UNIVERSITY OF EDUCATION, WINNEBA

MUSIC TRAINING AND PERFORMANCE SCORE OF STUDENTS IN UNIVERSITY OF GHANA BASIC SCHOOL

WISE COLETTE WUNU

JUNE, 2016

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A THESIS IN THE DEPARTMENT OF MUSIC EDUCATION, SCHOOL OF CREATIVE ARTS, SUBMITTED TO THE SCHOOL OF GRADUATE STUDIES, UNIVERSITY OF EDUCATION, WINNEBA IN PARTIAL FULFILMENT OF THE REQUIREMENTS FOR AWARD OF THE MASTER OF PHILOSOPHY (MUSIC EDUCATION) DEGREE.

JUNE, 2016

DECLARATION

STUDENT'S DECLARATION

I, Wunu Wise Colette, declare that this Thesis, with the exception of quotations and references contained in published works which have all been identified and dully acknowledged, is entirely my own original work, and it has not been submitted, either in part or whole, for another degree elsewhere.

SIGNATURE.....

DATE.....

SUPERVISOR'S DECLARATION

I hereby declare that the preparation and presentation of this work was supervised in accordance with the guidelines of supervision of Thesis as laid down by the University of Education, Winneba.

NAME OF PRINCIPAL SUPERVISOR.....

SIGNATURE.....

DATE.....

NAME OF CO- SUPERVISOR.....

SIGNATURE.....

DATE.....

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DEDICATION

This work is dedicated to my lovely mother, Catechist Olivia Wunu, and Rev. Michael Ohene-Okantah, my lecturer.

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ABSTRACT

This research was a correlational study conducted in the University of Ghana Basic School to investigate the relationships between music training and English Language and Maths performance score. The study employed quantitative approach using the positivist paradigm**.** In the study multiphase sampling techniques were used to select 84 students from primary 6 classes. They were put into two strata of students with background of music training and students with background of no music training to correlate with their performance scores. The data was analysed using Pearson Product moment correlation and ANOVA. Results indicated that there are significant differences between the subject score of school children who have had music training and school children who have not. However, there were no statistical significant differences between the number of years a student have had music training and his or her English and Maths performance scores. Implications of this study are that music training influences performance scores among school children in the University of Ghana Basic School. The study however did not quantifiably examine if it was the years of music training that enhances performance or years of quality music training. Future researchers should therefore study quantifiably how years of quality music training increases performance score among students.

CHAPTER ONE

INTRODUCTION

Background to the Study

Phenomena about participation in music training and its relationship on academic achievement have been one of the central focuses of research for many years as discussed by various scholars (Boyd, 2013; Santos-Luiz, 2007; Rauscher, 2000; Campbell, 1997; Hargreaves, 1988; Sloboda, 1985; Gardner, 1983;). Hodges and O'Connell (n.d.) commented that studies have attempted to argue that education in music can boost test scores, attendance, attitudes toward school, and overall academic achievement and that experimental studies have been identified that tested various effects of investigations into Music training and instruction on academic achievement.

Temmerman (2000) stated that a person's life attitudes to or level of involvement with and success in music learning are all tied to his or her first musical experiences and that these experiences have various influences on development. For this reason, concerns about the planning of any musical programme for young children need considerations which should aim at acknowledging their interests in and attitudes to different musical activities (Temmerman, 2000). School musical experiences appear to leave a lasting influence on people's lives regardless of whether this influence is perceived in favourable or unfavourable terms (Temmerman, 2000).

The influences of music on humans had been a vital concern of music psychologists (Hargreaves, 1988; Sloboda, 1985; Gardner, 1983; Gabriel, 1981). Sloboda (1985) stated that research efforts into such fields are relevant to musicians and music educators who are seeking to understand the psychological bases of their profession and practices (Sloboda, 1985). These

concerns were among various motivations for the proposal of this research; that is to find out the extent to which music training can impact on children's Maths and English performance.

Idealists held that musical works are mental entities (Tavakol & Dennie, 2011). If music is mostly concerned with the mind (mental entity) as proposed, then its effect on humans could be of important concern. Tavakol and Dennie (2011) perceived music of more concern to the mind and imaginary experiences for which it is believed that it will be necessary to find out its impact on children academic efficiency and performance.

Studies in psychology revealed that the mind controls human behaviour (Bridger, 2015) and that what one imagines could have an immediate effect on the body. Theories of Multiple Intelligences (MI) as proposed by Howard Gardner identified musical intelligence as form of intelligence (Gardner, 1993) which is achieved through music training. The theoretical phenomenon of Multiple Intelligence (Gardner, 1983) had been proposed for investigation in this study, which is *'Music Training and Performance score of basic school students of University of Ghana Basic School'*. Scholars such as Gardner (1983) and Hanna-Plady (2014) have informed that music is a high form of intelligence with its content of creativity. If music had been identified as a form of intelligence that can contribute to the achievement of performance score in the classroom, then there is a verity that issues about Intelligent Quotient (I.Q.), developmental psychology of music (Hargreaves 1988) in relation to classroom performance tasks could be of important concern to scholars and academia as disclosed in the review of literature.

While some perceive music for its enjoyment and pleasure, some also use it consciously or unconsciously as a vehicle to help create a certain feeling or mood within the listener because it looks to be just like a natural part of life (Yoon, 2000). To Bennett Reimer, music education is

aesthetic education (Reimer 1983), so that music is studied as an aesthetic work. Nketia related his concept of music education to the relevance of the culture of society or societies concerned (Nketia, 1999, Nketia, 1997, Amuah, 1997); whiles Shepherd (1977a) as cited by Hargreaves (1986, p.8), states that "…music represents a vehicle by which the meaning of society might be expressed." Albeit, the concept and the concern that music is an added power to the development of one's mind and to the enhancement of learning is often overlooked (Yoon, 2000). Since it had been found out that the presence of music has positive achievement on the mind (Hall, 2007; Shaw; Stein n.d; Strickland n.d), then it is possible to deduce that it can have a positive relationship on students' academic achievement. Music has been found by scholars to be a significant instrument in children's growth and academic development (Hedland, 2000a). Others have also found out how music had contributed to the development of spatial temporal and the improvement of various disciplines among school children (Hetland, 2000b).

Sloboda proposed that such issues about music and psychology were relevant to music scholars and practicing musicians 'who are seeking to understand the psychological bases of their practices (Sloboda, 1985). Sloboda continued to explain that music psychologists assume that psychology relates just little (or does not) to what musicians really do or practice. He notified that such conceptions might lead to failure to engage into matters of central musical importance (Sloboda, 1985). Furthermore Sloboda accounted that writers of psychology of music have tended to address themselves exclusively as either professional psychologists or as music educators and educational researchers. This resulted therefore to an insufficient dialogue between psychologists and music scholars as well as practicing musicians. Sloboda was therefore concerned about scholars who will break this interdisciplinary barrier, for which this researcher was inspired about, among other things.

It was understood that humans use music for various purposes such as soothing of pain, nostalgia, recreational and religious activities. Humans also respond to music in various ways such as happiness, crying and laughter, for which the study of its effect on the mind can also not be ignored. Studies in Early Childhood Music Education have shown that children's response to music has impact on their academic performance (Nketia, 2003; Dzansi, 2004). Flolu and Amuah (2003) noted that children express their profound interest in music participation. Whiles learn to play adults music instruments they also create musical instruments of their own. Scholars have also anticipated that music affects academic performance among school children (Bilhartz, Bruhn, & Olson, 2000). Hedland (2000a) also commented on such phenomenon. It could then be deduced that music education and its concerns about the relationship on academic performance seem necessary. For these reasons the researcher aimed at investigating into such phenomena.

Statement of the Problem

It has been a common knowledge that when a child does well in school or attains high achievement scores, then he or she is said to be intelligent. This has been the common practice since the introduction of Intelligence Quotient (I.Q) theory by Alfred Binet (Kamin, 1995). However the theory did not recognise Music Intelligence (Gardner, 1983) as a form of intelligence that could contribute or could have any relationship with the achievement of academic goals or in the development of the child.

Furthermore, the phenomenon of the significance of music as intelligence and as a contributing factor to memory and academic achievement goals has been investigated in educational, theoretical and psychological discourse (Gardner, 1983; Sloboda, 1985; Yoon,

2000; Reimer, 1989; Hargreaves, 1986). Many scholars have also investigated into creative music abilities and memory response as well as cognitive processes involved in various forms of music participation (Amuah, 1994; Dompreh, 2002; Gardner, 1983; Sloboda, 1985; Boyd, 2003). Nevertheless, these studies did not purposely investigate Music Intelligence in Gardner's MI theory and its relationship on other academic achievement goals such as mathematics achievement and English language achievement among Ghanaian school children.

Couples of scholars in Ghana have also investigated into creative musical abilities, relationships between musical participation and experience and musical memory and cognitive response among primary and secondary school students (Amuah, 1994, 1998; Dompreh, 2002). Amuah (1994) provided a study on the relationship that exists between musical memory and specified aspects of musical achievement goals such as musical behaviour. Environmental and personal factors were also part of his investigation, but then, he focused on four specific variables: musical memory, environmental factors, musical behaviours and personal factors. Amuah's (concern) was to determine various cognitive processes that are mostly involved in musical participation. He cited Sloboda (1985) and Mursell (1931) as some of the literature that shared worried concern about the need for music educators to participate more in various studies in such fields; that is relating to music psychology.

However, Amuah did not specifically investigate into the relationship that existed among various forms of musical participation and experience and other forms of academic achievement goals such as those in mathematic achievement and language achievement. Furthermore, his study (Amuah, 1994) was neither conducted in Ghana nor any part of Africa. Amuah accounted that 'The collection of data began on Tuesday, March, 1993, in a suburban Chicago high school' (Amuah, 1994, pp.114). Detailed reports in the data collection processes of Amuah's research

informed that the study was mainly conducted in a suburban of Chicago high school in the United States of America (USA) and submitted to Northwestern University. This has identified that the problem of environmental barrier (Hargreaves, 1985) still existed in Amuah's (Amuah, 1994) study. Moreover, Amuah's study was designed within the framework of causation (causal) and correlation.

The researcher also noticed that Amuah's literature used most of the familiar tools such as statistical package (SPSS), questionnaires, among others. This has supported the methodology of this study, which compared to Amuah's, have some similar characteristics in methodological processes which have to do with music psychology. However, Amuah used exploratory data analysis but this study was a correlation. Dompreh's study, on the other hand conducted a study among primary school pupils in Hohoe and Jasikan districts of Ghana. In his study he proposed four (4) specific purposes to determine the differences among variables of creative music abilities; Basic one to six pupils, boys and girls, urban basic pupils, rural basic pupils, and also differences in creative factors among and sex of pupils (Dompreh, 2002). However, his study was focused on creative music abilities, and that he (Dompreh, 2002) also employed exploratory design.

For Shepherd (1977a) as cited by Hargreaves (1986), music is a vehicle that could be used to expressing meaning by society, while Yoon (2000) accounted that some perceived music for its enjoyment, pleasure, mood, and as a natural part of life. In his view, Reimer (1989) was concerned about music education as aesthetic education. Nketia, believed that Music Education should be linked to the culture of society so that Music Education is cultural education (Nketia, 2003). Yoon (2000) then reported that music for the development of the mind and to the enhancement of learning has often been overlooked (Yoon, 2000). Hall (2007), Rauscher &

Shaw (1995) had also proposed to buttress the verity that music can enhance mental development which could have a transfer impact on academic achievement.

Sloboda (1985) confirmed that such phenomena as pointed out above relating to music psychology must be of vital importance to music scholars. He therefore hoped that such and other related matters, even as he discussed in his book will be useful to scholars in the field of music as well as psychology (Sloboda, 1985). Sloboda continued to account that musicians do not attach much seriousness and importance to the psychological studies and awareness to their field of schoolwork. He remarked that such a stipulation indicates the loss of insight. He therefore aimed at seeing scholars who will work towards breaking this interdisciplinary barrier. This was one of the main reasons for I which took the challenge to research into this proposed topic (*Music Training and Performance Score of Basic School Students in the University of Ghana Basic School*).

Music as a discipline had been found to be a highly significant instrument and tool in children's development (Cox, 2006; Shaw, 2003) and that the researcher believed that these psychological concerns should not be overlooked. Also contributing to the development of spatial temporal, academic achievement and improvement of various disciplines among children were among significant research findings by scholars.

However, almost all studies related to these phenomena were conducted in the Western environments, using mostly Western classical music with Western children (Hargreaves, 1986). Studies informed that research results may vary from one environment to another by what is called eco-driving, which considers topographical discrete (distinctions) conditions and behaviours in a study (Sivak, & Schoettle, 2012). For this reason this study aimed at bridging the environmental gap, by using Ghanaian school children; University Ghana Basic School.

Purpose of the Study

The purpose of this research study was to study the relationship between music training and the performance scores of University of Ghana Basic School pupils t. The researcher believed that educators would benefit from the knowledge about the benefits of music training, which may be an integral component for students who perform poorly in their academic endeavour. Also, it aimed at supporting school authorities and members of school boards to be informed about various knowledge relating benefits of music training as they relate to the phenomena of accountability and provision supportive music curriculum and education as an integral component of academic achievement goals. Also, the understanding of various concepts that relate to the relationship between music participation and academic achievement can help administrators to make important decisions that can support various services including funding for music programs.

Objectives of the Study

The objectives of this study were:

1. To determine the descriptive difference(s) in performance scores of school children who participated in music training in comparison to school children who do not participate in music training
2. To investigate the form of music training that influences performance scores among school children in University of Ghana Basic School
3. To evaluate the descriptive difference(s) between the levels (duration) of music training and performance scores.

Research Hypotheses

The following hypotheses were formulated to guide the study.

1 H_0: There is no significant difference in performance scores of pupils who have had music training and pupils who do not music training in University of Ghana Basic School.

H_1: There is significant difference in performance scores of pupils who have knowledge in music training and pupils who do not have music training in University of Ghana Basic School.

2 H_0: There is no significant difference between specific forms of music training and performance scores of pupils in University of Ghana Basic School.

H_1: There is significant difference between specific forms of music training and performance scores of pupils in University of Ghana Basic School.

3 H_0: Duration of music training will not affect the performance score of pupils in University of Ghana Basic School.

H_1: Duration of music training will affect the performance score of pupils in University of Ghana Basic School.

Significance of the Study

Significantly, this study will assist educational practitioners to understand the phenomena of the need for musical skills and training as it addressed various issues that had evidenced that music training and skills have various relationships with performance scores among school children. The impact of participation in music education on performance scores had been one of

the central focuses of researchers for many years for which this study will also add its information to available literature as reviewed in the literature of this study.

The study will also contribute to bridging the gap between music education and psychology (Sloboda, 1985). The study had therefore conducted investigations to break an interdisciplinary barrier between music and psychology. Also a positive relationship had been observed between music participation and increased performance such as Mathematics or English language arts test scores (Angle, 2002; Huber, 2009) for which this study will incorporate learning and serve for further investigations in the future. It has been a common practice over the years that if a child perform well in class or score high marks then he or she is believed to be intelligent, but I Q did not recognise music as a form of intelligence as proposed by Gardner (1983). Gardner's MI theory will be used in the investigations in the University of Ghana Basic School. Gardner's theory (Gardner, 1993) informed that Music Intelligence is a high form of intelligence among the other intelligences because its high characteristic nature of creativity. Garner's continued that music is an intelligence which incorporated and increase learning in other intelligences (Gardner, 1993) and that logical and spatial awareness are involved in Music Intelligence and which are important in other processes including mathematics (Cox, 2006; Shaw, 2003).

