“Effectiveness of Teaching Mathematics with Transitional background music on Mathematical Achievement, Interest in learning Mathematics and Attitude towards Mathematics among secondary School Students.”

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By

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FEB - 2018

DECLARATION

I declare that the thesis entitled ***"Effectiveness of Teaching Mathematics with Transitional background music on Mathematical Achievement, Interest in learning Mathematics and Attitude towards Mathematics among secondary School Students",*** is the outcome of the original work undertaken and carried out by me in the Department of Education, Kuvempu University, under the guidance of Dr. Jagannath K. Dange, Associate Professor, Department of Education, Kuvempu University, Shankaraghatta. I also declare that, the thesis has not either wholly or in part, been submitted for any other Degree or Diploma, anywhere.

Date: 12 · 02 · 2018

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I certify that the present thesis entitled ***“Effectiveness of Teaching Mathematics with Transitional background music on Mathematical Achievement, Interest in learning Mathematics and Attitude towards Mathematics among secondary School Students”,*** incorporates the results of the independent research work of Mrs. Mamatha M., designed and carried out under my guidance and supervision in the Department of Education, Kuvempu University, Shankaraghatta. I also certify that it has not previously formed the basis for the award of any degree, diploma or associate fellowship of the Kuvempu University or any other University.

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ABSTRACT

Learning mathematics has become a necessity for an individual's full development in today's complex society. Despite its utility and importance, mathematics is perceived by most pupils as difficult, boring, not very practical, and abstract, etc (Ignacio, Nieto & Barona, 2006). Therefore, students' low success level in mathematics has been a worry for a long time in many countries. It is generally believed that students' attitudes towards mathematics and interest in mathematics determine their mathematical success.

In this sense to make easy the teaching and learning mathematics in active manner the researcher made an attempt to study the Effectiveness of Teaching Mathematics with Transitional background music on Mathematical Achievement, Interest in learning Mathematics and Attitude towards Mathematics among secondary School Students. The study is true experimental in nature. Pre-test, post-test Experimental and Control group design was used. By adopting random sampling technique the researcher selected 60 secondary school students from an English Medium High School. Interest in Learning Mathematics scale, interest in music scale and Mathematical Achievement Test, these three tools were constructed and standardized by the investigator. And another two standardized tools – Raven's Standard Progressive Matrices Test (SPM) and Ali Imam's Mathematics Attitude scale (MAS) all these tools were used to collect the data. In the present study t-test and two-way ANOVA were used to analyze the data by using IBM SPSS 19 version. The experimental group showed a lot of improvement than the control group in their Mathematical Achievement, (28.26 >17.83) Interest in learning Mathematics (80.80 >71.53) and Attitude towards Mathematics (93.00 >79.46). The study also revealed that, The transitional background music approach was equally effective for all the three interest in music levels of students in developing academic achievement in mathematics ($F= 2.15 < 3.15$), Interest in learning mathematics ($F= 0.90 < 3.15$) and Attitude towards mathematics ($F= 2.89 < 3.15$).

The transitional background music approach was equally effective for both boys and girls in developing Attitude towards mathematics ($F = 2.35 < 3.15$) and Interest in learning mathematics ($F = 2.68 < 3.15$). But in fostering the academic achievement in mathematics, the teaching mathematics with the transitional background music approach is significantly differs on girls than boys ($F = 19.84 > 3.15$). It means the girls are academically more benefited from the transitional background music approach than the boys. From the delayed post tests its found that all the three variables were developed through Transitional background music approach were sustained by the secondary school students.

Key Words: Teaching Mathematics, Transitional background music, Interest in learning mathematics, Attitude towards Mathematics and Achievement in Mathematics.

CHAPTER I

INTRODUCTION

May not Music be described as the Mathematic of sense, Mathematic as the Music of reason? The soul of each the same! Thus the Musician feels Mathematic, the Mathematician thinks Music, Music the dream, Mathematic the working life, - each to receive its consummation from the other.

– James Joseph Sylvester – 1865.

1.1 Background of the Study:

'Education is a proximate means of the progress of society'- Ward (1983). Thus, one the aims of education is to bring about desirable changes in the students with respect to knowledge, skills and attitudes in such a way as he may effectively perform the changing roles in a changing society.

The Education Commission (1964-66) reiterates that the education is a threefold process of imparting knowledge, developing skill and inculcating proper study habits, interests, attitudes and values. Therefore, education has been regarded as a matter of primary national importance and an indispensable agency in the difficult task of building a nation.

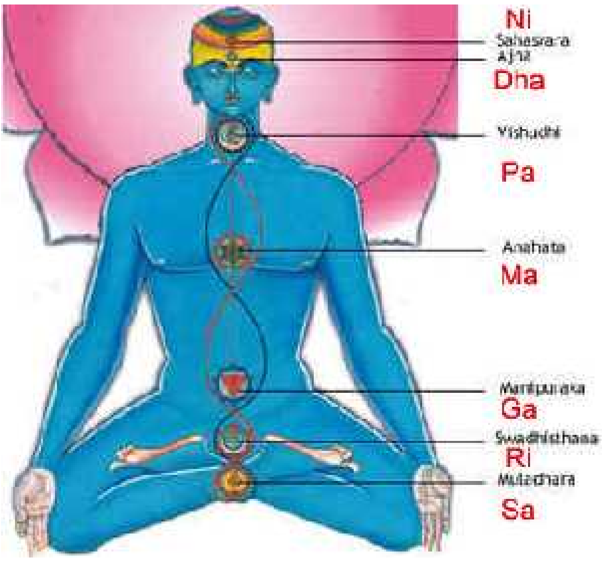
Mathematics has become one of the most important subjects in the school curriculum during this century. As modern societies have increased in complexity and as that complexity has accompanied rapid technological development, so the teaching of mathematics has come under increased scrutiny. Mathematics has played a significant role in building our civilization. The Education Commission (1964-66), and the National Policy on Education (1986) has underlined the importance of Mathematics Education. Therefore, Mathematics is a compulsory subject at school level. If the students take interest in this subject, then they can achieve better in Mathematics. But the fact is that there is more failure of students in Mathematics. For many people, mathematics is an enigma. Characterized by the impression of numbers and calculations taught at school, it is often accompanied by feelings of rejection and disinterest, and it is believed to be strictly rational, abstract, cold and soulless.

Music engages much of the brain, and coordinates a wide range of processing mechanisms. This naturally invites consideration of how music cognition might relate to other complex cognitive abilities. The tremendous ability that music has to affect and manipulate emotions and the brain is undeniable, and yet largely inexplicable. Very little serious research had gone into the mechanism behind the music's ability to physically influence the brain and even now the knowledge about the neurological effects of music is scarce.

Early childhood educators know the value of music in their classrooms. Most will unequivocally state that music contributes to the academic environment in ways that positively impact the whole child. The emotional range of music during this period was considerably widened, as was its harmonic vocabulary and the range and number of instruments which might be called upon to play it. Music often had a 'programme' or storyline attached to it, sometimes of a tragic or despairing nature, occasionally representing such natural phenomena as rivers or galloping horses.

Music seems to be present in all cultures, and it appears to be very deep-rooted in the human psyche. We know that music is a perceptual entity and is controlled by our auditory mechanisms. Music affects emotions and mood. It makes people want to dance. It is intensely connected to memories. People can remember song lyrics from decades ago without any effort. The emotional content of music is very subjective. A piece of music may be undeniably emotionally powerful, and at the same time be experienced in very different ways by each person who hears it.

1.1.1 (Fig.1) The effects of Music on Human Brain from Neuro-physics Approach



The physical body is unsheathed by auric field in which seven major chakras (invisible to the naked eye) are present. The seven chakras are Sahasrara, Ajna, Vishudhi, Anahatha, Manipura, Swadhistana and Mooladhara. Each chakra is associated with an endocrine gland and controls specific organs. Each swara resonates with one major chakra. When each note is sung concentrating on the shruthi, vibration of the corresponding chakra can be experienced. According to an ancient Indian text, Swara Sastra, the seventy-two melakarta ragas (parent ragas) control the 72 important nerves in the body. It is believed that if one sings with due devotion, adhering to the raga lakshana (norms) and sruti shuddhi, (pitch purity) the raga could affect the particular nerve in the body in a favorable manner. The vibration of the notes activates a chakra and through the nadis emanating from the chakras, the organ at the side of the disease begins the healing process.

The human brain, which is one of the most complex organic systems, involves billions of interacting physiological and chemical processes that give rise to experimentally observed Neuro-electrical activity, which is called an electroencephalogram (EEG). Music can be regarded as input to the brain system which influences the human mentality along with time. Since music cognition has many emotional aspects, it is expected that EEG recorded during music listening may reflect the electrical activities of brain regions related to those emotional aspects. The results might reflect the level of consciousness and the brain's activated area during music listening. It is anticipated that this approach will provide a new perspective on cognitive musicology. Music is widely accepted to produce changes in affective (emotional) states in the listener. However, the exact nature of the emotional response to music is an open question and it is not immediately clear that induced emotional responses to music would have the same neural correlates as those observed in response to emotions induced by other modalities. However, although there is an emerging picture of the relationship between induced emotions and brain activity, there is a need for further refinement and exploration of neural correlates of emotional responses induced by music (Archi Banerjee, Shankha Sanyal, Ranjan Sengupta, Dipak Ghosh, 2015).

1.1.2 History of Classical music

Who does not like the melody of music? Whose emotions do not vibrate and flow with the sonorous tunes and rhythm of music? Indeed, we all experience the enchanting effects of good music in some form or the other. The classical compositions (ragas) of music create a deep impact on our mind and emotions. The melody of vocal and instrumental music soothes our mind and heart. Not only has that, the sonic vibrations of its specific compositions also healed psychological disorders. Moreover, depending upon its nature, music can awaken or intensify specific kinds of emotional streams and mental tendencies and thus influence the habits and nature of the engrossed singers/players and audiences.

The immense potential of the power of Shabda (cosmic flow of sound) hidden in music was well recognized by the ancient Indian sages and they had devised several musical patterns emanating from the "Omkara" for chanting of the Vedic hymns and for distinct spiritual effects. The Shastric schools of music discovered musical octave (sa, re, ga, ma, pa, dha, ni, sa) indwelling in the subtle sounds of Nature and invented the basic classical ragas for activating specific streams of natural powers and effects; a wide variety of musical compositions were generated consequently. Ever since then music has been an integral part of human culture with varied applications and forms. Despite its degeneration into the noisy and destructive kinds of so-called ’modern music’, the creative and the soothing role of music has not lost its prominence. The last few decades have seen a revival of classical Indian and western music in a big way through increasing interest of researchers in music therapy.

Rhetorically commenting on the ecstatic impact of soothing music, Carlyle had once said "God walks behind good music". So, how could there be any disease or suffering where God is? There will only be an unflinching flow of bliss all over. His feelings seem to be true if we look at the marvelous effects of sonorous, calming musical compositions on the soft cores of emotions and subtle layers of the mind and also on physiological processes, as observed by some music therapists in the modern laboratories. In this respect, the effects of music can be likened to that of yoga. According to the Vedic Philosophy, yoga and music, both are part of Nada Vidya. Yoga deals with the realisation of anahata nada the sublime sound (extrasensory vibrations) of the eternal force of cosmic consciousness. Music pertains to the perception and expression of the infinite spectrum of the rhythmic flow of the ahata nada (perceivable sonic currents) pervading in Nature. Both have direct impact on the shat chakras hidden along the endocrine column and hence affect our physical as well as subtle bodies.

The seven basic swaras (musical notes) of the musical octave have a one-to-one correspondence with these chakras (nuclei of subtle energy). The lower most (in the kava equina region along the erect endocrine column), viz., the Muladhara Chakra is associated with the swara "sa"; that means, the practice of chanting this particular musical note will have impact on awakening or activation of this particular chakra. Similarly, the chakras successively upwards in this direction namely, the Swadhisthana, Manipura, Anahata, Vishuddha, Agya and the top-most Sahastrara Chakra… have correspondence respectively with the swaras "re", "ga" "ma", "pa", "dha" and "ni". Significantly, the order of the compositions of these swaras in the "aroha" (ascending) and "avaroha" (descending) patterns of the Shastric musical tunes also match with the top-down (from Sahastrara to Muladhara) and bottom-up (from Muladhara to Sahastrara) directions of the flow of energy.

Some of the sounds naturally produced inside the human body are easily perceivable if one sits quietly in a calm place. Usually these are felt in the heart (beat), throat and head (cerebral region). In the state of deep meditation, while concentrating on the internal sounds of the body, one can distinctly feel these and several otherwise non-audible sounds; their rhythmic compositions are also said to be in tune with the musical octave. The subtle sounds of the heart are said to be musical expressions of the emotions. Also, it is said that humans feel, recognize, create and express music only because of the emotional sensitivity of the human heart. Moreover, music also happens to be the best means of expressing the inner feelings. This is why good music is often described as the voice of the heart.

The original ragas of the Indian classical music (Shastric Music) are created according to the deep knowledge of harmonious consonance between the seven swaras and chakras. This is why shastric musical compositions are found to have a significant positive effect on the mind-body system and also have the potential to awaken the otherwise dormant faculties. There are several historical examples of the immense remedial power of the shastric ragas. For instance, in 1933, when the Italian dictator Mussolini was terribly suffering from insomnia, no medicine or therapeutic mode could help him get sleep. Pandith Omkarnath Thakur, a great shastric musician was visiting Europe around that time. When he heard of Mussolini’s affliction, he agreed to perform a remedial musical programme to allay the latter’s sufferings. His performance of the raga puriya indeed worked magically and Mussolini went into deep sleep within half-an-hour. This and similar incidents attracted the attention of many contemporary musicians, scientists and physicians and triggered research in music therapy.

A group of London based physicians scientifically experimented on different aspects of music therapy. In their views, the shastric ragas could induce healing of all kinds of ailments. They argue that the immediate benefit these ragas offer is mental peace by alleviating tensions and providing an enchanting and creative diversion to the mind. Interpretation of the Vedic scriptures on Nada Vidya implies that Shastric Music helps synergetic augmentation of the panch pranas (the five major streams of vital energy in a human being). In concordance, research in energy medicine (pranic healing) and classical music shows that specific shastric ragas enhance the level of vital energy. It is the deficiencies and disorders in the vital energy distribution in the mind body system, which is the root cause of its ailing state. The smooth and increased flow of vital energy rejuvenates the mind and empowers the immune system as well as the auto-regulatory healing mechanism of the body. This is how classical music generates new hope, joy and enthusiasm in the otherwise dull or depressed mind and removes the disorders and relieves one of the untoward pressures and excitements of inferiority, despair, fear, anger, etc. Because of its fast remedial effects, which lead to eventual cure of the psychosomatic disorders, music therapy based on classical ragas is being used or advised these days for the treatment of insomnia, migraine, hypertension, chronic headache, anxiety, etc. and empowers the immune system as well as the auto-regulatory healing mechanism of the body. This is how classical music generates new hope, joy and enthusiasm in the otherwise dull or depressed mind and removes the disorders and relieves one of the untoward pressures and excitements of inferiority, despair, fear, anger, etc. Because of its fast remedial effects, which lead to eventual cure of the psychosomatic disorders, music therapy based on classical ragas is being used or advised these days for the treatment of insomnia, migraine, hypertension, chronic headache, anxiety, etc.

Because of its impact on the chakras (and hence on the pranas), shastric music not only vibrates and soothes the mental strings, but also energizes and balances the organs of the body. According to W. H. J. Wales, the Indian classical music can cure the problems of the digestive system, liver including the diseases like jaundice. Jane remarks that this music rhythmically vibrates the tissue-membranes of the ear and, relaxes the nerves and muscles beneath the temple and in the brain; as a result of which the sensory and motor systems are energized and activated.

The empirical studies on therapeutic evaluation of the classical ragas have shown interesting results. Singing or engrossed listening of Raga Bhairavi has been found to uproot the diseases of kapha dosha e.g. asthma, chronic cold, cough, tuberculosis, some of the sinus and chest related problems etc. Raga Asavari is effective in eliminating the impurities of blood and related diseases. Raga Malhar pacifies anger, excessive mental excitements and mental instability. Raga Saurat and raga Jaijaivanti have also been found effective in curing mental disorders and calming the mind. Raga Hindola helps sharpening the memory and focussing mental concentration. It has been proved effective in curing liver ailments.

Apart from the classical ragas played on musical instruments, the rhythmic sounds of temple bells and shankha (conch shell or bugle) produced during devotional practices have also been found to have therapeutic applications. A research study in Berlin University showed that the vibrations of the bugle sound could destroy bacteria and germs in the surroundings. More specifically, it was found that if the shankha is played by infusing (through the mouth) twenty-seven cubic feet of air per second, within a few minutes it will kill the bacteria in the surrounding area of twenty-two hundred square feet and inactivate those in about four-hundred square foot area further beyond.

D. Brine of Chicago had treated hundreds of cases of hearing impairments/ deficiencies by making the patients play or listen to the sounds of shankha played rhythmically at appropriate (as per the case) pitch and intensity. Several research experiments on music therapy in general and on the sounds of temple-bells and bugles are going on in the Moscow Sanatorium and some research centres in Germany, Holland and Australia. The results are very positive and encouraging towards developing suitable courses on music therapy that could be an integral part of medical practices. The need and importance is especially felt and emphasized for healing of psychosomatic disorders. According to Hacken, although western classical music is also being used in some studies, its applications are limited to certain kinds of diseases/disorders and are also of much lesser significance in terms of the intensity and impact of positive effects as compared to the Indian classical music.

Rock, pop, jaz, rap and disco types of western music have become quite popular in the modern times especially among the teenagers and youth. But these and other varieties of fast and high-beat music are found to have detrimental effects on health in general. Balaji, who has been a part of music therapy research teams in Sweden and Germany, has shown that although, listening to such a music for five-ten minutes, removes lethargy and instantly generates new alacrity, listening to it for longer periods and frequently has damaging effects on the ear drums and the spinal column. The smooth and balanced flow of several important physiological fluids also gets disturbed and leads to different kinds of physical ailments. Further, as this kind of music induces sexual and other kinds of negative and unnatural excitements, its harms on mental health are far more serious; apart from its debauching effects on spiritual well being.

As mentioned earlier, the scope and utility of music therapy should be viewed, considering its intimate and delicate connection with the inner emotions. These and the core of consciousness force in the inner mind are most sensitive to the musical currents and corresponding vibrations in the sublime expansion of cosmic sound.

The nervous system and brain functions

The corresponding effects on the organs and the physiological system of the body as a whole are obvious consequences. From its very origin, the Indian classical music is most suitable and beneficial in this respect and also for spiritual elevation because of the soothing and harmonising impact of the shastric ragas on the sat chakras and the pranas. The findings of research

laboratories on immense potential of the shastric ragas in music therapy scientifically support these theories. The results and well-tested applications should be propagated by the researchers for the benefit of a large number of patients suffering from varieties of psychosomatic disorders these days.
Deeper research on the spiritual aspects of the Indian classical music and compositions of the shastric ragas might also give some clues about the lost links of the knowledge of the Vedic Science of mantras. This might also open new avenues of revieving the applications of mantra-therapy, as elaborated in the Scriptures.

The music is dominant mood enhancer. Thus, most often people listen to music since early in the morning till late night. Indian Classical Music is the soul of every music. Classical Music greatly effects on brain activity; it may have a positive effect on hormone system that’s why people feel relaxed after hearing the classical music. India has got the strong historical background of music. Archaeological studies and evidence too has validated the presence of music from the ancient time. The ‘Samaveda’ includes hymns and describes the Indian music. While discussing about the Indian Classical Music, the striking word comes “Raga”. It is the very heart of Hindustani Classical Music. Shastra says every Raga impacts on the human body and mind. A Raga is characterized by its own particular ‘Ras’ or ‘Mood’. (Ram K. Nawasalkar, & Pradeep K. Butey 2012).

It observed that while listening the music, brain parts are involved in processing music, this include the auditory cortex, frontal cortex, cerebral cortex and even the motor cortex. (Kristeva R, Chakarov V, Schulte-Monting J, Spreer J.,) Most of us listen music of choice during leisure time or while working / studying. Music can be used as a tool to relieve tension/ stress, solitude, it also enhances the listener’s mood. (Lonsdale, A. J. & North, A. C.) These changes are reflected clearly in the physiological system for human.

Music therapy is one of options for controlling aggression. It is an incredibly powerful form of expression. While music as a whole is well recognized for its entertainment value, the Indian civilization had gone a step forward to attribute the curative aspect to music (Aurora, S. & Kaur, G, 2011). Music, based on ragas, has a direct impact on the shat chakras hidden along the endocrine column and hence affects our physical as well as subtle bodies. Raga is the sequence of selected notes that lend appropriate mood or emotion in a selective combination. Depending on their nature, a raga could induce or intensify joy or sorrow, violence or peace. Playing, performing and even listening to appropriate ragas can work as a medicine (Bagchi, 2003). Various ragas have since been recognized to have a definite impact on certain ailments. Some ragas like Darbari, Kanhada, Kamaj and Pooriya are found to help in defusing mental tension, particularly in the case of hysterics. For those who suffer from hypertension, ragas such as Ahirbhairav, Pooriya and Todi are prescribed. Carnatic ragas, Punnagavarali and Sahana can be used to bring down the violence within (Sairam, 2004b).

Raga Bhairavi and Hindola -Its Effects and Timings

One of the unique characteristics of Indian music is the assignment of definite times of the day and night for performing or listening Raga melodies. It is believed that only in this period the Raga appears to be at the height of its melodic beauty and majestic splendor. There are some Ragas which are very attractive in the early hours of the mornings; others which appeal in the evenings, yet others which spread their fragrance only near the midnight hour.

This connection of time of the day or night, with the Raga or Raginis is based on daily cycle of changes that occur in our own body and mind which are constantly undergoing subtle changes. Different moments of the day arouse and stimulate different moods and emotions.

Each Raga or Ragini is associated with a definite mood or sentiment that nature arouses in human beings. The ancient musicologists were particularly interested in the effects of musical notes, how it affected and enhanced human behavior. Music had the power to cure, to make you feel happy, excited, keep you calm, balance your mind and so on. Extensive research was carried out to find out these effects. This formed the basis of time theory as we know it today.

Emotions, feelings and thoughts have been reported to be greatly influenced by music listening or participation. Emotional experience derived from music has a powerful effect on the formation of one’s moral and intellectual outlook. Music activities enhance imagination & creative thinking.

Hindoḷaṃ is a ragam in Carnatic music (musical scale of South Indian classical music). It is an audava ragam (or owdavaragam, meaning pentatonic scale). It is a janya ragam (derived scale), as it does not have all the seven swaras (musical notes). Hindolam is not the same as the Hindustani Hindol.The equivalent of Hindolam in Hindustani music is Malkauns or Malkosh.

It is known to be a ragam that is generally beautiful and soothing to listen to. Being symmetrical in its ascending and descending scales, it lends itself very well to improvisation and is therefore popular at concerts.

Hindolam is a symmetric ragam that does not contain rishabam and panchamam. It is a pentatonic scale. Since pentatonic scales can be found in other world music such as Chinese music, shades of Mohanam and hindolam can sometimes be traced in Chinese and east asian music. This ragam uses the swaras sadharana gandharam, shuddha madhyamam, shuddha dhaivatham and kaisiki nishadam. Hindolam is not a melakarta ragam, since it does not contain all the seven swaras.

Experts in carnatic music hold differences of opinion on the janaka ragams (ragams of origin) that should be attributed to hindolam. It is widely accepted that 20th melakarta, Natsbhairavi is the parent ragam of hindolam, but some would like to associate it with 8th melakarta, Hanumatodi. It can be derived from both, by dropping the rishabham and panchamam.

Hindolam – The Raga with a Hypnotizing Melody.

A derivative of Hanumathodi (Mela 8) belonging to the 2nd Music Chakra, Hindolam is a serene, gentle, soulful, enchanting and pleasing meditative raga. It is an audava – audava janya ragam. Experts in Carnatic music hold differences of opinion on the janaka ragams (ragams of origin) that should be attributed to Hindolam. It is widely accepted that 20th melakarta, Natabhairavi is the parent ragam of Hindolam. It can be derived from both Natabhairavi and Hanumathodi, by dropping the rishabham and panchamam. The Hindustani equivalent of Hindolam is "Malkauns". Malkauns is one very beautiful raga, derived from the Bhairavi Thaat. This raga is said to have been created from Siva's Taandav (cosmic dance), so it has a vigour and energy about it.

In Mind, Body and Soul Chakra – Chakra 2 (Nestled between the Root and Sacral Chakras) depicts Joy arising out of desire fulfillment; to bring a richer feeling of everything that one does – to remember the joy of life, the joy of living, it is the bringing of Heaven onto earth. Hindolam (meaning swing) invariably evokes a romantic feeling.

This raga is associated with Vasantha Rithu(Spring) which is full of freshness and colours, which brings forth the feelings of well being and boosts our mood. The air smells clean and floral. It can be aptly said that Hindolam conveys the moods of Shringara primarily. Raga Hindola helps sharpening the memory and focussing mental concentration. It has been proved effective in curing liver ailments. Hindol for devotion, peace with tinge of melancholy; boosts self-confidence; Arthritis, Spondylitis, Backache, gastritis; Cell degeneration due to ageing can be controlled (Mythili 2002).

The raga creates increased feelings of compassion and reduced anxiety which in turn provides relief to patients of low blood pressure. It is also said that the raga helps to maintain normal digestive gas and body temperature along with restful sleep and tranquility. This raga also conveys the divine Bhakthi Bhava and is astonishingly refreshing when sung in the mornings.

Hindolam is a Tri-sthyayi Raga. It is known to be a ragam that is generally beautiful and soothing to listen to. Being symmetrical in its ascending and descending scales, it lends itself very well to improvisation and is therefore popular at concerts. It is one of the most popular ragas, extensively used in concerts. It is also considered an auspicious raga and is a favourite of Nadaswara Vidwans for playing in temples and marriages. It is a raga with great scope for extensive swaraksharas and beautiful phrasing of the raga alapana and sangatis. Compositions start on s; m; n In the hands of a skilled vocalist or instrumentalist, the raga transports one to an ethereal world of divine bliss.

Hindolam is regarded as one of the most enchanting, ingenious, pleasant and soft raga. The compositions of Hindola ragam are unique not only because of its Sahitya and Satvika Bhava, but also they lead the singer/listener to extreme bliss and divinity. Ragas are eloquent vehicles of emotions with limitless powers of expression. A genius bends them to his purpose and makes them carry his message.

Raag Bhairavi:

Bhairavi is a janya ragam in Carnatic music (musical scale of South Indian classical music). Though it is a sampoorna ragam(scale having all 7 notes), it has two different dhaivathams in its scale making it a Bhashanga Ragam, and hence is not classified as a melakarta ragam (parent scale). This is one of the ancient ragams, said to have been prevalent about 1500 years ago. There are numerous compositions in this ragam.

Though a Raga called Bhairavi also exists in Hindusthani music, it is very different from the Carnatic version. Hindusthani's Bhairavi, in terms of its aroha and avaroha alone, corresponds to Carnatic music's Thodi.

The notes used are chathusruthi rishabham, sadharana gandharam, shuddha madhyamam, chathusruthi dhaivatham & shuddha dhaivatham and kaishika nishadham. Note the use of both dhaivathams, chathusruthi (D2) in ārohaṇa and shuddha (D1) in avarohaṇa.

Bhairavi is one of the most popular ragas on the concert stage, due to its very wide scope for improvisation. This raga can be elaborated to beautiful effect in all three sthayis, but shines particularly well in the upper madhya and thara sthayis. The nishada, an important jeeva swara, can be rendered with varying degrees of gamaka, depending on which daivatha is used. The weight of this raga and the lack of vakra sancharas make brighas and slower phrases equally appealing. This characteristic also means that the raga is well-suited to thanam, kanakku, and sarvalaghu swaras. Bhairavi is also one of the most common ragas in which ragam-thanam-pallavi is rendered, due to the scope for elaboration. There is a near-infinite number of compositions in this raga, which can be sung at any time of day. Ragas which have similar murchanas and/or anya swara patterns to Bhairavi include Manji, Mukhari, and Huseni.

Raag Description: Anyone who claims to know or appreciate music cannot be unaware of the queen of melodies i.e. Raag Bhairavi. The soft (Komal) notes and their smooth rendering with pleasing touches - Khatke, Jhatke and Murkiyan simply mesmerize the audience. A pleasant sobering atmosphere full of love and piety is created and one feels so close to the Supreme. Its compositions include several Thumris, Bhajans, Ghazals, Songs etc. Since it is an ocean of immense possibilities the melodic combinations can include all the twelve notes with skill.

Singing or engrossed listening of Raga Bhairavi has been found to uproot the diseases of kapha dosha e.g. asthma, chronic cold, cough, tuberculosis, some of the sinus and chest related problems etc. Bhairavi - a soothing reducing violent forms of schizophrenia (Tambe 2002); discourages attachments to material possessions (preferred by shadus in bhajans); useful in Rheumatic Arthritis, Sinusitis; colds TB, cancer (Subramanian 2002); Abdul Karim Khan's Bhairavi recitals caused plants to grow by 430% more than others.

1.1.3 Benefits of Music in Education

Music therapy is the prescribed use of music and musical interventions in order to restore, maintain, and improve emotional, physical, physiological, and spiritual health and well being. It is an efficacious and valid treatment for persons who have psychological, affective, cognitive and communicative needs. It can be defined as the controlled use of music and its influence on the human being to aid in physiological, psychological and emotional integration of the individual during the treatment of an illness or disease (Munro S, Mount B. 1978).

Music therapy can be used in active and passive mode (Pacchetti C, Mancini F, Aglieri R, Fundaro C, Martignoni E, Nappi G. 2000). In active music therapy, the therapist and patient are actively involved in playing music using instruments and voice. Passive music therapy is conducted with the patient at rest. The therapist plays calming music and invites the patient to visualize peaceful images with the aim of producing a state of mental relaxation ((Pacchetti C, Mancini F, Aglieri R, Fundaro C, Martignoni E, Nappi G. 2000).

Music therapy has been found that music provides opportunities for enhancing a sense of control over emotions through emotional catharsis (Lippin RA, Micozzi MS. Art’s therapy 2006; Wiesenthal DL, Hennessy DA, Totten B. 2003). When music enters the sensory system, it goes to the limbic system before passing it to the prefrontal cortex (Goleman, 1995). The limbic system is where the brain processes the emotion. These limbic-prefrontal circuitries can be enhanced through music program (Chalabi, Turner and Delamont, 2006), as music invokes emotions (Khalfa, Schon, Anton and Liegeois-Chauvel, 2005). It will not only improve learning and memory, but also emotional intelligence (Goleman, 1998). Therefore, the emotional state of the person may be improved by music (Campbell, 1997). Group music therapy can facilitate self-expression and provides a channel for transforming frustration, anger, and aggression into the experience of creativity and self-mastery (Montello, L.M., & Coons, E.E., 1998).

Music intervention also has effects on the brain function resulting in neural network activation, and ultimately leads to activation of different regions of the brain if performed regularly (Schmithorst VJ, Holland SK, 2003). These effects also produce better physical and psychological function, and therefore have beneficial effects on stress responses; reducing anxiety, improving mood and lessening pain perception (Sacks O., 2006).

Music education readies students for learning by helping to develop their basic mental skills and capacities. Music instruction impacts learning in the following ways:

Music education prepares students to learn: Enhances fine motor skills, Prepares the brain for achievement, Fosters superior working memory and Cultivates better thinking skills.

Music education facilitates student academic achievement: Improves recall and retention of verbal information, Advances Mathematics achievement, boosts reading and English language arts (ELA) skills and Improves average SAT scores.

Music education develops the creative capacities for lifelong success: Sharpens student attentiveness, Strengthens perseverance, Equips students to be creative and Supports better study habits and self-esteem.

***Enhances fine motor skills*:** Motor function is the ability to use small, acute musicle movements to write, use a computer, and perform other physical activities essential for classroom learning. The parts of the brain associated with sensory and motor function are developed through music instruction, and musically trained children have a better motor function than non-musically trained children (Forgeard, 2008; Hyde, 2009; Schlaug et al., 2005).

Prepares the brain for achievement: Complex Mathematical processes are more accessible to students, who have studied music because the same parts of the brain used in processing Mathematics are strengthened through practice in music (Helmrich, 2010).

Fosters superior working memory: Working memory is the ability to mentally hold, control and manipulate information in order to complete higher order tasks, such as reasoning and problem solving.

Musicians are found to have superior working memory compared to non-musicians: Musicians are better able to sustain mental control during memory and recall tasks, most likely as a result of their long term musical training (Berti et al., 2006; Pallesen et al., 2010).

***Cultivates better thinking skills*:** Thinking skills such as abstract reasoning are integral to students' ability to apply knowledge and visualize the solutions. Studies have shown that young children who take keyboard lessons have greater abstract reasoning abilities than their peers, and these abilities improve over time with sustained training in music (Rauscher, 2000).

***Improves recall and retention of verbal information*:** Musical training develops the region of the brain responsible for verbal memory—the recall and retention of spoken words—which serves as a foundation for retaining information in all academic subjects. Music students who were tested for verbal memory showed a superior recall for words as compared to non-music students (Ho et al., 1998; 2003).

***Advances Mathematics achievement*:** Students who study music outperform their non-music peers in assessments of math, and the advantage that music provides increases over time. Additionally, students involved in instrumental music do better in algebra, a gateway for later achievement (Helmrich, 2010; U.S. National Mathematics Advisory Panel, 2008).

Boosts reading and English language arts (ELA) skills: Students who study music surpass non-music students in assessments of writing, using information resources, reading and responding, and proofreading. The gains in achievement of music students compared to non-music students increase over time (Baker, 2011; Catterall, 1998).

Increases average SAT scores**:** The SAT is a standardized test designed to measure “readiness for college.” An analysis of 10 years of SAT data revealed that students who took four years of arts courses in high school earned the highest scores on both the verbal and Mathematics SAT, but overall, students taking any arts courses scored significantly higher than students who took no arts courses (Vaughn et al., 2000). Of these students, those who took music courses earned the highest Mathematics and second highest verbal SAT scores (College Board, 2010).

Music education develops the creative capacities for lifelong success: Engagement, persistence, and creativity are components of higher-level thinking and complex problem solving (Costa & Kallick, 2000). Music education nurtures these habits of mind that are essential for success in today’s global knowledge world.

Sharpens student’s attentiveness**:** The ability to pay attention—visual focus, active listening and staying on task—is essential to school performance. It begins to develop early in life and is continuously refined. Early childhood training in instrumental music improves these attention abilities, while continued music education throughout adolescence reinforces and strengthens them (Neville et al., 2008).

Strengthens perseverance**:** Perseverance is the ability to continue towards a goal when presented with obstacles. It is developed and strengthened through music education. Students involved in music lessons surpass their peers on tasks measuring perseverance. At the foundation of perseverance are motivation, commitment and persistence, all traits of creative individuals (Scott, 1992).

Equips students to be creative: Music education helps develop originality and flexibility, which are key components of creativity and innovation. Graduates from music programs report that creativity, teamwork, communication, and critical thinking skills and competencies are necessary in their work, regardless of whether they are working in music or in other fields (Craft, 2001; SNAAP, 2011).

***Supports better study habits and self-esteem*:** A study of music majors found that they felt more prepared for success in college than non-music majors. This readiness may be due to the music majors' discipline and focus developed via intense practice and performance routines prior to college. These habits are typical of music students and may generalize to other academic areas and social/ emotional aspects of life, contributing to higher self esteem

1.1.4 Mathematics and Music Connections

Music plays an important role in patterning experiences at home and at school. Music activities and materials are excellent for promoting patterning and emergent mathematics (Geist & Geist 2008; Southgate & Roscigno 2009). Music keeps children engaged in a mathematical activity for long periods of time. Such experiences promote positive attitudes toward mathematics and support the construction of mathematical concepts in a developmentally appropriate way for infants and toddlers. Edelson and Johnson (2003) found that music enriches the mathematical learning environment for children because such activities are infused with a degree of pleasurable intensity, promote the fun of learning, and allow the child to be an active participant (Kamile Geist, Eugene A. Geist, and Kathleen Kuznik 2012).

Numbers, patterns, proportions, and ratios are just some of the concepts that are mastered by both mathematicians and musicians. Great thinkers from ancient times to the present have seen and used these conceptual links. For example, Pythagoras, the Greek mathematician, used Mathematics to make sense of musical concepts as he developed his ideas on music theory. Boethius, the Middle Age music expert, articulated some of his musical ideas using Mathematics concepts. And who hasn't heard about Einstein's great love of music, which he said extraordinarily helpful to him in his work?

Studies focused on music for young children are also suggesting that Mathematics gains increase, according to the number of years that students engage in active music learning (Gardiner, 2000), with some indication that the younger children are when they begin music instruction, the greater the gains will be. Certain brain development research shows that the early years are a prime time to make strong connections along the associated neural pathways, with music exposure as a perfect entryway.

1.1.5 Attitude towards Mathematics:

One of the factors that affect students' math achievement is students' attitude. Finding out students' attitude does not solve all problems. We should know the factors that affect our attitude. At that time we can manipulate/interfere the factors and as a result we can change their attitude towards positive. Though it may affect our behavior, our attitude shows our tendencies not directly our behavior. Attitude is generally defined by using some concepts such as our emotional content opinion, beliefs, prejudices, tendencies and evaluations (Kadhiravan & Balasubramanian, 1999). Attitude tendencies either positive or negative about a person or a behavior (Koballa, 1988) can be learned through either our observations or acquired knowledge (Shrigley, Koballa & Simpson, 1988) (Nuholu, 2008).

There are a lot of factors affecting students' success in mathematics. One of these factors is their mathematical fears (Peker & Mirasyedio÷lu, 2008). One of the reasons for mathematical fears is attitude towards mathematics (Baloglu, 2001). It is generally believed that students' attitudes towards mathematics determine their mathematical success. A student's constant failure in mathematics and his/her mathematics anxiety can make him to believe that he can never do well on the subject thus accepting defeat. On the other hand, his successful experience can make him to develop a positive attitude towards learning mathematics (Biller, 1996; Akinsola & Olowojaiye, 2008). So, the importance of measuring students' attitudes increases every passing day in educational system (Gerçek & di. 2006). In a teaching settings in which student's attitudes are not considered, expected learning experiences become difficult and hence teaching activities are not precisely performed. Whereas, conducting teaching activities are the signs for students' success in education. To achieve the expected student success, it is required to know students' attitudes (Hançer & dig. 2007), because one of the objectives of elementary mathematics education is to get students improve affirmative attitudes towards mathematics, Determining how much students reached the educational objectives will be beneficial for assessing of the current education and, if there are needed, making some changes on it. Determining student attitudes which can be affected by different variables will be beneficial for remediation of students' disregard, biases and learning difficulties about mathematics. A lot of studies have been performed which have aimed at specified of attitudes both primary and secondary school levels (Aukar, 1986; Baykul, 1990; Altun, 1995; Guler, 1997; Peker & Mirasyedioglu, 2003; Yılmaz, 2006).

Factors that affect students' attitude towards math course positively

The first external factor that emerged from the data pertained to characteristics of the teacher. This characteristic is one of the most important since teachers often have the power to affect other factors. When speaking with students, they often spoke of the influence a teacher's demeanor had on their attitude toward the class. These students described memories of nice teachers, funny teachers, unapproachable teachers, and devoted teachers. Another category that emerged was the amount of interaction and type of relationships that students had with their teachers. This often led to a discussion of the amount of personal attention that students receive from teachers and the effect this has on student attitudes.

The second external factor of teaching characteristics is clearly closely related to teacher characteristics. First and foremost, students felt that the clarity of their teacher's explanation influenced their understanding of mathematics and, hence, their attitude toward mathematics. Some students also discussed the importance of seeing mathematics and explanations from multiple points of view and multiple representations, such as graphically and algebraically.

Some also felt that the explanations and examples used in the class should highlight the usefulness of mathematics. The presence of collaborative learning also had an effect on some students' attitudes, along with the use of time and pacing during instruction. Another student thought illustrating the usefulness of mathematics can have a lasting effect on students.

Size and environment were the two primary classroom characteristics that students felt affected their attitude toward mathematics. Since this study was conducted with students enrolled in a large lecture college algebra class, size was one of the most referenced characteristics.

The fourth external factor is assessments and achievement. In terms of achievement, students spoke often of the value of success in mathematics courses and the role success plays in student attitudes. Specifically, students found their attitudes improved as their success in the course improved.

The next theme is the internal factor that affects student attitudes toward mathematics: individual perceptions and characteristics. In the interviews, a few students drew on early family experiences and the influence they had on their attitude toward mathematics. Individual perceptions of challenge level, frustration level, and a sense of accomplishment were believed to impact student attitudes. A student discusses the enjoyment and sense of accomplishment that comes with meeting a challenge, but also the frustration and negative feelings associated with a problem that is too challenging. Challenge and frustration are often linked with motivation. Students conveyed their need to connect to math topics in order to improve student attitudes.

Finally, the most discussed category that students felt influenced their attitude toward mathematics was the level of understanding. Most students truly felt that their attitude towards mathematics was often in direct relation to their level of understanding. (Erin Goodykoontz 2008).

Those factors are related to connecting math topics with real life, using materials in teaching math, teachers’ personality, teachers’ content knowledge, teachers’ classroom management and students’ opinion about math course. (Çigdem YÕlmaza, Sadegül Akbaba Altunb , Sinan Olkunc)

1.1.6 Interest in Learning Mathematics

Learning mathematics has become a necessity for an individual's full development in today's complex society. Despite its utility and importance, mathematics is perceived by most pupils as difficult, boring, not very practical, and abstract, etc (Ignacio, Nieto & Barona, 2006). Therefore, students’ low success level in mathematics has been a worry for a long time in many countries.

The constructivist approach with emphasis on the affective dimension of learning, on the positive motivation, on solving concrete tasks, keeps "up" the students' interest in mathematics (Mihaela Voinea and Monica Purcaru 2014). Everyday learning experiences, such as listening to music, are especially important in supporting developing mathematics concepts in children from infancy to 5 years old (Linder, Powers-Costello, & Stegelin 2011). Kamile Geist, Eugene A. Geist and Kathleen Kuznik (2012) showed that, the listening to music helps interest in learning mathematics. Young children can learn mathematics through Beat, Rhythm, and Melody. It creates interest towards learning mathematics. Learning mathematics is a developmental process influenced by the child’s physical, social- emotional, and cognitive learning and development, and nurtured by a stimulating mathematical environment (Geist 2009). Examination of processes predictive of text learning indicated that topic interest was related to affective response, affect to persistence, and persistence to learning. Combining self-rating scales with dynamic measures of student activities provided new insight into how interest influences learning (Mary Ainley, Suzanne Hidi and Dagmar Berndorff Ontario 2002).

1.1.7 Constructivism: A Theory of Learning

The main features of constructivism suggest that knowledge is actively constructed, and its application has an emphasis on process, collaborated learning, and teaching for understanding. Olsen (2000) suggests that there are ‘two main branches of constructivism’, one based on philosophical theories of learning and one based on psychological theories. The diverse perspectives of constructivism are informed by many writers which include: Dewey (1938) who writes about a pragmatic approach, and Vygotsky (1934) and Bruner (1960) who inform social constructivism. In addition, Von Glaserfeld (1989) looks at radical constructivism and Habermas explores critical constructivism.

Constructivist Principles of Learning and Teaching Methods

1. Learning is an active process in which the learner uses sensory input and constructs meaning out of it. The more traditional formulation of this idea involves the terminology of the active learner (Dewey's term) stressing that the learner needs to do something; that learning is not the passive acceptance of knowledge which exists "out there" but that learning involves the learner s engaging with the world.

2. People learn to learn as they learn: learning consists both of constructing meaning and constructing systems of meaning. For example, if we learn the chronology of dates of a series of historical events, we are simultaneously learning the meaning of a chronology. Each meaning we construct makes us better able to give meaning to other sensations which can fit a similar pattern. 8

3. The crucial action of constructing meaning is mental: it happens in the mind. Physical actions, hands-on experience may be necessary for learning, especially for children, but it is not sufficient; we need to provide activities which engage the mind as well as the hands.9 (Dewey called this reflective activity.)

4. Learning involves language: the language we use influences learning on the empirical level. Researchers have noted that people talk to themselves as they learn on a more general level. There is a collection of arguments, presented most forcefully by Vigotsky, that language and learning are inextricably intertwined. 10 This point was clearly emphasized in Elaine Gurain's reference to the need to honor native language in developing North American exhibits. The desire to have material and programs in their own language was an important request by many members of various Native American communities.

5. Learning is a social activity: our learning is intimately associated with our connection with other human beings, our teachers, our peers, our family as well as casual acquaintances, including the people before us or next to us at the exhibit. We are more likely to be successful in our efforts to educate if we recognize this principle rather than try to avoid it. Much of traditional education, as Dewey pointed out, is directed towards isolating the learner from all social interaction, and towards seeing education as a one-on-one relationship between the learner and the objective material to be learned. In contrast, progressive education (to continue to use Dewey's formulation) recognizes the social aspect of learning and uses conversation, interaction with others, and the application of knowledge as an integral aspect of learning.

6. Learning is contextual: we do not learn isolated facts and theories in some abstract ethereal land of the mind separate from the rest of our lives: we learn in relationship to what else we know, what we believe, our prejudices and our fears. On reflection, it becomes clear that this point is actually a corollary of the idea that learning is active and social. We cannot divorce our learning from our lives.

