needs and purposes.					
24	I really care whether students understand their lessons or not.					
25	I usually use higher order questioning to encourage the students to challenge their thinking.					
26	I facilitate the learners to new ways of thinking.					
27	I use students' ideas to start my lessons.					
28	I develop the problem solving ability for the sake of students.					
29	I appreciate the importance of value of subject in day to day life.					
30	I usually welcome students' questions in my class.					
31	I organize and manage the classroom to support the learning of diverse students					
Section: C						
32	I give importance to the goals and purposes of individual children while teaching.					
33	I understand the importance of education at national level.					
34	I collect information about provisions made by the state and central governments for the benefits of students.					
35	I live within a pattern of professional responsibilities.					
36	I encourage the students a free play of mental activity on current controversial issues.					
37	I am open- minded toward change in educational policies and practices.					
38	If a student wants to share his problems with me, I extend reasonable help and boost his morale.					
39	I present the new concepts in real-life situations and experiences that are familiar to the students.					
40	I present the new concepts in the context of what the students already know.					
41	Examples and student exercises given by me cultivate the attitude of 'I need to learn this'.					

Sl. No.	Statement	SA	A	U	DA	SD
42	I help the students to gather and analyse data as they are guided in discovery of the important concepts.					
43	I provide opportunities for my students to gather and analyse their own data for enrichment and extension.					
44	I present my lessons and activities so as to encourage my students to apply concepts and information in unfamiliar situation.					
45	I encourage my students to participate regularly in interactive groups.					
46	I deliver my lessons and give exercises, lab activities so as to improve their communication and mathematical skills.					
47	I present the concepts using different examples so that the students get benefited.					
48	The examples given by me help the students to solve the problems.					
49	I encourage the parents to visit and discuss their children's performance with me.					
Section: D						
50	I use appropriate body movements and gesture while teaching.					
51	I focus on demonstration based teaching so as to develop the mathematical skills of the students.					
52	I consider language as a set of terms and symbols.					
53	I make appropriate change in the interaction pattern.					
54	I think questioning makes the lesson active.					
55	I use to ask questions in simple language.					
56	If the concept is a difficult one for students to grasp, I repeatedly explain it.					
57	I use concrete analogies which are couched in their own experience for better understanding,					
58	I always connect the content to other areas, the students have already learnt					
59	In order to keep the interest of students, I inject some humour into the explanation.					
60	I give concrete or verbal examples to create a chance to understand the concepts.					
61	While asking questions, I apply redirection and refocusing techniques.					
62	I have the ability to use voice modulation at appropriate places.					
63	I have the ability to present materials clearly.					
64	I use stimulus variation in appropriate places.					

Sl. No.	Statement	SA	A	U	DA	SD
65	I keep eye contact with student while I am doing problems on the blackboard.					
66	I understand and accept students' language codes and use them to promote their development.					
67	I adjust my instructional style to the level of development and maturity of the students,					
Section: E						
68	I strive to improve the level of student's achievement by conducting evaluation tests.					
69	I sum up the main points at the end of the lesson.					
70	I believe in transferring the values of humanity into young ones in the classroom.					
71	I have different expectations from different students.					
72	If a student need special help, I would refer the student to the appropriate agency.					
73	I find out the needs of the pupils and create a scheme for remedial teaching.					
74	The observations made by me are free from personal bias and value judgement.					
75	I follow well developed assessment scheme to evaluate my students' performance.					
76	I do evaluation in between my teaching.					
77	I record the information gathered through assessment with accuracy and consistency.					
78	I make the students mastery over the content.					
79	I encourage students' participation while I am teaching					
80	I motivate the students for their creative answers.					
81	I use methods that develop students' academic and social skills.					
82	I use the previous examination results to give feedback for improvement in leaning.					

Appendix 2C

Item Analysis

Item Analysis - Teaching Competency

Item	Lower	Middle	Upper	Discriminatory power	Difficulty Index	Selected Items
1	86	92	94	8	272	Y
2	71	90	99	28	260	Y
3	77	88	98	21	263	Y
4	84	88	96	12	268	Y
5	82	88	97	15	267	Y
6	77	82	90	13	249	Y
7	80	88	97	17	265	Y
8	74	89	95	21	258	Y
9	75	86	90	15	251	Y
10	81	87	92	11	260	Y
11	89	94	97	8	280	
12	74	84	89	15	247	Y
13	73	81	91	18	245	Y
14	78	86	95	17	259	Y
15	79	80	97	18	256	Y
16	70	74	92	22	236	
17	77	87	92	15	256	Y
18	85	92	98	13	275	
19	82	89	92	10	263	Y
20	75	84	87	12	246	Y
21	91	94	97	6	282	
22	88	89	96	8	273	
23	80	82	90	10	252	Y
24	86	90	92	6	268	
25	79	84	79	0	242	
26	77	84	93	16	254	Y
27	77	81	78	1	236	
28	80	82	89	9	251	Y
29	80	84	91	11	255	Y
30	83	92	93	10	268	Y
31	78	82	88	10	248	Y
32	80	90	95	15	265	Y
33	76	83	91	15	250	Y
34	69	78	87	18	234	
35	68	81	91	23	240	
36	75	82	94	19	251	Y
37	79	77	90	11	246	Y
38	85	85	98	13	268	Y
39	78	88	92	14	258	Y
40	79	80	93	14	252	Y
41	71	88	93	22	252	Y
42	78	87	92	14	257	Y