Delimitations

This study determined its population from the University of Ghana Basic School, a school in the Greater Accra region of Ghana only. This demarcation aimed at contributing to bridging the gap of environmental factors (Sivak & Schoettle, 2012), as identified in the research problem of the study. For instance many of the related research were done in the Western world. In Ghana Amuah (1994) also conducted a study on music and cognition, but his study was

conducted in Chicago in the United States of America. Dompreh (2002) also a study on creative musical abilities whiles this study was on the relationship between music training and performance scores in the classroom. This research was also narrowed to studies under music education, music psychology and those of general music studies only. The narrowing of this study to the mentioned interdisciplinary disciplines determined an effort to close an academic barrier of interdisciplinary gaps.

Limitations

One of the limitations of this study had been that the researcher could not examine all the disciplines (subjects) in the school's curriculum due to the unwillingness of the school's authority to provide requested documents such as end of term reports for the conduction of this research. The result therefore is that investigation could not be conducted on all the subjects in the school's curriculum. This therefore limited various efforts of investigations to Mathematics and English subjects only which serve for the two classroom assessment tests. Conclusions therefore cannot be generalized to all the subjects in the school's curriculum (University of Ghana Basic School).

Another outlines of limitations to this research study is that students were allowed to freely answer the questionnaires and the questions only and just as instructed. This may present issues with validity, as students could exaggerate or underreport their answers as some may not really understand the purpose of the exercise. Also, students may lack the ability to evaluate their participation in music effectively since the term, music participation, may have a different meaning across social groups. Boyd (2013) explained that social influence could be a large reason that a student may choose to exaggerate or underreport their answers. Societal influences

affect learning in unique ways. For this reason, it is difficult to know if the results from this study can be applicable to a much larger population.

Furthermore, the students included in this study represented diverse levels of achievement. For instance, some students may have had trouble answering questions accurately due to difficulty in comprehension and interpretation resulting to inaccurate data presentation, for instance ticking 'Yes' and 'No' answer for one question which may become invalid and affect data collection. Also, this researcher tested only correlation and not causation. This is because there are other factors that could be involved in the uncovered relationships. It was established that correlations exist, not whether one variable causes academic achievement to increase (Boyd, 2013).

Definition of Terms

Achievement: A measurement based on the quantifiable results of what the person knows (Boyd, 2013).

Performance score: Performance score in the classroom is the presentation of marks attained or reached in the process of classroom assessment or measurement in a specific subject area. In this study, Mathematics and English Language scores were obtained mainly through testing (Boyd, 2013).

Intelligence: Intelligence refers to intellectual functioning. Its explanation is elaborated by referring to Intelligence quotients, or IQ tests phenomena (Kamin, 1995).

Intelligence Quotient (IQ): An intelligence quotient or IQ is a score derived from a set of standardized tests developed to measure a person's cognitive abilities (intelligence) in relation to their age group (Science Daily, November, 2015).

Academic Achievement: Academic achievement represents performance outcomes that indicate the extent to which a person has accomplished specific goals that were the focus of activities in instructional environments, specifically in school, college, and university (Arul, 2013).

Multiple Intelligence (MI): As described by Gardner (1993), it is the seven forms of intelligence that all humans use to acquire information and view the world.

Musical Intelligence: As described by Gardner (1993) is the capacity to recognize and compose musical pitches, tones, rhythms, and patterns and to use them for performance or composition. It has also been described as a form of acquiring of information that is based in right brain processing in which a person perceives the world and acquires information through music (See also Boyd, 2013)

Music Training: The process of bringing a person, to an agreed standard of proficiency in the knowledge and practice of music through instruction (Boyd, 2013). The practice of music training goes with the teaching and the learning of the subject through various mediums such as voice training, piano lesson, and aural music or training in aural discrimination, among others.

Music Performance: The result of music learning that includes simultaneous demonstration of acquired musical skills of: (a) notation, (b) rhythm, (c) harmony, (d) pitch, (e) communication, and (f) motor skills through the production of music (Boyd, 2013).

Organisation of Thesis

The organisation of this study strictly followed the University of Education, Winneba General Guidelines for Preparation and submission of Theses, Dissertations and Project Reports

for Higher Degrees (2011) handbook requirements. The study therefore provided detailed account for background to the study, literature review with various supporting literature, an account for the various processes for data collection, data analysis, conclusion and recommendation.

CHAPTER TWO

REVIEW OF RELATED LITERATURE

Introduction

In this chapter, the research aimed at reviewing literature which is relevant to the study, putting the proposed theoretical framework of the study into consideration. Logical analysis and the examinations of various scholars' points of views were discussed to provide a summary and draw conclusions that connect the discussion various phenomena of the study. The literature reviewed of this study also aimed at contributing to the development of various hypotheses relevant to this study. This chapter discussed the followings; theoretical framework, music as a teaching and learning tool, forms of music training, concept of academic performance, music training and academic performance, relationship between music training and performance, contrary evidence of certain music exposure and children academic performance**,** music training**,** related literature in Ghana, and summary of literature review.

Theoretical Framework

In this study, Harvard Gardner's theory of multiples intelligence was used as the theoretical framework. Gardner explained that intelligence is in multiples, which he called Multiple Intelligence (MI) Gardner (1983). Gardner proposed that there are seven (7) of these Multiple Intelligences which he also defined, though some sources state that Gardner chose eight abilities, an eighth one called 'Naturalistic' Intelligence that he held to meet these criteria; Gardner (1983) proposed seven intelligences. These are:

1. Logical-mathematical intelligence
2. Linguistic intelligence

3. Musical intelligence
4. Spatial intelligence
5. Bodily-Kinaesthetic intelligence
6. Interpersonal intelligence
7. Intrapersonal intelligence

The main concern of the (MI) theory to this study is the Musical Intelligence. Gardner explained that Musical Intelligence is the form of intelligence that is attained through a high form of creativity (Gardner, 1983; Hanna-Pladdy, 2011), it will be significant to use tools such as hypotheses and classroom performance test to investigate the relationship that exist between the variables (music training and classroom performance tests in Maths and English).

Reimer (1989) also expressed his concern about the Gardner's multiple intelligence theory in his advocacy for music education in children education and he expressed his interest in the theory. Reimer adds that 'luckily, one of the theories, on the original list of seven, no less, was the musical intelligence' (Reimer, 2007). Gardner continued to provide further details into the theories by defining them. He defined Logical-mathematical intelligence as the ability to detect patterns, think logically, reason deductively and carry out mathematical operations; Linguistic intelligence as involving the mastery of spoken and written language to express oneself or remember things; Spatial intelligence entailing the potential for recognizing and manipulating the patterns of both wide spaces such as those negotiated by pilots or navigators, and confined spaces such as those encountered by sculptors, architects or championship chess players. He classified Musical intelligence (M.I) as consisting of the capacity to recognize and compose musical pitches, tones, rhythms, and patterns and to use them for performance or composition. He explained Bodily-Kinaesthetic intelligence as to involve the use of parts of the

body or the whole body to solve problems or create products and characterized Interpersonal intelligence as a person's ability to recognize the intentions, feelings and motivations of others whiles Intrapersonal intelligence describes the ability to understand oneself and use that information to regulate one's own life. Gardner defined that Musical Intelligence was the most important and the highest form of all the seven Multiple Intelligences (MI) (Gardner 1983).

If Musical intelligence had being proposed as the highest form of all intelligence, then it could be true that the importance of music and musical training cannot be overlooked (Sloboda, 1985). This investigation was therefore, inspired by these and other facts to propose for 'Music training and Performance Score of basic School Students in the University of Ghana Basic School for discussions under this phenomenon. Gardner explained that the human mind is better thought of as a series of relatively separate faculties, with only loose and non predictable relations with one another, than as a single, all-purpose machine that performs steadily at a certain horsepower, independent of content and context (Gardner 1997). Gardner (1993), in his theory of MI**,** indicated that students have an innately preferred learning style, and among those is musical intelligence. Musical intelligence was noticed as a high form of intelligence because of its key component of creativity (Hanna-Pladdy, 2014). Webster (1989) had thrown light on the matter of creativity to confirm that the more we know about music in terms of conceptual understanding and that the more we can internally hear music and music's movement through time, the more creative we can become. The subject was also considered to be related to all the other known intelligences. According to Gardner (1997), intelligence is much more than IQ because a high IQ in the absence of productivity does not equate to intelligence.

The significant of this theory to the relevance of this research had to do with the arising phenomena of intelligence which is view from the points of classroom performance scores. The

concern had been that if a child does very well in school, score high marks in class or is academically good then it has to do with his or her level of intelligence. This had actually been the common knowledge in practice over the years.

According to Kamin (1995) and Hallam (2000), concerns about intelligence had been traced to thousands of years back, until the French government had asked Alfred Binet, a psychologist to help them decide which students were most likely to experience difficulty in school, since they needed a way to identify and help these youngsters. (Primary school education was mandatory in France). In 1905 intelligence Quotient (IQ) test was born. According to Kamin (1995), IQ was a score derived from one of a number of standardized tests (psychologist-administered) designed to access one's intelligence. IQ test was proposed as:

Mental Age/Chronological Age X 100 = Intelligence Quotient.

Some sources also account that the concept of IQ was developed by either the German psychologist or philosopher Wilhelm Stern in 1912, or by Lewis Terman in 1916, depending on which source consulted. Intelligence testing was first done on a large scale before either of these dates. Those were actually development after Alfred Binet's invention in 1904. In 1904 psychologist Alfred Binet was commissioned by the French government to create a testing system to differentiate intellectually normal children from those who were inferior (Science Daily, November, 2015). IQ was evaluated to be a too narrow way of determining of children intelligence, with which Gardner proposes that children have variety of intelligence which he name Multiple Intelligence (MI) with which at least one was a dominant. Gardner (1993) provides further explanations that students have an innately preferred learning style, and among those was musical intelligence. Musical intelligence is most important, because it was considered to be related to all the known intelligences.

Music was proposed as a contributing factor to cognitive processing with its key component of creativity by Hanna-Pladdy (Hanna -Pladdy 2007). Also Cox & Stephens (2006), Gardner (1993), Hanna-Pladdy (2014) and Shaw (2004) have all provided buttressing information on the phenomenon.

The MI theory (Gardner, 1983) was a theoretical concern for this study to support discussions around the phenomena of academic achievement goals, which are matters, related to intelligence. The theoretical framework was selected as a tool for problem solving in this study. The MI theory was also selected to correlate with the structured hypotheses in this study which serve as testing tools to confirm the verity and validity of the Music Intelligence in the MI theory.

Gardner's (1983) proposal explained that Music intelligence (M.I) consists of the capacity to recognize and compose musical pitches, tones, rhythms, and patterns and to use them for performance or composition. Another view provided that Music Intelligence (MI) was the capacity to think in music and rhythm. People possessing it were considered to have a strong appreciation for music, can easily remember songs and melodies have an understanding of timbre and composition can identify differences between musical pitches and generally enjoy being immersed in music. The ability to play instruments comes naturally to these types of persons. The major concerns in this study converge around music intelligence as well as music training, intelligent quotient and academic achievement. It is of common knowledge that if a child does well in school then he or she was intelligent, with a hypothesis that an intelligent child did well academically. It was also of scholarly agreement that music training builds music intelligence and that music intelligence enhances academic achievement (see also Hargreaves, 1989; Gardner, 1993; Cox, 2006; Shepard 1965, Gabriel 1981; Hetland, 2000b).

According to Leng & Shaw (1991) intelligence associated with music is a way of knowing .Music intelligence has relationship with logical - mathematical intelligence, linguistic intelligence, spatial intelligence, bodily - kinaesthetic intelligence, interpersonal intelligence, and intrapersonal intelligence (Gardner, 1983). Intelligence was believed to be galvanized (stimulated) by participation in some kind of culturally valued activity and that the individual's growth in such an activity followed a developmental pattern; each activity had its own time arising in early childhood' (Armstrong, 1994). Yoon (2000) identified that approximately 80 to 90 percent of the brain's motor control capabilities regulate stimuli to and from the hands, mouth, and throat. Kinet explains that various forms of brain control capabilities, fitness and motor skills have been associated and have relationship with cognition and that better motor skills have been related to a better performance in various cognitive tests including tasks for IQ, attention, inhibitory control, memory and academic performance (Kinet, 2013).

Lehr (1998) believed that highly refined control in brain patterns and cognition is developed through music training in childhood with a counselled level of stimulation in almost the entire brain to improve smartness. Therefore, the brain's total capabilities were increased (Lehr, 1998). According to Gardner (1993), music students have greater spatial-logical reasoning and kinaesthetic intelligences because the focus of music is on movement and the interpretation of various muscle and motor movements, which are required to sing or perform on an instrument. Studies have explained that those capabilities such as brain motor control, fitness and good inhibitory control have influences on academic achievement (Diamond, 2013; Kinet, 2013). Inhibitory control was defined as the core of the higher cognitive functions called the executive control and that it is a higher order mental processes that are related to the control of attention, behaviour and emotions and involved mainly the neural networks in the prefrontal and parietal

cortices (Diamond & Hopson, 2013). Inhibitory control included a selective attention to the requisite stimulus despite inappropriate or interfering stimuli and maintenance of information in working memory. Among children, inhibitory control was shown to be an important predictor of academic performance but also physical and mental health in adulthood and thereby, it was an important component of childhood cognitive development (Diamond, 2013). If music training has been identified to enhance various forms of brain capabilities, then that could inform that music training can have an influence on academic achievement. This could be because it was of common knowledge that the brain controls behaviour, with which academic endeavours were inclusive. This had been buttressed by various literatures that good mental and physical health enhances attention and children's activity in the classroom which could enhance academic achievement.

Schools, health agencies, parents, and communities share a common goal of supporting the link between health, improved academic achievement of children and adolescents learn and their involvement in instructional musical participation (National Center for Chronic Disease Prevention and Health Promotion Division of Population Health, 2014). Some of the concerns discussed in the literature informed that the health of students is linked to their academic achievement. For this reason it was important to ensure that young people were always in good health state and that musical participation can promote these concerns such as good mental health and cognitive development. (National Center for Chronic Disease Prevention and Health Promotion Division of Population Health, 2014). Scholars confirmed this phenomenon that music was both a mental and physical exercise (Kalmar, 1989) which other scholars believe can enhance academic performance (Diamond, 2013; Kinet, 2013).

Kinet (2013) indicated that the left hemisphere analyzes the structure of music, while the right hemisphere focuses on the melody; thus music synchronizes the right and left hemispheres of the brain. This preposition had buttressed the conceptual understanding of musical benefit that its partaker may derive. This is also a characteristic of a musically intelligent child.

One of Beethoven's gifts was said to be his musical intelligence (Campbell, 1997). Some believed that musical intelligence might come naturally or be learned (McGee & Hantla, 2012). Musical intelligence is often expressed at a young age and that people who possess it were considered to have a strong appreciation for music (Valek, 2015). Music intelligence was part of the multiple intelligence (MI) theory developed by Howard Gardner. MI theory explains that people are born with different types of intelligences. Gardner's view of Multiple Intelligence was contrary to the traditional view of intelligence, which was defined as the ability to be proficient in math, science, general logic (Kamin, 1995). According to these traditional views, testing was the gold standard for measuring how smart a person was (Kamin, 1995).

American Institute for learning and Human Development (2015) added naturalist intelligence ("nature smart") as the eighth intelligence. It was believed that people with high music intelligence were often recognized as child prodigies with an amazing talent to think in patterns, sounds and rhythms. Beethoven, Mozart and cellist Yo-Yo Ma are considered to have musical intelligence, as were composers, conductors, music critics, instrument makers and musicians which could also buttress the validity of Gardner's multiple intelligence theory (Gardner, 1983). People with this kind of intelligence were observed to be sensitive to meter, tone and melody and can easily distinguish between the sounds of different instruments. Musical intelligent people sometimes can play a variety of instruments and may be constantly heard singing or making some type of quality music. They sometimes think and learn best using music.