7. One needs knowledge to learn: it is not possible to assimilate new knowledge without having some structure developed from previous knowledge to build on. The more we know, the more we can learn. Therefore any effort to teach must be connected to the state of the learner, must provide a path into the subject for the learner based on that learner's previous knowledge.

8. It takes time to learn: learning is not instantaneous. For significant learning we need to revisit ideas, ponder them try them out, play with them and use them. This cannot happen in the 5-10 minutes usually spent in a gallery (and certainly not in the few seconds usually spent contemplating a single museum object.) If you reflect on anything you have learned, you soon realize that it is the product of repeated exposure and thought. Even, or especially, moments of profound insight, can be traced back to longer periods of preparation.

9. Motivation is a key component in learning. Not only is it the case that motivation helps learning, it is essential for learning. This ideas of motivation as described here is broadly conceived to include an understanding of ways in which the knowledge can be used. Unless we know "the reasons why", we may not be very involved in using the knowledge that may be instilled in us. even by the most severe and direct teaching.

1.2 Need and Importance of the Study

School education has seen significant development over the decades since independence. According to the Government of India estimates while 82 per cent of the 20 crore children of the 5-14 age group were in school as per enrolment figures, nearly 50 per cent of these children drop out before competing class VIII. One finds the situation on the ground ridden with difficulties.

According to the NCFTE 2009 school education need to view learners as active participants in their own learning and not as mere recipients of knowledge, need to encourage their capacity to construct knowledge, ensure that learning shifts away from rote methods. Learning is to be viewed as a search for meaning out of personal experiences and knowledge generation as a continuously evolving process of reflective learning.

Transformational education involves reflection, introspection and action, with a deep relationship between the head, heart and hand. The National Curricular Framework 2005 (NCF) reminds that the school curriculum must integrate various domains of knowledge, so that the curricular encompasses all, and is not separated from the co-curricular or extra-curricular. This has significant implications for the role of art, music and drama in education, to nurture children’s creativity and aesthetic sensibilities.

Mathematics is a compulsory subject at school level. If the students take interest in this subject then they can achieve better in Mathematics. But the fact is that there is more failure of students in Mathematics. For many people, mathematics is an enigma. Characterized by the impression of numbers and calculations taught at school, it is often accompanied by feelings of rejection and disinterest, and it is believed to be strictly rational, abstract, cold and soulless.

Interest is an abstraction, a psychological construct, affective in domain that explains the state of being, especially with regard to the well being of an individual. According to Downie (1958) Interests have been defined as one of the main aspect of learning situation. They are motivators of learning, without interest very little learning takes place in many individuals. Several educationists and education psychologists have claimed that individuals tend to do better at things which interest those most. Rammers and others (1965) discussed the bearing of interests on education and revealed that because interest motivates learning, they effect education. When pupils are interested, they work harder, longer and more effectively. Even Charles (1902) stressed the importance of interest in education saying - When students are animated by powerful interests, as for example in professional courses, they submit cheerfully to large amounts of study, but when they are dealing with system of ideas to which no vital interests are attached, they clamor for variety and light work.

Music plays an important role in patterning experiences at home and at school. Music activities and materials are excellent for promoting patterning and emergent mathematics (Geist & Geist 2008; Southgate & Roscigno 2009). Music keeps children engaged in a mathematical activity for long periods of time. Such experiences promote positive attitudes toward mathematics and support the construction of mathematical concepts in a developmentally appropriate way for infants and toddlers. Edelson and Johnson (2003) found that music enriches the mathematical learning environment for children because such activities are infused with a degree of pleasurable intensity, promote the fun of learning, and allow the child to be an active participant (Kamile Geist, Eugene A. Geist, and Kathleen Kuznik 2012).

Any system in order to be forward looking must be bold in encouraging experimentation and innovations and also be involved with constant review of the outcomes of such efforts. The field of school education should be no exception. Such experimentation would, however, not mean replacement of the existing models but should be seen as an attempt to try new structures towards viable alternative models which would bring a culture of freshness and enjoyable learning vibrant. In this context, there is a need of innovative teaching and learning process.

However, there is no any research which has attempted to study the effectiveness of teaching mathematics with the transitional background music approach to determining and comparing how secondary school students' Achievement in mathematics, Interest in Learning Mathematics and Attitudes towards mathematics changes according to their levels of interest in Music and gender. If it is considered that education is a process which is deliberate, has goals and aimed to have students gain a positive behavioral change through this process in general, it is hoped that Achievement in mathematics, Interest in Learning Mathematics and attitudes towards mathematics of secondary school students positively improves through this process in all grade levels of secondary schools.

Hence, it is important to be conduct a study determining and comparing how secondary school students' Achievement in mathematics, Interest in Mathematics and attitudes towards mathematics changes according to grade levels in order to improve mathematics education. Therefore, the aim of this study is to find out the effectiveness of the teaching mathematics with transitional background music approach to determining and comparing how secondary school students' Achievement in mathematics, Interest in learning Mathematics and attitudes towards mathematics changes according to their levels of interest in Music and gender.

1.3 Statement of the problem

The problem selected for the present investigation is, ***"Effectiveness of Teaching Mathematics with Transitional background music on Mathematical Achievement, Interest in learning Mathematics and Attitude towards Mathematics among secondary School Students."***

1.4 Objectives of the Study

The study was undertaken with the following Objectives:

1. To study the effectiveness of Teaching Mathematics with Transitional background Music on Mathematical achievement among Secondary School Students.
2. To study the effectiveness of conventional approach on Mathematical achievement among Secondary School Students.
3. To find out the difference between the mean scores of post test of experimental and control groups with reference to Mathematical Achievement.

4. To study the effectiveness of Teaching Mathematics with Transitional background Music on Interest in learning Mathematics among Secondary School Students.
5. To study the effectiveness of Conventional Approach on Interest in learning Mathematics among Secondary School Students.
6. To find out the difference between the mean scores of post test of experimental and control groups with reference to Interest in learning Mathematics.
7. To study the effectiveness of Teaching Mathematics with Transitional background Music on Attitude towards Mathematics among Secondary School Students.
8. To study the effectiveness of Conventional Approach on Attitude towards Mathematics among Secondary School Students.
9. To find out the difference between the mean scores of post tests of experimental and control groups with reference to Attitude towards Mathematics.
10. To investigate the interaction between ‘Treatments’ and ‘Interest in music’ with reference to Mathematical achievement.
11. To investigate the interaction between ‘Treatments’ and ‘Interest in music’ with reference to Interest in learning Mathematics.
12. To investigate the interaction between ‘Treatments’ and ‘Interest in music’ with reference to Attitude towards learning Mathematics.
13. To investigate the interaction between ‘Treatments’ and ‘Gender’ with reference to Mathematical achievement.
14. To investigate the interaction between ‘Treatments’ and ‘Gender’ with reference to Interest in learning Mathematics.
15. To investigate the interaction between ‘Treatments’ and ‘Gender’ with reference to Attitude towards Mathematics.
16. To investigate whether the students sustain Mathematical achievement through the Teaching Mathematics with Transitional background Music approach.

17. To investigate whether the students sustain Interest in learning Mathematics through the Teaching Mathematics with Transitional background Music approach.
18. To investigate whether the students sustain Attitude towards Mathematics through the Teaching Mathematics with Transitional background Music approach.

1.5 Outline of the succeeding chapters

Chapter I:

This chapter has dealt with a brief introduction for the study, genesis of the problem, need for the study, objectives of the study, statement of the problem, variables of the study, hypotheses, scope of the study and an overview of the study.

Chapter II:

In the Second chapter, a brief review of related literature and how the related literature helped the researcher to design the present study will be discussed. While presenting this chapter an attempt had been made to arrange review, based on the key concepts extracted from the problem selected for the study.

Chapter III:

In Third chapter, the methodology adopted for the present study will be discussed. This chapter includes the operational definitions of the terms and concepts used in the study, discussion of the variables, formulation of hypotheses, tools used for the collection of data, sampling design, data collection procedure, scoring procedure and plan for analysis of data together with the statistical techniques used in the study will be discussed.

Chapter IV:

The fourth Chapter discuses statistical analysis and interpretation of the data.

Chapter V:

Fifth Chapter presents a brief summary of the study. It will also present over all findings and conclusions in relation to the variables, the limitations of the study and suggestions for further research along with educational implications of the study.

1.6 Scope of the Study

This study is confined to sixty 9th standard students of B.G.S. English Medium High School, Jayapura, Koppa (Tq). Chikkamagaluru for experimentation. The researcher has considered only Teaching Mathematics with Transitional Background Music approach, and the other Variables like Mathematical Achievement, Interest in Learning Mathematics and Attitude towards Mathematics were considered for the study.

CHAPTER –II

REVIEW OF RELATED LITERATURE

In the previous chapter, the researcher discussed on introduction to the background of the study, need for the study, title of the problem, objectives of the study, scope of the study and an overview of the study.

In this chapter a brief review of studies related to Effectiveness of background Music, Mathematical Achievement, Interest in Learning Mathematics and Attitude towards Mathematics are presented.

2.1 Importance of Review of Related Literature:-

Fox (1969) gives the following as functions of the Review of Related Literature.

- The conceptual frame of reference for the contemplated research.
- An understanding the status of research in the problem area.
- Clues to the research approach, method, instrumentation and data analysis.
- An estimate of the probability of success of the contemplated research and the significance are usefulness of the findings and assuming the decision is made to continue.
- Specific information needed to state the definitions, assumptions, limitations and hypothesis of the research.

According to Ary (1976) the importance of Review of Related Literature are as follows:

- It provides the researcher the means of getting to the frontier in his/her particular field of knowledge.
- It helps to understand the theory in the field and gives knowledge with regard to the procedures and tools which are proved.

- It avoids unintentional replication of previous studies and keeps the researcher in a better position to interpret the significance of his/her own results.
- It assures familiarity with both previous theory and research to the researcher.

In the words of Gay (1990), the Review of Related Literature is as important as any other component of the research process. He opines that the review tells the researcher what has been done and what needs to be done. The Review of Related Literature involves the systematic identification, location and analysis of documents containing information related to the research problem.

According to John Best (1992), the Review of Related Literature is a valuable guide to define the problem, recognising its significance, suggesting promising data gathering devices, appropriate study design and sources of data.

Thus it could be concluded that the Review of Related Literature is a very important and essential step in designing any research work. At the same time, the richness of source material in the development of a research design depend not so much on the area covered by the previous researcher in the field but, on the specificity of significant studies centred around a few crucial variables. Hence Review of Related Literature becomes imperative on the part of the researcher to review of the work done by other researcher.

The studies reviewed have been classified under five headings:

- Studies related to Effectiveness of Music on Academic Achievement
- Studies related to Mathematical Achievement
- Studies related to Interest in Learning Mathematics
- Studies related to Attitude towards Mathematics
- Studies related to Constructivism Approach

2.2 Reviews on Effectiveness of Music on Academic Achievement:

Joyanta Sarkar and Utpal Bisvas (2015). The Effect of Music on the Social Behaviour of a Child. The impacts of music therapy on children with disabilities are various. This study presented the effect of music on the social behaviour of a child. Music Therapy contributes to psychological, psychosocial and academic improvement. It provides practical guidelines to use music to accommodate children with disabilities.

Vijayakumar S H, Chakrabarti B & Singh N C (2015). Emotional responses to Hindustani raga music: the role of musical structure. In Indian classical music, ragas constitute specific combinations of tonic intervals potentially capable of evoking distinct emotions. A raga composition is typically presented in two modes, namely, alaap and gat. Alaap is the note by note delineation of a raga bound by a slow tempo, but not bound by a rhythmic cycle. Gat on the other hand was rendered at a faster tempo and follows a rhythmic cycle. The objectives of the study were, to (1) discriminate the emotions experienced across alaap and gat of ragas, (2) investigate the association of tonic intervals, tempo and rhythmic regularity with emotional response. 122 participants rated their experienced emotion across alaap and gat of 12 ragas. Analysis of the emotional responses revealed that (1) ragas elicit distinct emotions across the two presentation modes, and (2) specific tonic intervals are robust predictors of emotional response. Specifically, the results showed that the ‘minor second’ is a direct predictor of negative valence. (3) Tonality determines the emotion experienced for a raga where as rhythmic regularity and tempo modulates levels of arousal. The findings provide new insights into the emotional response to Indian ragas and the impact of tempo, rhythmic regularity and tonality on it.

Banerjee. A., Sonyal S, Sengupta R & Ghosh D (2015). Music and its Effect on Body, Brain / Mind, -A Study on Indian Perspective by Neurophysical Approach. The human brain, which is one of the most complex organic systems, involves billions of interacting physiological and chemical processes that give rise to experimentally observed neuro-electrical activity, which is called an electroencephalogram (EEG). Music can be regarded as input to the brain system which influences the human mentality along with time. Since music cognition has many emotional aspects, it is expected that EEG recorded during music listening may reflect the electrical activities of brain regions related to those emotional aspects. The results might reflect the level of consciousness and the brain's activated area during music listening. It is anticipated that this approach will provide a new perspective on cognitive musicology.

Mamta Sharma (2014). Comparative Study of Hindustani and Carnatic Music on Psychological and Physiological Processes of Aggressive Adolescents. The study aims to enhance emotional intelligence and reduce aggression among adolescents through therapy by using Hindustani and Carnatic music. It was hypothesized that Post intervention aggression scores would be significantly less as compared to Pre intervention scores. It was also hypothesized that Post intervention emotional intelligence would be better as compared to Pre intervention scores and individuals in experimental group would score low on EMG as compared to individuals in control group. Two hundred ten (210) subjects, between the age group of 13 to 16 years of age, were selected with the help of Aggression Scale and Emotional Intelligence Scale. These 210 subjects were randomly assigned to experimental groups and control groups. The experimental groups were given music therapy intervention for fifteen days. After intervention period, same scales were re-administered. In order to analyze the statistical data, ANOVA and MANOVA were applied to examine the effect of music therapy on Aggression.

To determine the difference in the efficacy of Hindustani & Carnatic Music Therapy Intervention, t-test was applied. The results shown that experimental groups were significantly higher on emotional intelligence in comparison to control group. Adolescents in experimental group showed significantly less aggressive tendencies as compared to those in control group. Results showed remarkable reduction in EMG scores after the intervention. Results showed no significant difference between the efficacies of Hindustani & Carnatic music. The research has concluded that music does have positive effects on the mind and brain of aggressive adolescents.

Angela Leea, & Yen Huai Jena (2014) Interactive Whiteboard Integration into Music Teaching and Learning: Preschool Children as a Case Study. This comparative research study contrasts the use of interactive whiteboards (IWB) and older models of teaching (OMT) to examine the effect of both upon children's learning attitude and their learning outcomes. This study was conducted across two preschool classrooms in a regional day care center in Taiwan. Classes were held as a 'one off' 50 minute lesson for the purposes of the experiment. One classroom used IWB and the other used older training methods. The research method entailed observational analysis of children's musical activity and a Likert Scale checklist was utilized to measure children's attitude towards music learning and their level of musical achievement. The participants included two head teachers, fourteen children, and five aides spread across both classrooms. Additional data were collected at the conclusion of the lesson via in depth interviews with the two classroom teachers. These interviews were intended to elicit evidence of perceived attitudinal change and validation of learning efficacy. The program of music activities used in this study offered multiple opportunities for children to improve their attitudes in the classroom while also acquiring musical skills and theory. The findings of this research showed that children were able to increase their own level of engagement and reach a high level of achievement during individual and peer play in a structured setting that is overseen by a professional. IWB and traditional methods of teaching both proved effective: it was the teacher's pedagogy, rather than technology per se, that brought about the benefits.

Kimberlyn T. Tiu (2013). The Effect of Background Music to College Students' Academic Performance. The study explained whether there is a significant relationship between background music to academic performance of college students. The relationship was studied based from thirty-five (35) respondents in the Phillippines taken through a survey questionnaire. The data analysis was done using the statistical software namely: Stata 12th and Gretel. For the data gathering, the proponent used Google form and Google spread sheet. Initially, only two out of four variables were deemed to be significant which were hours listening to music and pop music genre. However, sex and hours studying were not significant. But after testing the model, the model was not suffering from any violations.

Jhalukpreya Surujlal (2013). Music and Dance as Learning Interventions for Children with Intellectual Disabilities. Amongst the many disadvantaged groups of people in the world, an important minority are children with intellectual disabilities. Relative to their counterparts without intellectual disabilities, children with intellectual disabilities face a wide spectrum of challenges, including learning difficulties, social segregation and negative stereotyping. Children with intellectual disabilities find it difficult to perform various functions such as communicating and socialising with others, and, in many situations, even looking after themselves. They are extremely vulnerable to depression, poor self-image and a lack of self-confidence. The pace at which they learn and grasp things is much slower than that of children without intellectual disabilities. Appropriate interventions are therefore required for them to function at an acceptable level in school. Various interventions have been identified to assist such children cope with their learning challenges. Amongst these interventions is the integration of music and dance into formal lessons in order to facilitate their learning. The purpose of this study was to examine the contribution made by music and dance to improving learning in the classroom amongst children with intellectual disabilities. Following a qualitative approach, three focus group interviews were conducted using purposive samples of educators. Interpretative phenomenological analysis procedures were used to analyse the data. The following key themes emerged through the process: confidence in communicating, group work, knowledge, concentration and behaviour. The study found that dance and music are positive mediums that contribute significantly to the learning experience of children with intellectual disabilities.

Matthew A. Goldenberg., Anna H. L. Floyd & Anne Moyer (2013). No Effect of a Brief Music Intervention on Test Anxiety and Exam Scores in College Undergraduates. This study examined classical music's effect on test anxiety and exam performance in a college setting by randomizing students to (1) listen to Mozart while studying and taking an exam, (2) study and take the exam under usual conditions, or (3) choose between these two alternatives. The researcher controlled for: prior exam performance, year in college, age, the amount of time ordinarily listening to classical music and music while studying, and condition preference. There was no effect on either outcome. Students were positively disposed toward the intervention, but did not typically listen to classical music or to music while studying. Although this intervention did not decrease test anxiety or enhance exam performance, more extensive or tailored music interventions could hold promise.

American Music Therapy Association (2012). Inc. Music Therapy and Alzheimer's disease. Research Highlights Music therapy reduces depression among older adults. Music experiences can be structured to enhance social/emotional skills, to assist in recall and language skills and to decrease problem behaviors. Music tasks can be used to assess cognitive ability in people with Alzheimer's Disease. The music was effective in decreasing the frequency of agitated and aggressive behaviors for individuals diagnosed with Alzheimer's disease and related dementias. Individuals in the late stages of dementia respond to and interact with music.

Ram K. Nawasalkar & Pradeep K. Butey (2012). Analytical and Comparative Study on effect of Indian Classical Music on human body using EEG based signals. This study describes how to recognize and percept emotions from brain signals while listening the Indian classical music measured with the electroencephalogram (EEG) device. In the present paper, the relationship between emotions and classical music are analyzed. The positive effect on brain after hearing of Indian classical music was more, as compared with other music after capturing the EEG signals. The Indian classical music was found to be more effective on emotional status as compared to rock music in the state of quiet wakefulness.(open eyes) Indian Classical Music can be used as a tool to relieve tension/ stress and to relax.

Sibel Coban & Ilaya Dubaz (2011). The relationship between active learning models in music lessons in elementary schools and multiple intelligence areas. The objective of this study was to reveal the effect of the active learning model on the multiple intelligence areas of students when applied in elementary school music classes. The working group of the study consisted of 52 students, 52 students' parents and a music teacher. The study was conducted at an Istanbul elementary school during the first term of the 2010-2011 school years. The experimental group was taught using active learning education techniques. The pre test-post test was performed on students' parents and the music teacher of the school. The study used the Multiple Intelligence Development Assessment Scale, developed by Shearer (1994) and adapted to Turkish by Kaya (2004), with a Personal Information Form and Observation Form. According to the findings of this study, educational approaches that include multiple intelligence activities based on active learning result in more effective and permanent learning outcomes. The analysis showed a significant difference in the lower dimensions of multiple intelligence of the experimental and control groups. The experimental group showed a more homogeneous structure in terms of pretest-post test results. Students who were taught using the active learning model became happier and more successful in the music lesson. In addition, more permanent learning outcomes were observed among students taught using the active learning model, which is based on the work of Orff and the Multiple Intelligence Theory. The results of the pretest-posttest performed on the music teacher in the study indicated positive progress in the lower dimension of musical-rhythmic intelligence of students in the experimental group. On the other hand, according to the results of pretest-posttest performed in the control group, no differentiation was found in the lower dimension of musical-rhythmic intelligence of students.

Lutz Jancke & Pascale Sandmann (2010). Music listening while you learn: No influence of background music on verbal learning. In this study, the researcher investigated the influence of listening to background music on verbal learning performance and the associated brain activations. Musical excerpts were composed for this study to ensure that they were unknown to the subjects and designed to vary in tempo (fast vs. slow) and consonance (in-tune vs. out-of-tune). Noise was used as control stimulus. 75 subjects were randomly assigned to one of five groups and learned the presented verbal material (non-words with and without semantic connotation) with and without background music. Each group was exposed to one of five different background stimuli (in-tune fast, in-tune slow, out-of-tune fast, out-of-tune slow, and noise). As dependent variable, the number of learning words was used. In addition, event-related desynchronization (ERD) and event-related synchronization (ERS) of the EEG alpha-band were calculated as a measure for cortical activation.

The researcher did not find any substantial and consistent influence of background music on verbal learning. There was neither an enhancement nor a decrease in verbal learning performance during the background stimulation conditions. The researcher found however a stronger event-related desynchronization around 800 - 1200 ms after word presentation for the group exposed to in-tune fast music while they learned the verbal material. There was also a stronger event-related synchronization for the group exposed to out-of-tune fast music around 1600 - 2000 ms after word presentation.

Phillip M. Hash (2010). Music Education at the turn of the Twentieth Century. Educators of the nineteenth century believed that music influenced the will, and thus the character and conduct of human beings. Music instruction during this time was, therefore, used as a tool for shaping the behaviour and ideals of young Americans through songs communicating moral and patriotic messages.

In the following years, during the Progressive Era (circa 1890s1940s), educators came to value music not for the power of its internal qualities, but rather for the benefits that resulted from engaging in real life musical practices. Consequently, elementary and secondary music curricula expanded to include a greater variety of courses and performing organizations, promoted for their ability to teach students to use leisure time in a productive way and work together in a democratic environment. This study utilizes articles from periodicals, papers presented at meetings of the National Education Association (NEA), and other historical data to show music education's role in shaping American society around the turn of the twentieth century. These goals are then discussed in relation to values and practices found in contemporary music education.

Susan Hallam (2010). The power of music: its impact on the intellectual, social and personal development of children and young people. This study provided a strong case for the benefits of active engagement with music throughout the lifespan. In early childhood there seem to be benefits for the development of perceptual skills which effect learning language subsequently impacting on literacy which is also enhanced by opportunities to develop rhythmic co-ordination. Fine motor co-ordination is improved through learning to play an instrument. Music also seems to improve spatial reasoning, one aspect of general intelligence which is related to some of the skills required in mathematics. While general attainment is clearly affected by literacy and numeracy skills, motivation which depends on self-esteem, self-efficacy and aspirations is also important in the amount of effort given to studying. Engagement with music can enhance self-perceptions but only if it provides positive learning experiences which are rewarding. This means that musical experiences need to be enjoyable providing challenges which are also attainable. Teaching needs to generate an environment which is supportive and sufficiently flexible to facilitate the development of creativity and self-expression. Group music making is also beneficial to the development of social skills and can contribute to health and well-being throughout the lifespan and can therefore contribute to community cohesion providing benefits to society as a whole.

Mary S. Wagner (2008). Dimensions of Music: The Effect of Music/Brand Congruity on Advertising and Brand Evaluations. This research investigated the role of background music in the process of attitude formation. Specifically, this study examined how the fit between a piece of music and a brand in a product evaluation setting may affect attitudes toward the brand and the advertisement. Based on the theories of Mandler (1982) and Berlyne (1972), this research proposed that a moderate congruity between the music and the brand will lead to more positive evaluations of the brand and advertisement than either high or low congruity. In the first part of the research, a scale was created to measure how people describe their perceptions of music samples. A framework to measure the dimensions of music was developed by determining the number and nature of the underlying dimensions (calming, dark, energizing, jazzy, and sophisticated). In the second part of this research, an experiment was designed to test the effects of music/brand congruity on advertising and brand evaluations under conditions of high and low cognitive capacity. This experiment used the dimensions of music scale to create conditions of high, moderate, and low music/brand congruity. Music/brand congruity was determined by the degree to which people tended to evaluate the music and the brand similarly on the dimensions (calming, dark, energizing, jazzy, or sophisticated).

Kevin N. White (2007) The effects of background music in the classroom on the Productivity, Motivation, and Behaviour of fourth grade students. The action research study was conducted that implemented background music in the classroom. There were ten fourth grade students who participated in the study. The study was conducted over a course of three weeks. The researcher focused on four main points: does background music increase student motivation, positive behaviour, relaxation, and staying on-task. The results suggest that the overall class met the project’s main points. Implementing background music in the fourth grade classroom at Logan Elementary School has proven to be an effective tool.

De Groot, A. (2006). Effects of Stimulus Characteristics and Background Music on Foreign Language Vocabulary Learning and Forgetting. Using a variation of de Groot's (2006) study on foreign vocabulary learning, Küssner and his colleagues introduced the variable of extraversion. 15 highly extraverts and 16 highly introverts were used, split by high and low 'alpha' and 'beta' activity groups. They predicted that introverts, when learning with background music, would perform more poorly on the word recall task than when learning in silence. Extraverts were predicted to perform as well if not better on the word recall task when learning with background music compared with silence. More generally, people who had high cortical arousal were expected to perform more poorly on the task when background music was playing during learning, and those with low cortical arousal should be unaffected. This hypothesised interaction effect on word recall was not significant. However, there was an unexpected effect of cortical arousal in the beta band on word recall: individuals with high beta activity recalled more words than those with low beta activity. When this study was replicated however, no significant evidence whatsoever was found, apart from a beneficial effect of background music. This may have been due to there genuinely being no effects, or alternatively, it could have been caused by other individual differences such as musical training or neuroticism (another personality dimension).

Michael Beer (2005). Mathematics and Music: Relating Science to Arts? This study has outlined three different approaches to the question of how mathematics and music relate to each other. The first showed the particular perception of music by the ancient Greeks putting less importance on melody and movement than on tone, tuning and static harmony. In the second, the concept of the golden section was brought into relation with number ratios and their occurrence in diverse compositions. The most fundamental approach, however, was the third, in which connections were revealed concerning the artistic aspect of the mathematical way of thinking. However, these three represent probably the most often discussed concepts and ideas and were particularly suitable for providing a first impression of this topic. Whatever links between music and mathematics exist, both of them were obviously still very different disciplines, and one should not try to impose one on the other. It would be wrong to attempt explaining all the shapes of music by mathematical means as well as there would be no sense in studying mathematics from a musicological point of view. However, it would be enriching if these relationships were introduced into mathematical education in order to release mathematics from its often too serious connotations. It is important to show people that mathematics, in one way, is as much an art as it is a science. This probably would alter its common perception, and people would understand better its essence and its universality.

Carlson (2004). The effects of background music and relaxation on the reading performance of third grade students. Students who participated in the study sat in a Vibrio acoustic music chair, which allowed students to feel the vibrations of the music while completing the reading based tasks the results of the study showed a statistically significant positive impact for both sight words recognition and reading comprehension there was no significant increase for oral reading accuracy. Furthermore, the researcher stated that all students who were reading below grade level at the beginning of the study improved their performance to grade level or higher.

Fioranelli (2001) The effect of background classical music on mathematics, problem solving skills of third grade students in a computer lab setting. Classical music played in the background during the treatment groups' computer lab sessions while no music played during the control groups' sessions. Fioranelli found no significant difference between the mathematics problem solving skills of third grade students who had listened to classical music and those who did not.

Rauscher & Zupan (2000): The effects of classroom music instruction on spatial temporal reasoning of kindergarten students. Students were assigned to one of two group keyboard instruction or no music. After four months of treatment the keyboard group scored significantly higher on the spatial temporal tasks than the no music group the researchers found that after eight months of treatment the keyboard group still scored significantly higher than the no music group and the difference between groups was much greater.

James S. Catterall, Richard Chapleau & John Iwanaga (1999). Involvement in the Arts and Human Development: General Involvement and Intensive Involvement in Music and Theatre Arts. This study enlists the National Educational Longitudinal Survey (NELS:88), a panel study which has followed more than 25,000 students in American secondary schools for 10 years. The work addresses developments for children and adolescents over the period spent between the 8th and 12th grades, i.e. late middle school through high school. The first phase of the work examined involvement in the arts generally -- across all disciplines. The second phase examined the potential importance of sustained involvement in a single discipline, here using instrumental music and the theatre arts as case examples. The researcher focused on these two arts disciplines in the one case because of related research suggesting links between music and cognitive development at younger age levels, and in the other because of related research on drama and theatre in education. The findings presented in more detail below can be summarized in three main sets of observations:

Involvement in the Arts and Academic Success. Positive developments for children engaged in the arts are seen at each step in the research -- between 8 and 10th grade as well as between 10th and 12th grade. The comparative gains for arts involved youngsters generally become more pronounced over time. And more important, this pattern also holds for children from low-income and low parent education level homes.

Music and mathematics achievement. Students who report consistent high levels of involvement in instrumental music over the middle and high school years show significantly higher levels of mathematics proficiency by grade 12. This observation holds both generally and also for low SES students as a subgroup. (SES refers to socioeconomic status -- a measure of family education level, income, and type of job(s) held by parents). Moreover, differences in measured mathematics proficiency between students consistently involved versus not involved in instrumental music, grow significantly over time.

Theatre arts and human development. Sustained student involvement in theatre arts (acting in plays and musicals, participating in drama clubs, and taking acting lessons) associates with a variety of developments for youth: gains in reading proficiency, gains in self-concept and motivation, and higher levels of empathy and tolerance for others. Analyses of theatre arts were undertaken for low SES youth only. The presumption would be that more advantaged youngsters would be more likely to be involved in theatre and drama because of attendance at more endowed schools and because of parent ability to afford theatre opportunities in the private or community sectors.

Mike Manthei, Minneapolis & Steve N. Kelly (1997). Effects of Popular and Classical Background Music on the Math Test Scores of Undergraduate Students. The purpose of this study was to investigate the effects of five popular and classical background music listening styles on undergraduate students' math test scores. Students (n=72) from a required university music appreciation class were exposed to three different listening situations over an established period of time while completing three parallel forms of a math placement test consisting of 16 questions. Students also completed a questionnaire seeking to determine their type of response to music. The students, from rural communities, represented a cross section of the university community and none were music majors. Regression analysis found that the music had no statistically significant effect on the math test scores. This was further supported by a post-hoc questionnaire. This study lends support to previous research indicating that background music had no effect on performance in other academic learning areas.

The above studies conducted by Joyanta Sarkar and Utpal Bisvas (2015), Mathur A, Vijayakumar SH, Chakrabarti B and Singh NC (2015), Mamta Sharma. (2014) Angela Leea, Yen Huai Jena (2014), Jhalukpreya Surujlal (2013), Kimberlyn T. Tiu (2013), Ram K. Nawasalkar & Pradeep K. Butey (2012), American Music Therapy Association (2012), Susan Hallam (2010), Phillip M. Hash.,(2010), Mary S. Wagner (2008), Kevin N. White (2007), Michael Beer., (2005), Carlson (2004), Rauscher and Zupan (2000), and James S. Catterall, Richard Chapleau and John Iwanaga (1999) were showed that music is an effective tool to develop students' academic performance and some other positive behaviours like sight words recognition and reading comprehension, attitudes toward the brand and the advertisement, decreasing the frequency of agitated and aggressive behaviours, the development of social skills and can contribute to health and well-being throughout the lifespan, learning experience of children with intellectual disabilities, new insights into the emotional response, positive effects on the mind and brain of aggressive adolescents, and the development of a new perspective on cognitive musicology.

The studies conducted by Matthew A. Goldenberg., Anna H. L. Floyd & Anne Moyer (2013), Sibel Coban and Ilaya Dubaz (2011), Lutz Jäncke and Pascale Sandmann.,(2010), Lutz Jäncke and Pascale Sandmann.,(2010), De Groot, A. (2006), and Fioranelli (2001) concluded that there is no influence of music on verbal learning, vocabulary learning, test anxiety and exam performance and multiple intelligence.

2.3 Reviews on Mathematical Achievement

Wong Nguok Ling & Mohd Izam Ghazali (2016). The effectiveness of student teams-achievement division (stad) cooperative learning on mathematics comprehension among school students. This research aims to identify the effectiveness of Student Teams-Achievment Division (STAD) cooperative learning techniques towards Mathematics comprehension in Sarikei District, Sarawak. The number of subjects involved this research is seventy students from Year Five in Sarikei District, Sarawak. 35 students were in the experimental group – 20 males and 15 females – while another 35 students were in the control group – 19 males and 16 females. Data collection was done twice which were the pretest and the post test. The gap between the exam was four weeks. The Mathematics test has consisted of 10 comprehension items. The questions were adapted from Ujian Pencapaian Sekolah Rendah (Primary School Assessment Test). The data was analysed with mixed between-within subjects ANOVA. The findings of this research have shown that STAD techniques in Mathematics learning can increase Mathematics comprehension. This research has also shown main effect and direct interaction in students' Mathematics comprehension in the posttest between the experimental group and the control group. This shows that STAD cooperative learning techniques play important roles as an active pedagogy to increase Mathematics comprehension. STAD encourages the students and teachers to be innovative and creative to improve teaching and learning of Mathematics in the classroom. This benefits the students in Sarikei District and enable them to compete healthily with the other students from urban areas in Mathematics.

Anil Kumar Agnihotri (2016) Academic Performance in Mathematics among Class-Vii Students of UNA District of Himachal Pradesh. The study found that the rapid expansion of the school network and an exceptionally high teacher-pupil ratio notwithstanding, the quality of education, particularly at the Elementary level, continues to be a matter of concern in the hill state of Himachal Pradesh. Though, Himachal Pradesh has the distinction of providing sufficient number of teachers to schools, their quality raises some doubts. The selection of teacher trainees, training procedures for teachers and finally their recruitment in schools are the areas which need immediate attention.

Song A. An & Daniel A. Tillman (2015). Music activities as a meaningful context for teaching elementary students mathematics: a quasi-experiment time series design with random assigned control group. The purpose of the current research was to examine the effects of a sequence of classroom activities that integrated mathematics content with music elements aimed at providing teachers an alternative approach for teaching mathematics. Two classes of third grade students (n=56) from an elementary school in the west coast of the United States participated in the research. A random assignment pretest-posttest control group design was used to examine students' changes in mathematical ability between the two groups. A quasi-experiment time series design with multiple pre-tests, mid-tests and post-tests was utilized for investigating the effects of music-mathematics lessons on students' mathematics process ability level. The results demonstrated that the intervention of music-mathematics integrated lessons had statistically significant improvement on the music group students' mathematical abilities.

Boyd, W., Foster, A., Smith, J., & Boyd, W. E. (2014). Feeling Good about Teaching Mathematics: Addressing Anxiety amongst Pre-Service Teachers. Research regarding pre-service teachers’ attitudes towards teaching mathematics has revealed that many pre-service teachers experience high levels of mathematics anxiety about both the learning of mathematics and the teaching of the mathematics curriculum. Addressing anxiety towards mathematics and the teaching of mathematics could effectively eliminate later problems in teaching. Teaching mathematics confidently is associated with teachers’ beliefs about their mathematical ability, which is their mathematical self-efficacy. This paper reports on an investigation into the anxiety of first-year pre-service teachers towards their future teaching of mathematics. 223 students enrolled in a first-year mathematics unit for birth to eight years, in the

Bachelor of Education of Early Child-hood and Primary Education Courses attributed their beliefs about mathematics to external—their past teachers—or internal factors: that one is either good at mathematics or not. The findings highlighted the need for pre-service teacher's anxiety about mathematics to be addressed within the university education classroom context so that pre-service teachers become capable and competent teachers of mathematics.

Aliya Khatun (2014). Study on Family Climate and Achievement in Mathematics of Students at Secondary Level. The study aims at studying the relationship between family climate and achievement in mathematics of secondary school students of Aligarh city. The sample consists of 200 secondary school students of whom 100 were boys and 100 were girls. The sample was collected from the four schools of the Aligarh city of Uttar Pradesh by using simple random sampling techniques. In order to collect data on family climate, the Family Climate Scale (FCS) constructed by Beena Shah was used. To know the achievement in mathematics of the annual exam of IX was taken. Mean, SD and't'- test were used to assess the significant difference between boys' and girls' achievement. To compare mathematic achievement of the students having different levels of family climate (positive, moderate and low) t-test used. The findings showed that achievement of boys in mathematics was higher than girls. No significant differences were found in mathematics achievement, according to the three different levels of family climate.

Deanne Kells (2012). The impact of music on Mathematics Achievement. This study looks at studies focused on the music's impact on math abilities for children in preschool, kindergarten, and the primary grades. Finally, this study reveals the findings of one such research project built around a kinder music program that was a precursor to ABC Music & Me. This study provides compelling evidence that a music program like ABC Music & Me provides symbiotic gains in essential mathematics skills, research in general support cognitive gains associated with early childhood music programs. And more importantly, a specific study of the Kinder music approach points to gain in foundational mathematical skills as a result of students' regular participation in the program.

Tuncay Saritas & Omur Akdemir (2009). Identifying Factors Affecting the Mathematics Achievement of Students for Better Instructional Design. The quality of teaching and learning mathematics has been one of the major challenges and concerns of educators. Instructional design is an effective way to alleviate problems related to the quality of teaching and learning mathematics. Knowing the factors affecting math achievement is particularly important for making the best design decisions. This study was conducted to identify the factors affecting the math achievement of students through collecting the opinions of math department students. The subjects for the study included 250 undergraduate students enrolled in the mathematics department of a public university located in Turkey. 42.4% of the participants were females, and 57.6% were males. Subjects for the study were retrieved from freshmen, sophomores, juniors and seniors randomly. The distribution of the subjects by the grade level was 70 freshmen, 80 sophomores, 60 juniors and 40 seniors. 94.8% of the participants' age was between the years of 18 and 25, and the rest of them were above 25. Participants enrolled the mathematics department based on their scores on the nationwide university entrance exam. Descriptive analysis, ANOVA and Post Hoc Multiple Comparison LSD test were used to answer the research questions. All statistical analyses were conducted with a significant level of 0.05.Results revealed that instructional strategies and methods, teacher competency in math education, and motivation or concentration were the three most influential factors that should be considered in the design decisions. The results highlight the need to customize instruction to optimize the performance of each individual student. Instructional designers need to develop flexible teaching and learning based on awareness of students' experience and background, subject matter, and instructional communications and technology.

Wendi M. Kappers (2009). Educational video game effects upon mathematics achievement and motivation scores: an experimental study examining differences between the sexes. An experimental research study using a mixed-method analysis was conducted to examine educational video game effects on mathematics achievement and motivation between sexes. This study examined sex difference in a 7th grade mathematics (Mathematics 2/Mathematics 2 Advanced) classroom (n=60) learning algebra. Attributes and barriers relating to educational video game play, preference, and setting characteristics were explored. To examine achievement and motivation outcomes, a repeated-measure (SPSS v14) test was used. The analysis included ethnographic results from both student and teacher interview and observation sessions for data triangulation. Results revealed a statistically significant academic mathematics achievement score increase (F =21.8, df =1, 54, p<.05). Although, mathematics class motivation scores did not present significance (F =.79, df =1, 47, p>.05), both sexes posted similar data outcomes with regard to mathematics class motivation after using an educational video game as treatment during an eighteen-week term in conjunction with receiving in-class instruction. Additionally, there was an increase in male variability in standard deviation score (SD motivation pre=8.76, SD motivation post=11.70) for mathematics class motivation. Lastly, self-reported differences between the sexes for this limited sample, with regard to game design likes and dislikes and observed female game play tendencies, were also investigated. The data presented customization as a unified, but most requested, game design need between the sexes. Between sex differences were found only to be superficial other than a female delay in game acceptance with regard to time and game play comfort.

Orhun. N (2007). An investigation into the mathematics achievement and attitude towards mathematics with respect to learning style according to gender**.** This study aimed to investigate whether there is a relationship between gender and learning style, mathematical achievement and attitude towards mathematics. The subjects of this study were 5th-semester students (42 females, 31 males) from the Mathematics Department at Anadolu University.

The results of this study suggest that there were differences among learning modes preferred by female and male students, their mathematical achievements, and their attitudes towards mathematics. Mathematics achievement and attitude towards mathematics were not, themselves, dependent on gender. It was also noticed that while female students most preferred the Convergent learning style, male students most preferred the Assimilator learning style. No students were observed to prefer the Accommodator learning style in both groups.

Barbara Kabouridis (2001). Conceptualising the Factors That Influence Mathematics Teaching of A Group of Newly Qualified Teachers in Greece. This research work inquires into the hypothesis that the newly qualified teachers who have graduated from Greek Departments of Education need support in teaching mathematics in their classrooms. Here the study attempted to explore the needs and concerns that a group of newly qualified teachers has about mathematics teaching. Those teachers participated in the research project while teaching mathematics in a Greek primary school. The preliminary analysis of part of the data collected in the context of the research project revealed teachers' beliefs regarding the influence of particular factors in their teaching of mathematics. Those factors address issues in the teachers' university preparation and in the absence of programs for their induction as teachers in the school environment.

Jeffrey Lynn Klunn & Daryl Erick Trent (2000). The relationship of instrumental music instruction and academic achievement for the senior class. Significant correlations were found between the number of years of band instruction and academic achievement as measured by the Georgia High School Graduation Test (GHSGT) Mathematics and GHSGT science tests. An east Texas state university study by Daryl Erick Trent revealed that high school seniors who participated in instrumental music in grades 6-12 score significantly higher in language arts and Mathematics on standardized tests than do students involved in non music extra- curricular activities or with students not involved in any school related extra- curricular activity.

Schneider& Klots (2000). The relationship between enrollment in music performance classes and athletic extracurricular activities on academic achievement. Three hundred forty six subjects were divided into three groups; musicians (band or choir), athletes or non-participants. All three groups were statistically equivalent in fifth and sixth grade. During seventh, eighth, and ninth grades the musicians achieved significantly higher academic achievement scores than the athletes but did not score higher than the non-participants. The authors noted that the musicians showed a tendency to maintain stabilized scores while the athletes and non participant groups scores dropped.

Amy Graziano, Matthew Peterson & Gorden Shaw (1999). Enhanced learning of proportional Mathematics through music training and Spatial Temporal training. Children given piano keyboard training along with a specially designed Mathematics video game training significantly higher on proportional, Mathematics and fractions than children given control training along with the same video game.

Hallman & price (1998). The effect of background music on the behaviour and mathematics achievement of children with emotional and behavioural difficulties. All of the children in the study were between nine- and ten-years old and attended a school for children with emotional and behavioural difficulties. The researchers found that background music of a “Calming nature” significantly improved Mathematics performance and significantly decreased rule breaking behaviour of children with emotional and behaviour difficulties. Additionally the study found that the calming music had the greatest effect on children who had hyperactive behaviours.

James Catterall (1997). Regardless of socioeconomic background, music-making students get higher marks in standardized tests. The study shows that students involved in music generally tested higher than those who had no music involvement. The test scores studied were not only standardized tests, such as the SAT, but also in reading proficiency exams. The study also noted that musicians scored higher, no matter what socioeconomic group was being studied.

Attwell (1988). The effects of background music with subliminal auditory stimulation on Mathematics achievement and attitude of eighth-grade students. A taped sublime auditory "Mathematics can be fun and easy"(Attwell, 1988) was embedded in a music ask at 10db below the music level and repeated every ten seconds. Results from the Mathematics diagnostic test and scale revealed no background music on Mathematics achievement or attitude of eighth-grade students.

The above studies conducted by Song A. An & Daniel A. Tillman (2015), Deanne Kells (2012), Wendi M. Kappers (2009), Jeffrey Lynn Klunn, Daryl Erick Trent (2000), Schneider and Klots (2000), Amy Graziano, Matthew Peterson and Gorden Shaw, [1999], Hallman and price (1998), James Catterall (1997) showed that using music in the classroom is significantly effective to develop the mathematical achievement.

The studies conducted by Song Mike Manthei, Minneapolis & Steve N. Kelly (1997)and Attwell (1988) concluded that the Background music had no statistically significant effect on the mathematical achievement or attitude.

The study conducted by Wong Nguok Ling, Mohd Izam Ghazali (2016) studied that STAD cooperative learning techniques play important roles as an active pedagogy to increase Mathematics comprehension.

Orhun. N (2007) The results of this study suggest that there were differences among learning modes preferred by female and male students, their mathematical achievements, and their attitudes towards mathematics.

Aliya Khatun (2014). The findings of the study showed that achievement of boys in mathematics was higher than girls. No significant differences were found in mathematics achievement, according to the three different levels of family climate.

Tuncay Saritas & Omur Akdemir (2009). The results of this study suggest that instructional strategies and methods, teacher competency in math education, and motivation or concentration were the three most influential factors that should be considered in the design decisions.