43	76	86	93	17	255	Y
44	74	81	95	21	250	Y
45	75	89	94	19	258	Y
46	83	92	96	13	271	Y
47	88	90	96	8	274	
48	82	92	96	14	270	Y
49	82	91	100	18	273	
50	76	84	89	13	249	Y
51	82	87	98	16	267	Y
52	81	85	94	13	260	Y
53	74	80	88	14	242	
54	80	85	93	13	258	Y
55	83	83	97	14	263	Y
56	83	88	96	13	267	Y
57	76	85	94	18	255	Y
58	83	79	95	12	257	Y
59	78	83	92	14	253	Y
60	79	85	96	17	260	Y
61	78	87	89	11	254	Y
62	78	88	89	11	255	Y
63	73	93	95	22	261	Y
64	73	92	87	14	252	Y
65	83	87	99	16	269	Y
66	75	79	95	20	249	Y
67	78	80	94	16	252	Y
68	83	83	90	7	256	
69	82	90	95	13	267	Y
70	75	83	93	18	251	Y
71	78	86	97	19	261	Y
72	79	84	88	9	251	Y
73	82	86	96	14	264	Y
74	77	83	90	13	250	Y
75	78	87	95	17	260	Y
76	77	86	96	19	259	Y
77	74	87	94	20	255	Y
78	77	85	90	13	252	Y
79	86	96	96	10	278	
80	85	95	97	12	277	
81	75	90	95	20	260	Y
82	76	88	95	19	259	Y

Y – Selected Statements

Appendix 3C

Teaching competency Scale [TCScale]

Padma Rekha & Sobha- 2015

(Final form)

Certain information related to you are required for my research purpose. It is assured that information collected from you will remain confidential and will be used only for the academic purpose. Please answer with a tick mark (✔) in the appropriate box [SA-Strongly Agree/ A-Agree/N-Undecided/D-Disagree / SD-Strongly Disagree].

Sl. No.	Statement	SA	A	U	DA	SD
1.	I finish the lesson on time.					
1.	I break the content into small bits to enable the students to learn in steps					
2.	I go on improving my knowledge.					
3.	I take sufficient time and care to introduce new concepts.					
4.	I try to provide appropriate examples for clarification.					
5.	I try to educate children according to the law of nature of human development					
6.	I review my teaching from time to time.					
7.	I have strong command over my subjects.					
8.	I take active interest in the activities of my school.					
9.	I frequently discuss the performance of my students with their parents.					
10.	I manage my class well					
11.	I utilize variety of teaching strategies and methods of teaching					
12.	I relate my teaching materials with previous knowledge.					
13.	I motivate the pupil to collect the models, shapes and objects that are related to the concept.					
14.	I accept and encourage student autonomy and initiative.					
15.	I show respect for the enlightened individual.					

Sl. No.	Statement	SA	A	U	DA	SD
16.	I establish rapport with my class by playing the role of a guide.					
17.	I am sensitive to students' needs and purposes.					
18.	I facilitate the learners to new ways of thinking.					
19.	I develop the problem solving ability for the sake of students.					
20.	I appreciate the importance of value of subject in day to day life.					
21.	I usually welcome students' questions in my class.					
22.	I organize and manage the classroom to support the learning of diverse students					
23.	I give importance to the goals and purposes of individual children while teaching.					
24.	I understand the importance of education at national level.					
25.	I encourage the students a free play of mental activity on current controversial issues.					
26.	I am open- minded toward change in educational policies and practices.					
27.	If a student wants to share his problems with me, I extend reasonable help and boost his morale.					
28.	I present the new concepts in real-life situations and experiences that are familiar to the students.					
29.	I present the new concepts in the context of what the students already know.					
30.	Examples and student exercises given by me cultivate the attitude of 'I need to learn this'.					
31.	I help the students to gather and analyse data as they are guided in discovery of the important concepts.					
32.	I provide opportunities for my students to gather and analyse their own data for enrichment and extension.					
33.	I present my lessons and activities so as to encourage my students to apply concepts and information in unfamiliar situation.					
34.	I encourage my students to participate regularly in interactive groups.					

Sl. No.	Statement	SA	A	U	DA	SD
35.	I deliver my lessons and give exercises, lab activities so as to improve their communication and mathematical skills.					
36.	The examples given by me help the students to solve the problems.					
37.	I use appropriate body movements and gesture while teaching.					
38.	I focus on demonstration based teaching so as to develop the mathematical skills of the students.					
39.	I consider language as a set of terms and symbols.					
40.	I think questioning makes the lesson active.					
41.	I use to ask questions in simple language.					
42.	If the concept is a difficult one for students to grasp, I repeatedly explain it.					
43.	I use concrete analogies which are couched in their own experience for better understanding,					
44.	I always connect the content to other areas, the students have already learnt					
45.	In order to keep the interest of students, I inject some humour into the explanation.					
46.	I give concrete or verbal examples to create a chance to understand the concepts.					
47.	While asking questions, I apply redirection and refocusing techniques.					
48.	I have the ability to use voice modulation at appropriate places.					
49.	I have the ability to present materials clearly.					
50.	I use stimulus variation in appropriate places.					
51.	I keep eye contact with student while I am doing problems on the blackboard.					
52.	I understand and accept students' language codes and use them to promote their development.					
53.	I adjust my instructional style to the level of development and maturity of the students,					
54.	I sum up the main points at the end of the lesson.					
55.	I believe in transferring the values of humanity into young ones in the classroom.					

Sl. No.	Statement	SA	A	U	DA	SD
56.	I have different expectations from different students.					
57.	If a student need special help, I would refer the student to the appropriate agency.					
58.	I find out the needs of the pupils and create a scheme for remedial teaching.					
59.	The observations made by me are free from personal bias and value judgement.					
60.	I follow well developed assessment scheme to evaluate my students' performance.					
61.	I do evaluation in between my teaching.					
62.	I record the information gathered through assessment with accuracy and consistency.					
63.	I make the students mastery over the content.					
64.	I use methods that develop students' academic and social skills.					
65.	I use the previous examination results to give feedback for improvement in leaning.					