McLeod provided a preposition on Gardner's MI theory that intelligences are not fixed (McLeod, 2008). People who were not born proficient in music could still learn skills through practice as one could exercise his or her musical intelligence by learning about music theory, learning to play a new instrument, writing your own songs, exposing yourself to new music and actively listening to classical music. Temmerman (2000) buttresses that a person's life attitudes to, level of involvement with and success in musical learning are mostly tied to his or her first musical experience. Parents were urged to sing to their baby, expose their children to a variety of music, show children how to make rhythm and listen to live music. There were many studies describing the neurological connections of musical intelligence. The Mozart Effect theory by Don Campbell (Campbell, 1997) claimed that listening to Mozart which is classical music stimulates early brain development, leading to a higher rate of musical intelligence. Investigations have commented that both the Mozart effect and the MI theory were still subjects of controversy and are still undergoing investigation by the scientific community. Bilhartz, Bruhn, & Olson, 2000) have recommended that early childhood musical training can improve children's memory and academic performance. Costa-Giomi (1999) had provided evidence on the effects of piano instruction on children's cognitive development. Music was seen as contributing to the total development of the child, including intellectual, emotional, physical, social and aesthetic (Strickland, 2002; Waller, 2007; Sloboda, 1985; Rauscher, 2000; Kalmar, 1989). Literature provided that music and its analogous participation is a natural part of children's lives and activities (Flolu & Amuah, 2003). For instance, children enjoy singing, moving, dancing, playing instruments, and creating their own musical sounds by their natural way of characteristic traits of behaviour. Music was connected to play, encountered through radio and television, and associated with special occasions (Dzansi, 2004). Young children's

engagement with musical activities lays the foundations for studies in such phenomena such as the developmental psychology of music (see Hargreaves (1985) and music training and academic achievement as observed by Bridges (1994). Graziano, Peterson, & Shaw (1999) have also provided literature to reinforce a confidence on the matter. Along the process of investigation it also seemed that counter arguments about these observable facts should not be ignored when aiming at a fair process of investigation that the background of music training may provide or may not have a transfer effect on academic discipline and performance (McGee & Hantla, 2012).

Literature revealed that before MI, IQ had been in existence (Kamin, 1995). However, Gardner (1983) challenged the prevailing view of intelligence in 1983 with his book *Frames of Mind*, stating that there are a number of different types of intelligences, as opposed to the singular form of intelligence affirmed by the IQ (McGee and Hantla, 2012). Kamin (1995) accounted that around 1860, after Charles Darwin had established a case for his theory of evolution, he also began research into a keen interest of his in the psychological traits of humans. It was explained (by Kamin, 1995) that his cousin, Francis Galton, developed the first laboratory where human intelligence could be empirically measured, although Alfred Binet is typically attributed with developing the first intelligence test in the early twentieth century(McGee and Hantla, 2012). As the development of measuring intelligence progressed, the dominant theory in the mid twentieth century was that individuals possessed a general intelligence, which would determine those children who would succeed in school.

Consequently, society began to label children as “low” (an IQ < 70), “average” (an IQ between 70 and 130), and “gifted” (an IQ > 130) (Kamin, 1995). However, Gardner postulated a new paradigm that humans do not have a pervasive general intelligence only but rather a set of autonomous intelligences that have evolved due to adaptations, necessary for the survival of the

fittest. Although he originally proposed seven intelligences, literature (Kamin, 1995) informed that Gardner eventually incorporated an eighth (naturalistic intelligence) and possibly a ninth intelligence in human cognition, with the potential for even more.

However, McGee and Hantla (2012) refused to accept everything Gardner says regarding MI, specifically, his inferences regarding its origins, but rather choose to evaluate the potential of MI through the historical figures found throughout the Bible. As opposed to being a theory rooted in evolutionary adaptation for the purposes of survival of the fittest, they explained that Gardner's proposed intelligences, such as a musical intelligence, actually have more continuity when interpreted from a Biblical literalist's point of view, serving to support an intelligent design perspective over an evolutionary perspective (Boyd, 2013).

Literature (McGee & Hantla, 2012) argued that Gardner in the first case was not consistent with his definition about the word 'Intelligence'. They exposed that Gardner in one instance defined intelligence as the ability to solve problems or to create products that were valued within one or more cultures, whiles about twenty years later he redefined the same word as 'a biopsychological potential to process information that could be activated in a cultural setting to solve problems or create products that are of value in a culture'. This has provoked a scholarly argument of ambiguity. The article argued that the emphasis on the word 'culture' also engender problem to the definition, because within a particular cultural context, certain intelligences may or may not be valuable, which may result in individuals not accessing particular intelligences to the same degree that other cultures deem to be more desirable.

Another problem identified was Gardner's nomenclature (taxonomy) preference for the use of 'intelligences' instead of 'intelligence', 'music intelligence' instead of 'musical intelligence' because of the inaccurate association people naturally already establish about the

predominant theory (IQ) surrounding human intelligence (McGee & Hantla, 2012). In another instance the literature argued that Gardner was not confidence about the MI as holistic nature of human intelligence. Notwithstanding, Gardner disagreed with these suppositions and explained that individual intelligences were more of complex though and discussion on which he based his proposed theories of multiple intelligences. He then provided that an individual could participate in meaningful activities in the broader cultural milieu even without having a high IQ, per the traditional measuring tools.

McGee and Hantla (2012) continued to provide critical arguments about all the intelligences mentioned by Gardner including musical, bodily, spatial, and interpersonal intelligences. Though investigations continue to argue on the MI theory, literature also revealed that many scholars continue to appraise Gardner.

Concepts of Musical Training

The concept of Music Training informed that music training should be able to bringing a person, to an agreed standard of proficiency in the knowledge and practice of music through instruction (Boyd, 2013). The practice of music training goes with the teaching and the learning of the subject through various mediums such as voice training, piano lesson, aural music or training in aural discrimination, rudiment and theory, among others.

The results or the products of music training included simultaneous demonstration of acquired musical skills of: (a) notation, (b) rhythm, (c) harmony, (d) pitch, (e) communication, and (f) motor skills through the production of music (Boyd, 2013).

Piaget proposed that the various training processes should apply cognisance skills of what he named as Cognitive Structures (Barbara & Tambra, 2008). Piaget defined that these cognitive structures are the basic interconnected psychological systems that enable people to process information by connecting it with prior knowledge and experience, finding patterns and

relationships, identifying rules, and generating abstract principles relevant in different applications (Barbara & Tambra, 2008). For this understanding, the music teacher needed to be cognisant about this concept of Cognitive Structures that can enable him or her to provide effective music training to the child (the student).

Music as a Teaching and Learning Tool

It seems possible to ask why music should be used as well as how music can be used as a teaching and learning tool. I believe, as a general music teacher as well as a home piano teacher such questions must not be surprising in a rising era of music education awareness creation as well as the high quest for studies in music psychology. One other thing found while working with teachers in an educational setting was that many do not naturally think about music as a tool for learning (Yoon, 2000). In some investigations, understanding this was because many at times it could be evidenced that various cultures, including Ghanaian cultures have relegated music to entertainment or as background space filler (Shepherd, 1977a). For instance, among Twi speaking communities of Ghana, the word 'music' most literally means or translated as 'Ndwomto' or 'Hadzidzi' which generally means singing in the Ewe language of the Volta region of Ghana. On the contrary, music means much more serious business than just singing for which it was of vital concern for educationists who understand that music could do far and much better than such shallow thoughts, could developed convincing philosophies for public education as well as for the classroom (Sloboda, 1985). This is because music can be used as a working tool in various ways. For instance, music can be used as a teaching and learning tool in various academic endeavours (Yoon, 2000).

Hachmeister (2010) proposed that music is a tool for learning. Music can be used to help control a classroom environment or to support the content within that class. It could be used to

signal different transitions within the class as well as to serve as writing prompt itself. Caine and Caine (1990) as cited by Hachmeister (2010) identified 12 current brain-based principles that explain how thoughts, emotions, imagination and predispositions operate concurrently. These systems needed to be developed in a stress-free yet novel environment where the learner could pattern current stimulation into embedded natural spatial memory and their constantly engaged register of experiences into three-dimensional space (O'Keefe &Nadel, 1978). Meaningful learning requires "relaxed alertness, immersion and active processing" (Caine & Caine, 1990 as cited by Hachmeister (2010) which could be traced from music training and participation.

In further submissions as in Caine and Caine (1990) as cited by Hachmeister (2010), music was also identified as a way to build community and to share the teacher as an effable icon of learning experience. This was related to various academic achievement goals such as good mathematic achievement, good reading and communication skill and other forms of academic achievement that can be traced to a student's disciplinary background of musical training and skill acquisition to some extent (Hachmeister, 2010). One would note that reciprocal learning in a classroom, whether to build subject matter competency or community, seemed to be the key for pulling out the best academic results from those students.

Using Music to Teach Language and Vocabulary

Hachmeister (2010) also examined how an early elementary teacher can use music for her/his students who have language delays and problems with vocabulary. In further investigations, Hachmeister (2010) and Wiggins (2007) proposed that songs when coupled with a book can nurture auditory and visual discrimination, eye-motor coordination, visual sequential memory, language reception and, most importantly, promotes comprehension and dialogue when engaged in classroom teaching (Wiggins, 2007).

Wiggins confirmed various instances where music was successfully used to support children who have problems with vocabulary pronunciation, spelling and writing (Wiggins, 2007). Notwithstanding, the investigations (Hachmeister, 2010; Wiggins, 2007) did not propose that their various observations and findings are applicable to all students as well as children of all stages. But then, then notion is not terminated that music can enhance activities in classroom environment, and also that the activity could help the brain to be more receptive and calm to deeper critical thinking. The study (Hachmeister, 2010) and Wiggins, 2007) noted that music opens up neurons, opens doors in human brain that create a kind of loft space receptive for learning (Wiggins, 2007). This experience may support a conclusion that music can be used as a tool for enhancing vocabulary development among school children.

In many cultures as discussed earlier, music has been viewed as an object of entertainment and enjoyment (Yoon, 2000). If music could be so enjoying and entertaining to all as well as children, then it can confidentially be approached as a medium of conveying of information in the classroom (a bate) as it could capture peoples' attention. I could remember that when I was a little child I did not liked bitter medicine, but then I like honey very much. If I so much love honey, then coating honey on such a bitter medicine or mixing the medicine with honey will still be good for this boy with the same effective health result, my mother thought and that was how she handled me as a child. Literature has also provided various investigation, observation and finding to support this discussion that music can do the same to mathematic, or social studies, or any other subject which students find uncomfortable, difficult or reluctant to learn even as Campbell (1997), Cox, (2006), Gardner, (1993), Hanna, (2007) and Shaw, (2003) have all confirm yes to this phenomenon.

Using Music as Mnemonic Device

Kraus (2013) believed that music can be used as mnemonic for learning. Mnemonic device is a technique often used by students to aid in recall (Psych Central, 2013). A mnemonic was simply a way to remember information. For example, you might have associated a term, an object or sound you need to remember with a common item that you were very familiar with. The best mnemonics were those that utilize musical, positive imagery, humour, or novelty (Kraus, 2013). One might have come up with a rhyme, song, or rhythm to help remember a specific segment of information. If by forming a melody either by oral or written with a scientific formula or a sentence so that you can be able to recall any information in class, then one could agree that music is an essential tool for learning. Music could then be considered as a mnemonic device.

Kihlstrom and Barnhardt (1993) have stated that Memory was the repository of knowledge stored in the mind, but not all knowledge was alike. One important distinction is between *declarative* and *procedural* knowledge (Kihlstrom & Barnhardt 1993). Declarative knowledge is knowledge of facts, knowledge that has truth value. Procedural knowledge is knowledge of the skills, rules, and strategies that are used to manipulate and transform declarative knowledge in the course of perceiving, remembering, and thinking. Within the domain of declarative knowledge, a further distinction can be drawn between *episodic* and *semantic* knowledge (Hallam, 2000). Episodic knowledge is autobiographical memory: such memories record a raw description of an event; but they also contain information about the spatiotemporal context in which the event took place, and the self as the agent or the 'experiencer' of the event. Semantic knowledge is generic and categorical: it is stored in a format that is independent of episodic context and self-reference. In forming episodic memories, the

cognitive system draws on pre-existing world-knowledge stored in semantic memory; similarly, the accumulation of similar episodic memories may lead to the development of a context-free representation of what these events had in common (Hallam, 2000) . Therefore it is possible that music could be a good Mnemonic device as it is capable of drawing pre-existing knowledge or information for retaining of information.

Barwick proposed that attention is a concept studied in cognitive psychology that refers to how one actively process specific information present in our environment (Harder, Wagner, & Rash, 2014). For instance in the process of reading a comprehensive text, there are numerous sights, sounds and sensations going on around you, sound created by a passing vehicle, music from a boutique shop oozing through your window, the soft warmth of your shirt, or the memory of some music you heard. How people do manage to experience all of these sensations and still focus on just one element of our environment is one of the major components of memory (Harder, Wagner, & Rash, 2014). In order for information to move from short-term memory into long-term memory, you need to actively attend to this information environment (Harder, Wagner, & Rash, 2014). Try to study in a place free of distractions such as music from television, radio sets, compact discs, tape players and other sound diversions. One can notice that getting rid of distractions might be a challenge, especially if you are surrounded by boisterous sound or music producers including hawkers, hooters, roommates or noisy children.

Music Training and Mathematics Performance Score

Santos-Luiz (2007) confirmed boldly that Music improves the development of our brains and helps to improve our abilities in other subjects such as reading and mathematics. He further explained that from simple sums to complex functions, mathematical concepts form part of the world of music. Because of this connection, it was possible to establish a positive correlation

between participation or performance in music and cognitive development in mathematics. Scholarly investigation of Gardner's theory of multiple intelligences incited several researchers to re-examine the relationships between musical experiences, music learning, and academic achievement (Beer, 1998). The majority of studies have found that the most significant relationships are between music and mathematics, or to be more specific, between music and spatial-temporal reasoning (important in mathematical concepts), and music and performance in reading (Santos-Luiz, 2007). With regard to the former relationship, the assumption was based on a group of studies which explore the effects of learning to play the keyboard on spatial-temporal reasoning, suggesting that mastering a musical instrument helps one to develop an understanding of mathematics (Santos-Luiz, 2007).

Furthermore, much more attention had also been drawn to neuron scientific researchers who have also carried out more significant research into the phenomenon by associating certain types of musical practice with the cognitive development of humans. Beer (1998) referred to some basic elements of music which were related to mathematic achievements. He mentioned notes, intervals, scales, harmony, tuning, and temperaments as relating to proportions and numerical relations, integers, and logarithms (Beer, 1998). Secondly, he accounted that mathematical concepts are present in melody and rhythm; musical notations which include the concepts of time which include length of notes, bar lines, and time signatures, rhythms which include beat and the grouping of notes in tempos. He also talked about pitch clefs with its elements of staff, and frequency of the sound, and dynamics (signs of graduation of intensity, all in the circle of musical space which is called geometry of music (Fauvel, Flood & Wilson, 2006).

These elements were related to certain arithmetical operations (division, multiplication, addition, and logarithmic function), trigonometry, and geometry (Beer 1998). Third, mathematical patterns, "friezes", and motifs (types of symmetries) have been employed in musical compositions by a number of composers within geometrical ideas. Some examples were the motet *Non vosrelinquamorphanos* by Byrd, fugues by J. S. Bach, and *Le courliscendré* from the *Catalogue d'oiseaux* by Messiaen, among many others (Fauvel, Flood & Wilson, 2006).

In addition, the mathematical concepts of the "Fibonacci sequence" and the "Golden Section" theory may be found in musical compositions, such as piano sonatas by Mozart (Garland & Kahn 1995). We may thus conclude that music is connected to several different areas of mathematics: arithmetic, geometry, and trigonometry.