2.4 Reviews on Interest in Learning Mathematics

Mihaela Voinea & Monica Purcaru (2014). Boosting Romanian students' interest in learning mathematics through the constructivist approach**.** This study aims to describe the dynamics of student interest in mathematics over the levels of education, focusing on identifying the pedagogical factors involved in teaching and learning mathematics. The theoretical premises of this study are included in national studies on curriculum reform in Romania (coordinator L.Vl sceanu-2002 CNEE-2012), in works on constructivism in education (Siebert). From direct observations and practical experience with Maths teachers, the researcher noticed that as students advance on the steps of schooling, they do not show the same interest in Mathematics. The constructivist approach with emphasis on the affective dimension of learning, on the positive motivation, on solving concrete tasks, keeps "up" the students' interest in mathematics.

Kamile Geist, Eugene A. Geist & Kathleen Kuznik (2012). The Patterns of Music: Young Children Learning Mathematics through Beat, Rhythm, and Melody. Everyday learning experiences, such as listening to music, are especially important in supporting developing mathematics concepts in children from infancy to 5 years old (Linder, Powers-Costello, & Stegelin 2011). Music is made up of rhythmic patterns and can be structured to make the patterning simple or complex, depending on the activity. Zentner and Eerola (2010) suggest that infants and toddlers have an innate capability to not only see patterns but also hear them in music. Reinforcing these capabilities by teaching patterns through music at an early age may benefit children’s cognitive abilities (Bell et al. 2009; Meltzoff et al. 2009).Teaching patterns to very young children is also a key to the concept of emergent mathematics, which parallels the idea of emergent literacy. As with literacy, emergent mathematics suggests the following:

- Mathematical learning begins very early in life.
- Mathematics is related to many other developmental milestones.
- Mathematics develops from reallife situations in which the child is an active participant.
- Children learn mathematics through actively engaging their minds in as many different ways as possible.
- Thinking about relationships, such as bigger, smaller and faster, slower, and especially about pattern relationships, plays a special role in young children’s mathematical development.
- Learning mathematics is a developmental process influenced by the child’s physical, social- emotional, and cognitive learning and development, and nurtured by a stimulating mathematical environment (Geist 2009)

Dipak K. Chavan, (2010). Development of mathematics interest enhancement programme for student teachers and study its effectiveness. The objectives of present study are to test the Mathematics Interest of Mathematics student teachers, to compare the Mathematics Interest of student teachers according to their gender and medium, to develop Mathematics Interest Enhancement Programme and to study the effectiveness of the Programme. Survey method was used to test the Mathematics Interest of Mathematics student teachers and the Experimental Method is used to study. The sample for survey includes 200 Mathematics student teachers from five Colleges of Education, while the Experiment includes 100 student teachers from two Colleges of Education in Pune city. Mathematics Interest Inventory, the researcher made tool will be used for the collection of data. The mean, standard deviation and t test are the statistical tools used for data collection. The conclusions of this study were Mathematics Interest of student teachers is above average, Mathematics Interest of male and female student teachers is same, Mathematics Interest of English medium and Marathi medium student teachers is similar and The Mathematics Interest Enhancement Programme was effective.

Mary Ainley, Suzanne Hidi & Dagmar Berndorff Ontario (2002). Interest, Learning, and the Psychological Processes That Mediate Their Relationship. Although influences of interest on learning are well documented, mediating processes have not been clarified. The authors investigated how individual and situational interest factors contribute to topic interest and text learning. Traditional self-report measures were combined with novel interactive computerized methods of recording cognitive and affective reactions to science and popular culture texts, monitoring their development in real time. Australian and Canadian students read 4 expository texts. Both individual interest variables and specific text titles influenced topic interest. Examination of processes predictive of text learning indicated that topic interest was related to affective response, affect to persistence, and persistence to learning. Combining self-rating scales with dynamic measures of student activities provided new insight into how interest influences learning.

Gardner & Siek Toon Khoo (1988). Measuring interest in mathematics. This study reports on the development of instruments for measuring secondary school student interests in mathematics. Interest in mathematics is regarded as having three components (topics, activities and motives), each with several dimensions. Nearly all instruments employed summated ratings (Likert) procedures, but one adopted an unusual procedure, based on Zuckerman's (1960) Affect Adjective Checklist. Six instruments were developed altogether: IMT (interest in various mathematical topics), ILA (interest in learning activities), MCI (mathematics related career inventory), NMI (nature of motives inventory), GIM (general interest in mathematics) and AAC (affect adjective checklist). The IMT instrument, containing seven scales, was developed to measure students' interests in various mathematics topics, most of which are commonly taught in upper secondary school mathematics courses (eg algebra, statistics). The ILA (three scales) is concerned with interest in various modes of learning mathematics (reception learning, experiential learning, problem solving). The motives component was related to students' reason for studying mathematics; to investigate this component, one instrument (MCI) was developed to measure interest in various mathematics related careers, while another (NMI) explored other possible motives (eg desire for examination success). The GIM and the AAC were designed to obtain general measures of interest in mathematics. All instruments were administered to a sample of 151 Year 10 students in three Melbourne schools; the data were subjected to item, scale and factor analyses. The findings provide good general support for the conceptualisation underlying the study. Factor analysis indicates that there are distinct topic based patterns of interest in mathematics. Eight clear factors emerged, displaying a reasonably good fit with the seven topics originally proposed. There was also good support for the conceptualisation of the learning modes instrument, although the reception learning scale split into two factors (inside and outside the classroom). Three career factors were identified (academic, technical and business).

From the above studies it can be concluded that, the study conducted by Gardner and Siek Toon Khoo (1988) reflects the main components of students' interest in learning mathematics.

Mihaela Voinea, Monica Purcaru (2014). This study described the constructivist approach is significantly effective on students' interest in learning mathematics.

Mary Ainley, Suzanne Hidi and Dagmar Berndorff Ontario (2002). The study focused that topic interest was related to affective response, affect to persistence, and persistence to learning. It also showed that student activities provided new insight into how interest influences learning.

Kamile Geist, Eugene A. Geist, and Kathleen Kuznik (2012) The study suggest that the listening to music helps interest in learning mathematics.

2.5 Reviews on Attitude towards Mathematics

Melek Demirel, Ipek Derman & Edibe Karagedik (2015). A study on the relationship between reflective thinking skills towards problem solving and attitudes towards mathematics. The aim of this study was to examine the relationship between the 7th and 8th grade students' reflective thinking skills towards problem solving and their attitudes towards mathematics. In addition, during the research, whether there is a significant difference between the male and female students' reflective thinking skills towards problem solving and their attitudes towards mathematics has been analysed. The study had been conducted with 300 students studying in the 7th and 8th grades in two private schools in Cankaya, Ankara. In the study "Reflective Thinking Skills towards Problem Solving Scale" and "Mathematics Attitude Scale" tools were used. In order to determine the levels of students in terms of reflective thinking skills towards problem solving and their attitudes towards mathematics, the arithmetic mean and standard deviation values of the scores obtained via the scales have been calculated and to find out if there was a significant difference between those scores regarding gender, MANOVA had been used. Whether there is a significant difference between the scores of male and female students had been tested by using the scores the students got in total and in the sub-dimensions of the scales. It was found that there did not exist a significant difference between the students' reflective thinking skills towards problem solving and their gender. However, there was a significant difference in favour of the male students in terms of their attitudes towards mathematics. There was a moderate significant difference between the students' reflective thinking skills towards problem solving and their attitudes towards mathematics in the positive sense.

Cigdem Arslan, Gunes Yavuz & Yasemin Deringol-Karatas (2014). Attitudes of elementary school students towards solving mathematics problems. The main purpose of this study was to analyse the attitudes of elementary school students towards problem solving. Working group of the study covers elementary school students. “Attitude Scale for Mathematics Problem Solving” developed by Ozdemir (2011) was employed as data collection tool to measure the attitudes of students towards problem solving. The scale has two dimensions called “enjoyment” and “teaching”. At the end of the study, it was seen that there was a decrease in the level of “enjoyment” dimension as the grade level increased. This decrease became a significant difference for eighth grades.

Muhammad Asif Tanveer, Muhammad Rizwan, Naeem Ali, Muhammad Arif, Umer Saleem & Shaheer Rizvi (2013). Examining the Role of Attitude towards Mathematics in Students of Management Sciences. The aim of this study is to investigate the relationship between gender, marks obtained in mathematics and overall CGPA in previous semesters, with students’ attitude towards business mathematics. This empirical study is done through 18 items of attitude for business mathematics and demographic information of respondents and survey information is collected from 108 students of department of management sciences, The Islamia University of Bahawalpur. All the respondents have already passed out business mathematics course. In order to find out results descriptive statistics, ANOVA, and regression analysis employed. Results indicate that gender is not having significant impact on attitude for mathematics, male are slightly better than female. Higher achievements and grades increase the likeness of this subject. Surprisingly, students with higher CGPA are negatively inclined toward this course. On the average, students’ performance in mathematics remains below part compared to other subjects results. There is importance for the universities and business schools to know that failure and lower inclination toward mathematics due to little achievements and inadequate exposure of this subject. At entry level, these institutions should ensure that students have necessary mathematical abilities and skills.

Maria de Lourdes Mata, Vera Monteiro & Francisco Peixoto (2012). Attitudes towards Mathematics: Effects of Individual, Motivational, and Social Support Factors. This study aims to understand how certain different but interrelated variables such as background, motivation, and social support could lead to an explanation of student attitudes towards math and to an understanding of the defining characteristics of these attitudes in the school environment. Participants consisted of 1719 Portuguese students, from fifth-to-twelfth grade. The study utilized an adaptation of the "Intrinsic Motivation Inventory" assessing main determinants of intrinsic motivation. One section of the questionnaire—"In my Math Class"—also assessed student perceptions of teacher and peer support as well as student attitudes. The results revealed that, in general, students held positive attitudes towards mathematics and also highlighted the main effects of grade and math achievement on these attitudes. No gender effect was identified although the girls showed a continuous decline in attitudes the further they progressed in school. A hierarchical analysis using structural equation modelling showed that motivation-related variables were the main predictors of attitudes towards mathematics and that teachers and the social support of peers are also highly significant in understanding these attitudes.

Rebecca Lazarides & Angela Ittel, (2012). Instructional Quality and Attitudes toward Mathematics: Do Self-Concept and Interest Differ across Students' Patterns of Perceived Instructional Quality in Mathematics Classrooms? Using a person-centred research approach, the present study explored individual differences in students' perceptions of instructional quality in secondary school mathematics classes and their relations to students' self-concept and interest in mathematics. Drawing on data collected from425 high school students from ten schools in Berlin, Germany (male: 53.2%; female: 46.3%), latent class analyses (LCA) revealed four distinct patterns of perceived quality of instruction. Almost half of the sample (46%) had a high likelihood of perceiving an overall low quality in mathematics classes. Those students reported particular low self-concept and interest in mathematics. Compared to male students, female students were significantly more likely to belong to this "challenging pattern." Consequences for educational practice were discussed and suggested that instruction in mathematics should take into account learners' highly individual ways of perceiving and evaluating their learning environment.

The study highlights the necessity of instruction in mathematics classes to take into account learners' different ways of perceiving and evaluating their learning environment. Considering almost half of the sample in the present study had a high probability of perceiving low structurdness, low support, and low discursive effectiveness in their math classes and thus, particular low mathematical self-concept and interest, this research emphasizes that attitudes and emotions toward mathematics should be enhanced through increased adaption of mathematics classroom instruction to students' different learning strategies and by considering students expectations and perceptions of instructional quality in classroom discussions.

Murat Tezer & Emine Kivanc (2012). The relationship between the attitudes towards mathematics and music of prospective teachers. The present research has been performed in order to determine the relationship between the attitudes towards mathematics and music of school prospective teachers. With this aim, the attitudes of school prospective teachers towards mathematics and music have been identified and the magnitude of the relationship has been measured. The present study has been performed by using descriptive and correlational methods where Mathematics Attitude Scale and Music Attitude Scale were used. SPSS 17.00 has been used in analysing the data. Standard deviation, Pearson correlation, regression analysis were used in data analysis and a significant relationship was identified between the two variables (R=0.26, R 2 =0.07, p<.01).

The prospective teachers have been found to have positive attitudes towards math and music. It has been explored that the majority of prospective students from both departments are females. This result confirms the findings of previous research. A weak positive relationship has been found between the attitudes of the students towards mathematics and music. When the classroom teaching students excluded from the analysis, a weak positive relationship has been found between the pre-school teaching student's attitudes towards mathematics and music. When the pre-school teaching students excluded from the analysis, a moderate positive relationship has been found between the classroom teaching student's attitude towards mathematics and music. When correlation coefficient controlled for the departments, it has been found that the size of the relationship between the two scales differed. Moreover, the music and mathematics attitudes of the participants were found to be good.

Effandi Zakaria, Lu Chung Chin & Md. Yusoff Daud (2010). The Effects of Cooperative Learning on Students' Mathematics Achievement and Attitude towards Mathematics. The purpose of this study was to determine the effect of cooperative learning on mathematics achievement and attitude towards mathematics. This quasi-experimental study was carried out on two form one classes in Miri, Sarawak. One class (n = 44) was assigned as an experimental group and the other (n = 38) was assigned as a control group. The two groups were pre-tested prior the implementation. At the end of the study, post-test was given, while daily quiz was used as a tool for formative testing. Teaching and learning process was carried out for two weeks. Data were analysed using the t-test to determine performance by comparing the mean of the post test for treatment and control group. The results of this study showed that cooperative learning methods improve students' achievement in mathematics and attitude towards mathematics. The researchers concluded that cooperative learning is an effective approach, which mathematics teachers need to incorporate in their teaching.

Song A. An, Gerald O. Kulm & Tingting Ma (2008). The Effects of a Music Composition Activity on Chinese Students' Attitudes and Beliefs towards Mathematics: An Exploratory Study. This study presents an exploratory research investigating the integration of pop music and statistics lesson as an intervention to promote students' attitude s and strengthen and extend their beliefs towards mathematics. Thirty-five students randomly selected from 189 students in 6th grade in a primary school in Southeast China were provided a 90-minute mathematics lesson integrated with music composition activity taught by the first author. Pre-and post-questionnaires with closed-ended and open-ended questions on evaluating students' attitude and belief toward mathematics were provided before and after the lesson. The results demonstrated the mathematics lesson integrated with music had a positive effect on students' attitude and beliefs toward mathematics learning.

Jenkins, Natalie (2006). Factors that Influence Mathematics Attitudes.
In this action research study conducted within sixth grade High Ability Learner (HAL) classroom, the researcher investigated the current mathematics attitudes of the students and how those attitudes correlated to personal mathematics achievement and identified intelligence domains. The researcher discovered that most of nineteen students held a negative attitude toward the subject of mathematics. Consistent low ratings were also found in the logical/mathematical domain of most of the students' ALPS Multiple Intelligence Profiles. Regardless of this dominant affective data (indicating little mathematics interest or potential from student perspectives) surprisingly, most of sixth grade HAL students scored above the 90th percentile on the mathematics portion of their most recent Terra Nova nationalized testing report. As a result of this action research, the need for gifted students to be shown important connections between mathematics and its utility outside the context of school academia. By supplementing the school's gifted education curriculum with activities that actively engage students in mathematical interpretation and creative problem solving, the researcher hope to nurture an

intrinsic interest in mathematics as a vital part of the students' overall development.

Maria Nicolaidou & George Philippou (2000). Attitude towards Mathematics, Self-Efficacy and Achievement in Problem-Solving. The aim of this study was to explore relationships between students' attitudes towards Mathematics, self-efficacy beliefs in problem-solving and achievement. The possibility of attitudes and self-efficacy to predict problem-solving performance was also examined. Attitude and efficacy scales were completed by 238 fifth-grade pupils. Problem-solving performance was measured by a specially prepared test, including simple and multi-step problems. The analysis of the data indicated significant relationship between attitudes and achievement and a stronger relationship between efficacy and achievement. Attitudes and efficacy were also correlated and both predicted achievement in problem-solving. However, efficacy was a more powerful predictor than attitudes. No gender difference was found in any of the examined variables.

The studies conducted by Song A. An, Gerald O. Kulm & Tingting Ma (2008) and Murat Tezer and Emine Kivanc (2012) showed that the mathematics lesson integrated with music had a positive effect on students' attitude and beliefs toward mathematics learning.

Maria de Lourdes Mata, Vera Monteiro & Francisco Peixoto (2012). This study concludes that motivation-related variables were the main predictors of attitudes towards mathematics and that teachers and the social support of peers are also highly significant in understanding these attitudes.

Rebecca Lazarides & Angela Ittel, (2012). This research emphasizes that attitudes and emotions toward mathematics should be enhanced through increased adaption of mathematics classroom instruction to students' different learning strategies and by considering students expectations and perceptions of instructional quality in classroom discussions.

Effandi Zakaria, Lu Chung Chin & Md. Yusoff Daud (2010). The results of this study showed that cooperative learning methods improve students' achievement in mathematics and attitude towards mathematics.

Melek Demirel, Ipek Derman & Edibe Karagedik (2015). The study examined that there was a significant difference in favour of the male students in terms of their attitudes towards mathematics.

Cigdem Arslan, Gunes Yavuz & Yasemin Deringol-Karatas (2014). The study concluded that there was a decrease in the level of "enjoyment" dimension as the grade level increased.

Maria Nicolaidou & George Philippou (2000). The study indicated significant relationship between attitudes and achievement and a stronger relationship between efficacy and achievement.

Jenkins, Natalie, (2006). The action research examined that the need for gifted students to be shown important connections between mathematics and its utility outside the context of school academia.
Muhammad Asif Tanveer , Muhammad Rizwan, Naeem Ali, Muhammad Arif, Umer Saleem, Shaheer Rizvi (2013); the study showed that gender is not having significant impact on attitude for mathematics, male are slightly better than female.

2.6 Reviews on Constructivism Approach

Susanta Roy Chowdhury (2016). A Study On The Effect Of Constructivist Approach On The Achievement In Mathematics Of IX Standard Students. This study was a pre-test post-test quasi experimental design incorporating both qualitative and quantitative techniques. 5E's learning (Engage-Explore-Explain-Elaborate-Evaluate) strategy has been applied to experimental group and Traditional method of teaching followed by control group where total 60 students participated. The Mathematics Achievement Test (MAT) was used to estimate the students' achievement in both the groups. The experimental data revealed the following results. Firstly Constructivist learning approach significantly improves student’s achievement in mathematics as compared to using a traditional teaching. Secondly Constructivist learning approach was equally effective for boys and girls in improving their achievements in mathematics. Thirdly students taught in constructivist learning environment have significantly enhanced their understanding and application abilities as compared to other abilities like knowledge and skill.

Roya Jafari Amineh1 & Hanieh Davatgari (2015). Review of Constructivism and Social Constructivism, This research review represents the meaning and the origin of constructivism, and then discussed the role of leaning, teaching, learner, and teacher in the first part from constructivist perspective. In the second part, the paper discussed the same issues, as presented in the first part, from social constructivist perspective. The purpose of this research review was to make EFL teachers and EFL students more familiar with the importance and guidance of both constructivism and social constructivism perspectives. The researchers suggest that with the importance given to collaboration, knowledge, and creativity through both social constructivism and constructivism; the learners can start learning in pair work, group work, and teamwork, and later make their own contributions to the world of knowledge. The researcher proposed that learning can be considered on a continuum from social constructivism to constructivism.

Hala Abbas Laz & Karema Eid Shafei (2014). The Effectiveness of Constructivist Learning Model in the Teaching of Mathematics. This study demonstrates that the constructivist learning model in the teaching of mathematics has a great impact in the acquisition of concepts , constructivist theory of theories that are based on building knowledge of learners , cares structural model including the learners schemes conceptual , is also interested to apply the active and effective in new situations he cares what any after learning and transfer of knowledge and experience to take advantage of them in the construction of experiences associated with new positions .The study was applied to samples of students in the preparatory year at the University of Tabuk and the two divisions to choose at random to represent one of the experimental group and the other control group. The result was that there were statistically significant differences between the mean scores of students of experimental and control groups in the post application to test the statistical concepts for the benefit of students of the experimental group.

Shumaila Bhutto & Imran Umer Chhapra (2013). Educational Research on Constructivism - An Exploratory View. This exploratory study has been conducted with the core intention to understand the emergence of inquiry approach on constructivism as an important and thriving learning theory in the field of education. This study first focused on a concise account of different perspectives under recent investigation on constructivism in the educational ground, generally established currently by recent theorists, academic and intellectuals, point toward the practical implication of constructivist theory, Various aspects of study critically examine their belief to what extent they are going to act on the theory, and if they do so then view how they manage or maintain constructivist uniqueness and ideology of learning. It provides a link for potential agenda, policy and practice reforms, which is consistent with philosophical evidence and rate of success where it would be implemented. Use exploratory research method based on survey, research design stand on quantitative research, covering a sample of 26 different private and government schools of Defence and Clifton, Karachi, out of approximately more than 60 schools, by filling questionnaire from the principals/head of department of that schools. Regression and correlation analysis were used through SPSS. The time horizon for this research study was cross sectional. The results of the study suggest that occurrence of range of effects exist, effects were documented in two sorts: (a) concrete consideration of ideology and (b) substantial application to facilitate growth of constructivist education. It provides a link for potential agenda, policy and practice reforms, which is consistent with philosophical evidence and rate of success where it would be implemented. Finally, the study was critically assessed to find out gap in the field of research and education in particular to the country. Perhaps a crucial confront for education, 'educational restructuring' was suggested to arrive to a greater understanding of the ideology that informs recommended application.

Loyens, S. M. M., Rikers, R. M. J. P., & Schmidt, H. G. (2007). Students' conceptions of distinct constructivist assumptions. The study examined how students' beliefs and ideas (i.e., conceptions) about constructivist learning have an effect on their actual study behavior in terms of regulation and processing strategies. The authors concluded that structural relations exist between conceptions of constructivist learning and regulation and processing strategies. The study also indicates that students who express doubt with regard to their own learning capacities seem to be at risk for adopting an inadequate regulation strategy.

Panomporn Puacharearn & Darrell Fisher (2006). An Inservice Teacher Training Process for Improving Constructivist Learning Environments in Thai Small School Classrooms. This study describes a teacher training process conducted in Thailand (2006) using in class and at-school activities that resulted in changes in teachers' competencies to improve their classroom environments using a constructivist perspective. The process was conducted nearly one year. First, with the cooperation of university staff, educational-area supervisors and principals, research teams were constructed. Secondly, a training process was developed for implementation in schools, and finally the attitudes of teachers towards this process were assessed. The process involved three steps: forming teams in schools; working with teachers to improve their competencies; and providing an opportunity for teachers to present their own action research about improving student learning. There were three parts to the second step of this process. These involved: training teachers on instructional innovation (relevance to school needs ensured); and on how to implement instructional innovation in their classes through action research; and holding weekly individual meetings with the teachers concerning class occurrences and specific techniques that could be used in an attempt to improve student learning. All 23 teachers from three case-study schools successfully implemented instructional innovation in their classes through action research. Teachers' attitudes toward the training process activities and perceptions of self efficacy were changed in a positive direction following use of the networking activities. These results suggest that the training process in this research was effective in improving inservice-teachers competencies in teaching.

Gijbels, D., van de Watering, G., Dochy, F., & van den Bossche, P. (2006). New learning environments and constructivism: The students' perspective. The article looked into the influence of a constructivist learning environment on students' perceptions of assessments demands and students' approaches to learning. Further, the researchers examined how changes in approaches to learning relate to changes in assessment demands. Results demonstrated that a course designed according to constructivist principles led to more deep-level assessment demands. However, this change in perceptions did not influence students' approaches to learning, since students reported more frequent use of surface approaches to learning during the course. The authors conclude that students' initial approaches to learning at the beginning of the course are more determinative for the change in those approaches compared to students' perceptions of assessment demands.

Rajendra Kumar Nayak (2006). A Study on Effect of Constructivist Pedagogy on Students' Achievement in Mathematics at Elementary Level. This study outlined of an experimental study on students' learning in Constructivist environment and its subsequent effect on achievement in mathematics at elementary level of learners. The study tried to prove the difference in achievements of two groups of grade-V children who were exposed to traditional and constructivist pedagogy respectively in three different urban schools of Odisha. This study was a pre-test post-test quasi experimental design incorporating both qualitative and quantitative techniques. 5E's learning (Engage-Explore- Explain- Elaborate-Evaluate) strategy has been applied to experimental group and Traditional method of teaching followed by control group where total 249 students participated. The Mathematics Achievement Test (MAT) was used to estimate the students' achievement from both the groups and a Perception Scale was administered on experimental group. The hypothesis was tested at 0.05 level using t-tests and ANCOVA. The experimental data revealed two important results. Firstly, adopting constructivist learning approach significantly improves students' achievement in mathematics as compared to using a traditional expository teaching method. Secondly, most of the students were improved their abilities of understanding and reflection .They indicated that constructivist learning approach can help them to understand, integrate and clarify mathematical concept and also enhance their interest to participate in group in constructivist classroom. Different stake holders like teachers, parents and teacher educators in favour of the constructivist pedagogy, and they suggested the present policy and classroom practice need to be changed. Based upon the above findings, concluded that Constructivist Approach is an effective strategy to learn mathematics, which teachers need to incorporate in their teaching.

Olsen, Dwayne G. (1998). Constructivist Principles of Learning and Teaching Methods. This article identifies principles of cognitive science that teachers must know and apply. The ultimate goal was to identify ways in which principles from cognitive science, particularly constructivist theory and research from cognitive psychology, are useful in teaching and learning. As a result, teachers and teacher educators will have better theory, principles, and pedagogy on which to build their teaching and student learning so that all teachers are better prepared to educate their students. Based on these theories and principles, specific approaches to teaching and learning will be identified that assure high-quality learning experiences for all students.

The above studies conducted by Hala Abbas Laz and Karema Eid Shafei (2014), Panomporn Puacharearn and Darrell Fisher (2006), Gijbels, D., van de Watering, G., Dochy, F., & van den Bossche, P. (2006), Loyens, S. M. M., Rikers, R. M. J. P., & Schmidt, H. G. (2007), Shumaila Bhutto, Imran Umer

Chhapra (2013), Rajendra Kumar Nayak (2006) and Susanta Roy Chowdhury (2016) were concluded that the constructivism learning approach is significantly effective than the traditional learning approach.

The study Olsen, Dwayne G. (1998) suggests that teachers and teacher educators can adopt the theory, principles, and pedagogy of constructivism on which to build their teaching and student learning.

The researchers Roya Jafari Amineh1and Hanieh Davatgari (2015) agrees with Vygotsky (1978) about cognitive growth from social to individual level, and considered on a continuum from social constructivism to constructivism.

2.7 Conclusion

The overview of literature presented in this chapter helped the researcher in selecting appropriate variables. Besides it has also helped in the preparation and selection of tools for collection and analysis of data. It has also helped in the formulation of research design. It was possible to come up with specific recommendation by providing justification based on the present study, and also keeping in view, the total perspective of studies in this area.

The next chapter deals with the discussion of variables selected, conceptual definitions of the terms used in the study, discussion of hypotheses, sampling procedure, description and justification of tools used for data collection and analysis, development of the teaching mathematics with transitional background music approach, Statistical techniques used for the study and Delimitations of the study.

CHAPTER-III

METHODOLOGY

In the previous chapter, review of related literature concerning the study has been presented. The present chapter deals with when a problem is taken up for research, if followed certain logical steps and a well defined plan or layout for the accomplishment of its objectives. It also needs to go through a particular procedure and adopt the right strategy and technique to verify the hypotheses under consideration. Therefore, the investigator needs to prepare a layout of the method of following, the design of the study, organizing a proper sample, variables, description of the tools, collecting the data and adopting the suitable technique to arrive at the desired results and the verification of the hypotheses.

The detailed explanation of various aspects pertaining to the study is given ahead.

3. 1 Statement of the problem

The problem selected for the present investigation was**, *"Effectiveness of Teaching Mathematics with Transitional background music on Mathematical Achievement, Interest in learning Mathematics and Attitude towards Mathematics among secondary School Students."***

3.2 Objectives of the Study

The study was undertaken with the following Objectives:

1. To study the effectiveness of Teaching Mathematics with Transitional background Music on Mathematical achievement among Secondary School Students.
2. To study the effectiveness of conventional approach on Mathematical achievement among Secondary School Students.

3. To find out the difference between the mean scores of post test of experimental and control groups with reference to Mathematical Achievement.
4. To study the effectiveness of Teaching Mathematics with Transitional background Music on Interest in learning Mathematics among Secondary School Students.
5. To study the effectiveness of Conventional Approach on Interest in learning Mathematics among Secondary School Students.
6. To find out the difference between the mean scores of post test of experimental and control groups with reference to Interest in learning Mathematics.
7. To study the effectiveness of Teaching Mathematics with Transitional background Music on Attitude towards Mathematics among Secondary School Students.
8. To study the effectiveness of Conventional Approach on Attitude towards Mathematics among Secondary School Students.
9. To find out the difference between the mean scores of post tests of experimental and control groups with reference to Attitude towards Mathematics.
10. To investigate the interaction between ‘Treatments’ and ‘Interest in music’ with reference to Mathematical achievement.
11. To investigate the interaction between ‘Treatments’ and ‘Interest in music’ with reference to Interest in learning Mathematics.
12. To investigate the interaction between ‘Treatments’ and ‘Interest in music’ with reference to Attitude towards learning Mathematics.
13. To investigate the interaction between ‘Treatments’ and ‘Gender’ with reference to Mathematical achievement.
14. To investigate the interaction between ‘Treatments’ and ‘Gender’ with reference to Interest in learning Mathematics.
15. To investigate the interaction between ‘Treatments’ and ‘Gender’ with reference to Attitude towards Mathematics.

16. To investigate whether the students sustain Mathematical achievement through the Teaching Mathematics with Transitional background Music approach.
17. To investigate whether the students sustain Interest in learning Mathematics through the Teaching Mathematics with Transitional background Music approach.
18. To investigate whether the students sustain Attitude towards Mathematics through the Teaching Mathematics with Transitional background Music approach.

3.3 Variables of the study

Keeping these objectives in view the following variables were considered for the study.

Independent Variables

In the present study, teaching approaches of mathematics are the independent variables.

1. Teaching mathematics with transitional background music approach
2. Conventional approach

Dependent variables

In the present study, dependent variables are

1. Mathematical achievement
2. Interest in learning mathematics
3. Attitude towards mathematics

Moderator Variables

1. Interest in music
2. Gender

3.4 Operational Definitions of Technical Terms used in the study

1. ***Teaching Mathematics with Transitional background music;*** It refers to the Classroom discourse of mathematics subject that is well designed grouping strategy chooses by the teacher for students' learning. It refers that teaching mathematics in 5 E model constructivism approach with background music of instrumental sounds which are based on Bhairavi and Hindola ragas.

2. ***Conventional approach*;** It also refers that the classrooms discourse of teaching mathematics in 5 E model constructivism approach without background music.
3. ***Mathematical Achievement*;** It refers to the progress achieved by 9th standard students during the particular teaching period in particular lessons in mathematic subject.
4. ***Interest in learning mathematics*;** The state of wanting to know about mathematics. It is the liking of the students to learn mathematics content and participate in mathematics activities, which is indicated by example, solving, studying and getting involved in mathematical activity as a leisure time pursuit.
5. ***Attitude towards mathematics;*** It is a generalized attitude towards the universe of mathematics content and being measured in terms of its emotional content opinion, beliefs, prejudices, tendencies and evaluations. Attitude tendencies either positive or negative about a person or a behavior can be learned through either our observations or acquired knowledge of mathematics.
6. ***Interest in music;*** The state of wanting to know about music. It is liking of the students ability to understand, and process sound, rhythm and patterns in sound. Listening to music, participate and getting involvement in musical activities.

7. ***Gender;*** It is considered as one of the moderator variable in the present study. Gender refers to those biological distinctions, which differentiate boys from girls.

3.5 Hypotheses of the study:

Based upon the discussion of variables and also keeping objectives in view the following hypotheses were formulated to test the effectiveness of teaching mathematics with transitional background music on mathematical achievement, interest in learning mathematics and attitude towards mathematics among secondary school students.

The hypotheses of the present study are formulated in the null form as follows;

1. There is no significant difference between the mean scores of pre-test and post-test in the Mathematical achievement of Secondary School Students those who learn through the Transitional background Music approach.
2. There is no significant difference between the mean scores of pre-test and post-test in Mathematical achievement of Secondary School Students those who learn through the conventional approach.
3. There is no significant difference between the mean scores of post tests of experimental and control groups with reference to Mathematical Achievement.
4. There is no significant difference between the mean scores of pre-test and post-test in Interest in learning Mathematics of Secondary School Students those who learn through the Transitional background Music approach.
5. There is no significant difference between the mean scores of pre-test and post-test in Interest in learning Mathematics of Secondary School Students those who learn through the Conventional Approach.
6. There is no significant difference between the mean scores of post tests of experimental and control groups with reference to Interest in learning Mathematics.

7. There is no significant difference between the mean scores of pre-test and post-test in Attitude towards Mathematics of Secondary School Students those who learn through the Transitional background Music approach.
8. There is no significant difference between the mean scores of pre-test and post-test in Attitude towards Mathematics of Secondary School Students those who learn through the Conventional Approach.
9. There is no significant difference between the mean scores of post tests of experimental and control groups with reference to Attitude towards Mathematics.
10. There is no interaction effect between ‘Treatments’ and ‘Interest in music’ with reference to mathematical achievement in secondary school students.
11. There is no interaction effect between ‘Treatments’ and ‘Interest in music’ with reference to interest in learning mathematics among secondary school students.
12. There is no interaction effect between ‘Treatments’ and ‘Interest in music’ with reference to Attitude towards mathematics in secondary school students.
13. There is no interaction effect between ‘Treatments’ and ‘Gender’ with reference to Mathematical achievement in secondary school students.
14. There is no interaction effect between ‘Treatments’ and ‘Gender’ with reference to Interest in learning mathematics among secondary school students.
15. There is no interaction effect between ‘Treatments’ and ‘Gender’ with reference to Attitude towards mathematics in secondary school students.
16. There is no significant difference between the immediate and delayed post-test scores of the experimental group with reference to Mathematical achievement among secondary school students.
17. There is no significant difference between the immediate and delayed post-test scores of the experimental group with reference to Interest in learning mathematics among secondary school students.

18. There is no significant difference between the immediate and delayed post-test scores of the experimental group with reference to Attitude towards mathematics in secondary school students.

3.6 Methodology

In the present study, experimental method of research was used. Experimental research describes a method of investigation to derive basic relationship among phenomenon under controlled conditions or more simply to identify the conditions underlying the occurrence of given phenomenon. In an experimental research analysis or studies the effect of educative factors on growth and development of pupils under controlled condition.

The present study is True experimental in nature and designed on the lines of parallel group, pre-test, posttest, experimental design, which is a type of True experimental design. The layout is given below;

Table- 3.1: Shows the True Experimental design.

Group	**Pre-test**	**Treatment**	**Post-test**
Experimental	$\mathbf{O_1}$	$\mathbf{X_1}$	$\mathbf{O_2}$
Control	$\mathbf{O_1}$	$\mathbf{X_2}$	$\mathbf{O_2}$

3.7 Sampling:-

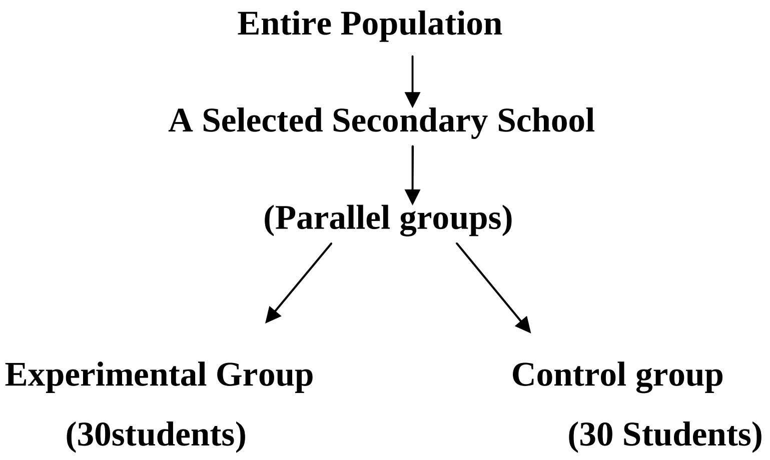
The researcher selected B.G.S. English Medium School, Jayapura, Koppa, because of its convenience to conduct the experiment. There were three sections in the ninth standard, and the researcher has randomly selected two (B and C) sections. There were 57 students in B section and 53 students in C section, the researcher conducted the Raven’s Standard Progressive Matrices test to measure their intelligence. On the base of their intelligence the researcher has considered 30 students from each section and divided them as experimental group and a control group. In out of 110 students, 60 students were considered as sample of the study. Random sampling technique was followed. The procedure of selection of the sample was as follows.

A suitable school where the experiment could have been conducted was identified keeping the following facts in view.

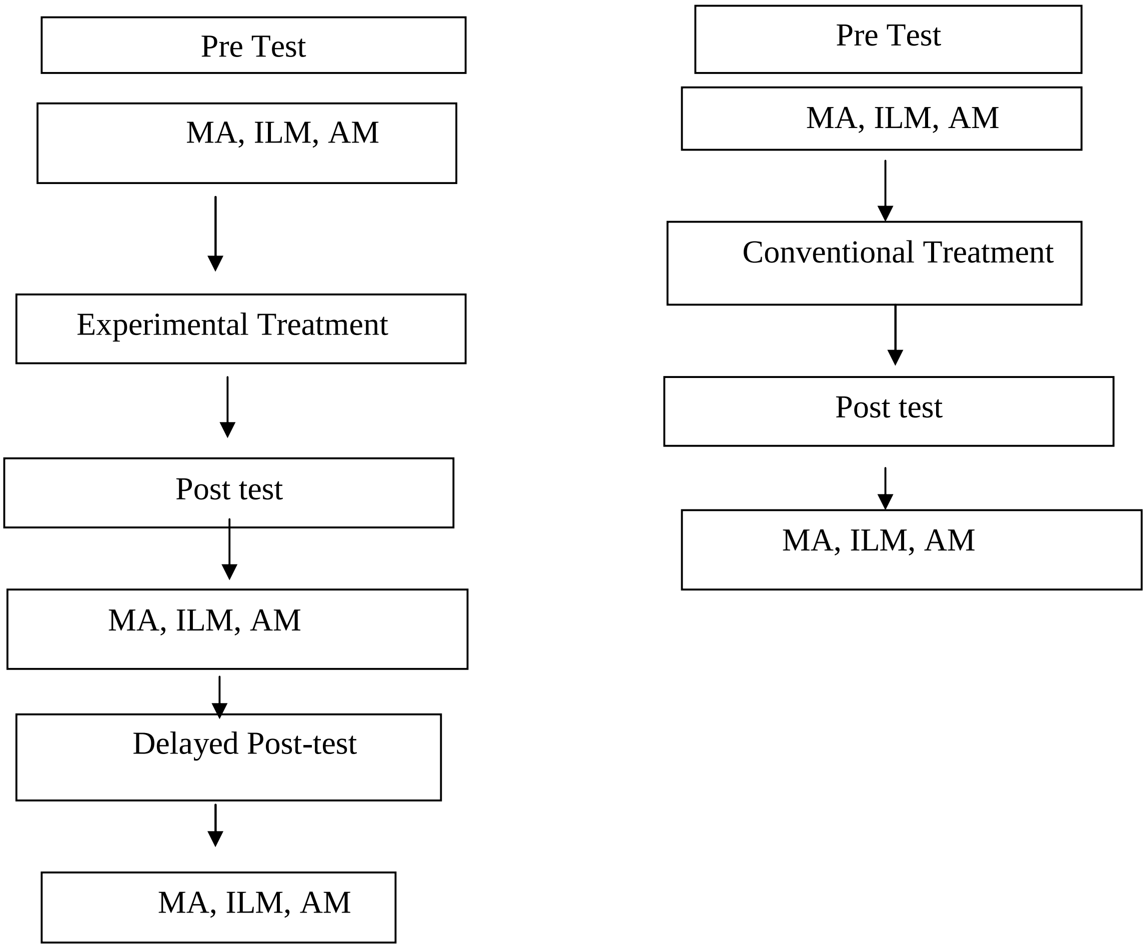
- The willing cooperation of the head of the institution and members of the staff.
- Regularity of the student-teachers attending the class.
- Co-education College as sample needed both male and female student-teachers.
- The school where the constructivism approach with the 5 E model is adopted to teach mathematics.
- The mathematics teacher availability who is specially trained in constructivism approach
- Students' level of interest in music is also considered.

Fig.2 Diagrammatic Representation of Sampling Procedure

Obtaining two parallel Groups



Representation of the Experimental Design



3.8 Development of the Teaching Mathematics with Transitional Background Music Approach:

Stages involved in developing the Teaching Mathematics with Transitional Background Music Approach are presented in the form of a flow chart.

Fig.3. Stages of the Experimental Approach

Purpose of the development of the Approach

⬇

Preparation of the Experiment

⬇

Validating the Experimental Approach

⬇

Conduction of the Experiment

⬇

Impact of the Approach

I. Purpose of the development of the Approach

The purpose of the development of the Teaching Mathematics with Transitional Background Music Approach is to develop Interest in learning mathematics, attitude towards mathematics and achievement in mathematics among secondary school students.

II. Preparation of the Experiment

The researcher studied theory and principles of constructivism before preparing the package of the research. Some related studies conducted in the same area were also reviewed and the format of the lessons were studied and discussed with few experts. While writing lesson plans the researcher has taken help from Mr. Shivashankar, Asst. Teacher, Govt. High School, Holekoppa, Sringeri, who is state level trainer of constructivism, especially in mathematics.

a. Selection of the Topics:

The researcher considered five lessons from the Karnataka State Board text book which were comes to teach in the months of December to February 2016, in the Government school year plan. These topics were considered from all the three parts of mathematics. A lesson Hire Purchase and Installment Buying is from arithmetic, Simultaneous Linear Equations lesson is from algebra and Circles and Concurrency in Triangles lessons from Geometry.

b. Selection of the School

After the selection of the topics the researcher considered one of the teachers, who is well trained and adopted the constructivism 5E model theory in his teaching in mathematics. To avoid the researcher's involvement in the experiment, the researcher has taken help from the mathematics teacher Mr. Shravan, Asst. Teacher, B.G.S. English Medium School, Jayapura, Koppa, to teach for both the groups. And to suit the need of the teacher, the researcher prepared 25 well planned lessons (PPT) in constructivism 5E model with blending music.

c. Selection and blending of music in the lessons:

The transitional Background Music refers that the music which brings desirable mood in the listener. As per the experts' guidance, the researcher has met ten musicians cum educational psychologists. By taking their opinion about ragas the researcher has selected the two ragas, such as Bhairavi and Hindola. Before finalizing the ragas the researcher has also considered these following backgrounds and psychological effects of the ragas.

The Hindola raga creates increased feelings of compassion and reduced anxiety which in turn provides relief to patients with low blood pressure. It is also said that the raga helps to maintain normal digestive gas and body temperature along with restful sleep and tranquility. This raga also conveys the divine Bhakthi Bhava and is astonishingly refreshing when sung in the mornings. This raga is associated with Vasantha Rithu(Spring) which is full of freshness and colours, which brings forth the feelings of well being and boosts our mood. Raga Hindola helps sharpening the memory and focussing mental concentration. It has been proved effective in curing liver ailments. Hindol for devotion, peace with a tinge of melancholy; boosts self-confidence; Arthritis, Spondylitis, Backache, gastritis; Cell degeneration due to ageing can be controlled (Mythili 2002).

Singing or engrossed listening of Raga Bhairavi has been found to uproot the diseases of kapha dosha e.g. asthma, chronic cold, cough, tuberculosis, some of the sinus and chest related problems etc. Bhairavi - a soothing reducing violent forms of schizophrenia (Tambe 2002); discourages attachments to material possessions (preferred by shadus in bhajans); useful in Rheumatic Arthritis, Sinusitis; colds TB, cancer (Subramanian 2002); Abdul Karim Khan's Bhairavi recitals caused plants to grow by 430% more than others.

Thus, considering these research outcomes and experts' suggestions, the researcher has finalized the two ragas, such as raga Bhairavi for beginning the lesson and raga Hindola for the process or according to the activities of the lesson. The mathematical content was based on constructivism theory and the instrumental sounds. Bhairavi and Hindola ragas were systematically arranged in the package. Seven to eight minutes of instrumental sounds were used in each period.

The instrumental music sounds were used according to the activities of the contents. It means the Bhairavi raga was using daily before starting the lesson to bring students moods towards the lesson and the Hindola was used while the students solving mathematical problems in their note book or on the blackboard, while constructing geometry problems and sometime after asking questions.

d. Stages of 5E model in Constructivist Learning:

This approach was introduced by Roger Bybee. The 5 Es are - Engage, Explore, Explain, Elaborate and Evaluate.

i. **Engage:** This stage assesses the previous knowledge of the learner and helps them become engaged in a new concept through the use of short activities that promote curiosity and elicit prior knowledge. The aim is to organize students' thinking toward the learning outcomes of the current activities.
ii. **Explore:** Expose the students to a variety of experiences at this stage. These experiences may involve observations of events or objects, manipulations of materials, work with simulations, examinations of representations, viewing a short video, or reading. These experiences provide a common basis for all students that the teacher can use to assist them in identifying and developing concepts and skills.
iii. **Explain:** Here students are provided with an opportunity to explain their understanding of their experiences from the explore phase. The questions and discussion lead students to patterns, regularities, and/or similarities, and prompt them to describe concepts or skills in their own words.
iv. **Elaborate:** The next phase challenges students to extend their understandings or skills and/or to practice them. Through new experiences at this time, students develop deeper understanding, an extended conceptual framework, and improved skills. Some of the tasks, such as reading an article, may be done as homework and discussed during the following class period.
v. **Evaluate:** The final phase of the instructional model encourages students to assess their understanding and abilities and provides opportunity for the teacher to evaluate student progress toward achieving the learning objectives for the activity. The tasks may involve writing summaries, applying concepts and skills to novel situations, constructing a concept map, or taking a quiz.