Gardner (1993) suggested that each individual possesses a portfolio of distinct forms of intelligence which could confirm these mathematic achievement abilities through music training. In this context, the musical ability was seen as its own discreet domain of intelligence. Gardner (1997) proposed that music may be a privileged organizer of cognitive processes, especially among young people. It therefore appeared that there is a connection between musical capabilities and certain spatial capabilities such as that of mathematic.

Other recent studies have found out that music instruction can also affect certain mathematical abilities (Rauscher & Lemieux, 2003). A more recent study found that at-risk children who received two years of individual keyboard instruction scored higher on a standardized arithmetic test than children in control groups, including a group that received computer instruction to rule out a possible Hawthorn effect (Rauscher & Lemieux, 2003).

Table 1

Mean Task Scores and Standard Deviations for Keyboard (N = 34) and No Music (N = 28)

Group Task	Puzzle Solving		Block Building		Pictorial Memory	
Group	M	SD	M	SD	M	SD
Music Training						
Pre-test	4.52	3.05	77.68	48.76	3.32	1.09
4 months	9.17	4.97	39.74	38.46	4.26	0.86
8 months	11.97	6.02	27.72	29.67	4.82	1.24
No music Training						
Pre-test	3.93	2.26	77.66	44.70	3.79	1.20
4 months	5.75	3.26	74.54	48.29	3.50	1.35
8 months	6.87	3.63	58.70	45.49	4.36	1.06

Source: Rauscher & Zupan (2000)

Table 1 is adopted from Rauscher & Zupan (2000) on how classroom keyboard instruction can improve children's spatial-temporal performance: it is a field experiment.

The table displayed an experimental and a control groups for three various periods for piano training with its relationship with other test scores. The periods which are pre-test, four months and eight months piano training as well as non music training displayed some differences to evidence that music training can add to the development of other achievement goals among school children. From the table, it could be noticed that the mean (M) score of school children

who have had music training at various durations scored higher than those who never had any music training. Likewise, the standard deviation (SD) scores in the various task revealed that children who have had piano training performs better than those who did not participate in any music training. This had provided a significant conclusion to evidence that music training enhances academic achievement (Rauscher & Zupan, 2000).

Various scholars provided confirmatory reports on mathematics achievement level and its relationship with music training or participation that music to inform that music really contributes to mathematics achievement, for that matter, academic achievement (Boyd, 2013; Rauscher & Zupan, 2000; Cox & Stephens, 2006; Fauvel, Flood, & Wilson, 2006)). Boyd (2013) for instance, presented a correlated research on this phenomenon and found out that there was a positive correlation between students' participation in music and their achievement in mathematics. In addition, there was a positive correlation between the variables of participation in vocal music and brass music, respectively, and mathematics achievement.

The greatest correlation was between years of vocal music participation and mathematics achievement. The results from Boyd's research procedure indicated that, when students participated in music for 3 years or more, there was a significant increase in mathematics scores (Boyd, 2013).

Boyd (2013) submitted that much research has been conducted in order to examine the relationship between music participation and increased academic performance for elementary and high school students but submitted that there were still gaps in the literature in regard to the effects of music participation on middle school students; and that specifically, there are few (scanty) empirical studies**.**

From another scholarly point of view, Deanne (2015) informed that numbers, patterns, proportions, and ratios are just some of the significant connections between mathematics and music participation concepts that were mastered by both mathematicians and musicians. She referred to scholarly thinkers as 'Great thinkers' from ancient times to the present who have seen and used these conceptual links. She mentioned, Pythagoras, the Greek mathematician as an example who used math to make sense of musical concepts as he developed his (Pythagoras) ideas on music theory. Boethius, the Middle Age music expert also for instance, articulated some of his musical ideas using math concepts (Deanne, 2015).

Deanne assured that one does not have to be a genius of these proportions to benefit from music mathematic connections and that the most beneficial time to make these links could be during early childhood (Deanne, 2015). 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 entry way (Flohr, Miller & Persellin, 1996; Halfon, 2001; Leng, Shaw, Wright, 1990; Leng & Shaw, 1991; Pantev, Oostenveld, Engelien, Ross, Roberts, & Hoke, 1998; Peretz & Morais, 1993; Strickland, 2002). She explained the scientific process that as one listen to music or make music, certain neurons in the cortex of the brain start firing. The pathways created are the same pathways that are used when one complete complex spatial reasoning tasks. The more of these pathways that are forged and the more they are in use, the stronger the connections become and that strong connections lead to easier access, which translates into better skills(Deanne, 2015).

Using Music to Teach Language

Recent concerns continue to produce investigational results to confirm the verity that music training can affect language learning. Many publications have exposed some level of

differences in performance score of the musically skilled students as compared to the non-musically trained ones to their language achievement scores (Sally, 2015; McGee & Hantla, 2012; McLeod, 2008; Shaw, 2004; MENC, 1998)

Elias (2009) proposed that music was a form of effective (valuable) tool in the education of a child, and that it is a magical medium for learning and retaining information. He added that music activates three different centres of the brain at the same time: language, hearing, and rhythmic motor control. By inducing emotions, it also creates a heightened condition of awareness and mental acuity (Elias, 2009). His investigation confirmed that words paired with music are far easier to retain. He provided the ability to remember the words and meanings of songs we have learnt for years even after school. Many of these publications provide explanations that music training can enhance language development.

The Relationship between Music Participation and Achievement in Language Development

Hallan (2000) accounted that recent advances in the study of the brain have enhanced understanding of the way that active engagement with music may influence other activities with which language and literacy skills are among its major benefits. She explained that the cerebral cortex self-organises as one engage with different musical activities, skills in these areas may then transfer to other activities if the processes involved are similar. Some skills transfer automatically without ones' conscious awareness, others require reflection on how they might be utilised in a new situation. Hallan described that speech and music have a number of shared processing systems. Musical experiences which enhance processing can therefore impact on the perception of language which in turn impacts on learning to read. Active engagement with music sharpens the brain's early encoding of linguistic sound. For instance eight year old children with

just 8 weeks of musical training showed improvement in perceptual cognition compared with controls (see also Rauscher &LeMieux 2003).

Hallam assured that learning to play an instrument enhances the ability to remember words through enlargement of the left cranial temporal regions (Hallam, 2000). Participants who were musically trained remembered 17% more verbal information than those without musical training and that children experiencing difficulties with reading comprehension have benefitted from training in rhythmical performance (Hallam, 2000). This concerns and many others as discussed in this chapter have provided supporting statements that music training and participation does not leave the benefactor unproductive, especially school children who also benefit so greatly.

Forms of Music Training

Music training involve the teaching and the learning of the subject (music) and that it has many forms including Rudiment and theory of music, Piano skills, , Guitar lessons, Drumming, singing, Auditory training, Violin lessons, trumpet lessons, Voice training, Musical analyses, among others (Boyd, 2013)

Researchers believed that music experiences that involve playing of instruments provide more favourable perception in a child's life in schooling years (Temmerman, 2000). Temmerman (2000) informed that piano lessons enhance cognitive control and allows the benefactor to retain information, as compared to other forms of music training. It also informed that children who play piano are more likely to be confident, have better language development, process information better and faster, helps children to improve in areas of discipline, self control, patience and problem solving as compared to other forms of training.

Campbell (1997) proposed a theory called the Mozart effect as a learning support apparatus. The Mozart effect was consigned as a challenged set of research results called the 'Mozart effect' indicated that listening to certain kinds of complex music may induce a short-lived (fifteen minutes) improvement on the performance of certain kinds of mental tasks known as spatial-temporal reasoning Rauscher (2003). Popularized versions of the theory, which suggested that listening to Mozart makes one smarter, or that early childhood exposure to classical music had a beneficial effect on mental development (Rauscher & Shaw, 1998). Rauscher (2000*)* made a claim that, after listening to Mozart's sonata for two pianos (K448) for 10 minutes, normal subjects showed significantly better spatial reasoning skills than after periods of listening to relaxation instructions designed to lower blood pressure or silence (Halfon, 2001)). The mean spatial IQ scores were 8 and 9 points higher after listening to the music than in the other two conditions. The enhancing effect did not extend beyond 10-15 minutes. Some investigators were unable to reproduce the findings but others confirmed that listening to Mozart's sonata K448 produced a small increase in spatial-temporal performance, as measured by various tests derived from the Stanford Binet scale such as paper-cutting and folding procedures or pencil-and-paper maze tasks. However, Rauscher has stressed that the Mozart effect is limited to spatial temporal reasoning and that there is no enhancement of general intelligence; some of the negative results, she thinks, may have been due to inappropriate test procedures.

The concept of Mozart effect involved listening to such music, either by live performance or records and other active participation such as analytical involvement, appreciation and scrutiny as well as deriving examinable details (Siribhakdi, 2006). Therefore the various forms of involvement in the Mozart effect also determine forms of music training.

Siribhakdi believed that Mozart's works were not too complicated, but that they were considered as a kind of pop music (popular music) in his time (Siribhakdi, 2006). It was with this quality that Mozart's music along with its quick tempo is believed to stimulate the brain (Siribhakdi, 2006). Sukree goes on to state that "a tempo that is faster than the rate of the heartbeat naturally excites listeners"(Siribhakdi, 2006). Nevertheless, through a series of events, the term *Mozart Effect* became generalized and popularized to refer to the beneficial effects of any type of music (Campbell), including music of Wolfgang Amadeus Mozart (1756–1791).

Concept of Academic Performance

Kamin (1995) defined academic performance as the representation of performance outcomes that indicate the extent to which a person has accomplished specific goals that were the focus of activities in instructional environments, specifically in school, college, and university.

Literature informed that one of the concepts of academic performance is Intelligence Quotient (IQ) (Kamin, 1995; Gardner, 1983). According to Kamin (1995) the IQ theory categorised Arithmetic, Reading, and Writing as the main areas of discipline in testing the intelligence of a person or a child. The phenomenon is that if a child does well in school, which is in these disciplines, then he is intelligent. Literature informed that this was the grading system of academic performance over the years (Kamin, 1995)

However, Gardner informed that the IQ theory is deficient, because there are other forms of intelligence that can determine a child's academic performance apart from IQ. Gardner therefore proposed the theory of Multiple Intelligence (MI) (Gardner, 1983).

According to Barbara and Tambra (2008), the concept of Cognitive Structures was also one of the academic achievement concept proposed by Jean Piaget. Piaget defined these

Cognitive structures as the basic interconnected psychological systems that enable people to process information by connecting it with prior knowledge and experience, finding patterns and relationships, identifying rules, and generating abstract principles relevant in different applications (Barbara and Tambra, 2008). This concept simply proposed that a child's academic performance largely depends on his or her level of cognitive processes. For this reason, the teacher or the educator needs to be cognisant about these processes to be able to help the child achieve a recommendable goal of academic performance (Barbara and Tambra, 2008).

Kamin (1995) provided further explanation that the exploration of academic achievement has led to numerous empirical studies and fundamental progress such as the development of the first intelligence test by Binet and Simon. It is on this note that Gardner proposed Multiple Intelligence and specifically mentioned Music Intelligence as a contributing factor to academic performance (Gardner, 1993). The concept therefore is that music is an intelligence that enhances cognitive development and boosts academic achievement. However, academic achievement is a broad subject matter, where several literature and investigations within different disciplines have focused mainly on selected aspects in its investigation processes. One of which is investigations relating to music training or participation and academic achievement; thus Music Psychology.

Kamin (1995) informed that academic performance is a multifaceted (many-sided) construct that comprises different domains of learning. The phenomenon also has diversity of concepts, those of Piaget, Vygotsky, Gardner, Don Campbell, and many others that have contributing principles to academic performance. Because the field of academic performance is very wide-ranging and covers a broad variety of educational outcomes, the definition of academic achievement depends on the indicators used for its measurement (Kamin (1995).

Among the many criteria that indicate academic achievement, there are very general indicators such as procedural and declarative knowledge acquired in an educational system, more curricular-based criteria such as grades or performance on an educational achievement test, and cumulative indicators of academic achievement such as educational degrees and certificates.

Music Training and Academic Performance

Ewa and Wiebke (2014) examined how musical training affects cognitive development: rhythm, reward and other modulating variables, and found out that music training had recently gained additional interest in education as an increasing neuron scientific research demonstrated by its positive effects on brain development. They noticed that, children who undergo musical training have better verbal memory, second language pronunciation accuracy, reading ability and other various executive functions.

It was noted that learning to play an instrument as a child may even predict academic performance and IQ in young adulthood. The degree of observed structural and functional adaptation in the brain correlates with intensity and duration of practice (Ewa &Wiebke, 2014). Importantly, the effects on cognitive development depend on the timing of musical initiation due to sensitive periods during development, as well as on several other modulating variables (For example, the environment). Notably, one could point to motivation, reward and social context of musical education, which were important but were neglected factors affecting the long-term benefits of musical training on academic achievement goals. Further, it was believed that the introduction of the notion of rhythmic entrainment could represent a mechanism supporting learning and development of executive functions (Sally, 2015). It also hones or sharpens up temporal processing and orienting of attention in time that may determine enhancements observed in reading and verbal memory. Literature affirmed that musical training uniquely bring

about transfer effects, preparing a foundation for a range of skills (an example is creativity), and thus fostering cognitive development (Ewa & Wiekbe, 2014). It could therefore be confirmed that musical training affects other areas of studies.

The American Psychological Association (APA) (2015) which is noted to be the largest scientific and professional organization representing psychology in the United States had made a declaration statement that musical training improves reading ability among children. In one of their published research works conducted entitled *'Musical Training Offset Some Academic Achievement Gaps*', it was noted that learning to play a musical instrument or to sing help disadvantage children to strengthen their reading and language skills. This was a content of a research findings presented at the American Psychological Association's 122nd Annual Convention in 2014. This phenomenon was also discussed in Liljequist (2002).

According to American Psychological Association, (2015) findings from an investigation involved hundreds of children participating in music training programmes in Chicago and Los Angeles public schools had highlighted the role that learning music could have on the brains of school children in impoverished (bankrupt or insolvent) areas, according to the presenter of the paper, Kraus. Research has shown that there are differences in the brains of children raised in impoverished environments that affect their ability to learn (Kraus, 2011). It was noted that affluent students do better in school than children from lower income backgrounds. That was one of one of the variables for academic achievement, but then there are investigational results that inform that musical training can alter the nervous system to create a better learner and help offset this academic gap (Kraus, 2011). Kraus (2011) informed that research on the impact of music training has been primarily conducted on middle- to-upper-income music students participating

in private music lessons to produce empirical results to confirm that musical training can influence academic scores. Kraus's lab research (American Psychological Association, 2015) has concluded that musical training appears to enhance the way children's nervous systems process sounds in a busy environment, such as a classroom or a playground (Kraus, 2011). This improved neural function may lead to enhanced memory and attention spans which, in turn, allow children to focus better in the classroom and improve their communication skills, she said (American Psychological Association, 2015).

Many of Kraus' study participants were part of the Harmony Project in Los Angeles, which was founded by fellow presenter Margaret Martin (American Psychological Association, 2015). In her most recent research, Kraus studied children beginning when they were in first and second grade. Half participated in musical training and the other half were randomly selected from the program's lengthy waiting list and received no musical training during the first year of the study (Kraus, 2012). Children who had no musical training had diminished reading scores while Harmony Project participants' reading scores remained unchanged over the same time span (American Psychological Association, 2015).