III. Validating the Experimental Approach

The package has been designed keeping certain specific objectives in view. The process of evaluation was built with the development process of the package.

After preparation, the package was given to the Educational experts, Psychological experts and Music experts and taken valuable suggestions. An opinionniere has given to the experts to validate the package.

Pilot study: The prepared package was tried out on a sample of 94 students of IX Standard English Medium students studying in Holekoppa Govt. High School, Sringeri. The package was tried out on these students for four classes and collected opinions and suggestions from the students and mathematics teachers. After the tryout the package was modified to suit the needs of students.

Evaluation sheet presented in appendix- A

IV. Conduction of the Experiment

In the month of December 2016 the researcher selected the school, B.G.S. English Medium School, Jayapura, Koppa, which is convenient to conduct the experiment. There were three sections in the ninth standard, in that the researcher has randomly selected two (B and C) sections. 57 students in B section and 53 students in C section, from these numbers of students, the researcher conducted the Raven’s Standard Progressive Matrices test to measure their intelligence. On the base of their intelligence the researcher has considered 30 students from each section and divided them as experimental group and a control group. After matching the groups the researcher has done the following procedures.

a. Pre testing:

The thirty pair students of both experimental and control groups were simultaneously pre-tested on Interest in Learning Mathematics Test, Attitude towards mathematics Test and Achievement in Mathematics Test. One test was conducted each day for both the groups to avoid fatigue.

b. Applying treatments:

The treatment was applied for a period of three months. The researcher applied the transitional background music approach in alternative days in the mathematics period.

The same teacher was taking mathematics classes for both the groups. The teacher taught the lessons according to the research plan. The experimental group was taught through the transitional background music approach and the control group was taught through without music. For the treatment group the instrumental music sounds were used according to the activity of the contents. It means the music was used daily before starting the lesson to bring students' moods towards the lesson, while the students solving mathematical problems in their notebook or on the blackboard, while constructing geometry problems and sometime after asking questions. The Bhairavi raga was used only before engage the students, but the Hindola raga was used in any step of the 5E model. Hindola raga was using according to their activity and only for the process of the lesson. Thus the classes were taking alternative days for both the groups. This treatment was applied for a period of three months. Each group taught twenty-five lessons on four topics.

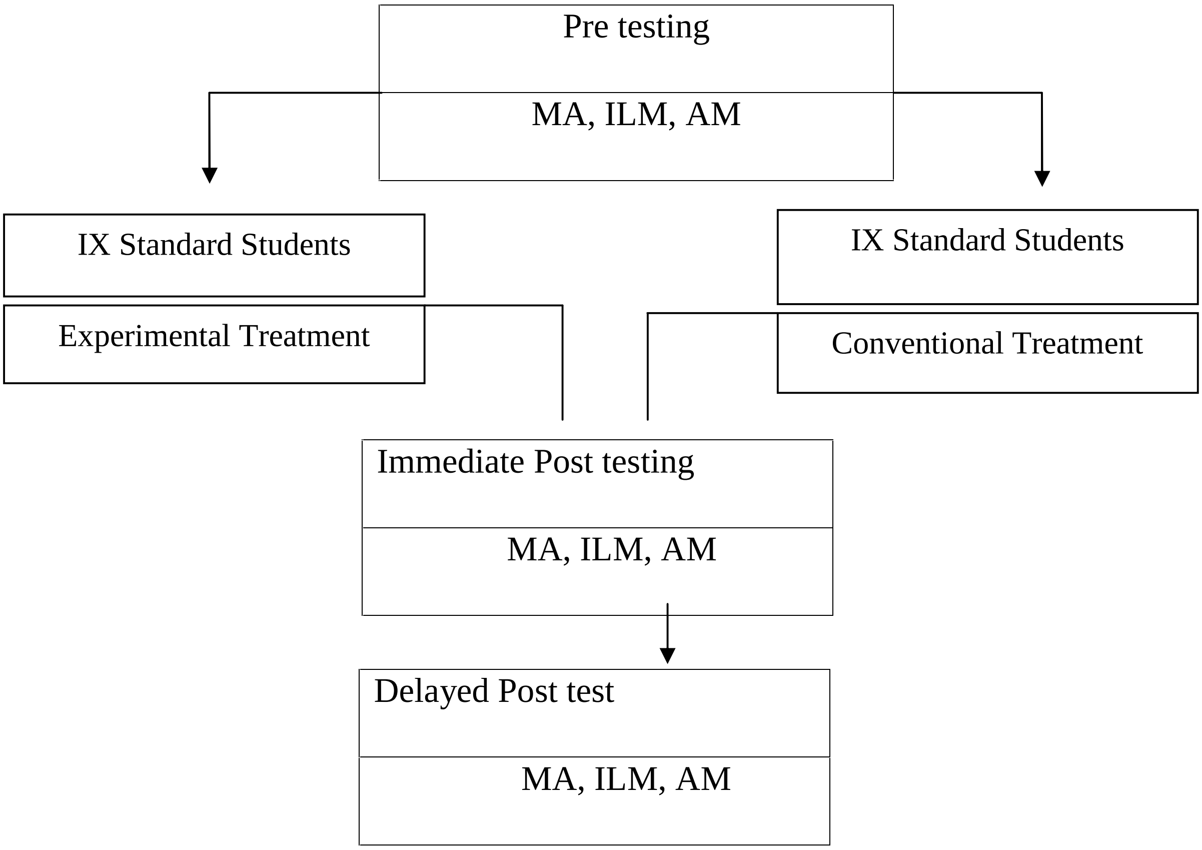
Meanwhile the control group was taught by the same teacher in conventional method. This method was also in constructivism 5E model teaching, but the difference is conventional method was taught by without music.

The present study is a pre-test, post-test parallel group design. In this design the effects of the experiments are judged by the difference between the pre-test , post-test scores. This is compared with the control group.

- Experimental and control groups were pre tested on Interest in Learning Mathematics Test, Attitude towards mathematics Test and Achievement in Mathematics Test.

- The Experimental group was taught by the Mathematics with the transitional background music approach and the control group was taught by the conventional method (without music) for a period of three months.
- Both the groups were immediately post-tested on Interest in Learning Mathematics Test, Attitude towards mathematics Test and Achievement in Mathematics Test.
- The experimental group was given a delayed post-test after a gap of four weeks in Interest in Learning Mathematics Test, Attitude towards mathematics Test and Achievement in Mathematics Test to see whether they sustain the improvements on the dependent variables (Interest in Learning Mathematics Test, Attitude towards mathematics Test and Achievement in Mathematics Test). The procedure followed in the conduct of the experiment is schematically shown in figure 3.2

Fig. 4. Schematic representation of the Experimental Design



V. Impact of the Approach

a. Immediate post-test:

After the completion of treatments both the experimental and control groups were post-tested on Interest in Learning Mathematics Test, Attitude towards mathematics Test and Achievement in Mathematics Test.

b. Delayed post-test:

After administering the post-test a gap of four weeks was given. After these four weeks the experimental group was post-tested again on the same tool viz. Interest in Learning Mathematics Test, Attitude towards mathematics Test and Achievement in Mathematics Test to know the retention of the experimental group of students on these dependent variables.

The whole package presented in Appendix-B

3.9 Tools used for the study

In experimental studies, two kinds of information are needed such as the nature of the sample and the measurement of desirable behavioral changes in the sample as a result of treatment variables. For collecting this information good instruments are required and the researcher constructed and standardized few tools and two more standardized tools were used for the study.

The aim of this investigation was to study the effectiveness of teaching mathematics with transitional background music on mathematical achievement, interest in learning mathematics and attitude towards mathematics among secondary school students. In view of this study, some standardized tools were required for collection of data. Due to Unavailability of Standardized tools on these variables the researcher herself has constructed the tools. Care was taken to assure that the tools had accepted the level of validity and reliability. The details of the tools selected and developed are presented in the following table 3.2

Table 3.2: Details of Tools Used for the Study

Sl. No.	Name of The Tool	Developed by
1.	Interest in Learning Mathematics Scale	Investigator
2.	Interest in Music Scale	Investigator
3.	Achievement in Mathematics Test	Investigator
4.	Attitude towards Mathematics	Ali Imam and Tahira Khatoon
5.	Standard Progressive Matrices general intelligence test (SPM)	J.C. Raven (Standardized)

3.10 Descriptions of the tools used for the study

3.10.1 Interest in Learning Mathematics Scale

The main aim of this study is to assess the secondary school students' interest in learning mathematics. Hence the researcher made an attempt to construct and validate the 'Interest in Learning Mathematics' scale for secondary school students.

Development of the tool

To determine the factors that contribute for Interest in Learning Mathematics as one of the objective of the study, the researcher reviewed many related literature in the field of interest and interest in learning mathematics, some particular dimensions were reported in several studies. From these studies few common components were identified and considered for construction of the rough tool. While selecting and editing the statements, the items were referred to the past, present and future aspects of the individual.

To develop the Interest in Learning Mathematics tool, the researcher has reviewed some studies and books. After reviewing the studies the researcher has found fourteen common components. Later by taking guidance from the experts in the field of education, six major components were finalized, such as Goal Directedness towards mathematics, Motivation towards learning Mathematics, (P,L. Gardner and Siek Toon Khoo 1988, Kjersti Wæge 2009), Different teaching styles in Mathematics, Usefulness of subject content (Mihaela Voinea, & Monica Purcaru, 2014) and Confidence in Mathematics, Preference for Understanding Mathematics (Frederick Koon-Shing Leung, Ida Ah-Chee Mok). Based on these components totally 63 items were constructed to measure individual interest in Learning mathematics.

*Interest in Learning Mathematics***:** It is the liking of the students to learn mathematics content and participate in mathematics activities, which is indicated by example solving, studying and getting involved in mathematics activity as a leisure time pursuit (Aiso Heinze, Kristina Reiss & Franziska Rudolph. 2005).

Data were collected from a sample of 219 of four secondary school students those who were studying in Chikkamagaluru District, by adopting a random sampling technique.

Framing Items

63 items were framed and included in the rough tool. Repeated items and similar meaning items were rejected by taking experts suggestion. The rough tool was submitted to the five experts in the field of education and psychology. They were requested to check the construction of the items and the representations of the content which is related to Interest in learning mathematics. Based on it six items were deleted and seven items were modified. Finally 50 items were framed with both positive and negative items in each component. All the positive and negative items were randomly presented in the scale.

Scoring procedure

The scale was constructed by using four points 'Likert' type scale. Each statement consists of responses like strongly agree, agree, disagree and strongly disagree. As the items were both positive and negative thus, if one choose the response of strongly agree in positive statement, the individual will score 3, likewise for agree 2, disagree 1 and strongly disagree 0. In case of negative items the reverse scoring was adopted i.e strongly agree 0, agree 1, disagree 2 and strongly disagree 3. Individual Interest in Learning Mathematics score was calculated by the sum of scores of all the items.

Validity

Content validity: Refers to the degree to which a test covers the content area to be measured. It is based upon the judgment of the subject experts. In the present study the scale was submitted to the experts and their opinion and suggestions were taken for final form of the tool. The experts agree that the items in the scale are relevant. It ensures the face and content validity.

Reliability

Item analysis: The table shows that the Cronbach's Alpha reliability scores which were above .30 were accepted items and below .30 were rejected items in six major components for the final tool.

Table No. 3.3 Item Analysis and reliability values of Interest in Learning Mathematics scale.

Sl. No	Item code	Components						Item Accepted / rejected
		I	II	III	IV	V	VI	
1	Item 1	.169						Rejected
2	Item 2	.311						Accepted
3	Item 3	.378						Accepted
4	Item 4	.164						Rejected
5	Item 5	.050						Rejected
6	Item 6	.347						Accepted
7	Item 7	.188						Rejected
8	Item 8	.368						Accepted
9	Item 9		.317					Accepted
10	Item 10		.132					Rejected
11	Item 11		.427					Accepted
12	Item 12		.055					Rejected
13	Item 13		.388					Accepted
14	Item 14		.148					Rejected
15	Item 15		.319					Accepted
16	Item 16		.440					Accepted
17	Item 17		.183					Rejected
18	Item 18		.413					Accepted
19	Item 19		.058					Rejected
20	Item 20		.182					Rejected
21	Item 21		.331					Accepted
22	Item 22		.307					Accepted
23	Item 23			.379				Accepted
24	Item 24			.359				Accepted
25	Item 25			.103				Rejected
26	Item 26			.230				Rejected
27	Item 27			.370				Accepted
28	Item 28			.504				Accepted
29	Item 29			.242				Rejected
30	Item 30			.448				Accepted
31	Item 31			.330				Accepted
32	Item 32			.232				Rejected
33	Item 33				.377			Accepted
34	Item 34				.317			Accepted
35	Item 35				.559			Accepted
36	Item 36				.391			Accepted
37	Item 37				. 422			Accepted
38	Item 38				.309			Accepted
39	Item 39					.207		Rejected
40	Item 40					.301		Accepted
41	Item 41					.225		Rejected
42	Item 42					.312		Accepted
43	Item 43					.486		Accepted
44	Item 44					.397		Accepted
45	Item 45						.323	Accepted
46	Item 46						.280	Rejected
47	Item 47						.436	Accepted
48	Item 48						.282	Rejected
49	Item 49						.271	Rejected
50	Item 50						.312	Accepted

Standardization of the tool: for the final form of the tool 31 items were assigned with six components and each component consists both positive and negative items. The test was administrated to 219 secondary school students. The subjects were included both boys and girls. The subjects were asked to put tick mark against one response which they agree after reading the each items. The directions were clearly mentioned on the test booklet.

Internal consistency: Refers to the test which measures the degree of which the items consistently measure the underlying latent construct. It estimates the homogeneity or the degree to which the item on test jointly measures the same construct (Henson R. K. 2001). The six components of Interest in Learning Mathematics show significant positive inter-correlations with each other. So, the internal consistency is adequate for each of the six components. The internal consistency for the six factors ranged from 0.414 to 0.671.

Table No. 3.4: Inter Dimension's Cronbach's alpha Reliability Statistics.

Sl. No.	Dimensions related to the scale	Mean	Std. Deviation	Cronbach's Alpha Corrected Item-Correlation	Total Correlation	N
1	Goal Directedness	18.15	3.09	.521	.803	219
2	Motivation	21.11	3.78	.671		
3	Confidence	11.08	2.62	.632		
4	Different Teaching Styles	14.43	3.22	.539		
5	Preference for Understanding	29.08	4.62	.658		
6	Usefulness of the Content	13.35	2.49	.414		

General Norms: It is the most common form of norms which represents the simplest method of presenting the data for comparative purposes. In the Interest in Learning Mathematics scale the general norms was established by taking quartiles from the group, such as Q1, Q2 and Q3. The level of Interest in Learning Mathematics scale is interpreted as 'low Interest in Learning

Mathematics, Average Interest in Learning Mathematics and high Interest in Learning Mathematics which is indicated in table 2. These interpretations are made irrespective of associated variables.

Table No. 3.5: Norms for the Level of Interest in Learning Mathematics Scale

Score Range	*Level of Interest in Learning Mathematics*
67-97	Low Interest in Learning Mathematics
98-116	Average Interest in Learning Mathematics
117-138	High Interest in Learning Mathematics

The Interest in Learning Mathematics scale was constructed and validated. The scale included 6 components, in each component 1:3 negative items and a total of 50 items. Finally 31 items remained and 19 items were deleted. The reliability, internal consistency and validity of the scale were established. It can be used for secondary school students and also for the students of age group 14 - 15 years.

Interest in Learning Mathematics scale Presented in Appendix-C

3.10.2 Interest in Music Scale

To determine the factors that contribute for Interest in Music as one of the objective of the study, the researcher reviewed many related literature in the field of interest and interest in learning mathematics, the following dimensions are reported in several studies. From these studies few common components were identified and considered for construction of the rough tool. While selecting and editing the statements, the items were referred to the past, present and future aspects of the individual.

To develop the Interest in Music tool, the researcher has reviewed few studies and books and found some common components. Later by taking guidance from the experts in the field of education four major components were finalized, such as Activities about the music, hobbies about the music, Motivation towards the music and usefulness of music. Based on these components totally 41 items were developed to measure individual interest in Music.

Interest in Music: It is the liking of the students to learn songs and participate in music activities, which is indicated by example singing, Listening music and getting involved in working along with the music.

Data were collected from a sample of 215 of four secondary school students those who were studying in Chikkamagaluru District, by adopting a random sampling technique.

Framing Items

50 items were framed and included in the rough tool. Repeated items and similar meaning items were rejected by taking experts suggestion. The rough tool was submitted to the five experts in the field of education and psychology. They were requested to check the construction of the items and the representations of the content which is related to Interest in learning mathematics. Based on it six items were deleted and seven items were modified. Finally 41 items were framed with both positive and negative items in each component. All the positive and negative items were randomly presented in the scale.

Scoring procedure

The scale was constructed by using four points ‘Likert’ type scale. Each statement consists of responses like strongly agree, agree, disagree and strongly disagree. As the items were both positive and negative, thus if one chooses the response of strongly agree with a positive statement, the individual will score 3, likewise for agree 2, disagree 1 and strongly disagree 0. In case of negative items the reverse scoring was adopted i.e strongly agree 0, agree 1, disagree 2 and strongly disagree 3. Individual Interest in Music score was calculated by the sum of scores of all the items.

Validity

Content validity: Refers to the degree to which a test covers the content area to be measured. It is based upon the judgment of the subject experts. In the present study the scale was submitted to the experts and their opinion and suggestions were taken in the final form of the tool. The experts agree that the items in the scale are relevant. It ensures the face and content validity.

Reliability

Determining the factors is one of the main objectives of the study, data was collected from the sample of 215 secondary school students and used to determine the factors contributing for interest in music. The collected data was analysed by Cronbach Alpha method by using SPSS version 20.0. The correlation was computed and the result of the test shows that the correlation coefficient was calculated as 0.852 which is highly positively correlated. It indicates that the scale has a high reliability value.

Item selection: The table shows that the Cronbach’s Alpha reliability scores which were above .30 were accepted items and below .30 were rejected items in six major components for the final tool.

Table 3.6: Item Analysis and reliability values of Interest in Music scale.

Sl.No	Item code	Components				Item Acceptance/ rejection
		I	II	III	IV	
1	Item 1	.351				Accepted
2	Item 2	.361				Accepted
3	Item 3	.374				Accepted
4	Item 4	.358				Accepted
5	Item 5	.366				Accepted
6	Item 6	.340				Accepted
7	Item 7	.144				Rejected
8	Item 8	.128				Rejected
9	Item 9	.369				Accepted
10	Item 10	.337				Accepted
11	Item 11	.374				Accepted
12	Item 12	.468				Accepted
13	Item 13		.245			Rejected
14	Item 14		.309			Accepted
15	Item 15		.094			Rejected
16	Item 16		.115			Rejected
17	Item 17		.128			Rejected
18	Item 18		.133			Rejected
19	Item 19		.509			Accepted
20	Item 20		.395			Accepted
21	Item 21		.354			Accepted
22	Item 22		.055			Rejected
23	Item 23			.565		Accepted
24	Item 24			.385		Accepted
25	Item 25			.356		Accepted
26	Item 26			.502		Accepted
27	Item 27			.449		Accepted
28	Item 28			.428		Accepted
29	Item 29			.544		Accepted
30	Item 30			.439		Accepted
31	Item 31			.424		Accepted
32	Item 32			.337		Accepted
33	Item 33			.421		Accepted
34	Item 34			.162		Rejected
35	Item 35				.285	Rejected
36	Item 36				-.035	Rejected
37	Item 37				.398	Accepted
38	Item 38				.510	Accepted
39	Item 39				.410	Accepted
40	Item 40				.505	Accepted
41	Item 41				.414	Accepted

Standardisation of the tool: for the final form of the tool 41 items were assigned with four components and each component consists both positive and negative items. The test was administrated to 215 secondary school students. The subjects were included both male and female. The subjects were asked to put tick mark against one response which they agree after reading the each items. The directions were clearly mentioned on the test booklet.

Internal consistency: Refers to the test which measures the degree of which the items consistently measure the underlying latent construct. It estimates the homogeneity or the degree to which the item on test jointly measures the same construct. The four components of Interest in Music show significant positive inter-correlations with each other. So, the internal consistency is adequate for each of the four components. The internal consistency for the four factors ranged from 0.564 to 0.735.

Table -3.7: Inter Dimension's Cronbach's Alpha Reliability Statistics.

Sl. No.	Dimensions related to the scale	Mean	Std. Deviation	Cronbach's Alpha Correlation	Total Correlation	N	Total No. of Items
1	Activities	24.45	5.00	.694	.810	215	04
2	Hobbies	18.24	3.96	.595			
3	Motivation	23.80	5.83	.735			
4	Usefulness of Music	15.17	3.39	.564			

General Norms: It is the most common form of norms which represents the simplest method of presenting the data for comparative purposes. In the Interest in Music scale the general norms was established by taking quartiles from the group, such as Q1, Q2 and Q3. The level of Interest in Music scale is interpreted as 'low Interest in Music, Average Interest in Music and high Interest in Music which is indicated in table 2. These interpretations are made irrespective of associated variables.

Table -3.8: Norms for the Level of Interest in Music Scale

Score Range of raw scores	*Level of Interest in* Music
33 – 72	Low Interest in Music
73 – 92	Average Interest in Music
93 – 114	High Interest in Music

The Interest in Music scale was constructed and validated. The scale included 4 components, in each component 1:3 negative items and a total of 41 items. Finally 30 items remained and 11 items were deleted. The reliability, internal consistency and validity of the scale were established. It can be used for secondary school students and also for the students of age group 14 - 16 years. **(The Interest in Music scale Presented in Appendix-D)**

3.10.3 Mathematical Achievement Test

The Achievement test was constructed keeping in mind the objectives, such as knowledge, understanding, application and skill of the students. The text book prescribed by the Government of Karnataka for IX standard was used in the construction of the test. The lessons taken for the test were

1. **Hire Purchase and Installment Buying**
2. **Simultaneous Linear Equations**
3. **Circles**
4. **Concurrency in Triangles.**

At the initial stage preliminary draft was prepared corresponding to four concepts of mathematics of IX class. This draft consists 66 items covering the major objectives of teaching; knowledge, understanding, application and skill in mathematics at the secondary stage. Items having similar concepts were grouped at one place; Items were multiple types, i.e. every item was fed with four options in which only one option was the appropriate answer. Here the students were expected to answer the questions by selected the right option from among the four listed responses. All the items were evaluated by the experts as well as by the investigator in order to remove vagueness, ambiguous terms and language difficulty in the format of test items. 8 items were deleted and a few items were modified as per suggestions received from the experts. In this way preliminary draft with 58 items was made.

Validity of the Test: The test was validated against the criteria of content validity. The content validity is concerned with the logical adequacy of sampling of a specified universe of contents. To determine the content validity the test items, the panel consisting of six experts in the subject matter. The panel was asked to identify which test items corresponded to which outcome. The panel also completed the test so that the scoring key could be verified. The experts agreed with the investigator on the assignment of the test items to objectives 90%. This concurrence of percentage was taken as evidence of content validity.

Item Analysis

After validating, the test items were administered on the 50, IX passed students of Holekoppa Govt. High School, Sringeri. This attempt was made to check the difficulty level as well as any language problem occurring in the construction of the test. All these students were having a difference in the achievement in mathematics. All the students were given a separate answer sheet on which they were supposed to mark the right answer, after giving the required instructions about the test. There was no time limit and time taken by every student was noted down. Out of 58, 8 items were found to be confusing/difficulty with the students. Thereby out of 58 items, 8 items were removed from the draft. Consisting 50 items were prepared keeping in view the nature of content as well as difficulty level.

(The blue print of the Test Presented in Appendix-E)

Difficulty value of the test items: The difficulty value of each of the items was calculated by using the following formula:

$$\mathbf{d = \frac{N_H + N_L}{N_T} \times 100}$$

Where, d = Difficulty of the item

N_H = Number in higher group answering the item correctly

N_L = Number in lower group answering the item correctly

N_T = Total Number of pupils who answered that item

Discriminative value of the items: 100 Students for the final tryout were arranged in descending order of their performance. The student getting highest marks was ranked first; the student next higher marks were ranked second and so on. Thus the student getting lowest marks was ranked 100th. After arranging the students in descending order of their performance, they were classified into three groups. The first group is termed as higher group consisting 27% of the top students which comes out to be 27. The second consisted of the next 46 students, which formed middle 46% of the total students. The third group termed as lower group which consisting of 27% of the total students on the lower side, it again consisting of 27 students. In order to find out the discriminative value of the various items, the two groups- higher and lower consisting of the top 27% of the students and bottom 27% of the students were compared.

The Index of discrimination is determined by using the formula

$$\mathbf{D = \frac{N_H - N_L}{N_t}}$$

Where, D = Difficulty of the item

N_H = Number in higher group answering the item correctly

N_L = Number in lower group answering the item correctly

N_t = Total Number of pupils either in high or low group

The process of Item analysis revealed that only 40 items were retained out of 50 items (The item difficulty and discrimination level of the achievement test is given below**).**

Table- 3.9: Difficulty and Discriminative Indices of the Items selected for the achievement Test for IX standard.

Item No	H-L	Difficulty Index	Discriminative Index	Item No	H-L	Difficulty Index	Discriminative Index
01	12-5	60.71	0.50	26	13-8	75	0.35
02	11-4	53.57	0.50	27	11-5	57.14	0.42
03	12-2	50	0.71	28	11-6	60.71	0.35
04	11-4	53.57	0.50	29	13-7	71.42	0.42
05	10-4	50	0.42	30	11-12	82.14	-0.07
06	11-12	82.14	-0.07	31	8-3	39.28	0.35
07	12-2	50	0.71	32	7-0	25	0.50
08	07-1	28.57	0.42	33	10-4	50	0.42
09	11-2	46.42	0.64	34	12-2	50	0.71
10	11-3	50	0.57	35	11-6	60.71	0.35
11	12-13	89.28	-0.07	36	10-9	67.85	0.07
12	14-13	96.42	0.07	37	14-8	78.57	0.42
13	14-9	82.14	0.35	38	13-4	60.71	0.64
14	11-2	46.42	0.64	39	10-7	60.71	0.21
15	12-6	64.28	0.42	40	14-5	67.85	0.64
16	14-11	89.28	0.21	41	13-5	64.28	0.57
17	13-5	64.28	0.57	42	12-5	60.71	0.50
18	14-5	67.85	0.64	43	12-3	53.57	0.64
19	12-10	78.57	0.14	44	14-9	82.14	0.35
20	13-5	64.28	0.57	45	11-5	57.14	0.42
21	11-6	60.71	0.35	46	10-4	67.85	0.42
22	12-5	60.71	0.50	47	12-7	67.85	0.35
23	12-13	89.28	-0.07	48	13-7	50	0.42
24	13-4	60.71	0.64	49	14-05	67.85	0.64
25	13-4	60.71	0.64	50	8-6	50	0.14

Final tryout of the test: The test was administered to 100 students of IX class who had just passed IX class exams, for final tryout. The answer sheets were scored with the help of scoring key. Each correct answer was given the score of one and total scores obtained by the student was the total number of correct answers.

All those items were selected for the final test which have difficulty value as well as discriminating value of 0.30 - 0.80. In this way the total number of items selected for the final draft of the test was 40. These 40 items selected after the final tryout had to be placed in order of difficulty. In this way the final form of Achievement Test in mathematics comprised of 40 items. Finally, instructions were carefully reviewed and modifications were done wherever necessary. The time limit of the test was fixed on the basis of the time taken by 90 percent of the students on the final tryout, which was 45 minutes, including 5 minutes for instructions.

Reliability of the Test: The term reliability has been considered by Anne (1982) as the consistency of the scores obtained by the same individuals on different occasions or with different sets of equivalent forms. The test retest method of reliability was found to be the most suitable for the Achievement Test in Mathematics. Hence for the present study test-retest method was used to find out the reliability co-efficient.

Forty items were used for Reliability Test by taking 104 samples from Darshini Composite School, B.G.S Campus, Shringeri. The Mathematical achievement test was administrated to 104 secondary school students and the data were collected. The same test was administrated to the same sample with three weeks interval, again the data was collected. The correlation was computed and the result of the test shows that the correlation coefficient was calculated as 0.939 which is highly positively correlated. It indicates that the scale has a high reliability value. Finally the Achievement Test found 0.939 highly positive correlations from Test-Retest method.

(Achievement Test presented in Appendix-F)

3.10.4 Standard Progressive Matrices (SPM)

Raven (1938) developed a nonverbal culture free test by name Progressive matrices' to measure the intelligence of literate as well as illiterate individuals. It tests a persons' capacity to apprehend meaningless figures presented for his observation. He sees the relationship between them conceives the nature of figures completing each system of relations presented and develops a systematic method of reasoning. The test provides an opportunity for the assessment of a person's capacity for intellectual activity. This test was designed to be used with persons of all ages, whatever their education, nationality and physical education.

Standard Progressive Matrices consists of five sets of items (A,B,C,D &E). each set has 12 items, constituting 60 items in all in the test. Each item has a large design in which a portion is missing. Below each item six alternative answers with numbers are given. The candidate is required to identify the correct answer and record it in a separate answer sheet provided for this purpose. The answers can be scored with the help of the scoring key given in the manual.

Reliability:

i. Test-Retest reliabilities reported by the authors (Stinissen, Dolke, Sheppard & Goetzinger) range from 0.80 to 0.93.
ii. Consistency reliabilities reported, range from 0.87 to 0.97 (Blansk & Sinha, Elley &Mac Arthur King, Laroche & Bruke).

Validity:

i. Concurrent validity: The correlations of SPM with Binet & Wescheler scale range from 0.54 to 0.86.
ii. Predictive validities of SPM with scholastic achievement range up to 0.70.
iii. Factoral Validity: The Progressive matrices have been described as one of the purest and best of the available measures of general intellectual functioning (g). Factor analytic studies reveal high loading up to 0.83 on ‘g’.

The above tool was used to obtain two matched groups. As a result of treatment variables there would be some change in the dependent variables.

(Model of SPM Test presented in Appendix-G)

3.10.5 Mathematics Attitude scale (MAS)

Ali Imam Tahira Khatoon developed and standardized this scale in 2002. The components are Usefulness of mathematics, Confidence in mathematics and enjoyment of mathematics. The time limit of the test was 20 minutes and five point Lickert scale procedure is in nature. Mathematics Attitude scale (MAS) consists 22 items.

Reliability:

A split-half reliability coefficient was found by correlating scores of the subjects on odd items of the form with their scores on even items. The reliability was calculated by using the scores of 250 subjects on the 22 items of the final test. The correlation coefficient obtained was 0.91 which when correlated by Spearman-Brown Prophecy Formula increased to 0.96.

Validity:

Content validity of the items was ensured through rational logical analysis of the math teachers and experts in questionnaire construction. Correlation between total scores and item scores were also used for validity. This approach assumes that the total score is valid. Thus the extent to which the item correlations with the total score is indicative of construct validity for the scale.

Mathematics Attitude scale (MAS) can be applied on all the students who are the age of 15+ years. This scale is used to measure the attitude of students of secondary, senior secondary and university level as well as the school and university teachers towards mathematics.

(**Mathematics Attitude scale (MAS) Presented in Appendix-H**)

3.11 Statistical Techniques used:

The pre-test, and immediate post-test answer sheets obtained from the students of both experimental and control groups were scored as per the guidelines and scoring keys of each test. These obtained scores were tabulated and the gain scores between pre-test and post-test were computed. These scores were considered as raw scores for further statistical analysis.

The following statistical techniques were used to analyze the collected data with a view to test the hypotheses.

a. ‘t’ test.
b. Two-Way Analysis of variance.

I) **‘t’ test**: ‘t’ test was used to know whether the experimental and control groups differ on the dependent variables initially, i.e., before applying the treatment. It was also used to know whether the immediate post-test and delayed post-test scores differ significantly with references to dependent variables.

II) Two-Way Analysis of variance: The principle involved in the analysis of variance is the comparison of variability found within the groups. As two-way analysis of variance permits the simultaneous study of two factors as well as interaction between the two, this technique was used for the purpose of analysis of data.

3.12. Delimitations of the Study:-

1. The study is confined to the sixty students of 9th standard B.G.S. English Medium School.
2. The study is restricted to variables, namely- mathematical achievement, interest in learning mathematics and attitude towards mathematics.
3. Only Transitional background music approach is followed by considering Hindola and Bhairavi ragas in the present study.
4. The study intends to find the effectiveness of teaching mathematics with Transitional background music among secondary school 9th standard students only.

On the basis of the method of analysis mentioned in this chapter, the related hypotheses were tested to draw inferences regarding the effectiveness of Teaching Mathematics with Transitional Background Music package and its dimensions. In the next chapter the details regarding analysis of data for testing the hypotheses, discussion, interpretation of results and conclusions are presented in detail.

CHAPTER – IV

ANALYSIS AND INTERPRETATION OF THE DATA

In the previous chapter the methodology adopted for the study was presented. This included the conceptual definitions of the variables, operational definitions of variables, discussion of variables, tools used for the collection of data, sampling procedure and statistical techniques used.

The present chapter is devoted to analysis and interpretation of data. The details of the testing of hypotheses and their interpretation would be discussed in the following pages.

4. 1 Objectives of the Study

Objective-1. To study the effectiveness of Teaching Mathematics with Transitional background Music on Mathematical achievement among Secondary School Students.

Hypothesis:1 There is no significant difference between the mean scores of pre-test and post-test in the Mathematical achievement of Secondary School Students those who learnt through the Transitional background Music approach.

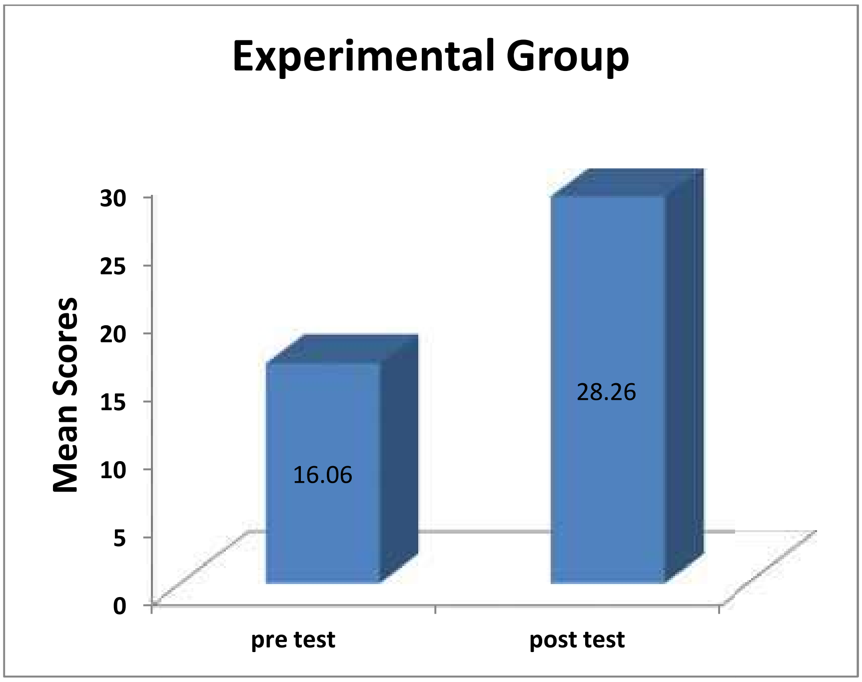
Table-4.0: Table shows Mean, S.D., and t- value of Transitional background Music Approach with reference to Mathematical achievement.

Group	Tests	N	Mean	S.D.	't' Value	df	Level of Significance
Experimental	Pre-test	30	16.06	3.72	11.91	29	Significant at 0.01 level
	Post-test	30	28.26	5.40			

From the above table 4.1, it is clearly noted that, obtained t-value 11.91 which is higher than the theoretical table value 2.76 with degrees of freedom 29 at 0.01 level of significance. Hence the null hypothesis is rejected and formulated the alternative hypothesis, i.e., “There is a significant difference between the mean scores of pre-test (16.06) and post-test (28.26) in the mathematical achievement of Secondary School Students those who learnt through the Transitional background Music Approach.

It is inferred that, there exists a significant difference in the Mathematical achievement of Pre-test and post-test of Experimental Group. The research found that the Transitional background Music approach is effective in developing the Mathematical Achievement among secondary school students.

Graph 4.0: The Mathematical Achievement mean scores of pre test and post-test of Experimental Group



The above graph 4.1 clearly indicates that, as the mean value of pre test is (16.06) and the mean value of post test is (28.26), it can be inferred that experimental group students’ mathematical achievement developed significantly.

Objective-2. To study the effectiveness of conventional approach on Mathematical achievement among Secondary School Students.

Hypothesis: 2. There is no significant difference between the mean scores of pre-test and post-test in Mathematical achievement of Secondary School Students those who learnt through the conventional approach.

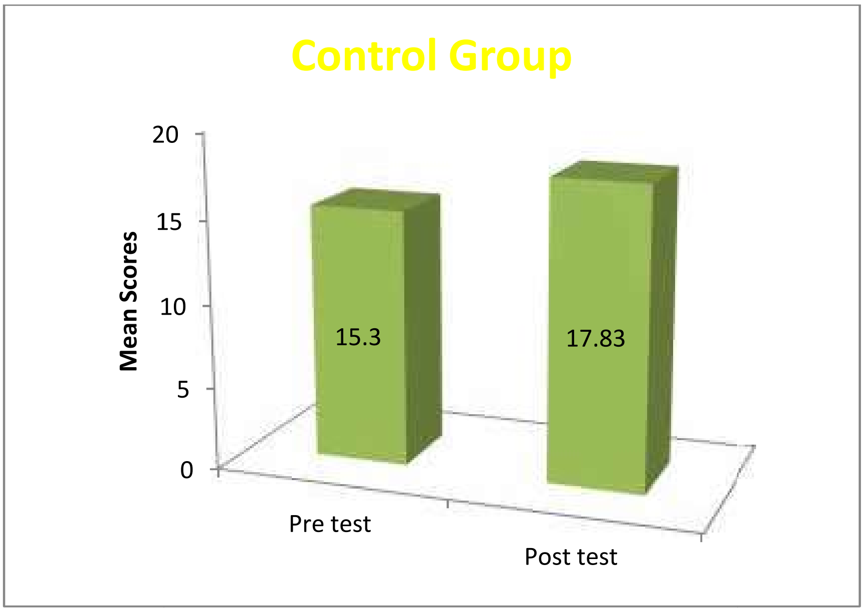
Table 4.1: Shows Mean, S.D., and t- value of Conventional Approach with reference to Mathematical achievement.

Group	Tests	N	Mean	S.D.	‘t’ Value	df	Level of Significance
Control	Pre-test	30	15.30	3.53	3.80	29	Significant at 0.01 level
	Post-test	30	17.83	3.30			

From the above table 4.2, it is clearly noted that, obtained t-value is 3.80 which is higher than the theoretical table value 2.76 with degrees of freedom 29 at 0.01 level of significance. Hence the null hypothesis is rejected and formulated the alternative hypothesis, i.e., “There is a significant difference between the mean scores of pre-test (15.30) and post-test (17.83) in the mathematical achievement of Secondary School Students those who learnt through the Conventional approach.

It is inferred that, there exists a significant difference in the Mathematical achievement of Pre-test and post-test of Conventional Group. The research found that the Conventional approach is also an effective learning approach to develop the Academic Achievement among secondary school students.

Graph 4.1: shows the Mathematical Achievement mean scores of pre test and post-test of Control Group



The above graph 4.2 clearly indicates that, The mean value of pre test is (15.30) and the mean value of post test is (17.83), it can be inferred that control group students' mathematical achievement also developed significantly.

Objective-3. To find out the difference between the mean scores of post test of experimental and control groups with reference to Mathematical Achievement.

Hypothesis: 3. There is no significant difference between the mean scores of post tests of experimental and control groups with reference to Mathematical Achievement.

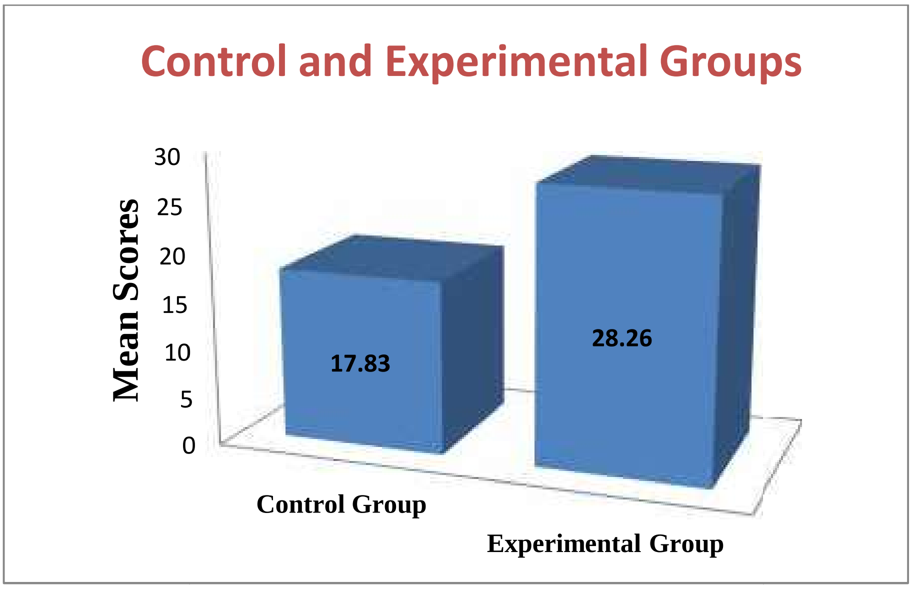
Table 4.2: shows Mean, S.D., and t- value of Transitional background Music Approach and Conventional approach with reference to Mathematical achievement.

Group	Tests	N	Mean	S.D.	't' Value	df	Level of Significance
Experimental	Post-test	30	28.26	5.40	11.62	58	Significant at 0.01 level
Control	Post-test	30	17.83	3.30			

From the above table 4.3, it is clearly noted that, obtained t-value 11.620, which is higher than the theoretical table value 2.66 with degrees of freedom 58 at 0.01 level of significance. Hence the null hypothesis is rejected and formulated the alternative hypothesis, i.e., “There is a significant difference between the mean scores of post-tests in the mathematical achievement of Secondary School Students those who learnt through the Transitional background Music approach and Conventional approach.

It is inferred that, there exists a significant difference in the mean scores of Mathematical achievement of post-tests in Experimental (28.26) and Conventional Groups (17.83). The research found that the Transitional background Music approach is more effective than the Conventional approach to develop the Mathematical Achievement among secondary school students.

Graph 4.2: shows the Mathematical Achievement mean scores of post-tests of Experimental and Control group



The above graph 4.3 clearly indicates that, The post tests mean value of experimental group (28.26) is significantly higher than the mean value of control group (17.83). Thus it can be inferred that experimental group students’ Mathematical Achievement is more than the control group.

Objective-4. **To study the effectiveness of Teaching Mathematics with Transitional background Music on Interest in learning Mathematics among Secondary School Students.**

Hypothesis: 4. There is no significant difference between the mean scores of pre-test and post-test in Interest in learning Mathematics of Secondary School Students those who learnt through the Transitional background Music approach.

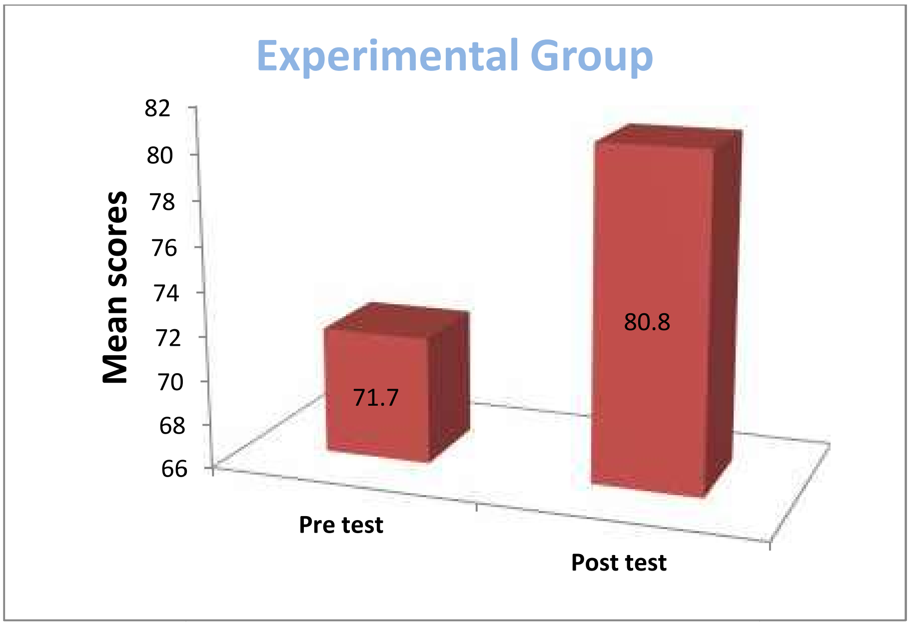
Table 4.3: shows Mean, S.D., and t- value of Transitional background Music Approach with reference to Interest in learning Mathematics.