Kraus' lab (Kraus, 2011) also found that, after two years, neural response to sound in adolescent music students were faster and more precise than in students in another type of enrichment class. The researchers tested the auditory abilities in adolescents from lower economic backgrounds at three public high schools in Chicago. Over two years, half of the students participated in either band or choir during each school day while the other half were enrolled in Junior Reserve Officers' Training Corps classes, which taught character education, achievement, wellness, leadership and diversity. All participants had comparable reading ability

and IQs at the start of the study. The researchers recorded the children's brain waves as they listened to a repeated syllable against soft background sound, which made it harder for the brain to process. The researchers repeated measures after one year and again at the two-year mark. They found music students' neural responses had strengthened while the non music participating students' responses had remained the same. Interestingly, the differences in the music students' brain waves in response to sounds as described above occurred after two years but not at one year, which showed that these programs cannot be used as quick fixes, Kraus said. 'This is the strongest evidence to date that public school music education in lower-income students can lead to better sound processing in the brain when compared to other types of enrichment education', she added (Kraus, 2011).

Even after the lessons stop, the brain still reaps benefits, according to studies on the long-term benefits of music lessons. In one study, Kraus's team surveyed college students and asked them how many years they have had music training (Kraus, 2011). As they found with the elementary school students, college students who had more than five years of musical training in elementary school or high school had improved neural responses to sound when compared to college students who have had no musical training (Kraus, 2011).

The Harmony Project provided instruments for the students who participate five or more hours a week in musical instruction and ensemble rehearsals (Kraus, 2011). The project was a one year-round and tuition-free based on income, said Martin. Many of the programmes build full-time bands in neighbourhoods where the students live and the students agree to commit to the programme from elementary school through high school, she commented (Kraus, 2011).

Various research findings here have also provided evidence that musical training could affect other areas of studies.

The level (duration) of Music Training and Performance Score

Various investigations provided results of various periods of involvement in music training in relationship with their various academic achievement goals (Schlaugh, Norton, Over & Winner, 2005; Boyd, 2013; Adolphs, 2009; Sally, 2015). According to Schlaugh, Norton, Over & Winner (2005), researchers provide preliminary results of a longitudinal study comparing 50 students taking music lessons and 25 students not taking music lessons to investigate if there are any differences in brain structure, function and or cognitive skills in children who are beginning to study a musical instrument compared to the students who are not taking music lessons. Schlaugh, Norton, Over & Winner (2005) have also provide findings from a cross-sectional study in which they compare students with an average of four years of training to students not taking music lessons. Results of the longitudinal study are preliminary because researchers only tested half of the students. Results revealed that after one year of music training, students had improved fine motor skills and musical skills using cognitive and behavioural tests. Adolph's data also supported the results, with students taking music lessons having greater gray matter than students not taking the lessons (Adolph, 2009). The grey matter is mainly composed of neuronal cell bodies with processing bodies called axon for carrying signals and processing information in the brain (Sally, 2015). The axon helps in the decision-making, thought-processing and the ability to evaluate rewards and consequences (Sally, 2015).

Schlaugh, Norton, Over & Winner (2005) conducted a cross-sectional investigation to examine the relationship between the number of years of a student's involvement in music training and his or her performance score in school. The study showed that students with an

average of four years of training performed significantly better on tests of vocabulary, musical skills, and motor skills than their non-lesson counterparts.

Key findings revealed that after one year of music training, students taking music lessons showed improved fine motor skills, a condition which was discussed earlier believed to have enhanced academic achievement (Schlaugh, Norton, Over & Winner, 2005). Also it enhances musical skills compared to students not taking lessons. Brain imagining data supported the findings, with students taking music lessons having greater gray matter than students not taking music lessons. Students with an average of four years of training performed significantly better in vocabulary tests, musical skills, and motor skills than students not taking music lessons Schlaugh, Norton, Over & Winner (2005).Results after this project indicated that students could benefit from music training, including improved reading skills, attention and musical skills.

Further, students with several years of music training performed better on vocabulary tests, musical skills, and motor skills. These research findings bearded out the phenomena that background of musical training could have positive influence on the academic performance of the beneficiary. The same concept had been tried and evidenced in meditation and some stress management workshops (Rauscher &LeMieux, 2003).After the research was carried out it was found out that:

a. **Students** who received daily music training for seven months had higher reading scores at the end than did a control group. A year later, their scores were still higher than the control groups.
b. **College students** who had received musical training before age 12 remembered significantly more words from a list than other students.

c. **Preschoolers** who had keyboard training did better at math reasoning than another group that had computer training instead.
d. **Infants** can distinguish differences in pitch, melody and rhythm from very early on. In fact, they even seem to recognize music they were exposed to repeatedly in the womb.
e. **Preschoolers** were able to learn body parts better in a lesson that used music and dance as opposed to conventional lessons, or even one including movement but no music.

Results after the project indicated that students could benefit from music training, including improved reading skills, attention and musical skills. Furthermore, students with several years of musical training perform better on vocabulary tests, musical skills and motor skills (Rauscher & LeMieux, 2003). The above project revealed some specific durations that provide certain academic achievements among school children. The various categories of students include preschoolers, college students, and infants to also represent that all students of school going age should not be denied music training as well as music education.

Another study revealed that preschool children who received keyboard lessons for six months improved their performance dramatically on a spatial-temporal reasoning task, with the residual effect lasting for days (Yoon, 2000). It was suggested that certain math and science concepts thought to be difficult to teach can be learned using spatial-temporal reasoning methods such as music training. Music can enhance the "hardware" for the spatial-temporal reasoning in the brain within a period of time (Yoon, 2000).

Norman (2000) informed that music and especially classical and baroque music has a predictable rhythm that mashes well with cyclical patterns and the spatial temporal in the brain. When listening to music of the appropriate amplitude, or volume, kids (the student's) brain

waves are stimulated. Music increases the activations in the temporal regions which is the auditory centre of the brain (Norman, 2000). Kids listening to these types of music often experience a calming effect which enables them to learn more easily. A calmer music of demeanour can make a great impact on disable students on the ability to learn. The calming effect may contribute to improve focus and reduce frustration. Relax enzymes and fewer enzymes rushing through the body enables a student to focus on the matter at hand.

Researchers (Graziano, Peterson, & Shaw, 1999) compared the proportional reasoning scores of several groups of children (n = 136, ages 7 to 9 years), including one group who received computer-generated spatial-temporal training alone and another group who received the same spatial temporal training coupled with piano keyboard instruction (Graziano, Peterson, & Shaw, 1999). The proportional reasoning of the children was then tested. Although both groups scored higher than a control group, the group that included piano training scored significantly higher than the other group. The study was conducted among children of different ages including seven months, infants, preschoolers, and college students.

The above findings provide positive results of the exposure of children to music training. The research had been conducted on children of different stages. This may imply that musical training is important to the development of children of all levels. Seeing that musical training and exposures could provide great benefit on children's personal and academic development, one may therefore notice that non-musically trained children may be losing benefits that may be derived from musical skills and training.

However, will any style of music produce the *Mozart Effect?* "Understanding how it does so and determining which among different types of music will also produce the Mozart effect are of great general and scientific interest in helping to understand the brain" (Shaw, 2004).

Long-Term Music Training and Performance Score

Literature revealed that the original experiments of Mozart's music were of short duration only. In related experiments, long-term effects of music were studied in groups of pre-school children aged 3-4 years who were given keyboard music lessons for six months, during which time they studied pitch intervals, fingering techniques, sight reading, musical notation and playing from memory. At the end of training all the children were able to perform simple melodies by Beethoven and Mozart. When they did, they were then subjected to spatial-temporal reasoning tests calibrated for age which contributed to their academic achievement, and their performances were more than 30% better (see also Rauscher & Shaw, 1998; Shaw, 2004; Siribhakdi, 2006).

Other schools of thought reflected on the notion to find out if music other than compositions by Mozart can provide similar effects. Several investigators including those of Bodner, Muftuler, Nalcioglu and Shaw have attempted to prove this theory as a comparison to a Beethoven composition or popular 1930s music (Rauscher, 2000). Beethoven's compositions "differently activated the prefrontal, occipital, and cerebellar regions – all regions associated with spatial-temporal reasoning'' (Rauscher 2000, p. 3-4). This provided that children or people trained in singing or trained to listen or perform Mozart music could have its associated effects than can have a transfer effect on their academic achievement.

Similarly Lawrence Parsons (n.d) (from the University of Sheffield in the United Kingdom) had found that it was Mozart's energetic rhythms rather than its melodies or

harmonies that created the performance enhancing effect (Lichtenstein Creative Media, 2002). Thompson (n.d) of York University found comparable results that energetic music by Schubert produces the same effect whiles slower, sadder piece such those by Albioni does not (Lichtenstein Creative Media, 2015). In spite of evidenced research, limitations to Rauscher et al., (1993) occurred, specifically, a small sample size. Moreover, little or no demographic information was provided other than participants were college students.

Contrary Evidence of Certain Music Exposure and Children Academic Performance

Some other investigations into the subject matter had met certain awareness that exposed certain challenges and dangers associated with exposure to curtain kinds of music and which are believed to affect children's academic development to some extent; mostly resulting from inefficient music education and awareness. Some other findings revealed that despite many good factors that music could add to teaching and learning, it could also disrupt achievement goals and processes if not properly handled.

According to the Strickland (2002), music to some extent, can distract children from concentrating on their assigned tasks at a volume that is too loud for their concentration. The research also analyzed one hundred top popular music, which were composed between 1959 and 2009. Some of these music genres contain unhealthy sexual explicit materials. It was noticed that these unhealthy sexual materials include unhealthy sexual lyrics and excessive loud and heavy sounds, which may turn out to be noise (contain excessive loud sound). Some of this music includes Hip-hop music, Rock, Country music and Raps.

It could be worth noting that educating children about the kind of music they should listen to is also a music training process. Literature (Akrofi, 1982) revealed that the study of the Ghanaian Educational Curriculum Plans does not give priority for music education at the basic

education level and so many school children have not been educated to guard against the kind of music they should listen to. This condition therefore results to school children learning certain kinds of unhelpful and unhealthy music that may affect their psychological development, innocence, moral behaviours and so may affect their academic development (Arul, 2013). It seemed that most parents, teachers, and the general public are not aware of the various dangers associated to improper music education for which some of the above mentioned problems occur ignorantly. One would also notice that the media which should also serve as a platform for public education and awareness creation on such issues rather turns out to promote such profane music.

In Paediatric and Adolescent Medicine (2008) '*Content Analysis of Tobacco, Alcohol and other Drugs in Popular music* it was revealed that an average teenager receives about 84 daily references to profane musical lyrics that expose children's mind to alcohol abuse, lyrics that advocated and motivate peers on social vices issues such as social pressure, glamorization, rapes, sexual abuses and among other things. Weikart (1987) noted that, frequently, most of these problems can deter academic achievement as such conditions may not be very favourable for a teenager or student. Some of this music also contains noisy and heavy sounds that do not provide a sound and convenient environment for productive learning for the purposes of academic achievement (Liljequist, 2002).

Center for Mental Health Services (CMHS) and *Substance Abuse and Mental Health Service Administration* (SAMHSA) in U.S supported the observation that when children encounter such unhealthy experiences, they become overwhelmed and terrified and so may perceive themselves as detached from their bodies. At its extreme, a child may cut off or lose touch with various aspects of their selves, a condition which may affect academic achievement gaols(Liljequist, 2002. Mostly, these conditions such as those associated to pop, rap and jazz

music also turn out to disrupt children's' attention from their assigned tasks leading to poor performance (Liljequist, 2002)

It was also believed that children with any form of harsh musical experience which may have resulted from music such as hip pop hip life may cause trigger (set off) which were more likely to cause very intense reactions (Weikart,1987). This might have affected their ability to think clearly, reasoning, or problem solving and act accordingly. Other problems may include attention sustaining struggles, deficits in language development and abstract reasoning skills or learning difficulties because of the unsupported learning environment. Discussions above showed that it was not advisable to expose children to unhealthy music or sound that turn out to disrupt their academic process (Weikart, 1987).

Further insight for discussions divulged that music has the potential to be a major influence in a child's life. Zepol (2014) informed that the average child listens to more than two (2) hours of music daily. The paper explained that music does not necessarily pose problems for teenagers who live a balanced and healthy lifestyle, according to the American Academy of Child and Adolescent Psychiatry. Literature (Zepol, 2014) warned that, if a teenager is persistently preoccupied with music that had seriously destructive themes, which is observed to pose changes in behaviours such as isolation, depression, alcohol or other drug abuse, evaluation by a qualified mental health professional should be considered as these could affect their attention process and academic performance.

The investigation had exposed that most of the content of such music including lyrics and heavy sounds do not discuss the dangers of sexual activity, such as unplanned pregnancy or sexually transmitted diseases. Instead, such music often rather glorified promiscuity and promote

gender stereotypes. In 2002, the journal Paediatrics, entitled *Exposure to Degrading Versus Non Degrading Music Lyrics and Sexual Behaviours Among Youth*, published that adolescents who listened to music with degrading lyrics were more likely to engage in riskier behaviours such as sexualized behaviours. Degrading music lyrics tend to objectify both genders, portraying men as sex-driven and women as sexual objects (Weikart, 1987).

It could be noticed that the issue of the lack of proper musical training and education seemed to be among the barriers that affect children's development and academic performance. This is because the choice of music listening and education among school children is also music training. It would be observed that some kind of music that children listen to disrupt their childhood moral innocence and incorruptibility. Reimer (1989) therefore placed a high concern on Music Education, so that its denial or failure to provide opportunities for musical training for children, obviously, affects their moral upbringing and educational achievement goals. It is true that some children's intelligence may not be linked to their participation or involvement in any musical training. However, scholars (Gardner, 1983; Yoon, 2000; Sloboda, 1985; Hallam, 2000; Han-Pladdy, 2011) believe that the training contributes added advantage to classroom score and other forms of academic achievement goals. In general it was clear that music and music education should not be denied school children as it serves as an avenue for their academic discipline and moral development.

Music Training

According to Boyd (2013), school educators were required by lawmakers to increase test scores in the content areas. While there were no clear directions as to how to accomplish this task, it was clear that educators should focus on the support of school programs and initiatives

that foster higher test scores in these areas. One intervention that appears to provide notable benefits, in relation to increased academic performance, was student participation in music (Shaw, 2003; Strickland, 2002).

According to Merriam (1964), music is a universal language for all learning. Also, music is present in all stages of human development (Campbell, 2007). For example, the importance of music in the lives of middle school students is demonstrated in the multibillion dollar industry based on the consumption of popular music (Boyd, 2013). If students spend large amounts of their personal time, energy, and finances on popular music then, also, it is possible that adolescents use music to assign their personal identities (Campbell, 2007). It is believed that music has its own aesthetic and social values, and it has the potential to bridge the gap between academic content and everyday lives of the students (Boyd, 2013).

As educators struggle to find ways to solve educational problems, often, the opportunities for participation in music programs are lost as a result of the pressure to comply with federal, state, and local laws have forced principals and other school officials to devote more time to reading and mathematics in order to accomplish the required testing gains for students (Boyd, 2013). For Boyd, there is no easy solution to the issue of increased accountability, soit is important to see how music participation meets the demands of the seven areas of experiential learning and that an examination of how music participation meets the needs of varied learners is necessary.

The participation of students in music supports academic success because it has the ability to assist with many different types of learners in a single classroom (Gardner, 1993). In many classrooms, there are students with differing learning abilities such as: (a) gifted students and average students, (b) students with disabilities who are included in the general classroom, as

well as (c) students who are economically disadvantaged. Boyd (2013) believed the challenge of the teacher is to create experiences that actively engage the knowledge and experience of all learners, regardless of their differences in learning ability or needs. This can be especially challenging in a middle school setting when the learners are in various stages of cognitive development (Piaget, 1973). Geber pointed out that school model was envisioned to be a unique place to accommodate the unique intellectual, creative, and social needs of students as they experienced puberty (Gerber, 2007). In this sense, music participation is an activity that promotes the vision of the true school model, so much so that music training promotes positive behaviours, both personally and socially (Robinson, 2007).