Group	Tests	N	Mean	S.D.	‘t’ Value	df	Level of Significance
Experimental	Pre-test	30	71.70	8.58	7.22	29	Significant at 0.01 level
	Post-test	30	80.80	5.37			

From the above table 4.4, it is clearly noted that, obtained t-value 7.22 which is higher than the theoretical table value 2.76 with degrees of freedom 29 at 0.01 level of significance. Hence the null hypothesis is rejected and formulated the alternative hypothesis i.e., “There is a significant difference between the mean scores of pre-test (71.70) and post-test (80.80) in the Interest in Learning Mathematics of Secondary School Students those who learnt through the Transitional background Music approach.

It is inferred that, there exists a significant difference in the Interest in Learning Mathematics of Pre-test and post-test of Experimental Group. The research found that the Transitional background Music approach is an effective learning approach to develop the Interest in Learning Mathematics among secondary school students.

Graph 4.3: Shows the Interest in Learning Mathematics mean scores of pre test and post-test of Experimental Group



The above graph 4.4 clearly indicates that, As the mean value of pre test is (71.70) and the mean value of post test is (80.80), it can be inferred that experimental group students' Interest in Learning Mathematics developed significantly.

Objective-5. To study the effectiveness of Conventional Approach on Interest in learning Mathematics among Secondary School Students.

Hypothesis: 5. There is no significant difference between the mean scores of pre-test and post-test in Interest in learning Mathematics of Secondary School Students those who learnt through the Conventional Approach.

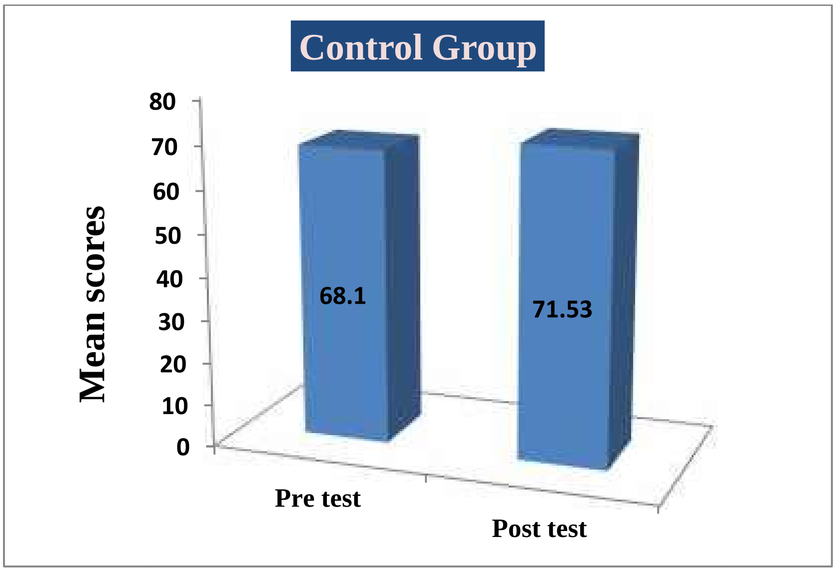
Table 4.4: shows Mean, S.D., and t- value of Transitional background Music Approach with reference to Interest in learning Mathematics.

Group	Tests	N	Mean	S.D.	't' Value	df	Level of Significance
Control	Pre-test	30	68.10	7.87	3.59	29	Significant at 0.01 level
	Post-test	30	71.53	8.18			

From the above table 4.5, it is clearly noted that, obtained t-value is 3.595 which is higher than the theoretical table value 2.76 with degrees of freedom 29 at 0.01 level of significance. Hence the null hypothesis is rejected and formulated the alternative hypothesis, i.e., "There is a significant difference between the mean scores of pre-test (68.10)and post-test (71.53) in the Interest in learning Mathematics of Secondary School Students those who learnt through the Conventional approach.

It is inferred that, there exists a significant difference in the Interest in learning Mathematics of Pre-test and post-test of Conventional Group. The research found that the Conventional approach is also an effective learning approach to develop the Interest in learning Mathematics among secondary school students.

Graph 4.4: shows the Interest in learning Mathematics mean scores of pre test and post-test of Control Group



The above graph 4.5 clearly indicates that, as the mean value of pre test is (68.10) and the mean value of post test is (71.53), it can be inferred that control group students' Interest in learning Mathematics also developed significantly.

Objective-6. **To find out the difference between the mean scores of post test of experimental and control groups with reference to Interest in learning Mathematics.**

Hypothesis: 6. There is no significant difference between the mean scores of post tests of experimental and control groups with reference to Interest in learning Mathematics.

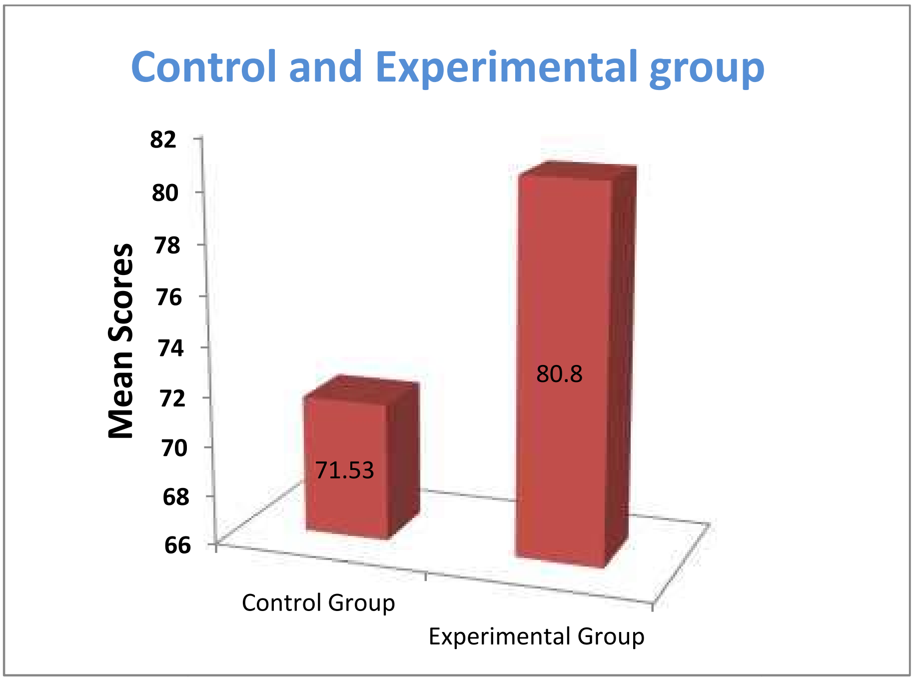
Table 4.5: shows Mean, S.D., and t- value of Transitional background Music Approach and Conventional Approach with reference to Interest in learning Mathematics.

Group	Tests	N	Mean	S.D.	't' Value	df	Level of Significance
Experimental	Post-test	30	80.80	5.37	5.31	58	Significant at 0.01 level
Control	Post-test	30	71.53	8.18			

From the above table 4.6, it is clearly noted that, obtained t-value 5.321 which is higher than the theoretical table value 2.66 with degrees of freedom 58 at 0.01 level of significance. Hence the null hypothesis is rejected and formulated the alternative hypothesis, i.e., "There is a significant difference between the mean scores of post-tests in the Interest in Learning Mathematics of Secondary School Students those who learning through the Transitional background Music approach (80.80) and the Conventional Approach (71.53).

It is inferred that, there exists a significant difference in the Interest in Learning Mathematics of post-tests of Experimental and control Groups. The research found that the Transitional background Music approach is more effective learning approach than the conventional approach to develop the Interest in Learning Mathematics among secondary school students.

Graph 4.5: Graph shows the Interest in Learning Mathematics mean scores of post-tests of Experimental and Control group



The above graph 4.6 clearly indicates that, The mean value of pre test is (71.53) and the mean value of post test is (80.8), it can be inferred that Experimental group students' Interest in learning Mathematics is higher than the Control Group.

Objective-7. To study the effectiveness of Teaching Mathematics with Transitional background Music on Attitude towards Mathematics among Secondary School Students.

Hypothesis: 7. There is no significant difference between the mean scores of pre-test and post-test in Attitude towards Mathematics of Secondary School Students those who learnt through the Transitional background Music approach.

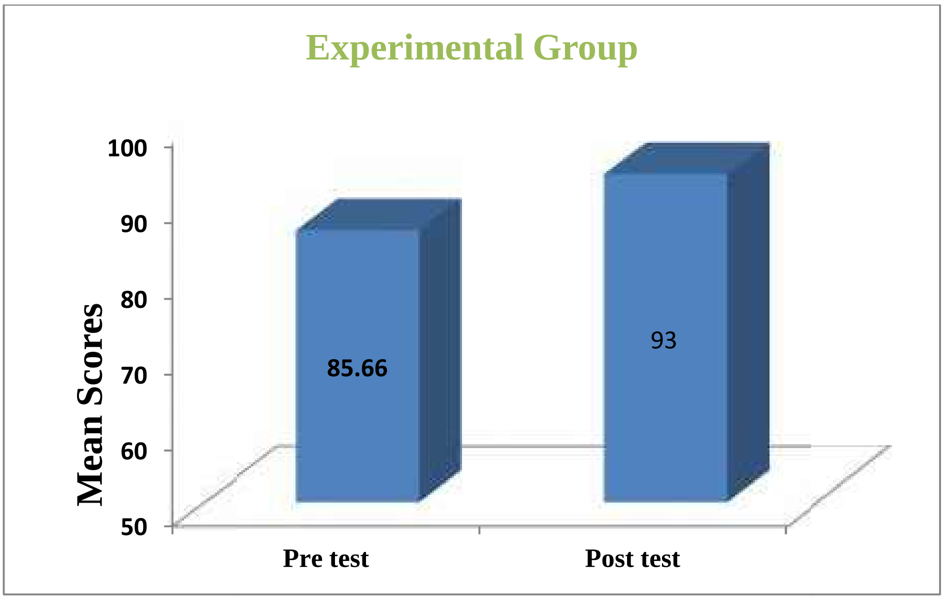
Table 4.6: shows Mean, S.D., and t- value of Transitional background Music Approach with reference to Attitude towards Mathematics.

Group	Tests	N	Mean	S.D.	‘t’ Value	df	Level of Significance
Experimental	Pre-test	30	85.66	10.65	2.98	29	Significant at 0.5 level
	Post-test	30	93.00	9.02			

From the above table 4.7, it is clearly noted that, the obtained t-value is 2.988 which is greater than the theoretical table value 2.76 with degrees of freedom 29 at 0.05 level of significance. Hence the null hypothesis is rejected and formulated the alternative hypothesis, i.e., “There is a significant difference between the mean scores of pre-test and post-test in Attitude towards Mathematics of Secondary School Students those who learnt through the Transitional background Music approach.

It is inferred that, there exists a significant difference in pre-test (85.66) and post–test (93.00) means scores of Attitude towards Mathematics of Secondary School Students those who learning through the Transitional background Music approach. Hence it may be concluded that the Transitional background Music approach is an effective approach to developing the Attitude towards Mathematics among Secondary School Students.

Graph 4.6: shows the Attitude towards Mathematics mean scores of pre-test and post-tests of Experimental group.



The above graph 4.7 clearly indicates that, The mean value of pre test is (85.66) and the mean value of post test is (93.00), it can be inferred that Experimental group students' Attitude towards Mathematics also developed significantly.

Objective-8. **To study the effectiveness of Conventional Approach on Attitude towards Mathematics among Secondary School Students.**

Hypothesis: 8. There is no significant difference between the mean scores of pre-test and post-test in Attitude towards Mathematics of Secondary School Students those who learnt through the Conventional Approach.

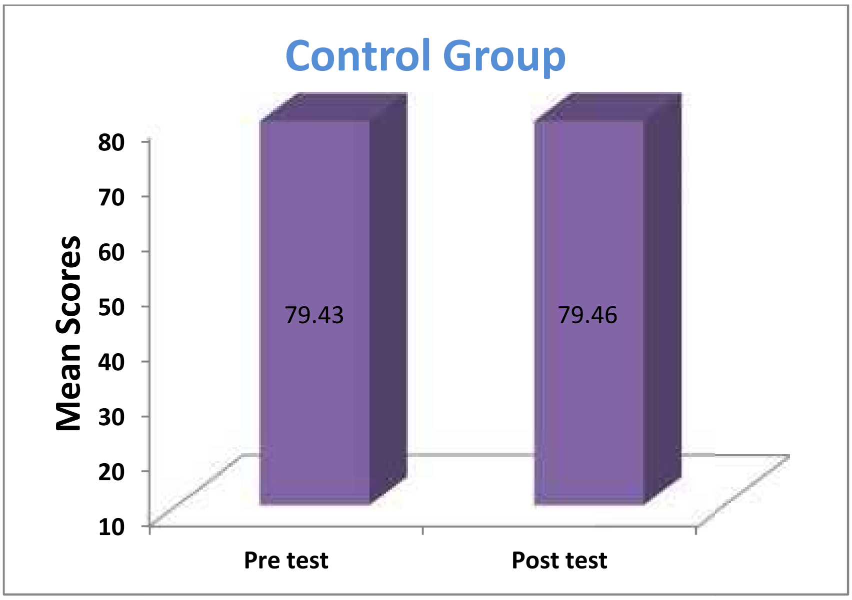
Table 4.7: shows Mean, S.D., and t- value of Conventional Approach with reference to Attitude towards Mathematics.

Group	**Tests**	**N**	**Mean**	**S.D.**	**'t' Value**	**df**	**Level of Significance**
Control	Pre-test	30	79.43	12.99	.06	29	Not Significant at 0.5 level
	Post-test	30	79.46	12.97			

From the above table 4.8, it is clearly noted that, the obtained t-value .061 which is less than the theoretical table value 2.76 with degrees of freedom 29 at 0.05 level of significance. Hence the null hypothesis is accepted i.e., “There is no significant difference between the mean scores of pre-test (79.43) and post-test (79.46) in Attitude towards Mathematics of Secondary School Students those who learnt through the Conventional approach.

It is inferred that, there is no difference in pre-test and post -test mean scores of Attitude towards Mathematics of Secondary School Students those who learning through the conventional approach. Hence it may be concluded that the conventional approach is not an effective approach to develop the Attitude towards Mathematics among Secondary School Students.

Graph 4.7: shows the mean scores of pre test and post-tests Attitude towards Mathematics of Control group.



The above graph 4.8 clearly indicates that, The mean value of pre test is (79.43) and the mean value of post test is (79.46), it can be inferred that, there is no any improvements in Control group students’ Attitude towards Mathematics.

Objective-9. **To find out the difference between the mean scores of post tests of experimental and control groups with reference to Attitude towards Mathematics.**

Hypothesis: 9. There is no significant difference between the mean scores of post tests of experimental and control groups with reference to Attitude towards Mathematics.

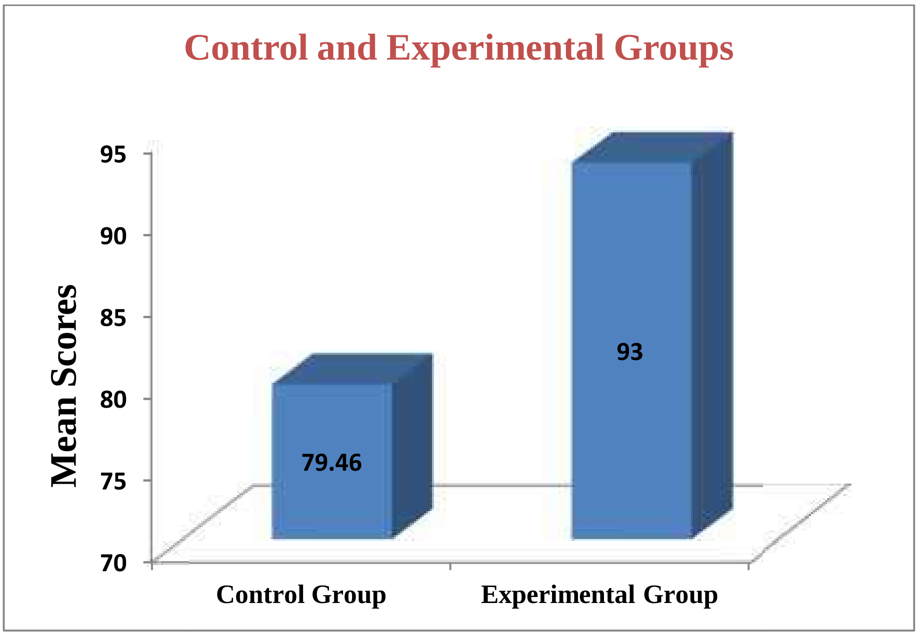
Table 4.8: shows Mean, S.D., and t- value of post tests of experimental and control groups with reference to Attitude towards Mathematics.

Group	**Tests**	**N**	**Mean**	**S.D.**	**‘t’ Value**	**df**	**Level of Significance**
Experimental	Post-test	30	93.00	9.02	4.59	29	Significant at 0.01 level
Control	Post-test	30	79.46	12.97			

From the above table 4.9, it is clearly noted that, obtained t-value 4.59 which is higher than the theoretical table value 2.66 with degrees of freedom 58 at 0.01 level of significance. Hence the null hypothesis is rejected and formulated the alternative hypothesis i.e., “There is a significant difference between the mean scores of post-tests in the Attitude towards Mathematics of Secondary School Students those who learnt through the Transitional background Music approach (93.00) and the Conventional Approach (79.46).

It is inferred that, there exists a significant difference in the Attitude towards Mathematics of post-tests of Experimental and control Groups. The research found that the Transitional background Music approach is more effective learning approach than the conventional approach to develop the Attitude towards Mathematics among secondary school students.

Graph 4.8: shows the mean scores of post tests of Attitude towards Mathematics of experimental and control groups.



The above graph 4.9 clearly indicates that, The mean value of Experimental group is (93) and the mean value of Control group is (79.46), it can be inferred that Experimental group students' Attitude towards Mathematics is higher than the control group.

Objective-10. To investigate the interaction between 'Treatments' and 'Interest in music' with reference to Mathematical achievement.

Hypothesis: 10. There is no interaction effect between 'Treatments' and 'Interest in music' with reference to mathematical achievement among secondary school students.

Table-4.9: Shows the Summary of ANOVA of mathematical achievement by Treatments and Interest in music.

Source	Type III Sum of Squares	df	Mean Square	F	Significance.
Treatments (A)	1627.66	1	1627.66	89.35	Significant at 0.01 level
Music levels (B)	137.64	2	68.82	3.77	Significant at 0.05 level
Treatments * Music levels(AB)	89.54	2	44.77	2.45	Not Significant at 0.05 level
Within groups(Error)	983.61	54	18.21		

From the above table 4.10, it is clearly noted that, The obtained F-value with reference to treatments and Music levels (interaction) is 2.458 and the corresponding table value is 3.18 with df 2 and 54 at 0.05 level. Since the F-value is less than the tabled value, it is not significant.

Hence the null hypothesis is accepted. This implies that there is no interaction between ‘Treatments’ and ‘Interest in Music levels’. Hence it may be concluded that the Transitional background Music approach is equally effective in developing the Mathematical Achievement for all the three Music levels.

There is a main effect of Interest in Music in developing the mathematical achievement among secondary school students (F = 3.77 > 3.15) those who learnt through the Transitional background music Approach.

Objective-11. **To investigate the interaction effect between ‘Treatments’ and ‘Interest in music’ with reference to Interest in learning Mathematics.**

Hypothesis: 11. There is no interaction effect between ‘Treatments’ and ‘Interest in music’ with reference to interest in learning mathematics among secondary school students.

Table-4.10: Shows the Summary of ANOVA of Interest in learning Mathematics by Treatments and Interest in music.

Source	**Type III Sum of Squares**	**df**	**Mean Square**	**F**	**Significance.**
Treatments (A)	1342.56	1	1342.56	29.47	Significant at 0.01 level
Music levels (B)	293.46	2	146.73	3.22	Significant at 0.05 level
Treatments * Music levels(AB)	82.16	2	41.08	.90	Not Significant at 0.05 level
Within groups(Error)	2459.94	54	45.55		

From the above table 4.11, it is clearly noted that, the obtained F- value with reference to interaction is .90 which is less than the corresponding tabled value 3.18 with df 2 and 54 at 0.05 level. Hence the corresponding null hypothesis is accepted. Therefore it may be concluded that the interaction between 'treatments' and interest in music levels of secondary school students with reference to developing Interest in learning mathematics is not significant.

In other words, when treatment and interest in music levels are allowed to interact, they are not significantly effective. This signifies that, Transitional background Music approach do not differ in their effectiveness in developing Interest in learning mathematics on interest in music levels.

There is a main effect of Interest in Music in developing the Interest in Learning Mathematics among secondary school students (F = 3.22 > 3.15) those who learnt through the Transitional background music Approach.

Objective-12. To investigate the interaction effect between 'Treatments' and 'Interest in music' with reference to Attitude towards learning Mathematics.

Hypothesis: 12 There is no interaction effect between 'Treatments' and 'Interest in music' with reference to Attitude towards mathematics among secondary school students.

Table-4.11: Shows the Summary of ANOVA of Attitude towards learning Mathematics by Treatments and Interest in music.

Source	Type III Sum of Squares	df	Mean Square	F	Significance.
Treatments (A)	2469.07	1	2469.07	22.37	Significant at 0.01 level
Music levels (B)	789.02	2	394.51	3.57	Significant at 0.01 level
Treatments * Music levels (AB)	639.22	2	319.61	2.89	Not Significant at 0.05 level
Within groups (Error)	5958.30	54	110.33		

From the above table 4.12, it is clearly noted that, the obtained F- value with reference to interaction is 2.897 which is less than the corresponding tabled value 3.18 with df 2 and 54 at 0.05 level. Hence the corresponding null hypothesis is accepted. Therefore, it may be concluded that the interaction between 'treatments' and interest in music levels of secondary school students with reference to developing Attitude towards mathematics is not significant.

In other words, when treatment and interest in music levels are allowed to interact, they are not significantly effective. This signifies that, the Transitional background Music approach will not differ in their effectiveness in developing Attitude towards mathematics on interest in music levels.

There is a main effect of Interest in Music in developing the Attitude towards Mathematics among secondary school students (F = 3.57 > 3.15) those who learnt through the Transitional background music Approach.

Objective-13.To investigate the interaction effect between 'Treatments' and 'Gender' with reference to Mathematical achievement.

Hypothesis: 13 There is no interaction effect between 'Treatments' and 'Gender' with reference to Mathematical achievement among secondary school students.

Table-4.12: Shows the Mean Scores of Treatments and gender with respect to Mathematical Achievement.

Descriptive Statistics				
Treatments				
Groups	**Gender**	**Mean**	**Std. Deviation**	**N**
Experimental	Boy	24.64	4.06	14
	Girl	31.43	4.36	16
	Total	28.26	5.40	30
Control	Boy	16.66	1.87	12
	Girl	18.61	3.83	18
	Total	17.83	3.30	30
Total	Boy	20.96	5.15	26
	Girl	24.64	7.64	34
	Total	23.05	6.88	60

Table-4.13: Shows the Summary of ANOVA of Mathematical Achievement by Treatments and Gender.

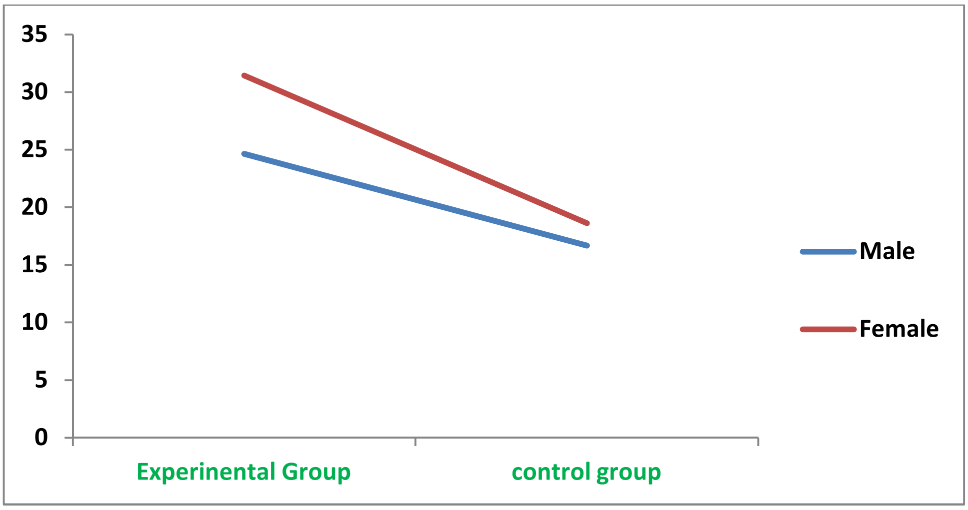
Source	Type III Sum of Squares	df	Mean Square	F	Significance.
Treatments (A)	1586.21	1	1586.21	112.42	Significant at 0.01 level
Gender (B)	279.93	1	279.93	19.84	Significant at 0.01 level
Treatments * Gender(AB)	86.22	1	86.22	6.11	Significant at 0.01 level
Within groups(Error)	790.09	56	14.10		

From the above table 4.13, it is clearly noted that, the obtained F- value with reference to interaction is 6.112 which is greater than the corresponding tabled value 4.03 with df 1 and 56 at 0.01 level. Hence the corresponding null hypothesis is rejected. Therefore it may be concluded that the interaction between 'treatments' and Gender of secondary school students with reference to developing Mathematical achievement is significant.

In other words, when treatment and Gender are allowed to interact, they are significantly effective. This signifies that, Transitional background Music approach differ in their effectiveness in developing Mathematical achievement on both male and female.

There is a main effect of Gender in developing the mathematical achievement among secondary school students (F = 19.84 > 3.15) those who learnt through the Transitional background music Approach.

Graph-4.10: Shows the Comparison of Treatments and gender with respect to Mathematical Achievement.



The above graph 4.10 indicates the comparison of Male and Female students of Experimental and Control Groups with respect to Mathematical Achievement.

Objective-14. To investigate the interaction effect between 'Treatments' and 'Gender' with reference to Interest in learning Mathematics.

Hypothesis: 14. There is no interaction effect between 'Treatments' and 'Gender' with reference to Interest in learning mathematics among secondary school students.

Table-4.14: Shows the Mean Scores of Treatments and gender with respect to Interest in learning Mathematics.

Descriptive Statistics				
Treatments				
Groups	**Gender**	**Mean**	**Std. Deviation**	**N**
Experimental	Male	77.35	4.73	14
	Female	83.81	3.95	16
	Total	80.80	5.37	30
Control	Male	72.00	9.85	12
	Female	71.22	7.15	18
	Total	71.53	8.18	30
Total	Male	74.88	7.86	26
	Female	77.14	8.60	34
	Total	76.16	8.30	60

Table-4.15: Shows the Summary of ANOVA of Interest in learning Mathematics by Treatments and Gender.

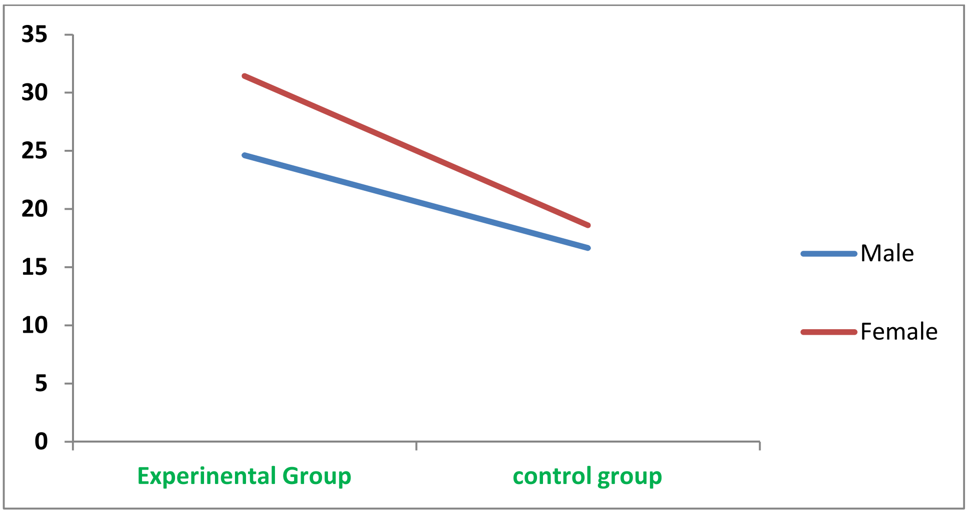
Source	Type III Sum of Squares	df	Mean Square	F	Significance.
Treatments (A)	1180.67	1	1180.67	26.84	Significant at 0.05 level
Gender (B)	118.15	1	118.15	2.68	Not Significant at 0.05 level
Treatments * Gender(AB)	191.77	1	191.77	4.36	Significant at 0.01 level
Within groups(Error)	2462.76	56	43.97		

From the above table 4.14, it is clearly noted that, the obtained F- value with reference to interaction is 4.361, which is greater than the corresponding tabled value 4.03 with df 1 and 56 at 0.01 level. Hence the corresponding null hypothesis is rejected. Therefore it may be concluded that the interaction between 'treatments' and Gender of secondary school students with reference to developing Interest in learning mathematics is significant.

In other words, when treatment and Gender are allowed to interact, they are significantly effective. This signifies that, the Transitional background Music approach differs in their effectiveness in developing Interest in learning mathematics on both male and female.

There is no main effect of Gender in developing the Interest in Learning Mathematics among secondary school students (F = 2.68 < 3.15) those who learnt through the Transitional background music Approach.

Graph-4.11: Shows the Comparison of Treatments and gender with respect to Interest in Learning Mathematics.



The above graph 4.11 indicates the comparison of Male and Female students of Experimental and Control Groups with respect to Interest in Learning Mathematics.

Objective-15. To investigate the interaction effect between 'Treatments' and 'Gender' with reference to Attitude towards Mathematics.

Hypothesis: 15. There is no interaction effect between 'Treatments' and 'Gender' with reference to Attitude towards mathematics among secondary school students.

Table-4.16: Shows the Mean Scores of Treatments and gender with respect to Attitude towards mathematics.

Descriptive Statistics				
Treatments				
Groups	**Gender**	**Mean**	**Std. Deviation**	**N**
Experimental	Male	24.64	4.06	14
	Female	31.43	4.36	16
	Total	28.26	5.40	30
Control	Male	16.66	1.87	12
	Female	18.61	3.83	18
	Total	17.83	3.30	30
Total	Male	20.96	5.15	26
	Female	24.64	7.64	34
	Total	23.05	6.88	60

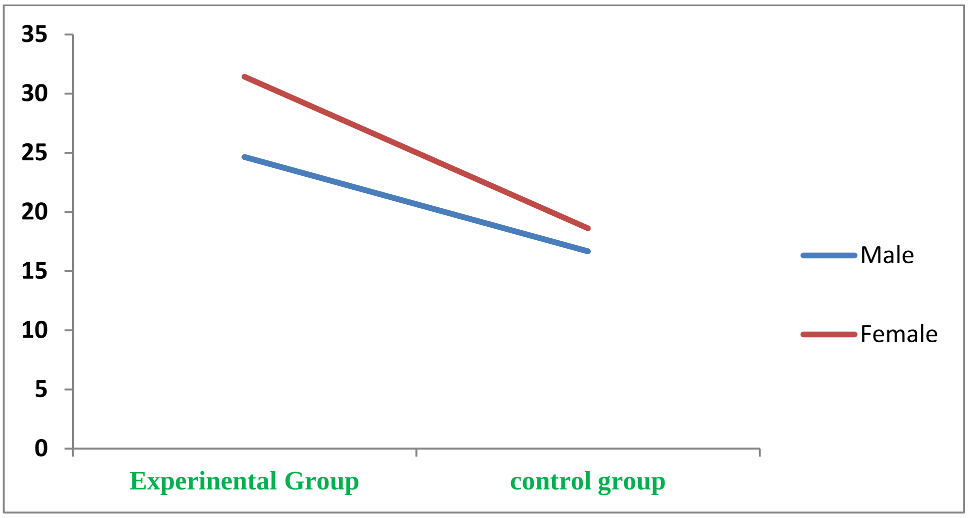
Table-4.17: Shows the Summary of ANOVA of Attitude towards mathematics by Treatments and Gender.

Source	**Type III Sum of Squares**	**df**	**Mean Square**	**F**	**Significance.**
Treatments (A)	2785.61	1	2785.61	22.43	Significant at 0.05 level
Gender (B)	292.46	1	292.46	2.35	Not Significant at 0.05 level
Treatments * Gender(AB)	1.84	1	1.84	.01	Not Significant at 0.05 level
Within groups(Error)	6954.20	56	124.18		

From the above table 4.15, it is clearly noted that, the obtained F-value with reference to treatments and Gender (interaction) is 0.015 and the corresponding table value is 4.03 with df 1 and 56 at 0.05 level. Since the F-value is less than the tabled value, it is not significant. Hence the null hypothesis is accepted. This implies that there is no interaction between 'Treatments' and 'Gender'. Hence it may be concluded that the Transitional background Music approach is equally effective in developing the Attitude towards mathematics for both male and female.

There is no main effect of Gender in developing the Attitude towards Mathematics among secondary school students (F = 2.35 < 3.15) those who learnt through the Transitional background music Approach.

Graph-4.12: Shows the Comparison of Treatments and gender with respect to Attitude towards Mathematics.



The above graph 4.12 indicates the comparison of Male and Female students of Experimental and Control Groups with respect to Attitude towards Mathematics.

Objective-16. To investigate whether the students sustain Mathematical achievement through the Teaching Mathematics with Transitional background Music approach.

Hypothesis: 16. There is no significant difference between the immediate and delayed post-test scores of the experimental group with reference to Mathematical achievement among secondary school students.

Table- 4.18: shows Mean, S.D., and t-value of Teaching Mathematics with Transitional Background Music Approach with reference to Mathematical achievement.

Group	Tests	N	Mean	S.D.	't' Value	df	Level of Significance
Experimental	Post-test	30	28.26	5.40	9.37	29	Significant at 0.01 level
	Delayed Post-test	30	30.30	5.09			

From the above table 4.16, it is clearly noted that, Immediate (28.26) and delayed post test scores (30.30) of experimental group differ significantly with reference to mathematical achievement (9.37).

Therefore, it may be concluded that mathematical achievement that is developed through Transitional background music approach was sustained by the secondary school students.

Objective-17. To investigate whether the students sustain Interest in learning Mathematics through the Teaching Mathematics with Transitional background Music approach.

Hypothesis: 17. There is no significant difference between the immediate and delayed post-test scores of the experimental group with reference to Interest in learning mathematics among secondary school students.

Table 4.19: shows Mean, S.D., and t-value of Teaching Mathematics with Transitional Background Music Approach with reference to Interest in learning mathematics.

Group	Tests	N	Mean	S.D.	't' Value	df	Level of Significance
Experimental	Post-test	30	80.80	5.37	4.34	29	Significant at 0.01 level
	Delayed Post-test	30	82.70	4.99			

From the above table 4.17, it is clearly noted that, Immediate (80.80) and delayed post test (82.70) mean scores of experimental group differ significantly with reference to Interest in Learning Mathematics. (4.34)

Therefore, it may be concluded that Interest in Learning Mathematics that is developed through Transitional background music approach was sustained by the secondary school students.

Objective-18. To investigate whether the students sustain Attitude towards Mathematics through the Teaching Mathematics with Transitional background Music approach.

Hypothesis: 18. There is no significant difference between the immediate and delayed post-test scores of the experimental group with reference to Attitude towards mathematics among secondary school students.

Table 4.20: shows Mean, S.D., and t-value of Teaching Mathematics with Transitional Background Music Approach with reference to Attitude towards mathematics.

Group	Tests	N	Mean	S.D.	‘t’ Value	df	Level of Significance
Experimental	Post-test	30	93.00	9.02	4.24	29	Significant at 0.01 level
	Delayed Post-test	30	96.50	7.29			

From the above table 4.18, it is clearly noted that, Immediate (93.00) and delayed post test (96.50) scores of experimental group differ significantly with reference to Attitude towards Mathematics. (4.24)**.**

Therefore, it may be concluded that Attitude towards Mathematics that is developed through Transitional background music approach was sustained by the secondary school students.

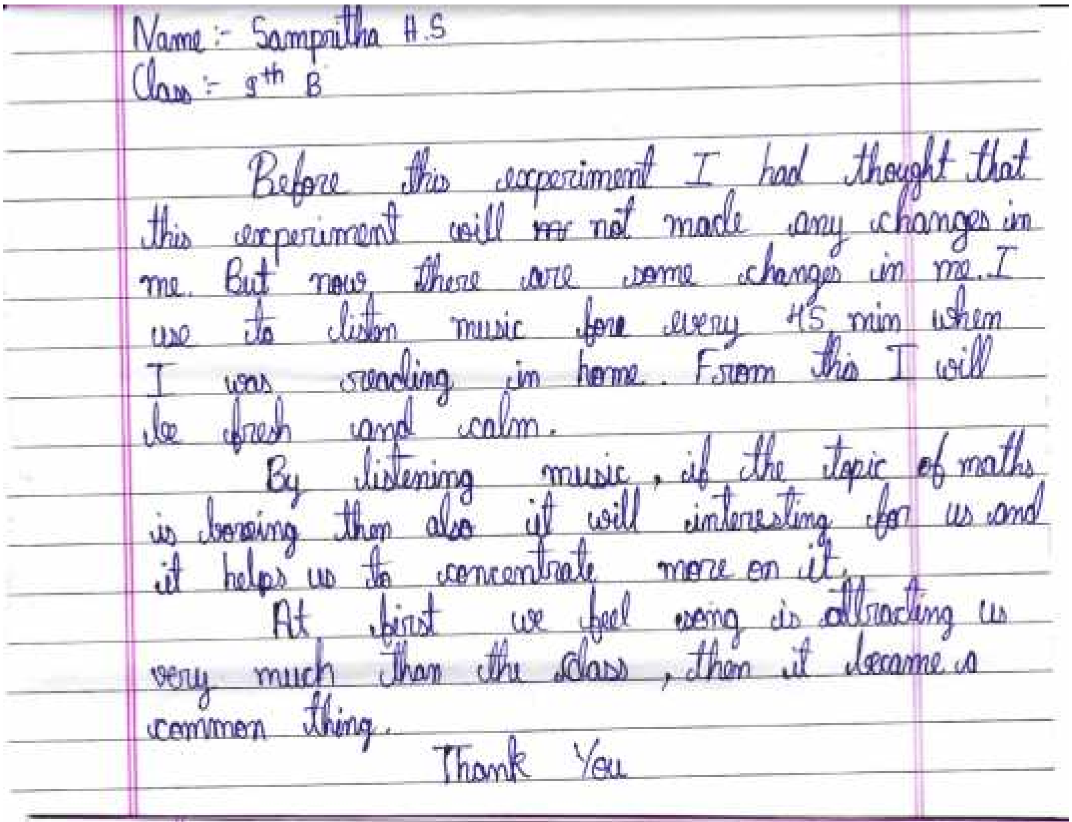
4.2 Researcher’s Profile:

Till now, the collected data was analyzed and interpretations were drawn based on quantitative analysis.

Since all the distractions can be done away with, the student must learn to concentrate in spite of these distractions. This is possible only if the student develops interest and then only it is possible to accomplish the work unless interest aroused. A student need not be interested in everything he is required to learn, but he must be interested in a fair share of his subjects in order to use the opportunities to good advantages.

In this sense the researcher was further interested in knowing the actual reactions of the students and teachers towards the new approach like Teaching mathematics with Transitional background music approach and noted the following changes, While conducting the experimental classes the students were disturbed in the beginning. It had taken two days to adjust them towards learning in the classroom. From third day onwards students were very much interested towards the mathematics and after few days they started to ask the researcher to take mathematics class even in their free periods. Some other subjects teachers opine that, the students are very much interested with this type of teaching approach, it would be little hard to bring them back towards their subjects after the mathematics period. The mathematics teacher said that, actually in order to teaching and learning process mathematics is a tough subject, but this approach created interest about the mathematics. And thanked to the researcher for making the teaching and learning easy and interesting. Also he said that the approach is very easy to adopt. So he collected the list of music from the researcher to teach mathematics for other classes, as they were eagerly waiting for that.

After completing all the procedures of the experimentation, the researcher asked each student to write down their opinion about the lessons in a sheet. Some of the students have taken permission to express their opinion in their comfortable language. The researcher collected opinionnaire from all the fifty seven students of the experiment section (B) and randomly picked six sheets. All the six opinionnaires are presented below in concise form.



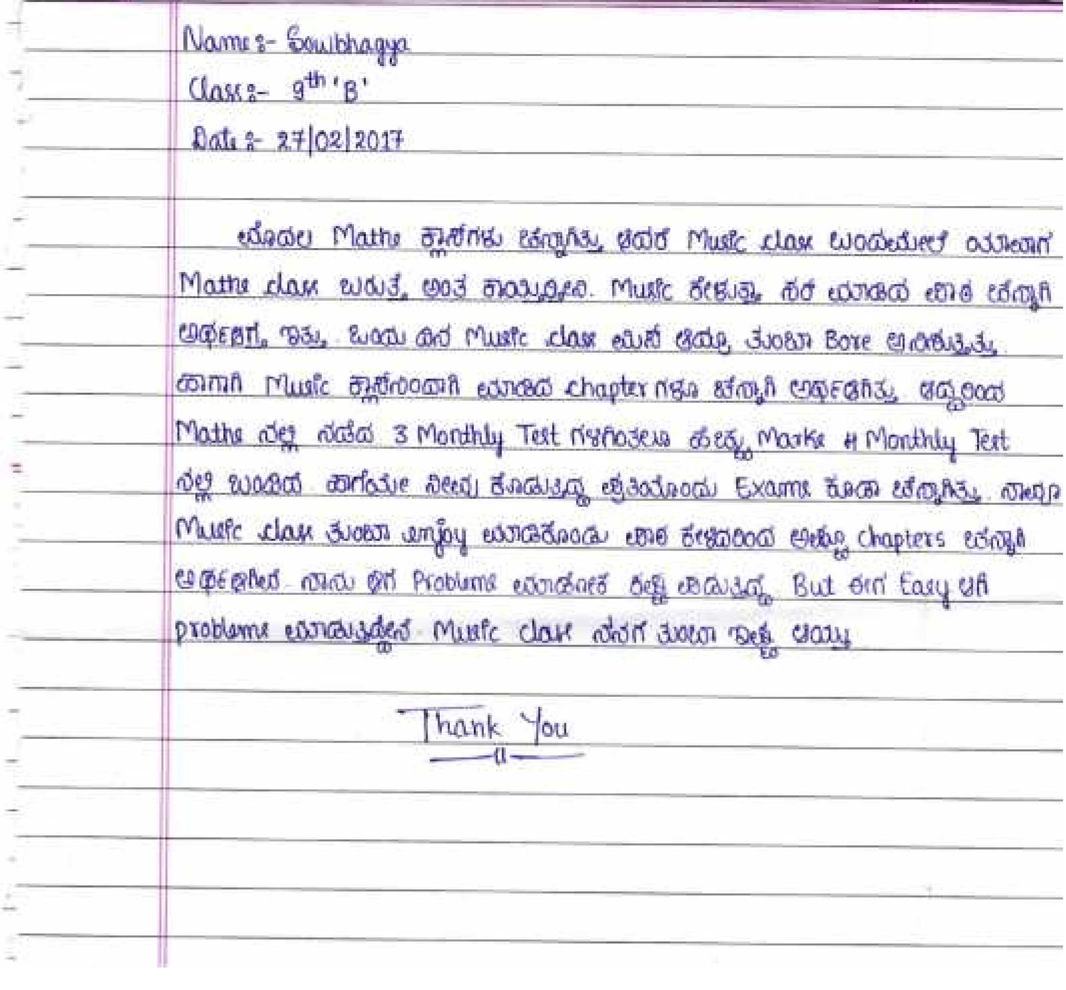
Name :- Sampritha H.S
Class :- 9th B

Before this experiment I had thought that this experiment will ~~m~~ not made any changes in me. But now there are some changes in me. I use to listen music for every 45 min when I was reading in home. From this I will be fresh and calm.

By listening music, if the topic of maths is boring then also it will interesting for us and it helps us to concentrate more on it.

At first we feel song is attracting us very much than the class, then it became a common thing.

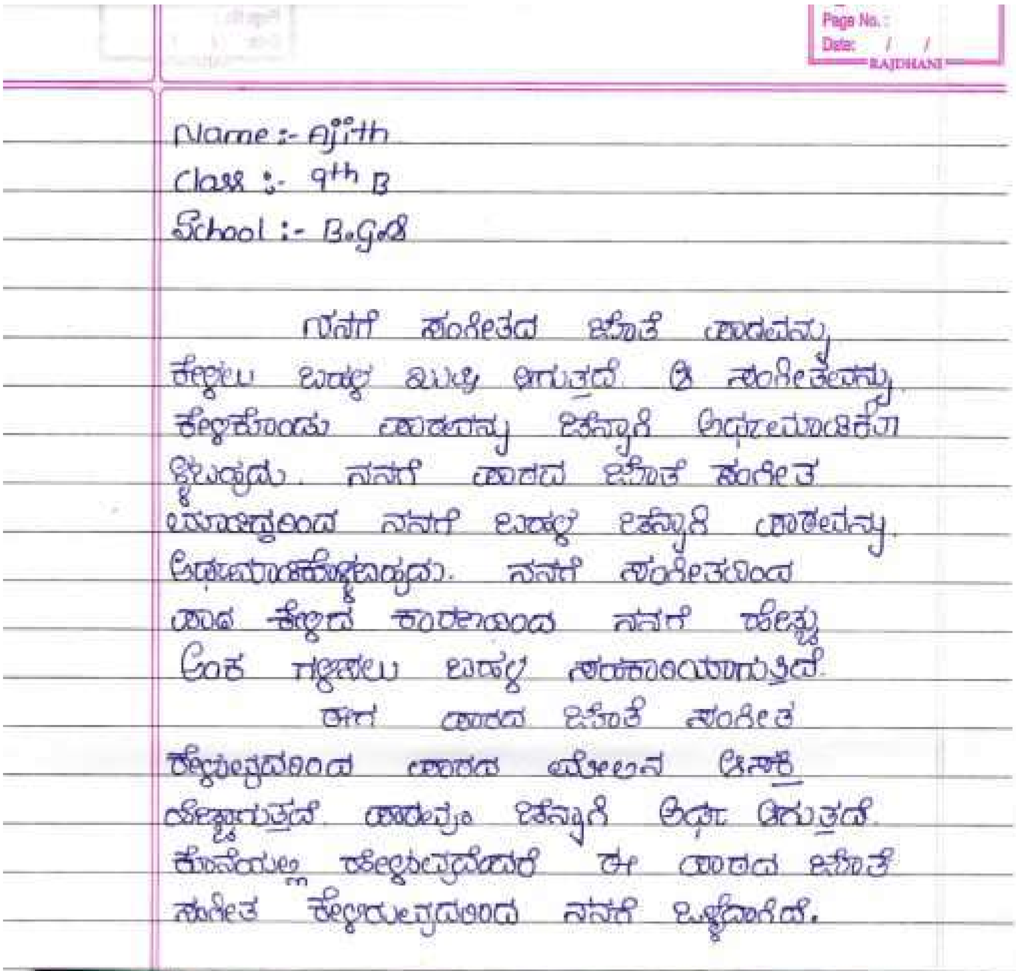
Thank You



Name :- Sowbhagya
Class :- 9th 'B'
Date :- 27/02/2017

ಮೊದಲು Maths ಕ್ಲಾಸ್‌ಗಳು ಬೋರಾಗ್ತಿತ್ತು, ಆದರೆ Music class ಬಂದಮೇಲೆ ಯಾವಾಗ Maths class ಬರುತ್ತೆ ಅಂತ ಕಾಯುತ್ತಿದ್ದೆ. Music ಕೇಳುತ್ತಾ ಸರ್ ಮಾಡಿದ ಪಾಠ ಬೇಗನೆ ಅರ್ಥವಾಗ್ತಿತ್ತು. ಒಂದು ದಿನ Music class ಇಲ್ದೆ ಇದ್ರೆ ತುಂಬಾ Bore ಆಗ್ತಿತ್ತು. ಹಾಗಾಗಿ Music ಕ್ಲಾಸ್‌ನಿಂದಾಗಿ ಮಾಡಿದ chapter ಗಳು ಬೇಗನೆ ಅರ್ಥವಾಗಿತ್ತು. ಅದರಿಂದ Maths ನಲ್ಲಿ ನಡೆದ 3 Monthly Test ಗಳಿಗಿಂತಲೂ ಹೆಚ್ಚು Marks 4 Monthly Test ನಲ್ಲಿ ಬಂದಿದೆ. ಹಾಗೆಯೇ ನಮಗೆ ಕೊಡುತ್ತಿದ್ದ ಟೆಸ್ಟ್‌ಗಳಿಂದ Exams ಕೂಡಾ ಬೇಗಾಗ್ತಿತ್ತು. ನಾವು Music class ತುಂಬಾ enjoy ಮಾಡಿದೆವು ಪಾಠ ಕೇಳುವಾಗ ಎಲ್ಲಾ chapters ಬೇಗನೆ ಅರ್ಥವಾಗಿದೆ. ನಾವು ಈಗ Problems ಮಾಡಿದರೆ ಬೇಗ ಬರುತ್ತೆ. But ಈಗ Easy ಆಗಿ problems ಮಾಡುತ್ತೇವೆ. Music class ನಿಂದ ತುಂಬಾ ಇಷ್ಟ ಆಯ್ತು

Thank You

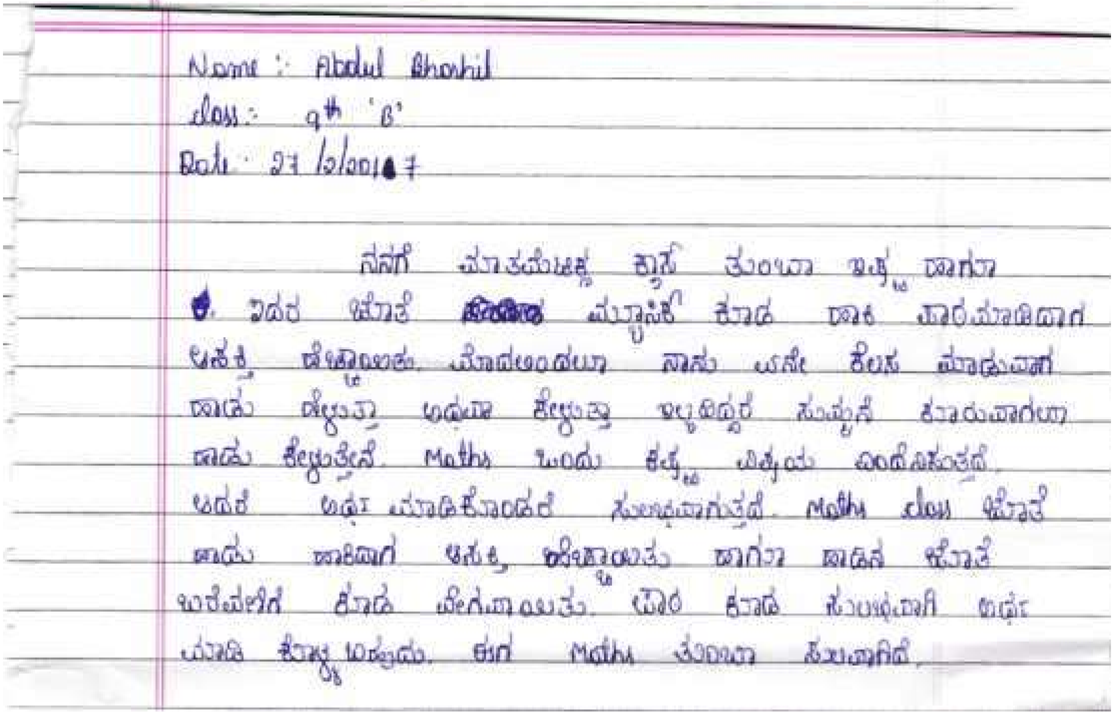


Page No.:
Date: / /
RAJDHANI

Name :- Ajith
Class :- 9th B
School :- B.G.S

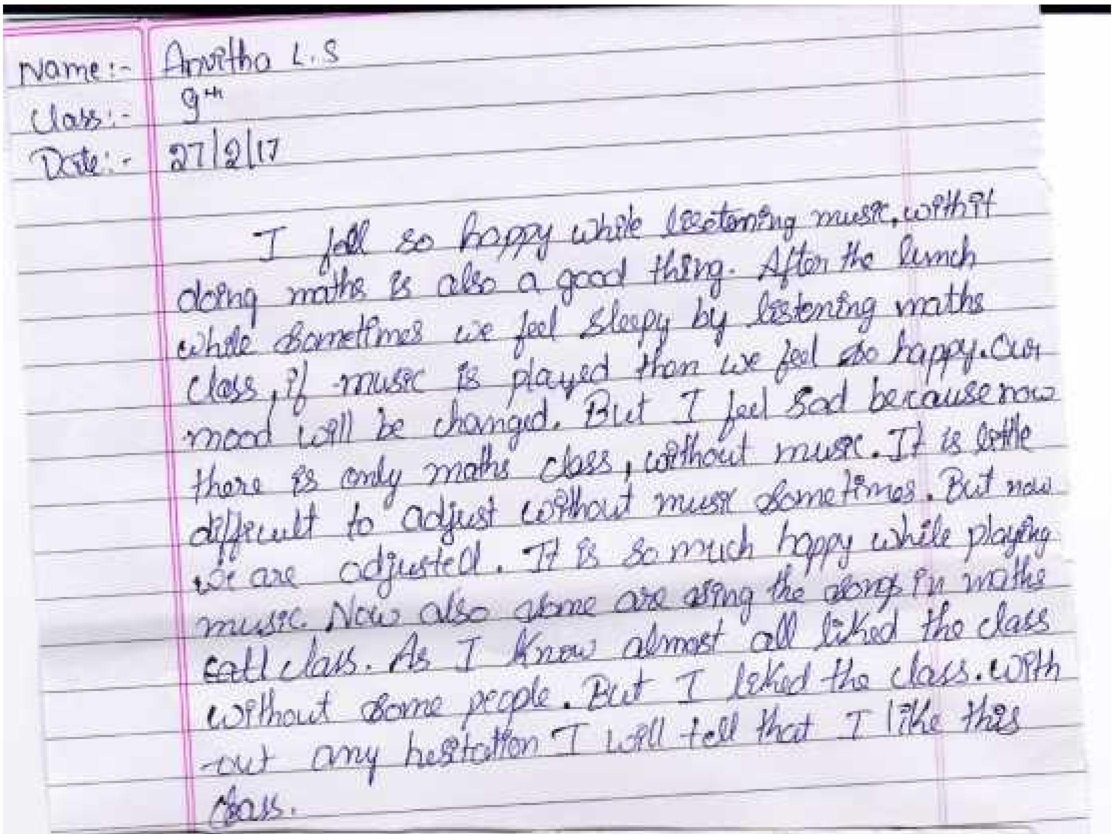
ನನಗೆ ಸಂಗೀತದ ಜೊತೆ ಪಾಠವನ್ನು ಕೇಳಲು ಬಹಳ ಖುಷಿ ಆಗುತ್ತದೆ. ಆ ಸಂಗೀತವನ್ನು ಕೇಳಿಕೊಂಡು ಪಾಠವನ್ನು ಬೇಗನೆ ಅರ್ಥಮಾಡಿಕೊಳ್ಳಬಹುದು. ನನಗೆ ಪಾಠದ ಜೊತೆ ಸಂಗೀತ ಬಾರಿಸುವುದರಿಂದ ನನಗೆ ಬಹಳ ಬೇಗನೆ ಪಾಠವನ್ನು ಅರ್ಥಮಾಡಿಕೊಳ್ಳಬಹುದು. ನನಗೆ ಸಂಗೀತದಿಂದ ಪಾಠ ಕೇಳಿದ ಕಾರಣದಿಂದ ನನಗೆ ಹೆಚ್ಚು ಅಂಕ ಗಳಿಸಲು ಬಹಳ ಸಹಕಾರಿಯಾಗುತ್ತದೆ.

ಈಗ ಪಾಠದ ಜೊತೆ ಸಂಗೀತ ಕೇಳುವುದರಿಂದ ಪಾಠದ ಮೇಲಿನ ಆಸಕ್ತಿ ಹೆಚ್ಚಾಗುತ್ತದೆ. ಪಾಠವು ಬೇಗನೆ ಅರ್ಥ ಆಗುತ್ತದೆ. ಕೊನೆಯಲ್ಲಿ ಹೇಳುವುದೇನೆಂದರೆ ಈ ಪಾಠದ ಜೊತೆ ಸಂಗೀತ ಕೇಳುವುದರಿಂದ ನನಗೆ ಒಳ್ಳೆಯದಾಗಿದೆ.



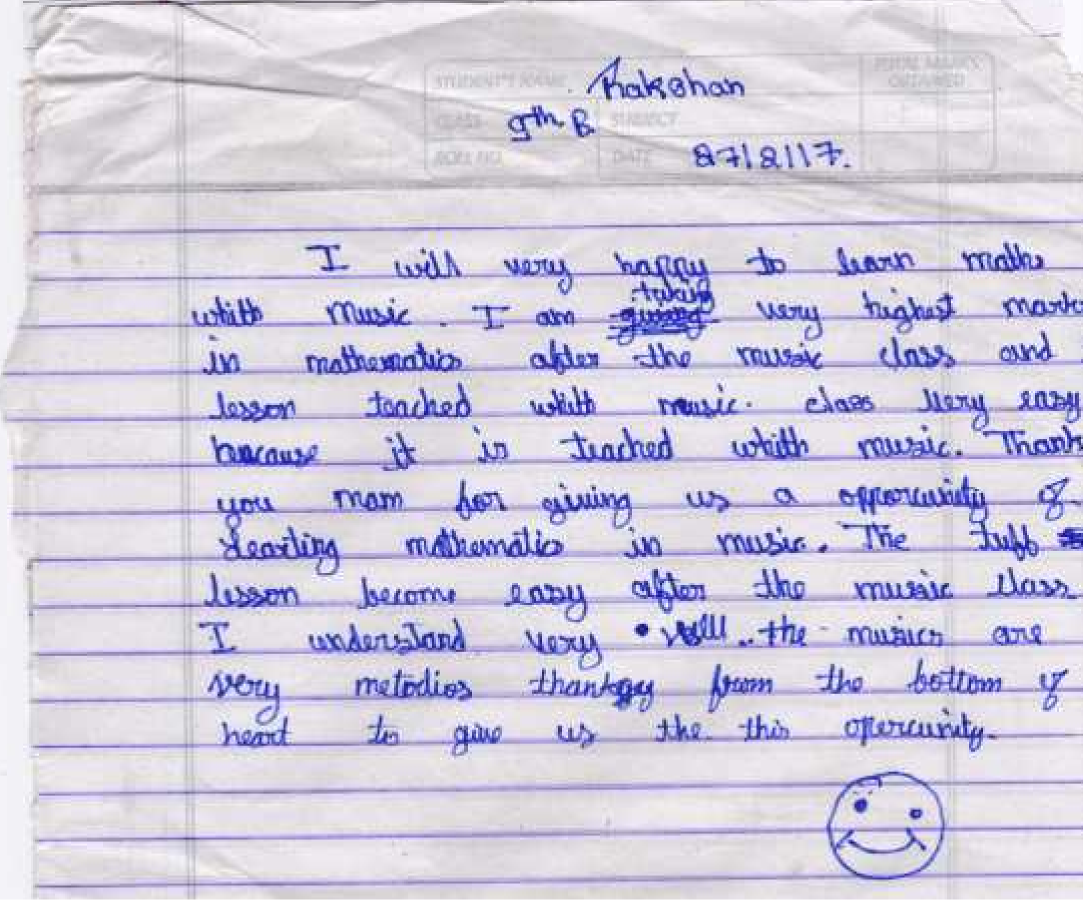
Name : Abdul Shahil
class : 9th 'B'
Date : 27/2/2017

ನನಗೆ ಮಾತಮೆಟಿಕ್ಸ್ ಕ್ಲಾಸ್ ತುಂಬಾ ಕಷ್ಟ ಆಗಿತ್ತು. ಇದರ ಜೊತೆ ಮ್ಯೂಸಿಕ್ ಕೂಡ ಪಾಠ ಪ್ರಾರಂಭ ಮಾಡಿದಾಗ ಆಸಕ್ತಿ ಹೆಚ್ಚಾಯಿತು. ಮೊದಲಿಂದಲೂ ನಾನು ಮನೆ ಕೆಲಸ ಮಾಡುವಾಗ ಹಾಡು ಕೇಳುತ್ತಾ ಅಥವಾ ಕೇಳುತ್ತಾ ಇಲ್ಲದಿದ್ದರೆ ಸುಮ್ಮನೆ ಕೂರುವಾಗಲೂ ಹಾಡು ಕೇಳುತ್ತೇನೆ. Maths ಒಂದು ಕಷ್ಟ ವಿಷಯ ಅನಿಸುತ್ತದೆ. ಆದರೆ ಅರ್ಥ ಮಾಡಿಕೊಂಡರೆ ಸುಲಭವಾಗುತ್ತದೆ. Maths class ಜೊತೆ ಹಾಡು ಹಾಕಿದಾಗ ಆಸಕ್ತಿ ಹೆಚ್ಚಾಯಿತು ಹಾಗೂ ಹಾಡಿನ ಜೊತೆ ಬರೆಯಲಿಕ್ಕೆ ಕೂಡ ಬೇಗನೆ ಆಯಿತು. ಮೇಡಂ ಕೂಡ ಸುಲಭವಾಗಿ ಅರ್ಥ ಮಾಡಿ ಕೊಟ್ಟಿದ್ದರು. ಈಗ Maths ತುಂಬಾ ಸುಲಭವಾಗಿದೆ.



Name:- Amritha L.S
Class:- 9th
Date:- 27/2/17

I fell so happy while lesstening music, with it doing maths is also a good thing. After the lunch while sometimes we feel sleepy by listening maths class, if music is played than we feel so happy. Our mood will be changed. But I feel sad because now there is only maths class, without music. It is little difficult to adjust without music sometimes. But now we are adjusted. It is so much happy while playing music. Now also some are sing the songs in maths call class. As I know almost all liked the class without some people. But I liked the class. With-out any hesitation I will tell that I like this class.



STUDENT'S NAME Rakshan
CLASS 9th B SUBJECT
ROLL NO DATE 27/2/17.
TOTAL MARKS OBTAINED

I will very happy to learn maths whith music. I am ~~[illegible]~~ taking very highest marks in mathematics after the music class and lesson teached whith music. class very easy because it is teached whith music. Thank you mam for giving us a opporunity of learling mathematics in music. The tuff lesson become easy after the music class I understand very well. the musics are very melodies thankyou from the bottom of heart to give us the this opercunity.

The researcher observed that all the fifty seven students had positive opinions about the lessons. Not even a single student has written negatives towards the lessons. The students have generally written that, the musical background approach created their interest in mathematics and helped them to get more marks in exams. The tough subject became very easy to understand after using the approach. This type of approach is more fruitful while teaching geometry lessons, especially on constructions. The students also said that they were getting refreshness from the beginning music and so much impressed about the classes. They thanked the researcher for making learning so easy, enjoyable and interesting.

As an investigator I have found that the Piece of music in a particular raga should not be repeated in the class, the soberness of the music would be deleted, the volume of the music should be slow and the flute sounds were more attractive from the students.

Thus it could be concluded that, the Teaching mathematics with Transitional Background Music approach could certainly be used to make teaching and learning more curious and enjoyable and thus it develops academic achievement, interest in learning mathematics and attitude towards mathematics.

The present chapter is devoted to analysis and interpretation of data. The details of testing the hypotheses and their interpretations are discussed. In the next chapter the summary of the study, findings and conclusions will be presented.

CHAPTER – V

SUMMARY, FINDINGS AND CONCLUSION

In the previous chapter, the analysis and interpretation of data were presented in detail. In this chapter, the researcher presents a brief summary of the research which includes the need for the study, the objectives, hypotheses and methodology followed by the researcher, the tools and techniques used for collection and interpretation of the data. It also includes, educational implications, limitations under which the present investigation has been carried out and suggestions are made for further research.

5.1 Introduction

‘Education is a proximate means of the progress of society’ - Ward (1983). Thus, one the aims of education is to bring about desirable changes in the students with respect to knowledge, skills and attitudes in such a way as he may effectively perform the changing roles in a changing society.

The Education Commission (1964-66) reiterates that the education is a threefold process of imparting knowledge, developing skill and inculcating proper study habits, interests, attitudes and values. Therefore, education has been regarded as a matter of primary national importance and an indispensable agency in the difficult task of building a nation.

Mathematics has become one of the most important subjects in the school curriculum during this century. As modern societies have increased in complexity and as that complexity has accompanied rapid technological development, so the teaching of mathematics has come under increased scrutiny. Mathematics has played a significant role in building our civilization. The Education Commission (1964-66), and the National Policy on Education

(1986) has underlined the importance of Mathematics Education. Therefore, Mathematics is a compulsory subject at school level. If the students take interest in this subject than they can achieve better in Mathematics. But the fact is that there is more failure of students in Mathematics. For many people, mathematics is an enigma. Characterized by the impression of numbers and calculations taught at school, it is often accompanied by feelings of rejection and disinterest, and it is believed to be strictly rational, abstract, cold and soulless.

Early childhood educators know the value of music in their classrooms. Most will unequivocally state that music contributes to the academic environment in ways that positively impact the whole child. The emotional range of music during this period was considerably widened, as was its harmonic vocabulary and the range and number of instruments which might be called upon to play it. Music often had a 'programme' or storyline attached to it, sometimes of a tragic or despairing nature, occasionally representing such natural phenomena as rivers or galloping horses.

The effects of Music on Human Brain from Neuro-physics Approach

The human brain, which is one of the most complex organic systems, involves billions of interacting physiological and chemical processes that give rise to experimentally observed Neuro-electrical activity, which is called an electroencephalogram (EEG). Music can be regarded as input to the brain system which influences the human mentality along with them. Since music cognition has many emotional aspects, it is expected that EEG recorded during music listening may reflect the electrical activities of brain regions related to those emotional aspects. The results might reflect the level of consciousness and the brain's activated area during music listening. It is anticipated that this approach will provide a new perspective on cognitive musicology. Music is widely accepted to produce changes in affective (emotional) states in the listener. However, the exact nature of the emotional response to music is an open question and it is not immediately clear that induced emotional responses to music would have the same neural correlates as those observed in response to emotions induced by other modalities. However, although there is an emerging picture of the relationship between induced emotions and brain activity, there is a need for further refinement and exploration of neural correlates of emotional responses induced by music (Archi Banerjee, Shankha Sanyal, Ranjan Sengupta, Dipak Ghosh, 2015).

History of Classical music

The music is dominant mood enhancer. Thus, most often people listen to music since early in the morning till late night. Indian Classical Music is the soul of every music. Classical Music greatly effects on brain activity; it may have a positive effect on hormone system that's why people feel relaxed after hearing the classical music. India has got the strong historical background of music. Archaeological studies and evidence too has validated the presence of music from the ancient time. The 'Samaveda' includes hymns and describes the Indian music. While discussing about the Indian Classical Music, the striking word comes "Raga". It is the very heart of Hindustani Classical Music. Shastra says every Raga impacts on the human body and mind. A Raga is characterized by its own particular 'Ras' or 'Mood'. (Ram K. Nawasalkar, & Pradeep K. Butey 2012).

It observed that while listening the music, brain parts are involved in processing music, this include the auditory cortex, frontal cortex, cerebral cortex and even the motor cortex. (Kristeva R, Chakarov V, Schulte-Monting J, Spreer J.,) Most of us listen music of choice during leisure time or while working / studying. Music can be used as a tool to relieve tension/ stress, solitude, it also enhances the listener's mood. (Lonsdale, A. J. & North, A. C.) These changes are reflected clearly in the physiological system for human.

Music intervention also has effects on the brain function resulting in neural network activation, and ultimately leads to activation of different regions of the brain if performed regularly (Schmithorst VJ, Holland SK, 2003). These effects also produce better physical and psychological function, and therefore have beneficial effects on stress responses; reducing anxiety, improving mood and lessening pain perception (Sacks O., 2006).

Mathematics and Music Connections

Numbers, patterns, proportions, and ratios are just some of the concepts that are mastered by both mathematicians and musicians. Great thinkers from ancient times to the present have seen and used these conceptual links. For example, Pythagoras, the Greek mathematician, used Mathematics to make sense of musical concepts as he developed his ideas on music theory. Boethius, the Middle Age music expert, articulated some of his musical ideas using Mathematics concepts. And who hasn’t heard about Einstein’s great love of music, which he said extraordinarily helpful to him in his work?

Studies focused on music for young children are also suggesting that Mathematics gains increase, according to the number of years that students engage in active music learning (Gardiner, 2000), with some indication that the younger children are when they begin music instruction, the greater the gains will be. Certain brain development research shows that the early years are a prime time to make strong connections along the associated neural pathways, with music exposure as a perfect entryway.

Attitude towards Mathematics:

One of the factors that affect students’ math achievement is students’ attitude. Finding out students’ attitude does not solve all problems. We should know the factors that affect our attitude. At that time we can manipulate/interfere the factors and as a result, we can change their attitude towards positive. Though it may affect our behavior, our attitude shows our tendencies, not directly our behavior. Attitude is generally defined by using some concepts such as our emotional content opinion, beliefs, prejudices, tendencies and evaluations (Kadhiravan & Balasubramanian, 1999). Attitude tendencies either positive or negative about a person or a behavior (Koballa, 1988) can be learned through either our observations or acquired knowledge (Shrigley, Koballa & Simpson, 1988) (cf, Nuholu, 2008).

Factors that affect students' attitudes towards math course positively

Those factors are related to connecting math topics with real life, using materials in teaching math, teachers' personality, teachers' content knowledge, teachers' classroom management and students' opinion about math courses. (Çigdem Yolmaza, Sadegul Akbaba Altunb , Sinan Olkunc)

Interest in Learning Mathematics

Learning mathematics has become a necessity for an individual's full development in today's complex society. Despite its utility and importance, mathematics is perceived by most pupils as difficult, boring, not very practical, and abstract, etc (Ignacio, Nieto & Barona, 2006). Therefore, students' low success level in mathematics has been a worry for a long time in many countries. There are a lot of factors affecting students' success in mathematics. One of these factors is their mathematical fears (Peker & Mirasyedio÷lu, 2008). One of the reasons for mathematical fears is attitude towards mathematics (Baloglu, 2001). It is generally believed that students' attitudes towards mathematics determine their mathematical success. A student's constant failure in mathematics and his/her mathematics anxiety can make him to believe that he can never do well on the subject thus accepting defeat. On the other hand, his successful experience can make him to develop a positive attitude towards learning mathematics (Biller, 1996; Akinsola & Olowojaiye, 2008). So, the importance of measuring students' attitudes increases every passing day in educational system (Gerçek & di 2006). In a teaching setting in which student’s attitudes are not considered, expected learning experiences become difficult and hence teaching activities are not precisely performed. Whereas, conducting teaching activities are the signs for students’ success in education. To achieve the expected student success, it is required to know students’ attitudes (Hançer & dig. 2007), because one of the objectives of elementary mathematics education is to get students improve affirmative attitudes towards mathematics, Determining how much students reached the educational objectives will be beneficial for assessing of the current education and, if there are needed, making some changes on it. Determining student attitudes which can be affected by different variables will be beneficial for remediation of students’ disregard, biases and learning difficulties about mathematics.

A lot of studies have been performed which have aimed at specified of attitudes both primary and secondary school levels (Aukar, 1986; Baykul, 1990; Altun, 1995; Guler, 1997; Peker & Mirasyedioglu, 2003; Yılmaz, 2006). But no study has been done to study the effectiveness of the transitional background music approach to make easy the teaching and learning process of mathematics. This prompted the researcher to make an attempt to study the effectiveness of teaching mathematics with the transitional background music approach on mathematical achievement, interest in learning mathematics and attitude towards mathematics among secondary school students.

5.2 Need and Importance of the Study

According to the NCFTE 2009 school education need to view learners as active participants in their own learning and not as mere recipients of knowledge, need to encourage their capacity to construct knowledge, ensure that learning shifts away from rote methods. Learning is to be viewed as a search for meaning out of personal experiences and knowledge generation as a continuously evolving process of reflective learning.

Mathematics is a compulsory subject at school level. If the students take interest in this subject then they can achieve better in Mathematics. But the fact is that there is more failure of students in Mathematics. For many people, mathematics is an enigma. Characterized by the impression of numbers and calculations taught at school, it is often accompanied by feelings of rejection and disinterest, and it is believed to be strictly rational, abstract, cold and soulless.

Interest is an abstraction, a psychological construct, affective in domain that explains the state of being, especially with regard to the well being of an individual. According to Downie (1958) Interests have been defined as one of the main aspect of learning situation. They are motivators of learning, without interest very little learning takes place in many individuals. Several educationists and education psychologists have claimed that individuals tend to do better at things which interest those most. Rammers and others (1965) discussed the bearing of interests on education and revealed that because interest motivates learning, they effect education. When pupils are interested, they work harder, longer and more effectively. Even Charles (1902) stressed the importance of interest in education saying - When students are animated by powerful interests, as for example in professional courses, they submit cheerfully to large amounts of study, but when they are dealing with system of ideas to which no vital interests are attached, they clamor for variety and light work.

However, there is no any research which has attempted to study the effectiveness of teaching mathematics with the transitional background music approach to determining and comparing how secondary school students' Achievement in mathematics, Interest in Learning Mathematics and Attitudes towards mathematics changes according to their levels of interest in Music and gender. If it is considered that education is a process which is deliberate, has goals and aimed to have students gain a positive behavioral change through this process in general, it is hoped that Achievement in mathematics, Interest in Learning Mathematics and attitudes towards mathematics of secondary school students positively improves through this process in all grade levels of secondary schools.

Hence, it is important to be conduct a study determining and comparing how secondary school students' Achievement in mathematics, Interest in Mathematics and attitudes towards mathematics changes according to grade levels in order to improve mathematics education. Therefore, the aim of this study is to find out the effectiveness of the teaching mathematics with transitional background music approach to determining and comparing how secondary school students' Achievement in mathematics, Interest in learning Mathematics and attitudes towards mathematics changes according to their levels of interest in Music and gender. Hence the researcher made an attempt to create interest in learning mathematics with an innovative approach through experimentation.

5.3 Review of Related Literature

The studies reviewed have been classified under five headings:

1. Studies related to Effectiveness of Music on Academic Achievement
2. Studies related to Mathematical Achievement
3. Studies related to Interest in Learning Mathematics
4. Studies related to Attitude towards Mathematics
5. Studies related to Constructivism Approach

5.3.1 Studies related to Effectiveness of Music on Academic Achievement:

The above studies conducted by Joyanta Sarkar and Utpal Bisvas (2015), Mathur A, Vijayakumar SH, Chakrabarti B and Singh NC (2015), Mamta Sharma. (2014) Angela Leea, Yen Huai Jena (2014), Jhalukpreya Surujlal (2013), Kimberlyn T. Tiu (2013), Ram K. Nawasalkar & Pradeep K. Butey (2012), American Music Therapy Association (2012), Susan Hallam (2010), Phillip M. Hash.,(2010), Mary S. Wagner (2008), Kevin N. White (2007), Michael Beer., (2005), Carlson (2004), Rauscher and Zupan (2000), and James S. Catterall, Richard Chapleau and John Iwanaga (1999) were showed that music is an effective tool to develop students' academic performance and some other positive behaviors like sight words recognition and reading comprehension, attitudes toward the brand and the advertisement, decreasing the frequency of agitated and aggressive behaviors, the development of social skills and can contribute to health and well-being throughout the lifespan, learning experience of children with intellectual disabilities, new insights into the emotional response, positive effects on the mind and brain of aggressive adolescents, and the development of a new perspective on cognitive musicology.

The studies conducted by Matthew A. Goldenberg., Anna H. L. Floyd & Anne Moyer (2013), Sibel Coban and Ilaya Dubaz (2011), Lutz Jäncke and Pascale Sandmann.,(2010), Lutz Jäncke and Pascale Sandmann.,(2010), De Groot, A. (2006), and Fioranelli (2001) concluded that there is no influence of music on verbal learning, vocabulary learning, test anxiety and exam performance and multiple intelligence.

5.3.2 Studies related to Mathematical Achievement

The above studies conducted by Song A. An & Daniel A. Tillman (2015), Deanne Kells (2012), Wendi M. Kappers (2009), Jeffrey Lynn Klunn, Daryl Erick Trent (2000), Schneider and Klots (2000), Amy Graziano, Matthew Peterson and Gorden Shaw, [1999], Hallman and price (1998), James Catterall (1997) showed that using music in the classroom is significantly effective to develop the mathematical achievement.

The studies conducted by Song Mike Manthei, Minneapolis & Steve N. Kelly (1997)and Attwell (1988) concluded that the Background music had no statistically significant effect on the mathematical achievement or attitude.

The study conducted by Wong Nguok Ling, Mohd Izam Ghazali (2016) studied that STAD cooperative learning techniques play important roles as an active pedagogy to increase Mathematics comprehension.

Orhun. N (2007) The results of this study suggest that there were differences among learning modes preferred by female and male students, their mathematical achievements, and their attitudes towards mathematics.

Aliya Khatun (2014). The findings of the study showed that achievement of boys in mathematics was higher than girls. No significant differences were found in mathematics achievement, according to the three different levels of family climate.

Tuncay Saritas & Omur Akdemir (2009). The results of this study suggest that instructional strategies and methods, teacher competency in math education, and motivation or concentration were the three most influential factors that should be considered in the design decisions.

5.3.3 Studies related to Interest in Learning Mathematics

From the Reviews on Interest in Learning Mathematics it can be concluded that, The study conducted by Gardner and Siek Toon Khoo (1988) reflects the main components of students' interest in learning mathematics.

Mihaela Voinea, Monica Purcaru (2014). This study described the constructivist approach is significantly effective on students' interest in learning mathematics.

Mary Ainley, Suzanne Hidi and Dagmar Berndorff Ontario (2002). The study focused that topic interest was related to affective response, affect to persistence, and persistence to learning. It also showed that student activities provided new insight into how interest influences learning.

Kamile Geist, Eugene A. Geist, and Kathleen Kuznik (2012) The study suggest that the listening to music helps interest in learning mathematics.

5.3.4 Studies related to Attitude towards Mathematics

The studies conducted by Song A. An, Gerald O. Kulm & Tingting Ma (2008) and Murat Tezer and Emine Kivanc (2012) showed that the mathematics lesson integrated with music had a positive effect on students' attitude and beliefs toward mathematics learning.

Maria de Lourdes Mata, Vera Monteiro & Francisco Peixoto (2012). This study concludes that motivation-related variables were the main predictors of attitudes towards mathematics and that teachers and the social support of peers are also highly significant in understanding these attitudes.

Rebecca Lazarides & Angela Ittel, (2012). this research emphasizes that attitudes and emotions toward mathematics should be enhanced through increased adaption of mathematics classroom instruction to students' different learning strategies and by considering students expectations and perceptions of instructional quality in classroom discussions.

Effandi Zakaria, Lu Chung Chin & Md. Yusoff Daud (2010). The results of this study showed that cooperative learning methods improve students' achievement in mathematics and attitude towards mathematics. Melek Demirel, Ipek Derman & Edibe Karagedik (2015). The study examined that there was a significant difference in favour of the male students in terms of their attitudes towards mathematics. Cigdem Arslan, Gunes Yavuz & Yasemin Deringol-Karatas (2014). The study concluded that there was a decrease in the level of “enjoyment” dimension as the grade level increased.

Maria Nicolaidou & George Philippou (2000). The study indicated significant relationship between attitudes and achievement and a stronger relationship between efficacy and achievement. Jenkins, Natalie, (2006). The action research examined that the need for gifted students to be shown important connections between mathematics and its utility outside the context of school academia.Muhammad Asif Tanveer , Muhammad Rizwan, Naeem Ali, Muhammad Arif, Umer Saleem, Shaheer Rizvi (2013); the study showed that gender is not having significant impact on attitude for mathematics, male are slightly better than female.

5.3.5 Studies related to Constructivism Approach

The studies conducted by Hala Abbas Laz and Karema Eid Shafei (2014), Panomporn Puacharearn and Darrell Fisher (2006), Gijbels, D., van de Watering, G., Dochy, F., & van den Bossche, P. (2006), Loyens, S. M. M., Rikers, R. M. J. P., & Schmidt, H. G. (2007), Shumaila Bhutto, Imran Umer Chhapra (2013), Dr. Rajendra Kumar Nayak (2006) and Susanta Roy Chowdhury (2016) were concluded that the constructivism learning approach is significantly effective than the traditional learning approach.

The study Olsen, Dwayne G. (1998) suggest that teachers and teacher educators can adopt the theory, principles, and pedagogy of constructivism on which to build their teaching and student learning. The researcher Roya Jafari Amineh and Hanieh Davatgari (2015) agrees with Vygotsky (1978) about cognitive growth from social to individual level, and considered on a continuum from social constructivism to constructivism.

5.4. Statement of the Problem

Keeping in mind the need and importance of the study researcher opted to conduct research on present study entitled as ***“Effectiveness of Teaching Mathematics with Transitional background music on Mathematical Achievement, Interest in learning Mathematics and Attitude towards Mathematics among secondary School Students.”***

5.5 Objectives of the Study

The Objectives of the present study are formulated as follows:

1. To study the effectiveness of Teaching Mathematics with Transitional background Music on Mathematical achievement among Secondary School Students.
2. To study the effectiveness of conventional approach on Mathematical achievement among Secondary School Students.
3. To find out the difference between the mean scores of post test of experimental and control groups with reference to Mathematical Achievement.
4. To study the effectiveness of Teaching Mathematics with Transitional background Music on Interest in learning Mathematics among Secondary School Students.
5. To study the effectiveness of Conventional Approach on Interest in learning Mathematics among Secondary School Students.
6. To find out the difference between the mean scores of post test of experimental and control groups with reference to Interest in learning Mathematics.
7. To study the effectiveness of Teaching Mathematics with Transitional background Music on Attitude towards Mathematics among Secondary School Students.

8. To study the effectiveness of Conventional Approach on Attitude towards Mathematics among Secondary School Students.
9. To find out the difference between the mean scores of post tests of experimental and control groups with reference to Attitude towards Mathematics.
10. To investigate the interaction between ‘Treatments’ and ‘Interest in music’ with reference to Mathematical achievement.
11. To investigate the interaction between ‘Treatments’ and ‘Interest in music’ with reference to Interest in learning Mathematics.
12. To investigate the interaction between ‘Treatments’ and ‘Interest in music’ with reference to Attitude towards learning Mathematics.
13. To investigate the interaction between ‘Treatments’ and ‘Gender’ with reference to Mathematical achievement.
14. To investigate the interaction between ‘Treatments’ and ‘Gender’ with reference to Interest in learning Mathematics.
15. To investigate the interaction between ‘Treatments’ and ‘Gender’ with reference to Attitude towards Mathematics.
16. To investigate whether the students sustain Mathematical achievement through the Teaching Mathematics with Transitional background Music approach.
17. To investigate whether the students sustain Interest in learning Mathematics through the Teaching Mathematics with Transitional background Music approach.
18. To investigate whether the students sustain Attitude towards Mathematics through the Teaching Mathematics with Transitional background Music approach.

5.6 Variables of the study

Keeping these objectives in view the following variables were considered for the study.

Independent Variables

In the present study, teaching approaches of mathematics are the independent variables.

1. Teaching mathematics with transitional background music approach
2. Conventional approach

Dependent variables

In the present study, dependent variables are

1. Mathematical achievement
2. Interest in learning mathematics
3. Attitude towards mathematics

Moderator Variables

1. Interest in music
2. Gender

5.7. Operational Definitions of Technical Terms used in the study:

- ***Teaching Mathematics with Transitional background music****;* It refers to the Classroom discourse of mathematics subject that is well designed grouping strategy chooses by the teacher for students' learning. It refers that teaching mathematics in 5 E model constructivism approach with background music of instrumental sounds which are based on Bhairavi and Hindola ragas.
- ***Conventional approach*****;** It also refers that the classrooms discourse of teaching mathematics in 5 E model constructivism approach without background music.

- ***Mathematical Achievement***; It refers to the progress achieved by 9th standard students during the particular teaching period in particular lessons in mathematic subject.
- ***Interest in learning mathematics***; The state of wanting to know about mathematics. It is the liking of the students to learn mathematics content and participate in mathematics activities, which is indicated by example, solving, studying and getting involved in mathematical activity as a leisure time pursuit.

- ***Attitude towards mathematics;*** It is a generalized attitude towards the universe of mathematics content and being measured in terms of its emotional content opinion, beliefs, prejudices, tendencies and evaluations. Attitude tendencies either positive or negative about a person or a behavior can be learned through either our observations or acquired knowledge of mathematics.

- ***Interest in music****;* The state of wanting to know about music. It is liking of the students ability to understand, and process sound, rhythm and patterns in sound. Listening to music, participate and getting involvement in musical activities.
- ***Gender;*** It is considered as one of the moderator variable in the present study. Gender refers to those biological distinctions, which differentiate boys from girls.

5.8. Hypotheses of the study

The hypotheses of the present study are formulated in the null form as follows;

1. There is no significant difference between the mean scores of pre-test and post-test in the Mathematical achievement of Secondary School Students those who learn through the Transitional background Music approach.

2. There is no significant difference between the mean scores of pre-test and post-test in Mathematical achievement of Secondary School Students those who learn through the conventional approach.
3. There is no significant difference between the mean scores of post tests of experimental and control groups with reference to Mathematical Achievement.
4. There is no significant difference between the mean scores of pre-test and post-test in Interest in learning Mathematics of Secondary School Students those who learn through the Transitional background Music approach.
5. There is no significant difference between the mean scores of pre-test and post-test in Interest in learning Mathematics of Secondary School Students those who learn through the Conventional Approach.
6. There is no significant difference between the mean scores of post tests of experimental and control groups with reference to Interest in learning Mathematics.
7. There is no significant difference between the mean scores of pre-test and post-test in Attitude towards Mathematics of Secondary School Students those who learn through the Transitional background Music approach.
8. There is no significant difference between the mean scores of pre-test and post-test in Attitude towards Mathematics of Secondary School Students those who learn through the Conventional Approach.
9. There is no significant difference between the mean scores of post tests of experimental and control groups with reference to Attitude towards Mathematics.
10. There is no interaction effect between ‘Treatments’ and ‘Interest in music’ with reference to mathematical achievement in secondary school students.
11. There is no interaction effect between ‘Treatments’ and ‘Interest in music’ with reference to interest in learning mathematics among secondary school students.

12. There is no interaction effect between ‘Treatments’ and ‘Interest in music’ with reference to Attitude towards mathematics in secondary school students.
13. There is no interaction effect between ‘Treatments’ and ‘Gender’ with reference to Mathematical achievement in secondary school students.
14. There is no interaction effect between ‘Treatments’ and ‘Gender’ with reference to Interest in learning mathematics among secondary school students.
15. There is no interaction effect between ‘Treatments’ and ‘Gender’ with reference to Attitude towards mathematics in secondary school students.
16. There is no significant difference between the immediate and delayed post-test scores of the experimental group with reference to Mathematical achievement among secondary school students.
17. There is no significant difference between the immediate and delayed post-test scores of the experimental group with reference to Interest in learning mathematics among secondary school students.
18. There is no significant difference between the immediate and delayed post-test scores of the experimental group with reference to Attitude towards mathematics in secondary school students.

5.9. Methodology

In the present study, experimental method of research was used. Experimental research describes a method of investigation to derive basic relationship among phenomenon under controlled conditions or more simply to identify the conditions underlying the occurrence of given phenomenon.

The present study is True experimental in nature and designed on the lines of parallel group, pre-test, posttest, experimental design, which is a type of True experimental design.

The layout is given below;

Group	Pre-test	Treatment	Post-test
Experimental	O_1	X_1	O_2
Control	O_1	X_2	O_2

5.10 Sampling Procedure:

The researcher selected the school, B.G.S. English Medium School, Jayapura, Koppa, which is convenient to conduct the experiment. There were three sections in the ninth standard, in that the researcher has randomly selected two (B and C) sections. 57 students in B section and 53 students in C section, from these numbers of students, the researcher conducted the Raven's Standard Progressive Matrices test to measure their intelligence. On the base of their intelligence the researcher has considered 30 students from each section and divided them as experimental group and a control group. In out of 110 students, 60 students were considered as sample of the study.

Random sampling technique was followed by considering some of the criteria in the study. The procedure of selection of the sample is as follows.

Selection of School

A suitable secondary school where the experiment could be conducted will be identified keeping the following facts in view.

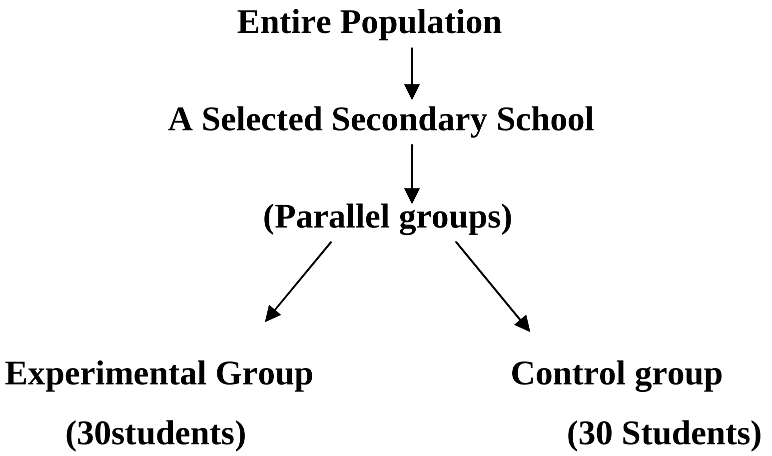
- The willing co-operation of the head of the institution and members of the staff.
- Co-education secondary school as sample needed both boys and girls students.
- Students' level of Intelligence and the level of interest in music are also considered.