It is believed that music participation is a tool, which can be used to address many problems, even those that affect students as they transit from childhood to adulthood (Shaw, 2003). Furthermore, it is a good way to address the problems of motivation. Shaw observed that students, who are involved in some form of music training, scored notably higher in spatial-temporal reasoning. This increase in spatial-temporal reasoning is important because a high level of spatial-temporal processing has been shown to be correlated with higher levels of science and mathematics achievement (Shaw).

It has been found out that many students experience a lack of motivation (Daniels, 2011). However, music can be used as a tool for cognitive development because it is an activity, in which they choose to engage (Nolen, 2003).

Boyd (2013) confirmed that there are several effective tools that can be used to support the learning environment, but none can serve more students at the same time as music. Music can be used as a motivational factor because students choose to involve themselves as a part of the learning process.

Boyd (2013) reported that results from multiple studies indicated that there was an increase in academic performance when students were engaged in music making. Kinney noted general increases in test scores when comparisons were made between music students and non music students, particularly in urban schools. Also, band students have been found to outscore non-band students in most subjects on standardized tests when individually compared to their pre-treatment scores in fourth grade and post-treatment scores (Kinney). Furthermore, this increase in test scores was found regardless of outlier factors, such as socioeconomic status (SES), in the area of mathematics.

The needs of many gifted and advanced learners are being served through an emphasis on science, technology, engineering, and mathematics initiatives (Block, 2012). According to Block, students' participation in music develops the same creativity and critical thinking skills that are accomplished in these programs. While some students may be intimidated by study of certain courses, they may enjoy arts courses, which promote the same skills of higher order thinking. At the heart of studies is the highest of higher order thinking skills, creativity. Boyd (2013) reported that creativity is a key component in the music classroom, as well. At schools with strong arts programs, many students are able to demonstrate improvement in attendance. In addition, frequently, test scores improve because of the emphasis on left- and right-brain thinking (Block, 2013).

Olson (2010) found that fifth grade students, who were given opportunities for critical thinking in their music classroom, scored better on a unit test than students, who studied the same material but received only activity based instruction. The students, who scored better, were taught through the use of the four Cs: (a) critical thinking, (b) creativity, (c) communication, and (d) collaboration. These skills can be used across the curriculum and can facilitate a whole

school approach to student learning which should include music programs (Olson). Also, these skills are related to the idea that music students are better able to self-regulate their behaviours (Boyd, 2013). These self-regulated behaviours are: (a) identification strategies, (b) planning and evaluation strategies, and (c) systematic thinking. According to Leon-Guerrero, all of these behaviours are related to increased achievement.

Scheib (2006) assessed the importance of music in the lives of middle school students. Scheib conducted a case study with a student, who was selected because she was an *average* band student. Average was the term used to describe her because she was not the best performer or musician in the band, and she was not the worst. Scheib identified several important themes. First, the student wanted to be in control of her academic destiny. Second, she reported her participation in band motivated her to be competitive. Scheib (2006) continued to account that some students observed that achievement in band was measured according to: (a) individual accomplishment, (b) evaluation, and (c) the development of technical skills and that the band was not only competitive, but it was task achievement and assessment based. Scheib found that participation in traditional band class reinforced other important factors to learning that a middle school student needs in his or her day, such as following rules and procedures.

Campbell (2007) reported five key themes found in middle school students, who engaged in music: He noted the student is able to identify formation (examples: structure and patterns) in and through music, emotional benefits, music's life benefits, including character-building and life skills, social benefits, and positive and negative impressions of school music programs. The students in this study mentioned several benefits beyond increased musical aptitude. They reported that the study of music helped them to understand other disciplines, such as knowing and understanding other civilizations and societies through the influence of music

and music history. Campbell stated that, music participation and training help students in various ways; students expressed their sense of music as culture. For other students, music gave them a positive behaviour to exhibit in middle school rather than negative behaviours such as drugs and alcohol (Boyd, 2013). In many situations, students with various disabilities are served in the classroom along with gifted and average learning level students (Simpson, 2010). The use of music in these classrooms may increase academic achievement, because it can be used with all students, including students with disabilities. Frequently, students with disabilities need additional support in order to process information. While each individual disability is different, and there is no one-size-fits-all approach in the provision of accommodations, music can be used as a tool to help these students learn. Simpson found that the use of song, combined with symbols, greatly assisted students with autism to recall information (Simpson, 2010).

Boyd (2013) recorded that one of the characteristics of students with autism is lack of motivation; however, music can be used as a tool to bridge this gap between content and motivation. In addition, the use of music has been found to increase social engagement in students with autism. Since music incorporates a lot of movement, it can help students with special needs to stay focused. The playing of instrumental music can be used to increase communication and response.

McPherson (2000) reported that music can be used to meet the needs of students with disabilities within a general education setting, specifically, those with separation anxiety. During periods of separation, whether from parents, friends, or a known environment, students need to be supported to explore self-reliance and autonomy. When students are involved in extracurricular activities, they are more likely to remain involved in school and active in the learning process. Chorus was one of the activities identified in the McPherson study, which

provided a sense of structure and balance for students. A main point, which McPherson emphasized, is that teachers should not necessarily target the areas where students underperform academically instead they should focus on the areas of student interest and use these interests to increase achievement. McPherson (2000) reported that music provides key elements that may assist students and parents with separation anxiety. Music is a tool, which can be used to assist every student in learning, including students with special needs. Music could be the reason that most students in the music classroom learn; it offers interpretation, remediation, and enrichment (McPherson).

According to Buchanan (2008), it has been found that student participation in band and chorus programs increase student academic performance. Economically disadvantaged students have special needs and, therefore, are considered an official required subgroup under the law in many communities (Buchanan, 2008). However, not only do economically disadvantaged students, who participate in music, score significantly ($p < .05$) higher than other disadvantaged peers who do not participate in music, but they have closed the achievement gap with non disadvantaged students (Fitzpatrick, 2006). An understanding of the value of music training and musical experience may help administrators and teachers to close this gap further. Economic status is the largest factor in the determination of access to a program (Albert, 2006). Economically disadvantaged students may not have the same access to music programs as their more advantaged counterparts. However, participation in music programs can assist in the retention of economically disadvantaged students (Albert).

The increased retention rates may be because these economically disadvantaged students experience more support and attachment to the school. Often, economically disadvantaged students come from single parent households and score lower on most state certified

achievement tests (Kinney, 2008). According to Kinney, academic achievement and family structure may play a role as predictors of student enrolment in band programs. Factors, which affect access to music programs, are demographics

Fitzpatrick (2006) conducted a study on the effect of instrumental music participation and SES with the proficiency test results for Ohio fourth, sixth, and ninth grade students. She found that instrumental music students scored higher than non instrumental students in every subject. Students, who were economically disadvantaged, attained higher scores than students who were not economically disadvantaged in the fourth grade. Also, there was a pattern of increased achievement by economically disadvantaged students as they progressed through their music program. Eventually, the economically disadvantaged students outscored their non disadvantaged peers, who were not involved in instrumental music by the ninth grade, in all subjects. These findings support the idea that music participation assists both economically disadvantaged and non disadvantaged peers, in that, they can attain higher achievement in academic areas outside of music.

Boyd noted that the findings from several studies supported the idea that music participation benefits the academic progress of all students in the classroom. As students progress through middle school and completion of high school, often, they are required to take standardized tests, which provide an indicator of college readiness. As noted by Cox and Stephens (2006), this final indicator of college readiness demonstrated that students, who were engaged in music participation, were more prepared for college. Scores on the College Entrance Board Exams showed that students, who had some form of music performance on their transcript, scored 39 points higher on the mathematics section of the Scholastic Aptitude Test (SAT) in comparison to those students who did not participate in music. Similarly, students, who

had music performance and appreciation courses listed on their transcript, scored 46 points higher on the mathematics portion of SAT in comparison to those who did not have music performance or participation (Boyd,2013).

Related Literature in Ghana

Couples of scholars in Ghana (See Amuah, 1994, 1998; Dompreh, 2002) have also investigated into creative musical abilities, relationships between musical participation and experience and musical memory and cognitive response among primary and secondary school students.

Amuah (1994) provided a study on the relationship that exists between musical memory and specified aspects of musical achievement goals such as musical behaviour. Environmental and personal factors were also part of his investigation. In Amuah's study, he was concerned with four main variables; musical memory, environmental factors, musical behaviours and personal factors. Amuah (1994) purposely observed the following:

(1) The strength and direction of the relationship that exist between memory ability for music and years spent in studying a musical instrument

(2) The strength and direction of the relationship between musical memory and ability and membership in a school band, and/or orchestra

(3) The relationship that exists between the strength and direction of musical memory and cognitive failures

(4) The relationship that exists between the between the ability of musical memory of music and various environmental factors; specifically are parents' ability to play a musical instrument, (b) availability of audio equipment at home, (c) family musical interaction, and (d) availability of musical instruments at home

(5) The relationship that exists between the ability in musical memory and specific personal factors

(6) The connections that exists between variables of years of mentioned specific form of musical participation and ability in musical memory

(7) The difference between instrumental music students and non-music students' ability in memory for music

(8) The extent to which high school students vary in their ability to remember music of varying styles

Amuah's main concern was to determine various cognitive processes that are mostly involved in musical participation. He cited Sloboda (1985) and Mursell (1931) as some of the literature that shared worried concern about the need for music educators to participate more in various studies in such fields; that is relating to music psychology.

Amuah's study was designed within the framework of causation (causal) and correlation. However his study (Amuah, 1994) was neither conducted in Ghana nor any part of Africa. Amuah accounted that 'The collection of data began on Tuesday, March, 1993, in a suburban Chicago high school' (Amuah, 1994, pp.114). Detailed reports in the data collection processes of Amuah's research informed that the study was mainly conducted in a suburban of Chicago high school and submitted to Northwestern University. This has identified that the problem of environmental barrier (Hargreaves, 1985) still existed in Amuah's (Amuah, 1994) study.

The researcher noticed that Amuah's literature used most of the familiar tools such as statistical package (SPSS), questionnaires, among others. This has supported the methodology of this study, which compared to Amuah's, have some similar characteristics in methodological

processes which have to do with music psychology. However, Amuah used exploratory data analysis whiles this study was a survey with correlation.

Dompreh, (2002) provided a study on creative music abilities of primary school pupils in Hohoe and Jasikan districts of Ghana. In his study he proposed four (4) specific purposes to determine the differences among variables of creative music abilities; Basic one to six pupils, boys and girls, urban basic pupils, rural basic pupils, and also differences in creative factors among and sex of pupils. The four specified purposes for his study were:

1. differences among the creative music abilities of pupils in primary one to six
2. differences among boys and girls
3. differences among the creative music abilities
4. differences among creative factors and sex of pupils and also rural and urban location of pupils.

Dompreh's (Dompreh, 2002) study employed exploratory design. Dompreh's findings informed that basic school pupils have the ability to create music with which the existence of various significant differences was identified. He also found out that boys do better than girls in musical creativity because of restrictions and anxieties that the girl child experience in the In conclusion, various investigations, explorations and surveys in the review of literature provided various findings to note that music enhances academic achievement. Boyd (2013),Hetland (2000b),Gardner (1983), Gardner (1993), Hanna-Pladdy (2011), Rauscher et al (1993), Bridges (1994), Butzlaff (2000) and Deanne (2015) were dominant among others scholars in this literature review who provided empirical findings and results from various endeavors of investigation to confirm the verity of the phenomena. From this point the anticipation of the

researcher had been increased to develop the various hypotheses for discussion and testing in the study. Notwithstanding, other counter arguments were also appreciated to put up with people with different views. This condition was also a motivation of a stronger desire to investigate into the phenomena. The various discussions in the review of this literature helped me to notice and be informed about various academic gaps (see Sloboda, 1985; Hargreaves, 1988 and Boyd, 2013) which I developed in my problem statement as part of the significance of this study. Adding to these, the review of literature had also informed about the current trends of high desire of music educators and other scholars who are currently investigating into these matters of Music and Psychology but which are mostly in the Western world for which I hope that Ghanaian scholars would be challenged to endeavour into the investigation of such matters of central musical importance as Sloboda had informed (Sloboda, 1985).

Summary of Literature

In conclusion, various investigations, explorations and surveys in the review of literature provided various findings to note that music enhances academic achievement. Boyd (2013),Hetland (2000b),Gardner (1983), Gardner (1993), Hanna-Pladdy (2011),Rauscher et al (1993),Bridges (1994),Butzlaff (2000) and Deanne(2015) were dominant among others scholars in this literature review who provided empirical findings and results from various endeavors of investigation to confirm the verity of the phenomena. From this point the anticipation of the researcher had been increased to develop the various hypotheses for discussion and testing in the study. Notwithstanding, other counter arguments were also appreciated to put up with people with different views. This condition was also a motivation of a stronger desire to investigate into the phenomena. The various discussions in the review of this literature helped me to notice and

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CHAPTER THREE

METHODOLOGY

Introduction

This chapter focused on the methodology that was used in the study. It dealt with research design, population, sample size and sampling techniques, research instruments, validity and reliability of instruments, data collection procedures, ethical considerations and data analysis techniques.

Research Design

The study was grounded on quantitative approach using the positivist paradigm. Positivism is concerned with uncovering truth and presenting it by empirical means (Orodho, 2003). The positivists assume that knowledge is objective and quantifiable and use scientific methods to enhance precision in the description of variables and the relationship among them. Borg and Gall (2007), defines a research design as the structured approach followed by researchers to answer a particular research questions. Creswell (2003) further added that this is a research design that involves the procedures of quantitative research in which investigators administer a survey to a sample or to the entire population of people to describe the attitudes, opinions, behaviours, or characteristics of the population. The study adopted correlational design to examine the relationship between music training and classroom performance scores.

McLeod (2008) defines correlational research as a type of research involving the measurement of two variables which are related. Creswell (2012) colloquially, defines correlation as relationship between two variables. Specifically, the researcher used explanatory design to explain the association between music training and classroom performance score of basic school students. An explanatory research design is a "correlational design in which the

researcher is interested in the extent to which two variables (or more) co-vary, that is, where changes in one variable are reflected in changes in the other" (Creswell, 2012, p.340).The researcher adopted explanatory correlational design because it helped in explaining the relationship between music training and classroom performance scores (in Mathematics and English subject) and also for theory verification(McLeod, 2008).

Setting

The study was conducted in the University of Ghana Basic School, Legon. The school curriculum included music education and training programme at the Junior High School but not at the primary school. Some of the children from the primary department freely participated in the secondary department music training programmes whiles some participated in home and other private music training programmes. Some also do not participate in any music training programme at all. The proposed setting for this study therefore was able to provide the useful data from music training and non-music training pupils for verifying Gardner's MI theory.

Population of the Study

Population of a study includes members of a defined class of people, events or objects upon which a researcher wishes to generalize (Creswell, 2012). The population of the study comprised primary school pupils of the University of Ghana Basic School, Legon. Pupils' enrolment at the primary section stood at 1,090, and was between the ages of 6-13 years (Assistant Head teacher's Office, 2015). The accessible population, however, was made up of all the students from the four classrooms of Primary 6 pupils in the University of Ghana Basic School, with a total population of 240 pupils (that is both school children with music background and those with non-music background), with mean age of 11 years. Primary 6 pupils formed the population because that particular stage is the apex (climax) of primary education.

Pupils at this stage are within Piaget's formal operational stage and can adequately report about themselves and their abilities (Hargreaves, 1988). The pupils were also chosen due to their exposure to regular musical events including Christmas carols, Easter music recital, music programmes in collaboration with language week, joint school music participation and outdoor music programmes for which some of them receive music training and are active participants.