Obtaining Two Parallel Groups

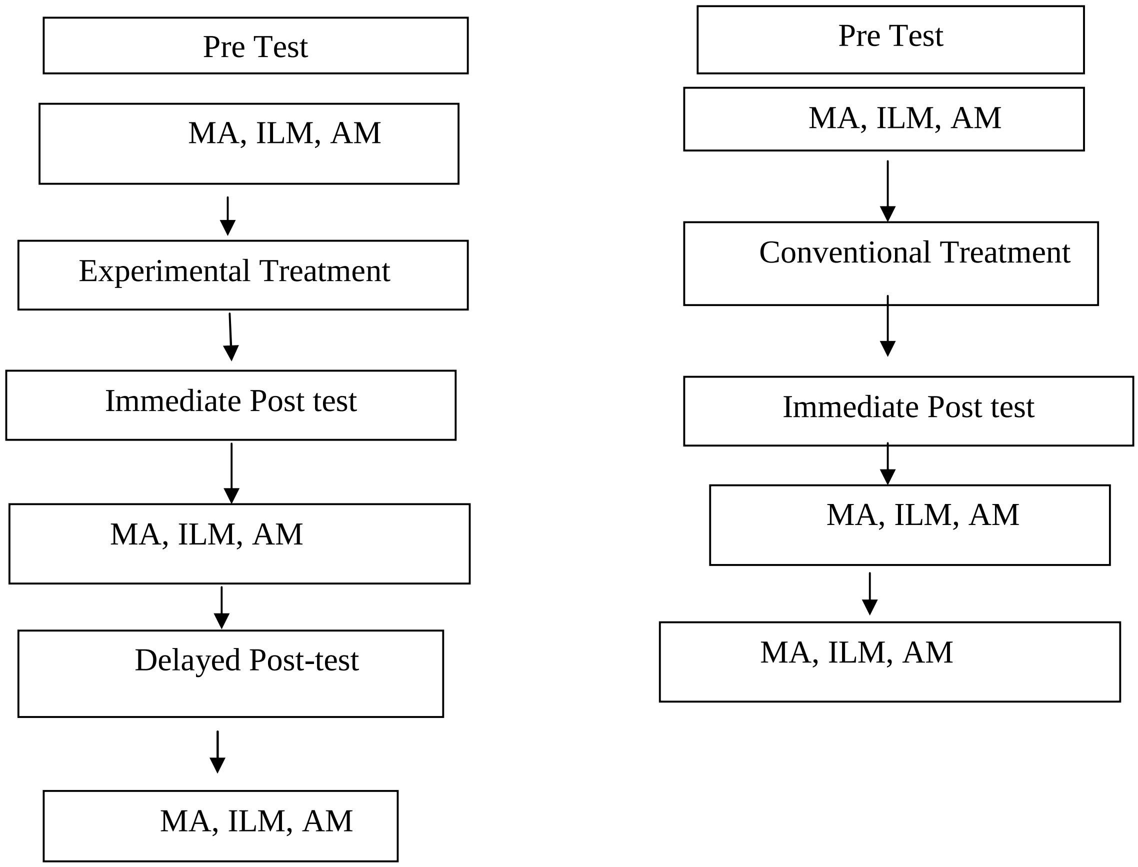
The equivalent group design would be ideal for experimentation.

Diagrammatic Representation of Sampling Procedure

Obtaining two parallel Groups



Schematic Representation of the Experimental Design



5.11. Teaching Mathematics with Transitional Background Music Approach:

The Transitional Background Music Approach was developed by the researcher. It is based on 5E model constructivism learning theory with Music. The researcher considered four lessons from the Karnataka State Board text book which were come to teach in the months of December to February (2016) in the Government school year plan. These topics were considered from all the three parts of mathematics. A lesson ‘Hire Purchase and Installment Buying’ is from arithmetic, ‘Simultaneous Linear Equations’ lesson is from algebra and ‘Circles’ and ‘Concurrency in Triangles’ lessons from Geometry.

After selecting the topics, by taking experts’ opinion about ragas the researcher has selected the two ragas, such as Bhairavi and Hindola. The raga Bhairavi is for beginning the lesson and raga Hindola is for the process or according to the activities of the lesson. The mathematical content was based on constructivism theory and the instrumental sounds based on Bhairavi and Hindola and these ragas were systematically arranged in the package. Seven to eight minutes of instrumental sounds were used in each period.

The instrumental music sounds were used according to the activities of the contents. It means the Bhairavi raga was using daily before starting the lesson to bring students’ moods towards the lesson and the Hindola was used while the students solving mathematical problems in their notebook or on the blackboard, while constructing geometry problems and sometime after asking questions.

Principles of 5E approach to Constructivist Learning:

This approach was introduced by Roger Bybee. The 5 Es are -Engage, Explore, Explain, Elaborate and Evaluate.

i. **Engage:** This stage assesses the previous knowledge of the learner and helps them become engaged in a new concept through the use of short activities that promote curiosity and elicit prior knowledge. The aim is to organize students' thinking toward the learning outcomes of the current activities.

ii. **Explore:** Expose the students to a variety of experiences at this stage. These experiences may involve observations of events or objects, manipulations of materials, work with simulations, examinations of representations, viewing a short video, or reading. These experiences provide a common basis for all students that the teacher can use to assist them in identifying and developing concepts and skills.

iii. **Explain:** Here students are provided with an opportunity to explain their understanding of their experiences from the explore phase. The questions and discussion lead students to patterns, regularities, and/or similarities, and prompt them to describe concepts or skills in their own words.

iv. **Elaborate:** The next phase challenges students to extend their understandings or skills and/or to practice them. Through new experiences at this time, students develop deeper understanding, an extended conceptual framework, and improved skills. Some of the tasks, such as reading an article, may be done as homework and discussed during the following class period.

v. **Evaluate:** The final phase of the instructional model encourages students to assess their understanding and abilities and provides opportunity for the teacher to evaluate student progress toward achieving the learning objectives for the activity. The tasks may involve writing summaries, applying concepts and skills to novel situations, constructing a concept map, or taking a quiz.

5.12. Tools used for the study:

The following tools were used for the study:

1. Raven's Standard Progressive Matrices (SPM): Is used to equate the groups

2. Attitude towards Mathematics: used as scale to measure the attitude towards mathematics of an individual.

   Constructed and Standardised by Ali Imam and Dr. Tahira Khatoon based on the components - usefulness of mathematics, confidence in learning mathematics and enjoyment of mathematics.

3. Interest in Learning Mathematics Scale – Constructed by the researcher to measure the interest in learning mathematics.

4. Interest in Music Scale- Constructed by the researcher to measure the interest in Music

5. Mathematical Achievement Test: - Constructed by the researcher to measure the Mathematical Achievement of IX standard students.

5.13. Statistical Techniques used

The ‘t’ test and ‘ANOVA’ statistical techniques were used to analyze the collected data.

The pre-test, and immediate post-test answer sheets obtained from the students of both experimental and control groups were scored as per the guidelines and scoring keys of each test. These obtained scores were tabulated and the gain scores between pre-test and post-test were computed. These scores were considered as raw scores for further statistical analysis.

I) ‘t’ test: ‘t’ test was used to know whether the experimental and control groups differ on the dependent variables initially, i.e., before applying the treatment. It was also used to know whether the immediate post-test and delayed post-test scores differ significantly with references to the dependent variables.

II) Two-Way Analysis of variance: The principle involved in the analysis of variance is the comparison of variability found within the groups. As two-way analysis of variance permits the simultaneous study of two factors as well as interaction between the two, this technique was used for the purpose of analysis of data.

Two way ANOVA factorial design was used

Group	Pre-Test	Treatment	Post-Test	Delayed Post-Test
Experimental Group (30)	MA,ILM, AM	Experimental Treatment	MA, ILM, AM	MA, ILM, AM
Control Group (30)	MA, ILM, AM	Conventional Treatment	MA, ILM, AM	

MA (Mathematical Achievement), ILM (Interest in Learning Mathematics) and AM (Attitude towards Mathematics).

5.14 Major findings of the study

1. There is a significant difference between the mean scores of pre-test (16.06) and post-test (28.26) in the mathematical achievement of Secondary School Students those who learnt through the Transitional background Music Approach. The research found that the Transitional background Music approach is an effective learning approach to develop the Academic Achievement among secondary school students.
2. There is a significant difference between the mean scores of pre-test (15.30) and post-test (17.83) in the mathematical achievement of Secondary School Students those who learnt through the Conventional approach. The research found that the Conventional approach is also an effective learning approach to develop the Academic Achievement among secondary school students.

3. There is a significant difference between the mean scores of post-tests in the mathematical achievement of Secondary School Students those who learnt through the Transitional background Music approach and Conventional approach. The research found that the Transitional background Music approach (28.26) is more effective than the Conventional approach (17.83) to develop the Mathematical Achievement among secondary school students.
4. There is a significant difference between the mean scores of pre-test (71.70) and post-test (80.80) in the Interest in Learning Mathematics of Secondary School Students those who learnt through the Transitional background Music approach. The research found that the Transitional background Music approach is an effective learning approach to develop the Interest in Learning Mathematics among secondary school students.
5. There is a significant difference between the mean scores of pre-test (68.10) and post-test (71.53) in the Interest in learning Mathematics of Secondary School Students those who learnt through the Conventional approach. The research found that the Conventional approach is also an effective learning approach to develop the Interest in learning Mathematics among secondary school students.
6. There is a significant difference between the mean scores of post-tests in the Interest in Learning Mathematics of Secondary School Students those who learning through the Transitional background Music approach (80.80) and the Conventional Approach (71.53). The research found that the Transitional background Music approach is more effective learning approach than the conventional approach to develop the Interest in Learning Mathematics among secondary school students.
7. There is a significant difference between the mean scores of pre-test (85.66) and post-test (93.00) in Attitude towards Mathematics of Secondary School Students those who learnt through the Transitional

background Music approach. Hence it may be concluded that the Transitional background Music approach is an effective approach to develop the Attitude towards Mathematics among Secondary School Students.

8. There is no significant difference between the mean scores of pre-test (79.43) and post-test (79.46) in Attitude towards Mathematics of Secondary School Students those who learnt through the Conventional approach. Hence it may be concluded that the conventional approach is not an effective approach to develop the Attitude towards Mathematics among Secondary School Students.
9. There is a significant difference between the mean scores of post-tests in the Attitude towards Mathematics of Secondary School Students those who learnt through the Transitional background Music approach (93.00) and the Conventional Approach (79.46). The research found that the Transitional background Music approach is more effective learning approach than the conventional approach to develop the Attitude towards Mathematics among secondary school students.
10. There is a main effect of Interest in Music in developing the mathematical achievement among secondary school students. ($F = 3.77 > 3.15$)

11. There is no interaction effect between Treatments and Interest in Music with reference to mathematical achievement among secondary school students ($F= 2.15 < 3.15$).

12. There is a main effect of Interest in Music in developing the Interest in Learning Mathematics among secondary school students. ($F = 3.22 > 3.15$)

13. There is no interaction effect between Treatments and Interest in Music with reference to Interest in Learning Mathematics among secondary school students ($F= 0.90 < 3.15$).

14. There is a main effect of Interest in Music in developing the Attitude towards Mathematics among secondary school students. ($F = 3.57 > 3.15$)

15. There is no interaction effect between Treatments and Interest in Music with reference to Attitude towards Mathematics among secondary school students ($F= 2.89 < 3.15$).

16. There is a main effect of Gender in developing the mathematical achievement among secondary school students. ($F = 19.84 > 3.15$)

17. There is an interaction effect between Treatments and Gender with reference to mathematical achievement among secondary school students ($F= 6.11 > 3.15$).

18. There is no main effect of Gender in developing the Interest in Learning Mathematics among secondary school students. ($F = 2.68 < 3.15$)

19. There is an interaction effect between Treatments and Gender with reference to Interest in Learning Mathematics among secondary school students ($F= 4.36 < 3.15$).

20. There is no main effect of Gender in developing the Attitude towards Mathematics among secondary school students. ($F = 2.35 < 3.15$)

21. There is no interaction effect between Treatments and Gender with reference to Attitude towards Mathematics among secondary school students ($F= 0.01 < 3.15$).

22. Immediate (28.26) and delayed post test scores (30.30) of experimental group differ significantly with reference to mathematical achievement (9.37). Therefore, it maybe concluded that mathematical achievement that is developed through Transitional background music approach was sustained by the secondary school students.
23. Immediate (80.80) and delayed post test (82.70) mean scores of experimental group differ significantly with reference to Interest in Learning Mathematics. (4.34). Therefore, it may be concluded that Interest in Learning Mathematics that is developed through Transitional background music approach was sustained by the secondary school students.
24. Immediate (93.00) and delayed post test (96.50) scores of experimental group differ significantly with reference to Attitude towards Mathematics. (4.24) Therefore, it may be concluded that Attitude towards Mathematics that is developed through Transitional background music approach was sustained by the secondary school students.

5.15. Discussions and Conclusion of the Study

In the field of education, the most serious problem is the increase in the number of failures in mathematics both at the primary and secondary school levels. The reasons for the failure rate at various examinations are many, but one of them is poor or ineffective teaching and learning methods. Learning mathematics has become a necessity for an individual's full development in today's complex society. Despite its utility and importance, mathematics is perceived by most pupils as difficult, boring, not very practical, and abstract, etc (Ignacio, Nieto & Barona, 2006). Therefore, students’ low success level in mathematics has been a worry for a long time in many countries. There are a lot of factors affecting students’ success in mathematics. One of these factors is their mathematical fears (Peker & Mirasyedio÷lu, 2008). The reasons for mathematical fears are attitude towards mathematics and low interest in learning mathematics.

Music plays an important role in patterning experiences at home and at school. Music activities and materials are excellent for promoting patterning and emergent mathematics (Geist & Geist 2008; Southgate & Roscigno 2009). Music keeps children engaged in a mathematical activity for long periods of time. Such experiences promote positive attitudes toward mathematics and support the construction of mathematical concepts in a developmentally appropriate way for infants and toddlers. Edelson and Johnson (2003) found that music enriches the mathematical learning environment for children because such activities are infused with a degree of pleasurable intensity, promote the fun of learning, and allow the child to be an active participant (Kamile Geist, Eugene A. Geist, and Kathleen Kuznik 2012).

The present study was undertaken with the intention to study the "Effectiveness of Teaching Mathematics with Transitional background music on Mathematical Achievement, Interest in learning Mathematics and Attitude towards Mathematics among secondary School Students".

As a result of this exposure, the experimental group showed a lot of improvement in their Mathematical Achievement, Interest in learning Mathematics and Attitude towards Mathematics . The results revealed that there was a significant difference in pre, post and post-delayed achievement test scores, interest in learning mathematics and attitude towards mathematics. Their success can be attributed to the teaching mathematics with the transitional background music approach.

5.16 Educational Implications of the study

1. The experiment conducted by the researcher reveals that the teaching mathematics with the transitional background music approach is significantly effective than the conventional approach in developing academic achievement in mathematics among secondary school students. Therefore the secondary schools can adopt the transitional background music approach for improving the academic achievement in mathematics.

2. It was found that the teaching mathematics with the transitional background music approach is significantly more effective than the conventional teaching method in developing Interest in learning mathematics among secondary school students. Therefore the schools can adopt the transitional background music approach for the development of Interest in learning mathematics.

3. It was found that the teaching mathematics with the transitional background music approach is significantly more effective than the conventional approach in developing Attitude towards Mathematics among secondary school students. Therefore the schools can adopt the transitional background music approach for the development of Attitude towards Mathematics.

4. The transitional background music approach was equally effective for all the three interest in music levels of students in developing academic achievement in mathematics, Interest in learning mathematics and Attitude towards mathematics. So they need not be segregated based on their interest in music levels in the classroom for this purpose.

5. The transitional background music approach was equally effective for both boys and girls in developing Attitude towards mathematics and

Interest in learning mathematics. Hence, boys and girls need not be segregated in the classroom on the basis of their gender in fostering the attitude towards the mathematics and interest in learning mathematics.

6. But in fostering the academic achievement in mathematics, the teaching mathematics with the transitional background music approach significantly differs on girls than boys. It means the girls are more benefited than the boys.
7. The mathematics teachers working in secondary school level can make use of the transitional background music approach in their mathematics classroom to attract the students towards the subject.
8. The mathematics teacher of secondary school level can make use of raga Bhairavi to bring out the students' mood towards the lesson and the raga Hindola for the process of the lesson to enhance their academic achievement, Interest and Attitude towards the mathematics.

5.17 Suggestions for the further study

1. The study showed that the teaching mathematics with the transitional background music approach is an effective teaching method than the conventional teaching method in developing academic achievement, Interest in learning mathematics, Attitude towards Mathematics. A study can be conducted to find out the effectiveness of the transitional background music approach to different subjects like social science, science and languages, and also on different levels viz., Primary and PU levels.
2. In the present study, the researcher has used two ragas such as Bhairavi and Hindola. Similar studies could be conducted on different ragas.

3. It was found that the teaching mathematics with the transitional background music approach was significantly more effective than the conventional teaching method in developing Interest in learning mathematics, Attitude towards Mathematics and Achievement in Mathematics among secondary school students. Hence the same approach can be used on different variables like self awareness, problem solving ability, creativity, decision making capacity, effective communication skill, self motivation towards to learn different subjects etc.

4. The study found that the girls are more benefited than the boys those who learnt through the teaching mathematics with transitional background music approach in fostering academic achievement. Hence the same approach can be used to develop different skills, especially for girls also a study can be conducted to find out the reason, how the girls were more benefited than the boys.

5. The researcher opines that, any teacher can easily adopt the approach to teach their subjects with Bhairavi and Hindola ragas. But a little awareness needed to use other ragas.

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APPENDIX-A

Evaluation of the package of 'Teaching Mathematics with Transitional Background Music'

Name of the Evaluator:——————————

Key;

5. To a very high degree

4. To a high degree

3. To a moderate degree

2. To a low degree

1. To a very low degree

Note: Please encircle the appropriate number to indicate your evaluation of each point.

In what extent do you feel that,

Constructivist Approach:

a) All the steps of 5E model of constructivist approach followed in each lesson

1. 2. 3. 4. 5.

b) All the lessons possess the necessary principles of constructivist approach with background music.

1. 2. 3. 4. 5.

c) The package of 'Teaching Mathematics with Transitional Background Music' is well organised.

1. 2. 3. 4. 5.

Content:

d) The objectives of each unit are achieved in the plan.

1. 2. 3. 4. 5.

e) The examples and explanation of each lesson are suitable in right stage.

1. 2. 3. 4. 5.

f) The package include all the four units of 9th standard mathematics

1. 2. 3. 4. 5.

g) The lessons motivate the students to learn mathematics.

1. 2. 3. 4. 5.

h) The concept of Mathematics with blended music is easy to understand by the students.

1. 2. 3. 4. 5.

Background Music:

i) The blended music in each lesson is in suitable place.

1. 2. 3. 4. 5.

j) The ragas (Bhairavi for motivation and raga hindola for the process) blended in the package are suitable.

1. 2. 3. 4. 5.

1. How would you evaluate the overall quality of the 'Teaching Mathematics with Transitional Background Music' package?
(Take into consideration of the constructive approach, Mathematics content and blended music, language structure and adopted learning principles and encircle any one of the following)

Superior, Excellent, Very good, Average, Poor

2. Make any other comments if you would feel appropriate to express your suggestion about the package.

Appendix -B

Unit: Hire Purchase and Installment Buying

Objectives; This helps the Students

1. To know the meaning of hire purchase and installment buying.
2. To know the differences between the hire purchase and installment buying.
3. To know the terminologies associated with hire purchase and installment buying.
4. To compute the formula to calculate the installment rate of installment buying.
5. To solve the problems by using formula.
6. To define down payment and cast price.

competencies	**Activities helps to learning**	**T.L.M. used**	**Evaluation**	
			Techniques	**Tools**
Engage	*[the teacher begins the class by playing music Bhairavri raga to motivate the students towards the lesson for three minutes]* Teacher by discussion create situation understand when consumer select the method of installment buying. For e.g.: Do you know the discount? Why the shopkeepers give discount? You want buy a washing machine, TV. etc., but you don't have that much of money? What are the ways you to buy that? One chance through lone. Another chance is with an agreement between owner and buyer, buyer can takes an article by paying some initial amount of its total cost. The balance amount is to be paid Periodically in installments.	*[Music playing Instruments]* Flash card	Discussion	Questioner sheet
Explore	Students define the installment buying and hire purchase	Flash card	Pupil teacher discussion	Questioner sheet

Explain	The cost of a cell phone is 8000 and the down payment is 1000. The balance amount is to be paid in 8equal installments of 1000 each find the rate of interest. The cost 8000 Down payment 1000 Balance ti pay 7000 No, of installments 8 Installments rate 1000 Total amount to be paid in installments 8x1000=8000 Interest= total paid- installment paid =8000-7000 =1000 Month principals 1 7000 2 6000 3 5000 4 4000 5 3000 6 2000 7 1000 8 ------- Total 28000 Therefore I= $\frac{PRT}{100}=\frac{28000XRX1}{100}$	Black Board *[While solving the problem the teacher plays hindola raga music for three to four minutes.]*	Pupil teacher discussion	Questioner sheet

	$1000\frac{28000X}{100}RX1$ $R=\frac{1000X100}{28000x1}x12$ =42.9			
Expand	The cost of a motor bike is 48.000. the company offers it in 30months of equal installments at 10% rate of interest find quantity of monthly installment.		Pupil- pupil discussion	Verification list
Evaluation	1. Define the installment buying. 2. Define the hire purchase. 3. A wash machine costs 10200rs. Cash down. It was bought by paying a down payment of Rs.2000 and the balance was agreed to be paid in 6 equal monthly installments of 15000rs. Find the rate of interest.	*[While solving the problem the teacher plays hindola raga music for three to four minutes.]*	Pupil teacher interaction	Verification list.
Engage	*[the teacher begins the class by playing music which is Bhairavri raga to motivate the students towards the lesson for three minutes]* List out the technical word you heard regarding about the system of purchase.	*[Music playing Instruments]*		

	Students can list out Customer, owner, seller, cash price, an article. Down payment, installment. Installment rate, rate of interest, monthly installment. Principal amount, balance etc.		Pupil -Pupil interaction.	Verification list.
Explore	Teacher helps the student to define the terminologies of the hire purchase and installment buying.			
Explain	Students can list out the differences of hire purchase and installment buying.			
Expand	Read the following problem and identify the technical words. Rakesh bought a bicycle from Ravi for the rate of 250000. But he gives only 50000 thousand at the time of buying and remaining he paid in installment 12000Rs. in 20m installments. Now who is the consumer, who is the owner, how much is the down payment, what is the installment rate? What is cash price? Calculate the interest. How much is balance?		Pupil teacher interaction	Verification list.
Evaluation	1. Define the terms cash price, Installment and down payment 2. List out the differences between hire purchase and installment buying			Verification list

Engage	*[the teacher begins the class by playing background music in Bhairavri raga to motivate the students towards the lesson for three minutes]*	*[Music playing Instruments]*	Pupil teacher interaction	Verification list
Explore	Define cash down payment, installment rate, interest etc.			
Explain	Explain the installment buying with an example. Now p is the principal I is the installment , n is the number of installment Month Principal 1^{st} month P 2^{nd} month P-I 3^{rd} month P-2I 4^{th} month P-3I .... nth month P-(n-1)I	Black Board *While solving the problem the teacher plays hindola raga for three to four minutes.*	Pupil teacher interaction Pupil	Verification list Questionnaire

Expand	nP-(1+2+3+...........+(n-1)I 1+2+3+..................(n-1)=$\frac{(n-1)n}{2}$ Thus monthly product is nP-$\frac{(n-1)n}{2}$ I the total interest levied in the scheme is $\frac{(np-\frac{(n-1)n}{2}I)xR}{12x1oo}$ but E=nI-P substituting we get 1200E=(n(nI-E)-$\frac{(n-1)n}{2}$xI)xR therefore R=$\frac{2400XE}{n((n+1)XI-2E)}$ The cost of a cell phone is Rs.8000 and the down payment is Rs.1000each. Find the rate of interest. Cost price=8000, down payment=1000Rs. Balance P=8000-1000=7000Rs. Number of installments n=8, installment amount=1000Rs. EI= nI-P=(8X1000)-7000=1000 R=$\frac{2400XE}{n((n+1)XI-2E)}$ R=$\frac{2400X1000}{8((8+1)X1000-2x1000)}$	*While solving the problem the teacher plays hindola raga for three to four minutes.*	individual interaction Pupil interaction Pupil interaction Pupil interaction Teacher pupil interaction	Questionnaire Questionnaire Questionnaire

Evaluation	$=\frac{2400X1000}{8((9000-2000)}$ $=\frac{2400X1000}{8X7000}=\frac{300}{7}=42.9$ 1. Define the terms down payment, installment rate. 2. The cost of motor bike is 48,000. The company offers it in 30 months of equal installments at 10% rate interest, Find the equated monthly installment.	*While solving the problem the teacher plays hindola raga for three to four minutes.*	Pupil teacher interaction	

Unit: Linear equations

Objectives; this helps the students

1. to define simultaneous linear equations
2. To list out the properties of simultaneous linear equations.
3. Able to give numberof examples for simultaneous linear equations.
4. to understand the substitution method of solving
5. Can able to solve linear simultaneous equation by elimination method.
6. Can able to solve linear simultaneous equation by evaluation of proportional value of variables.
7. To know the method of solving simultaneous equations by graphical method.
8. To know the applications of simultaneous linear equations.

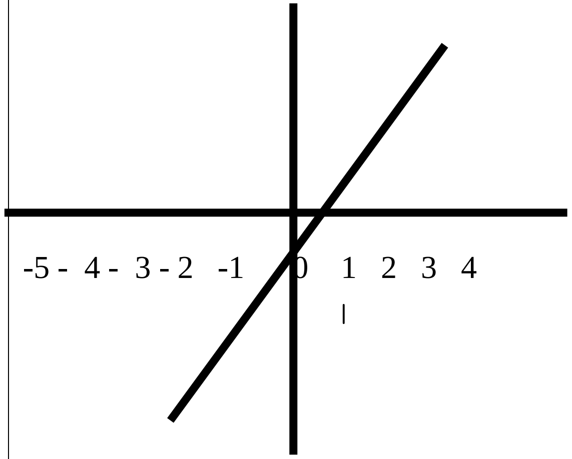
Steps	competencies	Activities helps to learning	T.L.M. used	Evaluation	
				Techniques	**Tools**
Engage		[*Teacher plays the background music to motivate them towards the class which is in Bhairavi raga for three minutes*.]	*[Music playing instruments.]*		
	definition of linear simultaneous equations,properties and examples	Consider the set of examples ; $X+4=10, 2y=20, x+y=4, p-2=8, p+q=10, a-b=2, y+2=8$ Separate the above equations. Set 1 set2 $X+4=10$ $x+y=4$ $2y=20$ $p+q=10$ $p-2=8$ $a-b=2$ $y+2=8$	Chart containing equations	Teacher pupil interaction	Observation list, Check list
Explore	Definition of linear equations	What are the differences between these sets? List out them. Students can able to tell first set of equations are linear equations with one variable. Consider $X+4=10$ solve for x $X=10-4=6$. Now solve $X+y=6$ it is not possible this is true for different set of values for x and y Now consider the other Relation between $x-y=2$ Now if we solve then $x=4$ and		Teacher pupil interactions	Questionnaire

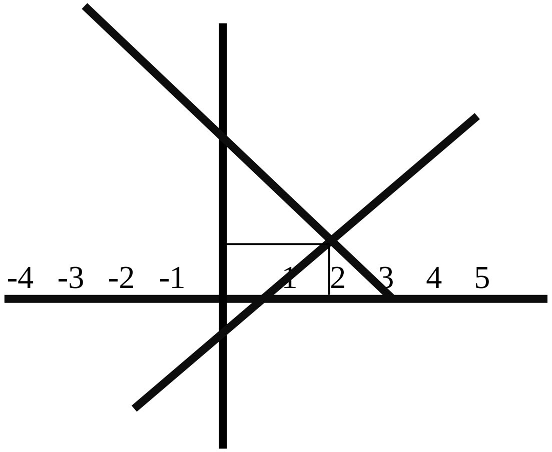
		y=2 are the only values. $X+y=6$ $X-y=2$ this is called simultaneous linear equation.			Questionnaires
Explain	Properties	Observe the above example and write the properties. • It contain two variables of degree 1 • It contains pair of equations. .general form of linear equations is $a_1x+b_1y=c_1$ $a_2+b_2y=c_2$	Chart	Group discussion	
Expand	Expression of verbal to equation form::	Rate of one pen and pencil is 15 rs. And the difference is 5Rs. Write the equation. Give this type of more situations. And express them as equations	Textbook, flash cards	Individual interaction	
Evaluation		1. Define the simultaneous equations 2. Write the general form of simultaneous equations 3. Give 5 examples for simultaneous equation 4. Write this statement in equation form. The sum of the ages of sun and daughter is 60 and difference is 25.	*While solving the problem the teacher plays hindola raga slowely for three to four minutes]*		Questionnaire

Engage	substitution method	*[Teacher plays the background music to motivate them towards the class which is in Bhairavi raga for three minutes.]* Each one of you give example for simultaneous equation	*[Music playing instruments.]*	Group discussion	
Explore	by inspection method	consider example by inspection method solve 1) X+Y=3, X-Y=1 2) X+Y=6,X-Y=10	Chart	Teacher pupil interaction	Questionnaire Problem chart
Explain	Substitution method of solving	Nowtry the above example by substitution method. X+y=3 ------(1) x-y=1--------(2) from (1) y=3-x substitute in (2) x-(3-x)=1, x-3+x=1,2x-3=1 2x=1+3,2x=4,x=4/2=2 Put x=2 in 1 , 2+y=3 Y=3-2=1 Therefore x=2 and y=1	*[While solving the problem, the teacher plays hindola music till the completion of the problem.]*	Interaction Discussion	check list Verification answer sheet
expand	verification	X+y=3 ------(1) x-y=1--------(2) here X=2,Y=1 then 2+1=3 2-1=1There fore verified.	Chart	Ppil pupil interaction Individual activity	Questionnaire
Evaluation	Solving problem	Solving the following problem by using substitution method. X+4=10,X-6=2,2X=10,$\frac{X}{2}=\frac{5}{2}$	*[Plays hindola music till solve the problem.]*	individual activity	Flash card

		1)X+2y,5x +6y 2)x+5y-6z and 5x-7y-4z Solve X+y=10-----(1) x-y=6-------(2) ----------------- Add 2x=16 then x=$\frac{16}{2}$ X=8 substituting x=8 in ---(1) X+y=10 8+y=10 Y=10-8=2	Textbook exercise block board	Individual activity Teacher pupil interaction	Evaluation sheet
		[Teacher plays the background music to motivate them towards the class which is in Bhairavi raga for three minutes.]	*[Music playing instruments.]*		
Engage	solve the linear problem	3x-4y=10-------------(1) x3			
Explore	adding of polynomials	5x-3y=24-------------(2)x4 9x-12y=30 20x-12y= 96 subtract -11x = -66 X=-66/-11 =6 substitute x=6 in any one of the above equation 3x-4y=10	Block board	Teacher interaction	Questionnaire
Explain		3x6-4y=10, 18-4y=10 -4y=10-18, y=-8/-4= 2			
	Solving by elimination method	Solve the fallowing by elimination method 1)5x-4y=-14 2) 3x+2y=5 3x+2y=-4 5x-4y=23	textbook	Pupil discussion	

		3) $3x+y=7$ $x-y=5$ 4) $3x+2y=1$ $2x+3y=4$			Questionnaire
Expand	Solving equation having different coefficient	Solve problems $x+y=10$ $x-y=12$ $3x+2y=5, 5x-4y=23$			Problem sheet
Evaluation	Problems	$3x+2y=4$-------(1) x7 $2x-3y=7$--------(2)x4 $21x+14y=28$ $8x -12y=28$by subtracting $13x+26y=0$ $x/26 = y/13 =k$ $x=-26k, y=13k$ $3x-26k+ 2x13k=4$ $-78k +26k =4$ $-52k=4$therefore $k=-4/52=-1/13$ Therefore $x=-26k =-26x-1/13 =$ $X=2$ $Y=13k=13x-1/13 =-1$ $3x+2y=4$ $3x2+2x-1 =6-2=4$ $2x-3y=2x4-3x-1=7$	*[While solving the problems the teacher plays hindola raga]* Textbook	Discussion Discussion	Questionnaire
Engage	Problems	*[Teacher plays the background music to motivate them towards the class which is in Bhairavi raga for three minutes.]*	*[Music playing instruments.]*	discussion	Value sheet
explore	Solve elimination method	Solve 1) $3x+y=7,x-y=5$ 2) $3x+2y=1,2x+3y=4$			

<table>
<tr><td>Explain</td><td>Solving of problem by evaluating proportional values</td><td>If y=3x then complete the table
<table>
<tr><td>x</td><td>-2</td><td>-1</td><td>0</td><td>1</td><td>2</td></tr>
<tr><td>y</td><td>-6</td><td>-3</td><td>0</td><td>3</td><td>6</td></tr>
</table>
By using above values draw graph

</td><td>Block board</td><td>discussion
pupil discussion
discussion</td><td>Questionnaire
Questionnaire</td></tr>
<tr><td>Expand</td><td>Verification</td><td></td><td></td><td>Discussion</td><td></td></tr>
<tr><td>evaluation</td><td>Problems</td><td></td><td>Ppt</td><td></td><td>Questionnaire</td></tr>
<tr><td>Engage</td><td>To solve simultaneous equation graphically</td><td><i>[Teacher plays the background music to motivate them towards the class which is in Bhairavi raga for three minutes.]</i></td><td><i>[Music playing instruments.]</i></td><td>Discussion</td><td></td></tr>
<tr><td>Explore</td><td>Graph of linear</td><td></td><td>graph sheet</td><td></td><td></td></tr>
</table>

<table>
<tr><td></td><td>equations</td><td>X+y=3 and x-y =1 construct a value table</td><td></td><td>Discussion</td><td></td></tr>
<tr><td>**Explain**</td><td>To find the values</td><td><table><tr><td>x</td><td>-2</td><td>-1</td><td>0</td><td>1</td><td>2</td></tr><tr><td>Y=3-x</td><td>5</td><td>4</td><td>3</td><td>2</td><td>1</td></tr></table>
<table><tr><td>x</td><td>-2</td><td>-1</td><td>0</td><td>1</td><td>2</td></tr><tr><td>Y=x-1</td><td>-3</td><td>-2</td><td>-1</td><td>0</td><td>1</td></tr></table></td><td>*[Teacher plays raga hindola till complete the graphical work]*</td><td>Individual interaction</td><td>Questionnaire</td></tr>
<tr><td>**Expand**</td><td>By using calculated values of the table draw the graph</td><td>
</td><td>Graph sheet</td><td>Individual interaction</td><td></td></tr>
<tr><td>**Evaluation**</td><td>Solve graphically</td><td>1)x+y=7,2x-3y=9, 2)2x+y=6,x-2y=-2

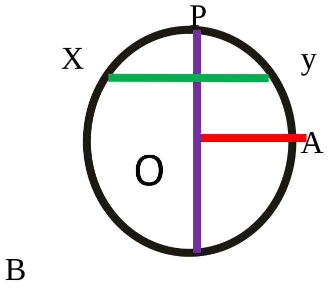
Express the following in equation form.
1) if four is added to six then the sum is 10.
2)if two times of a number added to 3 then the sum is 15</td><td>Graph sheet</td><td></td><td></td></tr>
</table>

Engage	to solve verbal problems	*[Teacher plays the background music to motivate them towards the class which is in Bhairavi raga for three minutes.]*	*[Music playing instruments.]*	interaction	
Explore	Solving problems	Solve these problems 1) X+y=10,x-y=6 2) 2x+3y=3, 3x-y=10			Questionnaire
Explain	To solve verbal problems	Eg: Sum of the rate of pen and pencil is 15 and difference is 5 find the rates. Let the rate of pen be X Rs. And the rate of pencil is YRs. Then X+Y=15 X-y=5 X+Y=15 X-Y= 5 Add 2X= 10 then X=20/2 =10	Block board		
Expand	To solvethe problem in any one of the method	Substitute value of x in any one of the equation. X+Y=15 10+y=15, y=15-10=5 Therefore the rate of a pen is 10Rs. And Pencil is 5 Rs.	*Teacher plays raga hindola till complete the work*		
Evaluation	Exercise problems	A father is 25 years older than his son after 8 years the ratio of their ages will be 13:8. Find their present ages.			

Unit: Circles

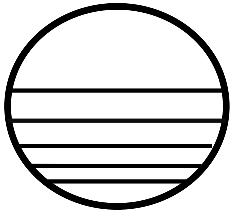
Objectives; this helps the students

1. To identify the center, radius, chord, diameter, segment, arc, circumference of a circle.
2. To define the center, radius, chord, diameter, segment, arc, circumference of a circle.
3. To define secant, concentric circles, congruent circles. Intersecting circles.
4. To understand the perpendicular drawn to the chord from the center of circle bisects the chord
5. To understand the line joining the center of a circle and the midpoint of a chord of the circle is perpendicular to the chord.
6. To understand the relation between the chord, radius and the distance between the chord and the center of the circle.
7. To conclude equal chords in a circle is equidistant from the centre.
8. To conclude and to prove the angle at the centre is twice of the angle at the circumference of a circle.
9. To conclude and to prove the angle in semicircle is a right angle.
10. To conclude the angle in the same segment are equal, the angle in a minor segment is an obtuse angle and the angle in a major segment is an acute angle.
11. To define cyclic quadrilateral, to understand the properties of cyclic quadrilaterals.
12. To construct the cyclic quadrilateral.
13. To develop the knowledge to solve the proble
14. ms on the above concepts

Steps	**Competencies**	**Activities helps to learning**	**TLM. used**	**Evaluation**	
		[Teacher begins the lesson with playing background music for three minutes which is in bhairavi raga.]		Techniques	Tools
Engage	To identify the different terminals of circles.	 Identify the radius, chord and diameter of the circle. Activity 2: by using geo board identify the radius, chords and diameter of the circle . Activity 3: by using thread bind the circumference of circle.	circular geoboard and rubber bands. Charts	Group discussion	Observation sheet. Questioners sheet.
Explore	To define the different terminals about circles	By using above activities try get answers to the following questions. 1. Define circle. 2. Define centre of the circle. 3. Define the circumference of a circle. 4. Define radius of a circle. 5. Define radius, chord, and diameter.	Drawing sheet, scissors, sketch pens etc.	Interaction Group interaction	Questionnaires sheet Activity sheet

<table>
<tr>
<td>Explain

Expand</td>
<td>To understand different properties of circles

To solve the problems by using. the knowledge getting</td>
<td>Activity:1. Draw a circle. Construct 10 radii, measure them. What is conclusion? How many radius can be drawn to a circle?
Activity 2: Take paper, cut a circle shape. Fold the paper in the middle. That is diameter. Now again fold once more you will get radius compare the radius and diameter, what is the relation between them.
How many diameters can be drawn?
Activity 3: take a paper and cut a circle shape and goes folding on as show in the figure until to get diameter, what is your conclusion.

1,What is the length of the largest chord can be drawn in a circle of 5cm, radius.
1. Draw a circle of 5cm,4cm, and 6cm radius circles measure d and c
<table>
<tr><td>Sl, no.</td><td>D</td><td>c</td></tr>
<tr><td>1</td><td></td><td></td></tr>
<tr><td>2</td><td></td><td></td></tr>
<tr><td>3</td><td></td><td></td></tr>
</table>
Compare d and c what is your conclusion.</td>
<td>*Teacher plays bhairavi raga till the end of each activity.*

Chart

While drawing, plays hindola raga.</td>
<td>Interaction

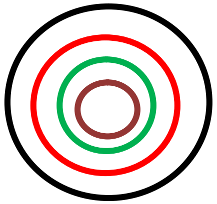
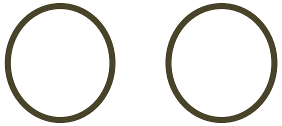
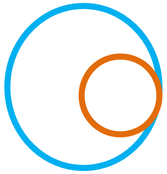
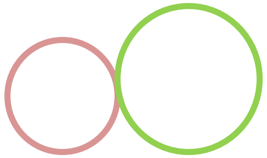
Pupil teacher interaction

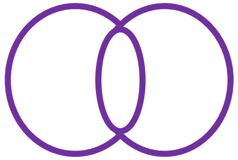
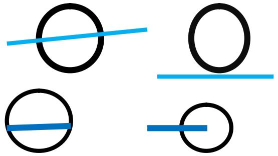
Individual activity

Group activity</td>
<td>Observation sheet

Analysis sheet

Activity sheet</td>
</tr>
</table>

Evaluation	To evaluate the above knowledge	1. Draw a circle of 4c.m. radius and identify the radius, chord, diameter, arc 2. Define the radius ,chord, diameter, arc of a circle 3. Prepare model of circle shape shows the center, radius, chord etc	charts	Group activity	Observation sheet
Engage	To know the chord, secant, tangent of a circle, to get the idea of the concept of concentric, congruent circles. touching circles,intersecting circles	*[Teacher begins the lesson with playing background music for three minutes which is in bhairavi raga.]* Figure 1;  Fig2:  Fig3:   Fig:4	*[Music playing instruments.]* Charts	Group activity	Analysis sheet

Explore	To identify congruent circles, concentric circles etc	Fig5  Set 2:  Observe the fallowing set of figures. Differences..... Activity 2: 1. Draw a line having the length of AB=4cm. construct circles of 2cm radius at A and B 2. Draw a line having the length of AB=4cm. construct circles of 3cm radius at A and B 3.. Draw a line having the length of AB=4cm. construct circles of 1,5cm radius at A and B 4. Draw a line having the length of AB=2cm. construct circles of 3cm and 1cm,radius at A and B	*[Teacher plays music which is in hindola raga till the end of each drawing.]*	Teacher pupil interaction	
Explain	To explain the important inferences about the above.	From the above activity identify the concentric circles, congruent circles, touching circles and intersecting circles, secant of a circle etc		Group activity	

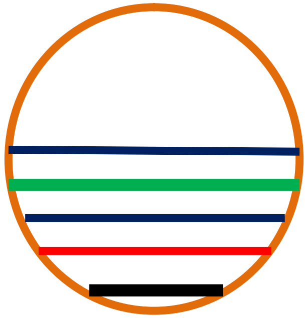
<table>
<tr>
<td>Expand

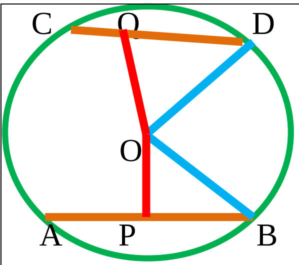
Evaluation</td>
<td>To construct the concentric circle…

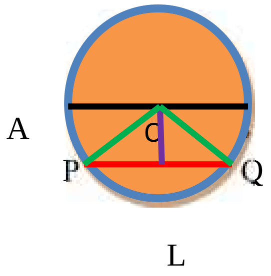
To evaluate the above acquire knowledge.</td>
<td>Activity Draw 4 circles of having radius 3cm, measure the following and complete the table.
<table>
<tr><td>Sl. No,</td><td>R</td><td>d</td><td>c</td></tr>
<tr><td>1</td><td></td><td></td><td></td></tr>
<tr><td>2</td><td></td><td></td><td></td></tr>
<tr><td>3</td><td></td><td></td><td></td></tr>
<tr><td>4</td><td></td><td></td><td></td></tr>
</table>
.what is your conclusion?
Activity 2: Draw a circle of radius and draw 4 straight lines
<table>
<tr><td>Sl, no,</td><td>Number of intersecting points</td></tr>
<tr><td>1</td><td></td></tr>
<tr><td>2</td><td></td></tr>
<tr><td>3</td><td></td></tr>
<tr><td>4</td><td></td></tr>
</table>
What is your conclusion?
1. From the centre o construct circles of having radius 3cm,4cm,5cm, and 6cm,
2.construct 3 circles having radius of 5c.m at centers,
3. Write the differences between concentric and congruent circles.</td>
<td><i>[While constructing circle, plays hindola raga]</i></td>
<td>Individual activity

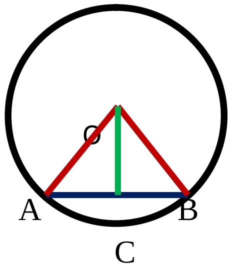
Individual activity</td>
<td>Observation sheet

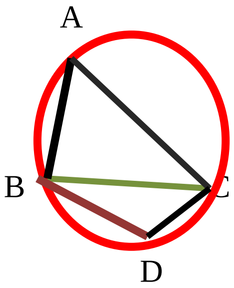
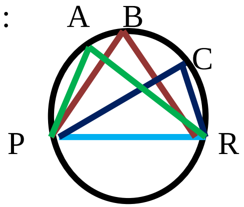
Observation sheet</td>
</tr>
</table>

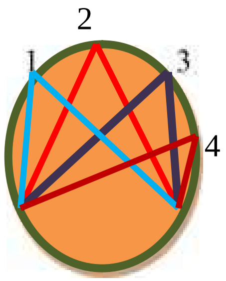
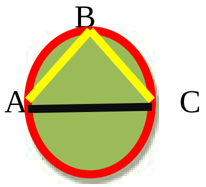
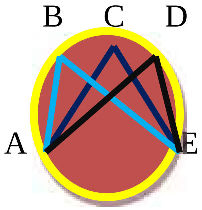
Engage	To identify the properties of the Chords.	*[Teacher begins the lesson with playing background music for three minutes which is in bhairavi raga.]* .1. Define congruent and concentric circles. 2. Define secant. 3. A line which cut circles at two distinct place is called------- 4. If 4cm and 5cm radius circles touches externally then the distance between the centre is----------	Activity sheet		Analysis sheet
Explore	To state properties of chords.	Fig 1: Draw a circle and draw the diameter and chords as shown. Measure them 	*[While drawing and preparing the model of circle, plays raga hindola till the end of activity.]* Drawing sheet markers scale etc.	Individual Activity	
Explain	To prove that the	Activity 1: take a paper and cut circle shape. Fold on diameter and continue folding and then draw the different chords and measure them Activity:2 by using geo board, and rubber bends join different nails and measure them By observing the above activity what is your conclusion?	Circular geo board, rubber bands etc.	Individual activity	Activity sheet

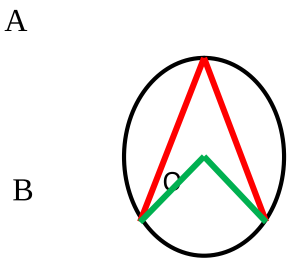
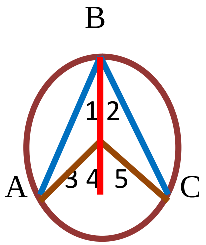
Expand	To prove the converse of the above property and other problems	 Given: A circle with centre O, chords AB and CD such that AB=CD, Draw $OP\perp AB$ and $OQ\perp CD$ To Prove: OP=OQ Construction: Join OB and CD. Proof: AP=PB, and CQ=QD hence PB=$\frac{1}{2}$AB and QD=$\frac{1}{2}$ CD Since AB=CD (given) we get PB=QD, in Δ OPB and Δ OQD $\angle OPB = \angle OQD = 90^0$ OB=OD(radii of a circle) PB=QD(proved) Δ OPB ≡Δ OQD(RHS axiom) OP=OQ Hence Chords in a circle are equidistant from the centre	Ppt about Properties of Chords.	Pupil teacher interaction	Check list
Evaluation	To evaluate the above knowledge	1.Prove that if two chords of a circle are equidistant from the centre of the circle are having same length. 2. Two chords of a circle are unequal length. Prove that the chord of larger length is nearer to the centre than the chord of smaller length.			

Engage	To identify the relation between the length of the chord, radius and distance of the centre.	*[Teacher begins the lesson with playing background music for three minutes which is in bhairavi raga.]* 1. The longest chord is -------- 2. The distance between the centre and the longest chord is--- 3. As the length of the chord increases then chords are moves away from the ----- 4. As the distance between the centre and the chord decreases then it moves ------ from the centre. 5. If AB=8cm, CD=6cm, EF=3cm are the chords in circle. Which one is the closest to the centre?	*[Music playing instruments.]* Chart	Individual activity	Observation sheet
Explore	To define the formula between r, l and d			Individual activity	
Explain	To prove the above result theoretically i.e.,The perpendicular drawn to the chord from the circle bisects the chord.	1.Draw the figure as above and measure chord, radius and the distance between the centre and the chord .and find r^2 and d^2 and l^2 where r is radius ,d is the centre and l is the length. What is your conclusion?	circular Geo board, thread ,scale etc.,		Questionnaire sheet

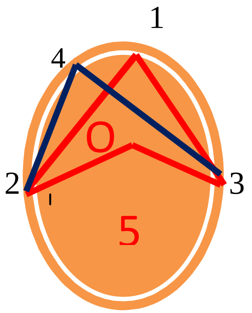
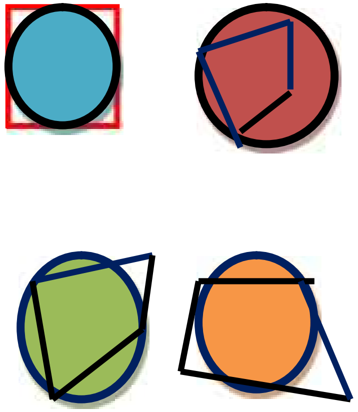
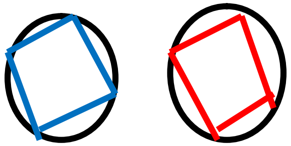
Expand	To expand the above know ledge to prove converse of the theorem	 Write given: A chord AB of a circle with centre o.oc ⊥AB To prove: AC=CB Constructions: OA and OB are joined. Proof: In ΔOCA and ΔOCB OA=OB(HYP) ∠OCA=∠OCB =90^0 OC=OC(common) ΔOCA ≡ ΔOCB (RHS axiom) Therefore AC=BC(corresponding sides of congruent triangles)	Circular geo board ,story book in mathematics	Individual activity	Questionnaire sheet
Evaluation	To evaluate the above knowledge.	1.line joining the centre of a circle and the midpoint of a chord of the circle is perpendicular to the chord. 2.Prove that $r^2=l^2+d^2$ if r is radius ,l is the half length of the chord and d is the distance between them.	*While solving the problem plays bhairavi raga till complete the work.*		

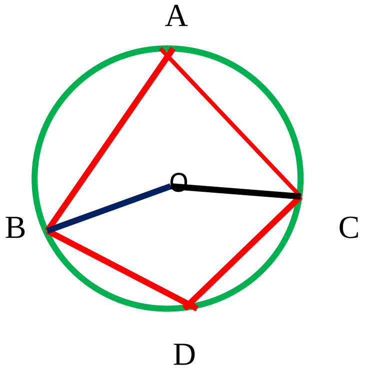
Engage Explore Explain	To identify the angle made by the different segment of a circle. To obtain the conclusion about the above activities To get the relation between angle in segments of a circle	*[Teacher begins the lesson with playing background music for three minutes which is in bhairavi raga.]* 1.If two circles intersect at two distinct points ,prove that the line through their centers is the perpendicular bisector of their common chord. Find the radius of the circle if the length of chord is 8c.m. and the distance between the chord and centre is 3c.m. Fig1:  Write these figures and measure the angles Activity2: By using model do the same activity. By the conclusions of the above activity. Define major segment ,semi segment ,minor segment . Fig 2: 	*[Music playing instruments.]* Ppt. Models to show semi circle minor segment and major segment.	Group activity Teacher group interaction	Verification sheet Observation sheet Questioner sheet

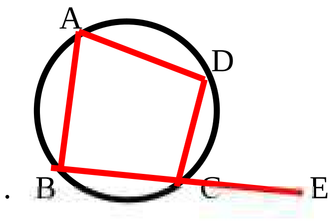
Expand Evaluation	Expansion of the above knowledge to solve the problem. To evaluate the knowledge of properties of segment angles	Fig3:  Conclusions to be expected the angle in minor segment is obtuse, an angle in major segment is acute, the angle in semi circle is right angle , the angles in same segments are equal. 1.  If AC is diameter AB=BC then find angle BAC and ACB 2.  If the angle ABE=70^0,then the angle ADE= ? 1. The angle in minor segment is ---------- 2. The angle in major segment is ----------- 3. The angle in semi circle is------------ 4. The angles formed by a same arc are-------- 5. The angles in semi circle is-------	models Model of circular geoboard chart about list of the problems	Teacher pupil interaction Individual activity	Questionnaire sheet Analysis

<table>
<tr><td>Engage</td><td>To identify the relation between centre angle and angle on circumference of a circle.</td><td>Teacher begins the lesson with playing background music for three minutes which is in bhairavi raga.
 </td><td>Geo board Model</td><td>Group activity</td><td>sheet</td></tr>
<tr><td>Explore</td><td>To Compare the values and come to the conclusion that centre angle=2 circumference angle</td><td>Write the four figures as like the above
<table><tr><td>sl. No.</td><td>Centre angle</td><td>Circumference angle</td><td>2xcircumference angle</td></tr><tr><td>1</td><td></td><td></td><td></td></tr><tr><td>2</td><td></td><td></td><td></td></tr><tr><td>3</td><td></td><td></td><td></td></tr><tr><td>4</td><td></td><td></td><td></td></tr></table>
What is your conclusion?</td><td>Ppt which showing table</td><td></td><td>Activity sheet</td></tr>
<tr><td>Explain</td><td>To Prove theoretically</td><td> </td><td>Ppt of the Theorem</td><td>Group activity
Teacher pupil interaction</td><td>Verification sheet</td></tr>
<tr><td>Expand</td><td>To solve the</td><td>Given: A circle with centre O, AOC centre angle and ABC is an angle on circumference</td><td></td><td></td><td></td></tr>
</table>

Evaluation	above problem To evaluate the knowledge of above concept	To prove: $\angle AOc=2\angle ACB$ Construction: CO and Produce it to a suitable point D To Proof:OA=OB=OC $\angle 3=\angle 1=\angle 2=\angle 4$ Therefore $\angle 4=\angle 1+\angle 3$ Or $\angle 4=\angle 1+\angle 1$ $\angle 4=2\angle 1$-------(1) $\angle 5=\angle 2+\angle 6$ $\angle 5=\angle 2+\angle 2$ $\angle 5=2\angle 2$----------(2) Add 1 and 2 $\angle 4+\angle 6=2\angle 1+2\angle 2$ $\angle AOC=2\angle ACB$ Prove that angle in semicircle is a right angle. Prove that an angle in minor segment is obtuse.		Group interaction Individual activity	Observation sheet Questioners sheet
Engage	To identify cyclic quadrilateral	*Teacher begins the lesson with playing background music for three minutes which is in bhairavi raga.* 1,Prove that angle in semicircle is a right angle. 2.find the angles in the figure.	*[Music playing instruments.]*		Questionary sheet

Explore	To identify the special future of cyclic quadrilateral		charts	Individual activity	Directionary sheet
		If angle 4 is 70^0 find angle 1 and 5 Set of figures 1  Set 2: 	*[Plays hindola music while constructing]*.	Group activity	Practical's sheet

Explain	To define the cyclic quadrilateral, and to state the prosperities quadrilateral	Write the figure as above and measure all the four angles, add opposite angles and compare them. Using geo board model and repeat the same what is conclusion? 1 Define cyclic quadrilateral. 2.Both pair of opposite angles of cyclic quadrilateral are supplementary	Circular geoboard.	Individual activity	Observation sheet
Expand	To prove in cyclic quadrilateral the opposite angles are supplementary	 Given: A circle with centre O and a cyclic quadrilateral ABCD. To Prove: $\angle A + \angle C$=180 $\angle C + \angle D$=180 Construction: join AO and CO Proof:$2\angle BAC$ =$accute\ \angle BOC \ ----(1)$ $2\angle BDC$ =obtuse $\angle BOC \ ----(2)$ ADD 1 and 2	Ppt Model to show the thereom	Teacher pupil interaction Teacher pupil interaction	Observation sheet Questionary sheet

	To prove next theorem by using above knowledge	$2\angle$ AC $+ 2\angle BDC =$ acute $\angle BOC$ + obtuse $\angle BOC$ $2(\angle BAC + \angle BDC) =$ complete $\angle BOC + \angle BOC$ Prove that when one side of a cyclic quadrilateral is produced, the exterior angles so formed is equal to the interior opposite angle.	Ppt	Teacher pupil interaction	Verification sheet
Evaluation	To evaluate the above knowledge	1.Define cyclic quadrilateral. 2. in cyclic quadrilateral PQRS ANGLE P is 60^0 then find angle R. 3. in cyclic quadrilateral ABCD $\angle A = 2x \angle c = 3x$ Then find x and angle A and B 4.  If $\angle BAD = 70^0$, $\angle DCR = ?$	Drawing sheets, sketch pens, protractor etc *[Music playing*	Individual activity Individual activity	Analysis sheet Observation sheet

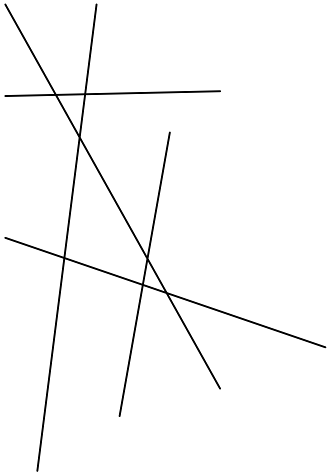
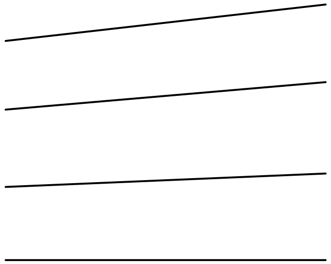
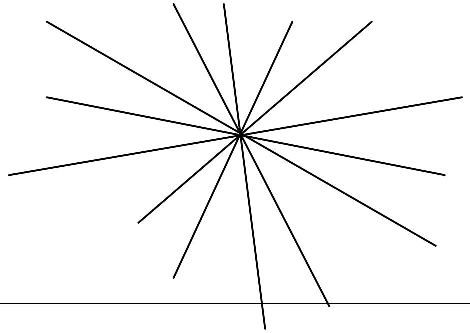
			instruments.]		
Engage	To construct the cyclic quadrilateral	*[Teacher begins the lesson with playing background music for three minutes which is in bhairavi raga.]* Recall and right to the fallowing what is perpendicular bisector, draw 10cm straight line and construct a perpendicular bisector.		Group interaction	Conclusion sheet
Explore	To develop the knowledge to construct circumference	Construct a triangle AB=7cm,BC=6cm and CA=8cm and construct a circumcentre.	Drawing sheets, sketch pens, protractor etc	Teacher pupil interaction	Questioners sheet
Explain	To explain the steps to construct cyclic quadrilateral	To construct a cyclic quadrilateral ABCD given AB=3cm,BC=6cm,AC=6cm, and AD=2cm. Steps: Draw a segment AB=3cm. 2.with B as centre Draw an arc of radius 6cm. 3.With A as centre ,draw another arc of radius 6cm to cut the previous arc in C. 4. Construct the circum circle of the triangle ABC 5. With A as centre and radius 2cm. draw an arc to cut the circum circle at D. 6. Join AD and CD.	*[While constructing the cyclic quadrilateral, the teacher plays hindola music till the end of construction]*	Teacher pupil interaction Individual activity.	Analysis shee

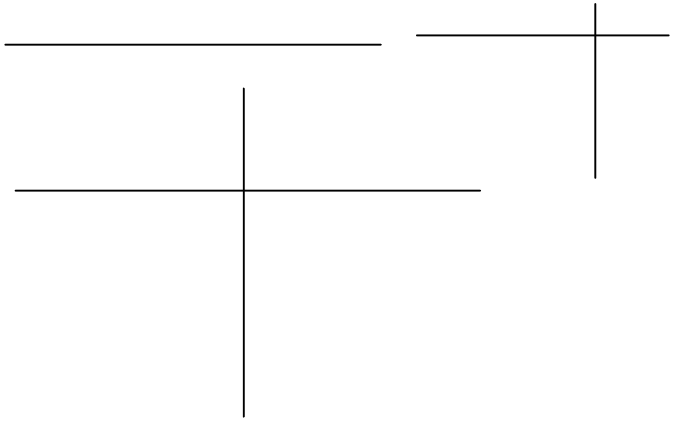
		Then the quadrilateral ABCD is the required cyclic quadrilateral.			
Expand	To expand the knowledge to construct a regular pentagon.	Construct a regular pentagon in a circle of radius 5c.m.	*[Plays hindola music while constructing]*.		
Evaluation	To evaluate the developed above knowledge	1. Construct cyclic quadrilateral of AB=4cm. BC=5cm CD=3cm. and angle B=105^0 2. Construct a square in a circle of radius 5cm. 3. Construct a regular hexagon in circle of radius 6cm.			

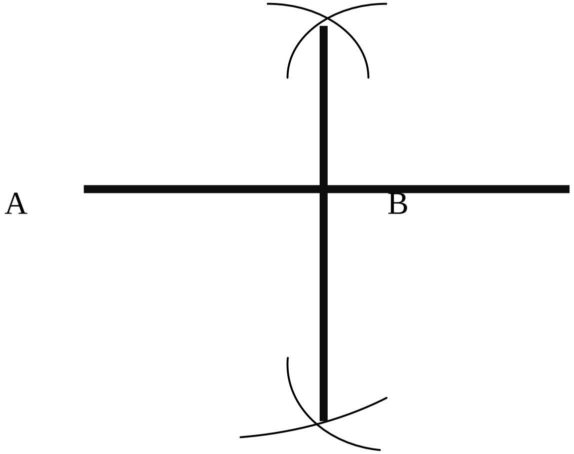
Unit: Concurrency in Triangles

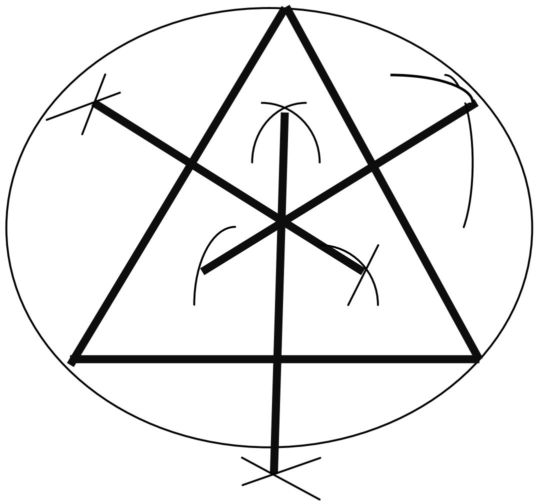
Objectives; this unit helps the students

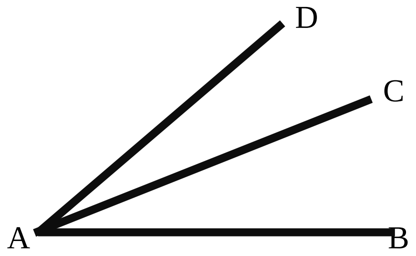
1. To understand the word concurrent
2. To define the concurrent lines.
3. To give a list of examples for concurrent rays and points of concurrence.
4. To define the perpendicular bisector, angular bisector, altitude and medians of a triangle.
5. To construct the perpendicular bisector, angular bisector, altitude and medians of a triangle.
6. To define circumcentre, incentre, centroid and orthocentre of a circle.
7. To construct circumcircle, incircle, centroid, orthocentre of a circle.
8. To write the properties of circumcentre of a circle.

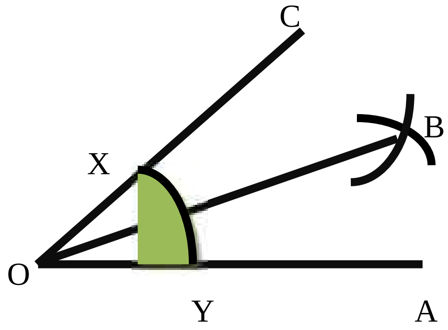
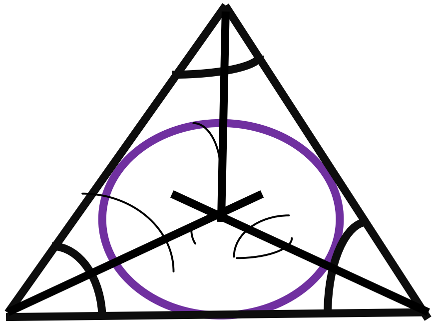
Steps	competencies	Activities helps to learning	T.L.M. used	Evaluation	
				Techniques	Tools
01. Engage	concurrency lines	*[Teacher plays the background music to motivate them towards the class which is in Bhairavi raga for three minutes.]* Observe the figure and try to define concurrency of lines   	*Music playing instruments.* The teacher draw the lines along with the music Charts The teacher shows, train track, curtains, window lines, along with the music.	Group discussion	Questionnaire

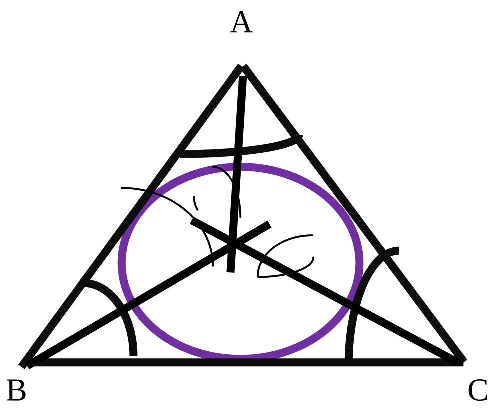
Explore	To define perpendicular bisector,	What differences do you find in these pictures? 	Chart	Teacher pupil interaction	Observation schedule
	Give examples	The first figure is bisector; second perpendicular third is perpendicular bisector. Now define perpendicular bisector 1. In circle two or more diameter concurrent at the centre. 2. In convex lens the light rays passing through it are converges. List out more examples		Individual interaction	Flash card

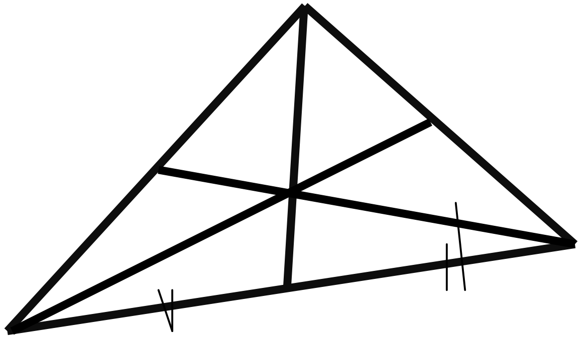
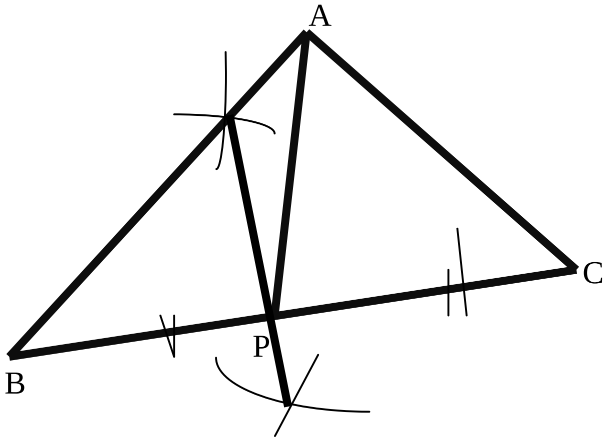
Explain	Construction of perpendicular Bisector	Draw AB=10cm straight line By using compass with radius more than five cm. Draw arcs up and below the line from point A. With the same radius cut the arcs. From point B. Those points are be x and y join them that is the perpendicular bisector. 	Teacher constructs the perpendicular bisector along with raga hindola. geometry box	Individual interaction	Flash card Problems sheet
	Concurrency of perpendicular bisector of triangles.	1. Construct triangle with AB=8cm. BC=7cm. CA=9cm. Construct perpendicular bisectors. Steps: Draw line AB=8cm. By using compass with the length of CA=9cm.draw an arc. from the point B with Radius 7cm cut the arc. That point is C. Join AC and BC. Construct an equilateral triangle of 6cm and inscribe that in a circle.	While constructing an equilateral triangle the teacher plays hindola raga till the completion.	Individual interaction	

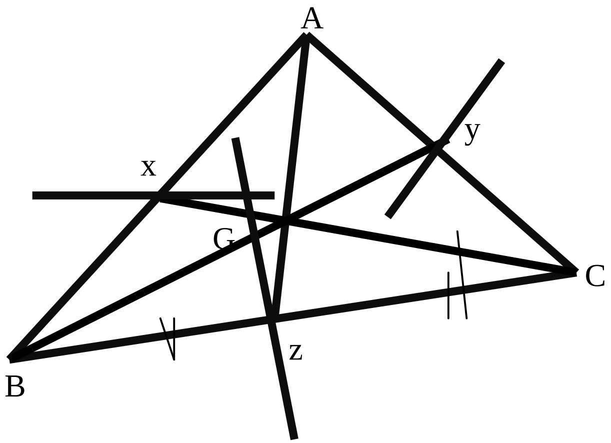
Expand	Expansion of the knowledge of concurrency and construction of bisector to inscribe in circle	 Construct the one right angled triangle inscribe it in a circle. Construct a obtuse angled triangle and inscribe it in a circle Compare these circumcentre of these circles. Conclusion: in acute angled triangle the circumcentre is inside the circle, in right angled triangle the circumcenter is in the middle of the hypotenuse. And in obtuse it outside the circle.	geometry box The teacher constructs the triangle with music. The teacher makes them to construct the triangles with music. Text book exercises	Individual interaction	Conclusion sheet

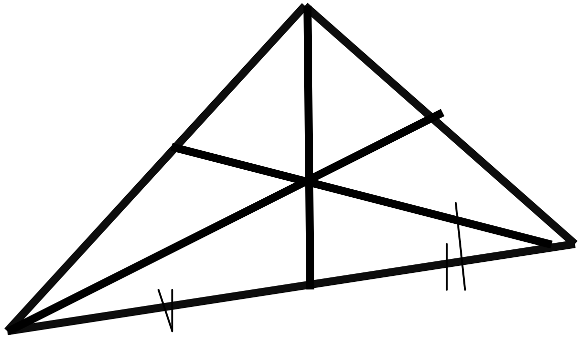
Evaluation	Construction of circumcircle.	1. Define concurrency of lines. 2. What is perpendicular bisector? 3. Draw a line PQ=10cm and construct perpendicular bisector. 4. Define circumcentre and circumradious. 5. Match the following Triangles Position of Circumcentre Acute angled Δ outside Right angled Δ inside Obtuse angledΔ at the Centre of hypotenuse. 6. Construct the triangle with AB=8cm,BC=5cm,andAC=6cm and inscribe it in a circle.	*[Music playing instruments.]* Chart		Questionnaire
02. Engage	To define the angular bisector	*[Teacher plays the background music to motivate them towards the class which is in Bhairavi raga for three minutes.]*  In the above figure **AC** is angular bisector	*While constructing angular bisector the teacher plays hindola raga for two to three minutes.*	Teacher pupil interaction	Observation schedule

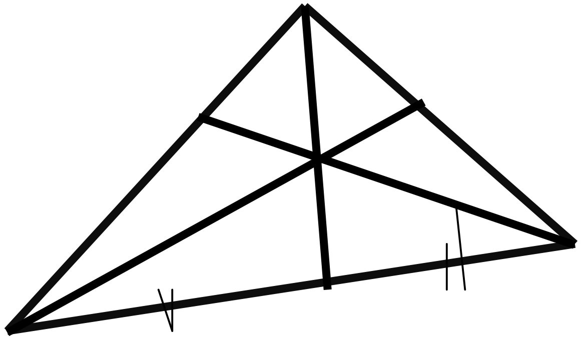
Explore	To construct angular bisector			Individual interaction	Questionnaire
	Concurrency of angular bisector. .	Construct an angle AOC, by using compass with suitable radius draw an arc which cuts x and Y with same radius from x and y draw arcs which cuts, join OB is the angular bisector. Construct an equilateral triangle of side 6cm construct angular bisectors which are concurrent.	Chart		Questionnaire
Explain	Construction of Incirle.	. 	*While constructing angular bisector the teacher plays hindola raga for two to three minutes.*	Teacher pupil interaction	

Expand	Properties Incentre of a triangle.	Construct a triangle and inscribe a circle in that. A .  Construct your own right angled triangle. And inscribe a circle. Construct an obtuse angled triangle. And inscribe a circle. Observation and conclusion: In centre is always inside the triangle. Incentre is always equidistant from the three side of the triangle. We can inscribe the circle with incentre as the centre.	*[Music playing instruments.]*	Group discussions	
Evaluation	To define the median of triangle	1. Define incentre. 2. Define the properties of incentre. 3. Construct an angle PQR=90^0 and construct angular bisector. 4. Construct a triangle XYZ with xy=8cm,$\angle$x=60^0,$\angle$Y=50^0, construct angular bisector Show that they are concurrent. And inscribe a circle.	Chart		Questionnaire

03. Engage	To construct a median of a triangle.	*[Teacher plays the background music to motivate them towards the class which is in Bhairavi raga for three minutes.]* 	*[Music playing instruments.]*	Pupil teacher interaction.	
Explore	To show the concurrency of the median of the triangle.	Now define the median of the triangle. 	Chart	Pupil-pupil interactions	Flash card quiz

explain	To understand the properties of medians of a triangle.	Draw perpendicular bisector to BC. Let that cuts BC at P Join AP. AP is the median. Construct a triangle ABC with AB=7cm,BC=8cm and CA=6cm 	Chart	Group discussion	
Expand	To construct find centroid of a triangle	Construct three medians for each side. They are concurrent at G.G is the centroid of triangle. In the above figure measure the ZG, GA, YG,YB and XG,GC compare what is your conclusion. The medians are divide each other in the ratio 1:2	*While constructing a triangle the teacher plays hindola music for three to four minutes.* *Music playing instruments.*	Teacher interaction.	

Evaluation		1. Define medians of a triangle. 2. Define centroid of a triangle. 3. Construct a triangle AB=8cm.BC=7cm. CD=10cm construct medians and find the medians of triangle.		Group discussion	Questionnaire
04. Engage	Define altitude of a triangle..	*[Teacher plays the background music to motivate them towards the class which is in Bhairavi raga for three minutes.]* 	*While constructing altitude of a triangle, the teacher plays hindola raga for two minutes.*		
Explore	To construct altitude for a triangle.	By knowing the above figure, define altitude.	Chart	Group discussion	

Explain Expand Evaluation	To Find the orthocentre. To show that in equilateral triangle all centroid,circumcentre, in centre, orthocentre are concurrent.	 Draw a perpendicular to the each side of a triangle. Those are concurrent at a point. That is called orthocentre of the triangle. Draw a triangle PQ=8cm, QR=10cm, RP=7cm, find the orthocentre of the triangle. Construct an equilateral triangle of radius 8cm. Construct circumcentre, Incentre, orthocentre and centroid.	Chart *While constructing equilateral triangle the teacher plays hindola music for three to four minutes*	Teacher pupil Actions Pupil pupil interactions	

Appendix - C

Kuvempu University
Department of Post graduate Studies and Research in Education
Shankaraghatta, Shivamogga.

Mamatha M
Research Scholar
Dept. of Education
Kuvempu University.

Dr. Jagannath K. Dange
Research Guide & Asst. Professor
Dept. of Education
Kuvempu University.

Interest in Learning Mathematics

Fill the Information

Name: ………………………………   Class: ……………………......
Sex: Boy / Girl   Locale: Rural / Urban
School: ………………………

Instructions

Here are given 31 statements regarding your ‘Interest in learning mathematics’. Read each statement carefully and decide your answer on 4 points alternatives, viz., **Strongly Agree, Agree, Disagree and Strongly Disagree.** Choose the closest response against each statement by putting a tick **(√)** mark in the box provided. Your responses will be used for the research purpose and kept confidential.

Sl. No	Statements	Responses			
		Strongly Agree	**Agree**	**Disagree**	**Strongly Disagree**
1	I like to learn mathematics because it is helpful to solve the routine numerical problems.				
2	I would never suggest to my friends to study mathematics.				
3	I don’t like to have mathematics knowledge because it’s not necessary in every field of life.				
4	Learning mathematics is not useful in my future life.				
5	I would concentrate in learning mathematics since it is essential in everyday life.				
6	I don’t like to learn mathematics, because it is not a favourite subject to me.				
7	I enjoy mathematics class more than any other classes.				
8	I don’t like to learn anything in mathematics class.				
9	I like to study mathematics more when compared to other subjects.				
10	I eagerly wait to learn new concepts in maths period.				

	Statements	**Strongly Agree**	**Agree**	**Disagree**	**Strongly disagree**
11	I never want to be absent in mathematics class.				
12	I like to learn mathematics so that I can solve difficult problems of mathematics myself rather than ask others.				
13	I like to learn mathematics because it helps me to complete my homework without taking anybody's help.				
14	I like to solve mathematical problems without using any electronic devices.				
15	I become irritated if anyone wants to learn mathematics from me.				
16	I like to follow all the steps of mathematical problems.				
17	Learning mathematics helps me to use it in day to day transaction.				
18	I like to learn mathematics because it helps me to answer numerical questions easily in the class.				
19	My mathematics teacher creates good environment to learn mathematics.				
20	Due to the use of many teaching aids in the classroom I am curious towards learning mathematics.				
21	I will be very happy if my mathematics teacher remains absent to the class.				
22	My mathematics teacher's deep content mastery attracts me towards learning mathematics.				
23	I like to learn mathematics because I feel easy to understand the sums taught by the teacher in the class.				
24	I would prefer to leave a sum in mathematics if I am unable to answer it.				
25	Learning mathematics creates mental tension in me.				
26	I am always eager to ask doubts to the teacher when I cannot understand mathematical problems in the class.				
27	I feel sleepy while solving mathematical problems.				
28	I like to learn mathematics so that I can help others in their numerical activities.				
29	Learning mathematics makes shopping easy to me.				
30	I like to learn mathematics because it helps me in calculations of my routine work.				
31	I like to utilize my leisure time by doing other work than mathematical problems.				

Appendix -D

Kuvempu University

Department of Post graduate Studies and Research in Education
Shankaraghatta, Shivamogga.

Mamatha M
Research Scholar
Dept. of Education
Kuvempu University.

Dr. Jagannath K. Dange
Research Guide& Asst. Professor
Dept. of Education
Kuvempu University.

Interest in Music

Fill the Information

Name: ……………………………………..

Class: ……………………....

Special Music Classes attended: Yes / No

Sex: Boy / Girl

Locale: Rural /Urban:

School: ………………………

Instructions

Here are given 30 statements regarding your Interest in Music. Read each statement carefully and decide your answer on 4 points alternatives, viz., **Strongly Agree, Agree, Disagree and Strongly Disagree.** Choose the closest response against each statement by putting a tick **(√)** mark in the box provided. Your response will be used for the research purpose and kept confidential.

Sl. No.	**STATEMENTS**	**Responses**			
		Strongly Agree	**Agree**	**Disagree**	**Strongly Disagree**
1	I like to listen to music.				
2	I feel bad if anybody disturbs me while listening to music.				
3	My body automatically responds while listening to music.				
4	I feel happy if there is no music while travelling.				
5	I like to sing songs along with FM / TV.				
6	I can sing most of the songs without seeing the lyrics.				
7	I like to write poems / songs on my own.				
8	Watching musical programs in TV channels is too boring to me.				
9	I try to sing our textbook poems melodiously.				
10	I am entirely involved myself while listening to music.				

	Statements	**Strongly Agree**	**Agree**	**Disagree**	**Strongly Disagree**
11	Playing musical instruments is boring to me.				
12	I like to collect varieties of songs.				
13	I feel that day is wasted if I do not hear to any song in a day.				
14	I don’t like to buy flute, mouth organs, music CDs, violin etc.				
15	Music encourages me to work more.				
16	Music will never attract me in any situations.				
17	I eagerly wait for music classes.				
18	I want to become a good singer.				
19	I hate learning music.				
20	If anybody starts to sing I am tempted to join with them.				
21	I always sing along while doing work.				
22	I prefer to listen to music instead of chatting with friends.				
23	I attempt to sing like my favourite singer.				
24	I like to be a noted person by learning music				
25	I never try to learn the lyrics of any songs.				
26	I like to listen to music to reduce my mental tension.				
27	I like to listen to music whenever I feel boredom.				
28	I will be happy by listening music.				
29	Time passes soon if I listen to music while travelling.				
30	I like to listen to music to do work more.				

Appendix- E

Blue Print for Achievement Test

Objectives Units	Teaching Points (Sub Units)	Knowledge	Understanding	Application	Skill	Total	Grand Total
1. Hire Purchase and Instalment Buying	1. Hire Purchase and Instalment Buying	1 (1)				1 (1)	
	2.Difference between Hire Purchase and Instalment Buying	1 (1)		1 (1)		2 (2)	
	3.Some Terminologies associated with Hire Purchase and Instalment Buying		1 (1)		1 (1)	2 (2)	
	4. Calculation of Interest in Instalment Buying		1 (1)	1 (1)		2 (2)	7 (7)
2.Simultaneous Linear Equations	1. Simultaneous Linear Equations	1 (1)				1 (1)	
	2. Substitution Method	1 (1)				1 (1)	
	3. Elimination Method		1 (1)			1 (1)	
	4. Evaluation of Proportional Value of Variables			1 (1)	1 (1)	2 (2)	
	5.Graphical Method		1 (1)			1 (1)	
	6. Applications of Simultaneous linear Equations						
	7. Additional Problems on Simultaneous linear Equations			1 (1)		1 (1)	7(7)
3. Circles	1.Introduction of different parts of a circle		1 (1)			1 (1)	
	2.Theorem - 1	1 (1)				1 (1)	
	3.Theorem - 2	1 (1)		1 (1)		2(2)	
	4.Theorem - 3		1 (1)			1 (1)	
	5.Theorem - 4			1(1)		1 (1)	
	6.Theorem - 5	1 (1)				1 (1)	
	7.Theorem - 6				1 (1)	1 (1)	
	8.Theorem - 7			1 (1)		1(1)	9 (9)
4.Concurrency in Triangles	1.Concurrency in Triangles,Concurrency of Angle and Bisectors of a Triangles	1 (1)				1 (1)	
	2. Construction of the Bisector of the angles of a Triangle		1 (1)	1 (1)		2 (2)	
	3. Concurrency of Medians		1 (1)			1 (1)	
	4. Circumcenter of a Triangle	1 (1)		1 (1)		2 (2)	
	5.Concurrency of Altitudes						
	6.Properties of the Orthocentre of a Triangle		1 (1)			1 (1)	7 (7)
Total	25 Periods	9 (9)	9 (9)	9 (9)	3(3)		30 (30)

Note–Figures Within brackets indicate the marks allotted for questions and figures outside the brackets indicate the number of questions or items.

APPENDIX -F

Achievement Test on 9th standard Mathematics

Fill the information

Name -- Class --------------------------

School -- Date of Birth ----------------------

Sex : Male / Female -------------------------------- Rural / Urban ----------------------

Instructions

Given below there are 40 statements about Achievement in Mathematics. For each question four alternative answers have been given out of only one is correct. You have to select the correct answer alternatives A, B, C or D and put a √ mark against it. Be assured this test will have no effect on your final examination result. The time limit for test is 40 minutes. So hurry up and try to answer maximum questions. Your answer will be kept confidential.

---

1). Agreement between hirer and vender is known as ---------------

a) Hire purchase agreement b) Instalment agreement

c) Sales Goods Act d) Rent to own

2). The hire purchase scheme is bounded with the provision of ----------------

a) Sale of goods act b) Hire purchase act

c) VAT d) Financial act

3) If buyer gets the article, bid ownership lies with the vender till full payment is comes under -------

a) Instalment Scheme b) Hire purchase Scheme

c) Financial Scheme d) Payment Scheme

4) If buyer gets the article with ownership of themselves is comes under --------

a) Hire purchase Scheme b) Instalment Scheme

c) Loan d) Compound Interest

5) A certain amount out of the total cost of the article is to be paid for the possession of the article is known as ------------------.

a) Down payment b) Instalment

c) Final payment d) Interest

6) Formula to find rate of interest in instalment buying is ---------------

a) $R = \frac{2400E}{n((n+1)I-2E)}$ b) $R = \frac{2400E}{n(n+1)I}$ c) $R = \frac{3400E}{n}$ d) $R = \frac{2400E}{(n+1)I-E}$

7) In which scheme hirer cannot resell, pledge are cause any damage before full payment?

a) Hire purchase scheme b) Instalment scheme

c) Ownership scheme d) LIC scheme

8) In which scheme buyer has the liberty to resell is pledge as he is the owner?

a) Hire purchase scheme b) Instalment scheme

c) Goods scheme d) Rent scheme

9) Which scheme if the buyer fails to pay off all the instalments, vender can repossess the article.

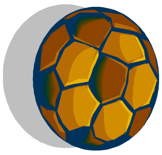
a) Hire purchase scheme b) Instalment scheme

c) goods scheme d) EMI

10) Angle in a semicircle is a -------------------------

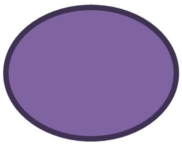
a) Straight angle b) Right angle c) Reflex angle d) obtuse angle

11) The following figures which is an example for circular shape -------------------

a) 

b) 

c) 

d) 

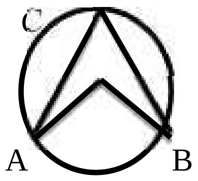
12) A line segment joining the centre to any point on the circumference circle is called -------------------

a) Radius b) chord c) diameter d) tangent

13) The sum of any two opposite angles of a cyclic quadrilateral is ----------------

a) 90° b) 120° c) 180° d)360°

14) In the figure ABC is a circle with centre O. If $\angle AOB = 82^{\circ}$ then the value of $\angle ACB$ is -----------



a) 82° b) 41° c) 180° d) 360°

15) When two circles cut each other at two different points, they are called -----------

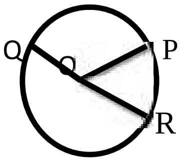
a) Intersecting circles b) concentric circles

c) Common circles d) congruent circles

16) If the radius of the circle is r, then the diameter d = ----------------

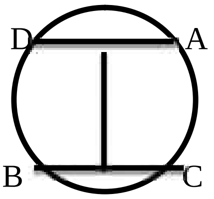
a) d=2r b) d = r/2 c) d = ½ r d) d = $2\pi r$

17) In the figure radius OP is 3 cm, then the value of QR is ....



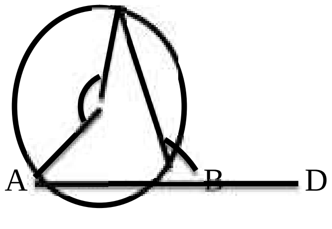
a) 6 cm b) 3 cm c) 4 cm d) 5cm

18) In the figure DA =BC=3cm. If OP = 2cm then which is equal to OP ………..



a) AP b) DP c) OQ d) QC

19) In the figure $\angle CBD = 110^{\circ}$, find $\angle AOC$



a) 140° b) 70° c) 55° d) 180°

20) General form of linear equation with one variable is -------------

a) $ax-b=0$ b) $ax+b=0$ c) $ax=bx$ d) $ax^2+b=0$

21) Which of the following is an example for pure quadratic equation -------------

a) $x-25=0$ b) $x^2+2x=0$ c) $x^2=0$ d) $x^3+x^2=0$

22) A single linear equation in one variable has a --------------- solution.

a) different b) unique

c) Equal with opposite solution d) none of the above

23) In linear equation variable degree is equal to ---------------

a) Zero b) two c) one d) four

24) $x-5 = 0$, in this equation the value of x is ---------------

a) 15 b) – 5 c) 5 d) 0

25) The equations $3x – 2y =7$ and $6x - 4y=8$ are --------------

a) consistent b) inconsistent

c) both (a) and (b) d) none of the above

26) Simultaneous linear equations are consistent only when -------------------

a) $\frac{a1}{a2}=\frac{b1}{b2}=\frac{c1}{c2}$ b) $\frac{a1}{a2}\neq\frac{b1}{b2}=\frac{c1}{c2}$ c) $\frac{a1}{a2}=\frac{b1}{b2}\neq\frac{c1}{c2}$ d) none of these

27) Two or more linear equations in the same variables are called ………………..

a) simultaneous linear equations b) graphical linear equations

c) substitution linear equations d) none of the above

28) A father is 25 years older than his son. After 8 years the ratio of their ages will be 13: 8. Their present ages are -------------

a) 50 and 30 b) 45 and 25

c) 67 and 37 d) 57 and 32

29) The sum of two numbers is 40. If the smaller number is doubled, it becomes 14 more than the larger number. Find the numbers.

a) 30 and10 b) 22 and 18

c) 20 and 20 d) 35 and 15

30) The ray that bisects an angle is called -------------------

a) angle bisector b) line bisector

c) tangent d) secant

31) The point of intersection of three altitudes of a triangle is -------------

a) circumcentre b) incentre

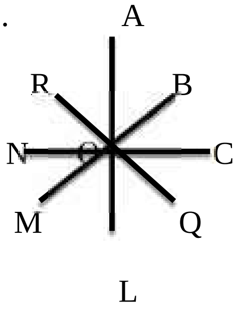
c) orthocentre d) geocentre

32) Centroid always lies in the ------------------- triangle.

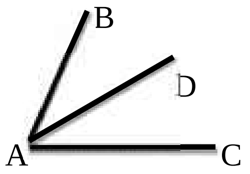
a) exterior of b) interior of c) above the d) below the

33) For the adjoining figure point of concurrency is …………

a) M b) Q c) O d) R



34) In the adjacent figure $\overrightarrow{AD}$ is bisects $\underline{\angle BAC} = 70^{\circ}$, then $\underline{\angle DAC}$ = …………………..



a) 70º b) 35º c) 30º d) 0º

35) The angle bisectors of a triangle concur at a point. This point is called ………..

a) incentre b) inradius c) incircle d) none of these

36) Centroid divides the median in the ratio …………….

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

37) Circumcentre of the triangle is the point of concurrency of the …………..of sides of a triangle

a) medians b) angles of the bisector

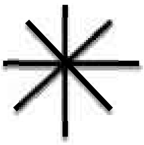
c) perpendicular bisector d) all of these

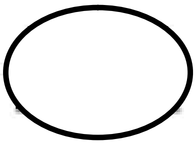
38) The circumcenter of a right angled triangle is the midpoint of its …………….. side.

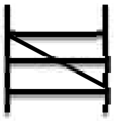
a) adjacent b) hypotenuse

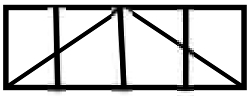
c) opposite d) none of the these

39) An example for concurrent lines is …………….

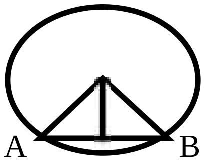
a) 

b) 

c) 

d) 

40) In the figure AB is a chord with centre O. OC $\perp$AB, then AC = ……………..



a) OC b) CB c) OA d) OB