Sample and Sampling Technique

Sampling refers to the process of selecting a suitable smaller size of a population of a representative part of a population for the purpose of determining parameters or characteristics of the whole population (Kombo & Tromp, 2006). Kombo and Tromp (2006) informed that the suitable proportion of 240 is 84. For this reason, a convenient sample of 84 pupils was involved in the study. This technique was used in order to effectively and efficiently managed data collected and it also fairly represented the population understudy. In selecting the participants for the study, multiphase sampling techniques were used (Cohen, Manion& Morrison, 2007). In the first of phase of the sampling process, purposive sampling technique was used to select the four basic 6 classes in line with the purpose of the study. Secondly, the population was put into two equal strata (stratum 1 = music training (42 pupil), and stratum 2 = non-music training (42 pupils)) for equal weighting and representation of a stratum. Finally, simple random technique was used to select participants for the study using the lottery methods. In doing so, the researcher randomly gave identification numbers (1-42) to each of the two groups. These numbers were then re-written on pieces of paper and placed in an opaque bowl. The researcher then drew from the bowl 42 numbers at random and selected the pupils whose numbers corresponded to the drawn numbers for each stratum (group) for data collection.

Instrumentation

Structured aptitude test was used to gather the needed data to answer the research hypotheses. The instrument was structured into three sub-sections. The first section elicited information of participants' biographical data (e.g. age, knowledge of music training, forms of music training and duration of practice). The second section assessed pupils' knowledge and understanding in Mathematics. Twenty (20) multiple choice questions were carefully self-constructed (with inputs from Primary 6 teachers) from the Primary 6 Mathematics syllabus. The third section assessed pupils' knowledge and understanding of English Language (e.g. nouns, verbs, adjectives, spellings, etc.) with 20 fill-in-the-blank items. These items were written based on the English Language syllabus for Primary 6 with assistance from English Language teachers of the primary department. The instrument has duration of 1hr of which pupils (both music training and non-music training) attempted the test.

The test was scored over 100 percent (Mathematics = 100% and English Language = 100%) and arranged according to the following criteria; Less than 50% (1), 50% – 59% (2), 60% – 69% (3), 70% – 79% (4) and 80% – 100% (5).

Data Collection Procedures

A letter of introduction was obtained from the Department of Music Education, University of Education, Winneba, seeking permission from the University of Ghana, Legon Basic School authorities to conduct the study. After obtaining informed consent from the school authorities, convenient date and time was scheduled for data collection. On the day of administration, a large convenient room was secured for the test. The tables in the room were labelled with reference special numbers (001 – 084) and the pupils were asked to occupy any of these tables for the test. Next, the sampled population was taken through some test procedures in

responding to the items. After the debriefing session, the pupils were given the test to respond to. The classroom assessment test was taken under examination conditions (e.g. pupils were not allowed to communicate and were asked to do independent work). Assistance was sorted for invigilation. Pupils were allowed 1 hour to complete the test on the paper. After the test, the researcher collected the papers thanked them for comporting themselves and appreciating their participation in the study. The test was subsequently scored and recorded for easily data entry and analysis.

Validity and Reliability of Instrument

Face and content validity of the research instrument was ascertained with assistance from the researcher's supervisors and field experts. Necessary corrections and modifications made by the supervisors and the experts were effected before putting the instrument to use. In term of reliability, the instrument produced internal consistency alpha level of .71. The alpha value is deemed satisfactorily in collecting reliable data (Tavakol & Dennie. 2011).

Ethical Considerations

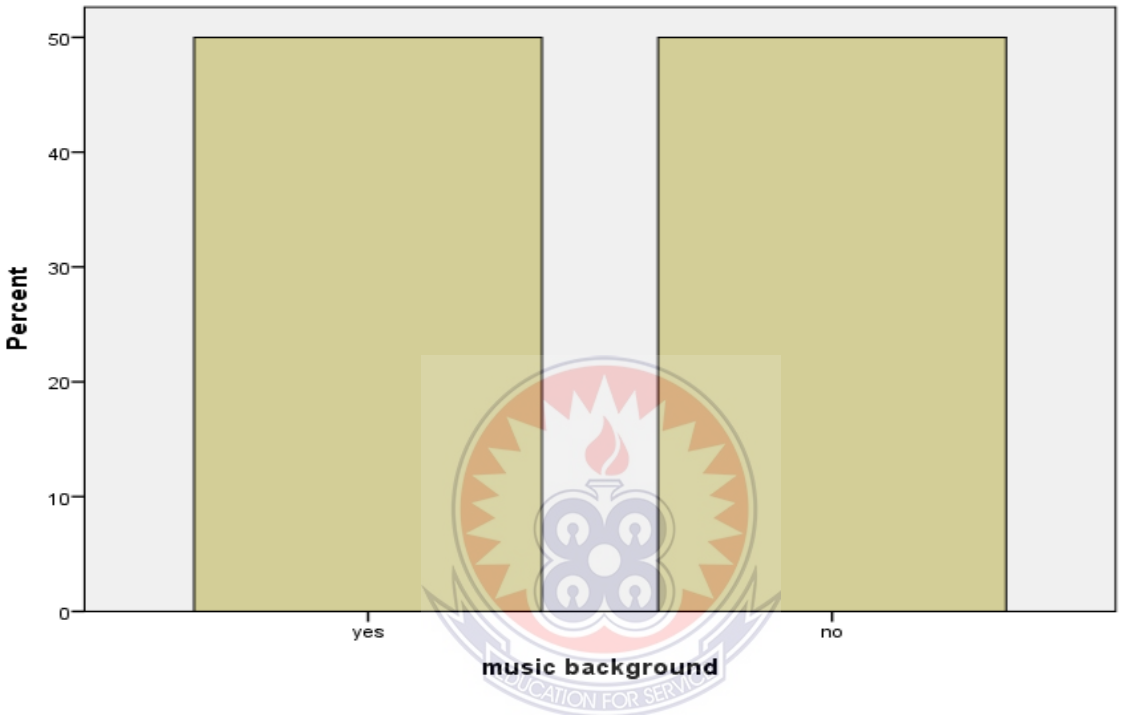
Participation in the study was strictly on voluntary basis. Participants were duly informed fully as to the purpose of the data. Measures were taken to ensure respect, dignity and freedom of each individual participating in the study. Participants were informed that the information provided would be kept confidential and would not be disclosed to anyone else, including the school authorities.

Data Analysis

Both descriptive and inferential statistics were used to analyze the data. The biographical data of the participants were analyzed descriptively using percentages and presented in the form of chart. Inferential statistics was used to test the hypotheses. Hypothesis 1 was tested using independent t-test. Hypothesis 2 and Hypothesis 3 were analyzed using ANOVA (Analysis of Variance). Before the tests were run, descriptive analyses, in the form of means and standard deviations were computed.

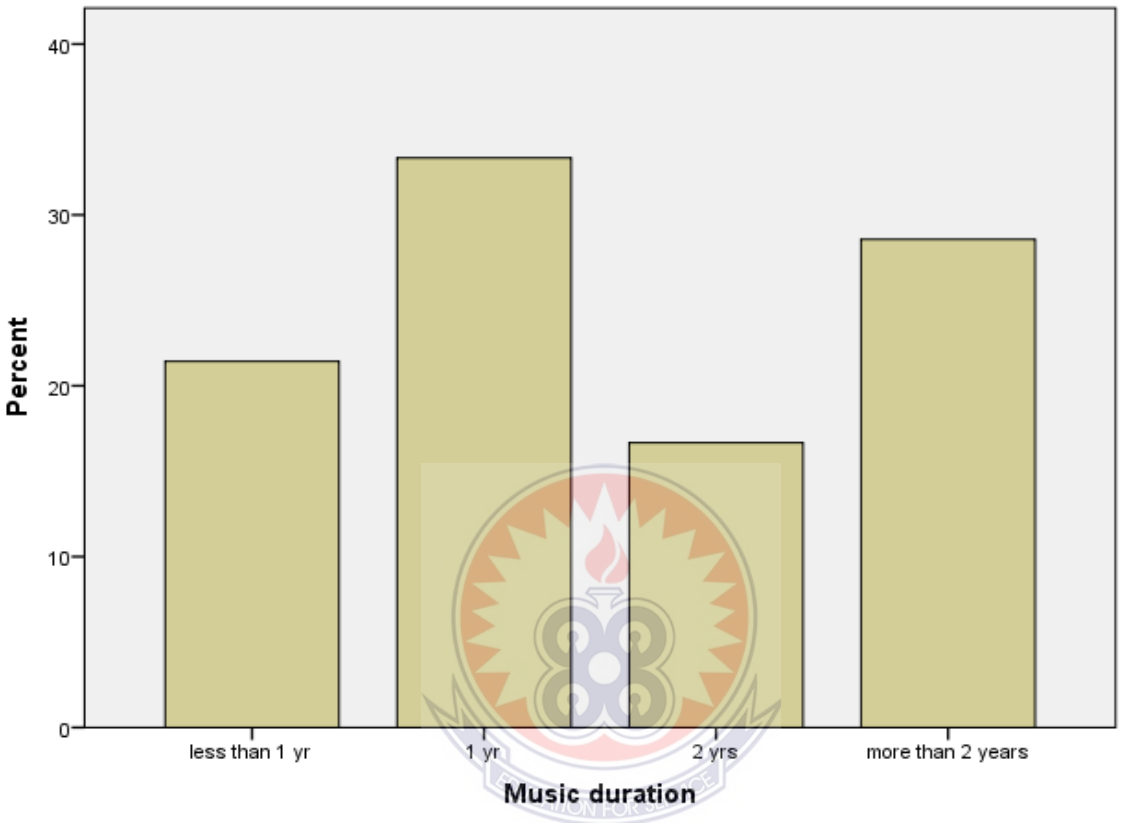
Figure 1 presents age distribution of 84 pupils used for the study. Out of the this number, 9.5% were 10 years, 48.8% were 11 years, 28.6% were 12 years and 13.1% were 13 years of age. Pupils' background in music training was also investigated. The result is presented in Figure 2.

Figure 2: Distribution of pupils' music background



The result in figure 2 shows that 42 (50%) of the participants have had music training and the remaining 42 (50%), do not have any knowledge in music training. This data was necessary in testing for hypothesis 1 and 2. The forms of music training were also investigated among pupils who have had knowledge of music training. The result is presented in figure 3

Figure 4: Duration of pupils' involvement in music training (N = 42)



As shown in Figure 4, out of 42 pupils who indicated their involvement and participation in music training which is 21.4%, were involved in music training in less than 1 year, 33.3% had music training for 1 year, 16.7% practiced less than 2 years and 28.6% practiced more than 2 years. This data is significant to the study since it provided the needed information in testing hypothesis 4.

Testing of Hypothesis 1

Hypothesis 1 sought to find out whether there are significant differences in the performance scores of music training and non-music training pupils in University of Ghana Basic School, Legon. In arriving at this objective, the hypothesis was posed and tested at an alpha level of 0.05 using Independent sample t-test.

H_0: There is no significant difference in performance scores of pupils who participate in music training and pupils who do not participate in music training in University of Ghana Basic School.

H_1: There is significant difference in performance scores of pupils who have knowledge in music training and pupils who do not participate in music training in University of Ghana Basic School.

Table 2

Differences in performance scores of music and non-music training pupils

Variable	Mean (M)	Standard Deviation (SD)	*Df*	*t-cal*	*Sig.*
Mathematics score			82	10.784	.00
Music training	3.81	.83			
Non-music training	1.59	.54			
English Language score			82	10.732	.00
Music training	4.48	.99			
Non-music training	1.98	.16			

P < 0.05(2-tailed)

As shown in Table 2, there was difference in the mean score of pupils with music training (M = 3.81, SD = .83) and non-music training (M = 1.59, SD = .54) in Mathematics. In terms of performance in English Language, the mean scores in performance varies with pupils with music training (M = 4.48, SD = .99) and non-music training pupils obtaining (M = 1.98, SD = .16). To establish whether differences in the means are statistically significant, t-test was run. The result suggested that there was a statistically significant difference in the performance score of the students who do have or have had music training music and those who does not participate in any form of music training in among the year six (6) pupils in the University of Ghana Basic School for Mathematics [t = 10.784, p = .000]. Regarding differences in mean score of music and non-music pupils with relating to the test scores of English Language, the result revealed that there is statistically significant difference [t = 10.732, p = .000].

From the results, it was concluded that there is significant difference in the performance scores of those who have music training and those who do not participate in any form of music training. The null hypothesis is rejected and the alternate hypothesis is accepted at a probability alpha of 0.05. It can be concluded that participating in music training enhances classroom performance score of pupils. To examine the relationship between music training and performance score of basic six pupils, Pearson correlational test was run and the result is presented in Table 3.

Table 3

Relationship between Music Training and Performance Scores

		Music Training	Maths Scores	English Scores
Music Training	Pearson Correlation	1	.766**	.764**
	Sig. (2-tailed)		000	000
	N	42	42	42

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

A Pearson product-moment correlation was computed to assess the relationship between music training and Mathematics performance (r = .766; p = 0.00) and English Language score (r = .764; p = 0.00). The strength of the relationship between performance scores and music training is large (Cohen, 1988). The perceived music training helps to explain nearly 59% of the variance in respondents' Mathematics score and 58% in respondents' English Language score. The results suggest that knowledge in music training significantly influence pupil's performance scores.

Testing of Hypothesis 2

Hypothesis 2 sought to find out whether the form of music training influence the performance scores of pupils in University of Ghana Basic School. To achieve this objective, the following hypotheses were posed;

H_0: There is no significant difference between specific forms of music training and performance scores of pupils in University of Ghana Basic School.

H_1: There is significant difference between specific forms of music training and performance scores of pupils in University of Ghana Basic School.

Table 4

Descriptive analysis of forms of music training and performance scores

Forms	Frequency	Mathematics Score		English Score	
		Mean	Standard Deviation	Mean	Standard Deviation
Piano	19	3.89	.94	4.32	1.16
Drumming	2	3.40	1.41	3.09	.26
Trumpet	6	3.83	.41	4.10	1.10
Guitar	7	3.42	.58	3.06	.28
Music theory	4	3.09	1.15	3.20	1.11
Flute	4	3.71	.50	4.25	.96

Table 3 shows the forms of music training pupils of University of Ghana Basic School reported to participate in. The results showed differences in mean performance scores of pupils who participate in music training. The mean scores of pupils in Mathematics as against the forms of music training include; Piano lessons (M = 3.89), Drumming (M = 3.40), Trumpeting (M = 3.83), Guitar (3.42), Music training (M = 3.09) and Flute (M = 3.71). For English performance scores, Piano lessons (M = 4.32), Drumming (M = 3.09), Trumpeting (M = 4.10), Guitar (3.06), Music training (M = 3.20) and Flute (M = 4.25).

To find out whether differences in the mean scores are statistically significant, ANOVA test was run. The result is presented in Table 5.

Table 5

ANOVA of Forms of Music Training and Performance Scores of Pupils

	Sum of Squares	D*f*	Mean Square	F	Sig.
Mathematics scores				.881	.504
Between Groups	3.103	5	.621		
Within Groups	25.373	36	.705		
Total	28.476	41			
English scores				1.232	.315
Between Groups	5.621	5	1.124		
With Groups	32.855	36	.913		
Total	38.476	41			

There was not statistically significant difference in the performance scores of pupils in Mathematics [F (5, 36) = .881, p = .504] and English Language [F (5, 36) = 1.232, p = .315]. Therefore, the null hypothesis is accepted and alternate hypothesis rejected at an alpha value of 0.05. It can be concluded that pupils who participate in music training have similar classroom performance level irrespective of the forms of music training in the University of Ghana Basic School.

Testing of Hypothesis 3

Hypothesis 3 established whether duration of music training influence performance scores of pupils who practice music training in the University of Ghana Basic School. To find empirical evidence, the following hypotheses were formulated;

H_0: Duration of music training will not affect the performance score of pupils in University of Ghana Basic School.

H_1: Duration of music training will affect the performance score of pupils in University of Ghana Basic School.

Table 6

Descriptive analysis of duration of music training and performance scores

Duration	Frequency	Mathematics Score		English Score	
		Mean	Standard Deviation	Mean	Standard Deviation
Less than 1 year	9	3.67	.71	4.14	.44
1 year	14	3.71	.95	4.78	1.29
2 years	7	3.86	.99	4.33	.19
More than 2 years	12	3.92	.99	4.99	.98

As shown in Table 6, differences exist in the duration of music training and performance scores of pupils. The mean scores of pupils in Mathematics as against the duration of music training include; less than 1 year (M = 3.67, SD = .71), 1 year (M = 3.71, SD = .95), 2 years (M = 3.86, SD = .99) and more than 2 years (M = 3.92, SD = .99). For English performance scores; less than 1 year (M = 4.14, SD = .44), 1 year (M = 4.78, SD = 1.29), 2 years (M = 4.33, SD =

.19) and more than 2 years (M = 4.99, SD = .98). The table suggests that pupils with more than 2 years practical experience in music training perform better than the remaining year group.

However, to find out whether differences in the mean scores are statistically significant, ANOVA test was carry out. The result is presented in Table 7.

Table 7

ANOVA of Duration of Music Training and Performance Scores of Pupils

	Sum of Squares	D*f*	Mean Square	F	Sig.
Mathematics scores				.188	.904
Between Groups	.417	3	.139		
Within Groups	28.060	38	.738		
Total	28.746	41			
English scores				1.694	.184
Between Groups	4.540	3	1.513		
With Groups	33.937	38	.893		
Total	38.476	41			

The data in Table 7 suggested that there were no statistical significant difference in the performance scores of pupils in the Mathematics test score [F (3, 38) = .188, p = .904] and English Language [F (3, 38) = 1.694, p = .184] of pupils who have varied duration of music training practices. The null hypothesis is therefore accepted and alternate hypothesis rejected at

an alpha value of 0.05. It can be concluded that pupils who participate in music training have similar intelligence level irrespective of duration of music training.

CHAPTER FIVE

DISCUSSIONS

Introduction

This chapter presented the discussion of the review of analysis, results, findings and theoretical framework, methodology as well as various analogous discussions for continued research. The chapter also was to provide a contributing dialogue on the matter of various processes that contributed to the development of this study as to literature review, questionnaires, hypotheses, investigations, data collection, analyses of results and findings, setting, proposal and the discussion of a theoretical framework among other things. All efforts were to help to determine whether there was a relationship between music training and academic achievement in the University of Ghana Basic School children. An ANOVA, T-test and biographic data were major tools for analysis and for the determination of the hypothetical. There is also the use of mean differences and the standard deviation as part of analytical tools for this investigation.

Music Training and Performance Score

Hypothesis 1 sought to find out whether there are significant differences in the performance scores of music training and non-music training pupils in University of Ghana Basic School, Legon. It was found that there are significant differences in the performance scores of those who have had music training in correlation to those who do not participate in any form of music training. The result confirmed Gardner's theory of Multiple Intelligence (Gardner, 1983), which postulate that music is significantly an intelligence that is achieved through music training, and that it can enhance other achievement goals. Other related investigations, as discussed in literature have also confirmed the verity of hypothesis 1 results (Arul, 2013; Bergland, 2013; Boyd, 2013; Costa-Giomi, 2000; Yoon, 2000). It was also of scholarly

agreement that music training builds music intelligence and that music intelligence enhances academic achievement (see also Hargreaves, 1989; Gardner, 1993; Cox & Stephens, 2006; Gabriel, 1981; Hetland, 2000b).

Music training stimulates the brain to improve smartness, memory and retrieval of facts. Lehr (1998) agreed that highly refined control in brain patterns and cognition is developed through music training in childhood with a counselled level of stimulation in almost the entire brain to improve smartness. Music training increases the brain's total capabilities were increased which perhaps, is contributing to pupils' intelligence. Engaging in music training requires attending to principles and rudiments of musical instruments. The rhythmic and melodic nature of music activates the cyclical patterns of the brain which enhance memory. Music opens up pupils' minds in many ways as they learn to think creatively. This creativity is promoted through the composition of songs. In that regard Music promotes imagination as pupils can solve problem quickly. They can solve problems quickly through imagining various solutions. Music also teaches pupils to be empathetic, at the same time enhances team work and discipline. Music is also fun by its nature. Plating an instrument is fun and it brings self-confidence and satisfaction. In that regard Music contributes to the development of self- esteem and self-actualization. Music therefore contributes to the development of the individual. It touches the different tenets of development which are social development, emotional development, cognitive development, morale development and intellectual development among others.

Forms of Music Training and Performance Score

In Hypothesis 2, investigation was conducted to find out whether the form of music training participants engaged in could influence their respective performance scores in Mathematics and English Language. The forms of music training included in the study were

piano training, drumming lessons, singing and voice lessons, guitar lesson, training in wind instrument (both brass winds and wood winds) and lessons in stringed instruments such as violin or cello. Results indicated that there were no statistical significant differences in the performance scores among students in the various categories of the forms of music training as examined in the study among students in the University of Ghana Basic School. Results of this supposition provided a null hypothesis as against the assumption that those who participated in piano training attain higher performance scores as discussed by literature (Temmerman, 2000).

Whiles Temmerman (Temmerman, 2000) and other scholars reported that piano training had recorded higher scores of performance among some students this study also produced different empirical values that have gone contrary to what had been reported. For instance, when ANOVA test was used to determine whether a statistical relationship exist between the various forms of music training, there was no statistical significant difference. Mathematics was $F(5, 36) = .881$, $p = .504$ and English Language was $F(5, 36) = 1.232$, $p = .315$. Therefore, the null hypothesis is accepted and alternate hypothesis rejected at an alpha value of 0.05. The Null Hypothesis in hypothesis 2 in the study is anticipated as scholars confirmed that changes in results of efforts in replicating a study may be expected on various conditions including the training environment (Murillo and Martinez-Garrido, 2012). Even though piano training may enhance higher learning than trumpet, drumming, violin, or music theory, the environment where these instruments were taught may also contribute to performance. An example of these environmental variations mentioned were the classroom, the teaching and learning resources as well as the instrument and the teacher. The setting proposed for this study is therefore a matter of concern. It was proposed that some of these changes may affect the child or student's attention level as well as output (Murillo and Martinez-Garrido, 2012). Murillo and Martinez-Garrido

(2012) informed that apart from these environmental variations there are other factors that may affect achievement goals among students. Therefore though similar studies were conducted by examining various forms of music training, the results of the University of Ghana Basic School has produced a varied result. Therefore the results of hypothesis 2 resulting to a null hypothesis may be expected because this study was conducted in the University of Ghana Basic School, in Ghana, as compared to those carried out in Chicago, Canada, UK, and other Scandinavian countries (Hargreaves, 1986).

Akrofi (n.d), also, in a lecture, discussed that curriculum is not just about the syllabus but the total environment including the syllabus, the classroom, teaching and learning tools, research materials and all that contribute to the total development of a child in an academic environment and also to the achievement of academic goals. This has also supported to inform that for a successful output of any form of music training the total curriculum is of vital concern. In discussion it can be noted that the hypothesis that piano training enhances higher academic achievement goals as compared to other forms of music training such as drumming and music theory became a null hypotheses. However it may not completely dispute the proposal from other academic investigations that also provided various results that piano training produced higher performance goals. This is because results from the University of Ghana Basic School may be different from results from another environment such as those from other environments such the Western communities as informed by Hargreaves (Hargreaves, 1986).

The discussion then is that the environment in which every individual child lives is a key factor that contributes to determine the level of performance in academic achievement goals. The results informed that choosing to play piano other any other form of music training such as music theory, drumming or violin lesson does not completely guarantee higher academic performance

but the environment and all other learning processes for a successful reward were also necessary. Many scholars and researchers were of much concern with this matter in their various endeavours of research and investigational activities so as to generalise or to be specific with their findings. Hargreaves (1986) therefore pointed out his observation on this matter that majority of research works relating to academic achievement goals interdisciplinary investigations and other analogous studies in psychology and music were mostly conducted in the western world (for example, United States of America, United Kingdom, as well as other European countries) with the testing on western classical music, such as music of Mozart (The Mozart Effect, Campbell, 1997), Handel and Beethoven. Therefore the researcher believes that using University of Ghana Basic School would inspire such interdisciplinary investigations in future in its related environment (Ghana).

Discussion Hypothesis 3

Hypothesis 3 was formulated to anticipate that duration of music training may affect a change in performance scores among pupils who have background in music training in the University of Ghana Basic School. ANOVA was conducted to confirm the verity of this anticipation. However, results informed that there were no statistical significant differences in the performance scores of pupils in the Mathematics test score and English Language scores among pupils who have varied backgrounds in duration of music training in the University of Ghana Basic School. Results from the investigation into hypothesis 3 provided empirical data that had gone contrary to the anticipation that the longer the duration of music training the higher the performance scores (Schlaugh, Norton, Over & Winner (2005).

In some other studies, investigations were conducted among children for six (6) months (Yoon, 2000), children with several years of music training **(**Rauscher & LeMieux, 2003**),** One

year of music training (Schlaugh, Norton, Over & Winner, 2005) and four (4) years of music training (Schlaugh, Norton, Over & Winner, 2005). However, these studies did not provide empirical results that can compare differences in their results to confirm the verity of the anticipation as formulated in hypothesis 3.

However, Boyd (2013) informed that years of music participation were correlated with increased academic success. His proposal was in connection with a study he conducted to determine the relationship between music participation and academic achievement. Boyd's research found out that as students increase their time in music programs they increase their chances of higher achievement in academic areas such as mathematics (Boyd, 2013).

Nonetheless, Boyd used a comparative analysis with a descriptive survey (Boyd, 2013). Boyd's study population was also different from the one used in this study. For example, Boyd used middle school students whiles this study used basic school students. This categorisation provided different levels of thinking as informed by Hargreaves (1986) on the concept of developmental stages and developmental readiness. Boyd also used Georgia Criterion-Referenced Competency Test whiles this study employed Classroom Assessment Test. For this reason there were various implications when changes occur in hypothetical results as provided in hypothesis 3 of this study.

In the analyses of results provided in chapter 4, it was noticed that empirical differences existed in the duration of music training and performance scores of pupils. However, ANOVA was used in testing the statistical significance differences to note that there were actual no statistical significant differences. For instance as Mathematics test score was $F(3, 38) = .188$, $p = .904$ and English Language was $F(3, 38) = 1.694$, $p = .184$. Therefore there was a null hypothesis for hypothesis 3 to inform that there was no difference in performance score when it

comes to duration of music training as result confirmed from this study in the University of Ghana Basic School.

CHAPTER SIX

SUMMARY, CONCLUSIONS AND RECOMENDATIONS

Introduction

Presented in this chapter were the summary of findings, conclusions, recommendations and suggestions for further studies. The chapter considered the content of various documents including background information, discussions of research hypotheses, research problems, significant statements of the study, the critical observation of the theoretical framework, literature review, the empirical investigations of data collected and various analogous discussions that can help to present a standing premise aimed at contributing to academia and the world of work.

Summary of Findings

The collected data of the study were analyzed and examine with various apparatus including ANOVA, independent sample t-test, biographic data, Pearson correlation test, statistics and various hypotheses to determine the relationship between music training and performance scores among University of Ghana Basic School students.

The first hypothesis investigated the performance scores of music training pupils and non-music training pupils of University of Ghana Basic School. General and detailed testing and investigations provided evidence that the musically trained school children scored higher in their academic achievement scores than that of the non-musically trained. When a correlation test was run, it was found that participation in music training influence performance score of pupils.

Also, ANOVA was carried out to determine if there were any statistical difference in the various forms of music training and performance score. The data analysis produced a null hypothesis to inform that there were no statistical differences among the participants with

various forms of music training. This suggests that performance scores of pupils in Mathematics and English Language would remain the same irrespective of the forms of music training.

Testing of Hypothesis 3 informed that there is no significant difference in the performance scores of pupils with varied durations of music training. This suggests that the intelligence of pupils will not vary significantly due to duration of music training.

Conclusion

This study had revealed that musically trained children become musically intelligent children who averagely do better than those children who are not musically intelligent. For this reason, Gardner (1993)'s acknowledgment of Music Intelligence in his theory of multiple intelligence had been tested to be true according to the procedures of this study.

Implications of the Study

The results from this study clearly established a relationship between music participation and academic achievement in University of Ghana Basic School. These findings could be used to initiate vital discussions about the value of music programs in the public school settings. Public school (University of Ghana Basic School) was mentioned here because it is the main educational avenue for the mass, but where literature (Akrofi, 1982, 1988, 2002 and Flolu and Amuah, 2003) also revealed that music education here (public schools as compared to private schools) is dormant or that it is not an educational priority. It was found that participation in music training enhanced these students' mathematics achievement. This finding supports several key ideas that are present in various discussions in the study. Gardner (1993) reported that musical intelligence is one of the main intelligences by which students learn and interact with the world. It was noted that students who participate in music training activate their musical knowledge through the use of songs, patterns, rhythms, pitch recognition, as well as through

comprehension, application, and synthesis of each of these respective concepts. Ultimately, students who participate in musical activities will use all of these aspects and concepts to create new musical ideas.

Gardner emphasized that music intelligence is very important because it relates to all other forms of intelligence, especially in the area of mathematical intelligence due to the ability of music to help one encounter and understand ratio and regularity (Nolan). The findings in this study suggest that these statements by Gardner may be true, although it is important to study a causal relationship in the future.

Though literature such as Boyd (2013), provided that as a student increased his or her years of participation in musical activities, likewise, he or she increased the opportunity for increased test scores, the hypothetical results from this study could not support that and so provided a null hypothesis. On the other hand, though it cannot be stated that increased musical activity causes higher academic achievement, there is generally a clear connection between general participation in music training and its relationship with the various test scores of academic achievement averagely in this study.

The findings from this study supported previous research, which indicated that music participation correlates with academic success (Boyd, 2013; Costa-Giomi, 2000; Cox, 2006; Deanne, 2015; Hallam, 2000; among others). The main implication is that music programs are very important discipline and are a vital part of a child's development and achievement of academic goals. As students participate in music programs, they have higher probability of achievement in academic areas such as mathematics and language such as English which was tested in Basic 6 class of the University of Ghana Basic School. Music training also prepares the

mind for studies as evidenced in the content of an interview with Benedictor Okyere (see chapter three), my student interviewee in one of the primary 6 classes.

The correlation of music training with higher test scores deserved an important consideration in a time when the Ghana Education Service and the Ministry of Education in Ghana are aiming at meeting the goal of higher standards and proficiency in academic performance, especially in the Basic Education Certificate Examination (BECE). Music is a tool that can be used to bridge the learning gaps.

As the focus of educational objectives begin to move to career readiness, this researcher supports the idea that access to participation in music training may better prepare a student for future goals (Cox, 2006) because music training in itself too is a professional training which school children can develop to become music educators, musicians, music scholars and researchers, music therapist, music engineers, among other professions.

In this study, the students who participated in music training had higher average scores. This correlation supported Cox's finding that students, who participated in music and graduated from high school, scored 139 points higher on the SAT than those who did not participate in music. I therefore suggest also that school officials should consider the use of music programs as a means to influence higher academic achievement goals as indicated by standardized test scores.

However, an unexpected finding was that the number of years of music training did not correlate with their various achievement scores and therefore resulted to a null hypothesis. In the discussion of literature various scholarly reports have confirmed that as training duration increases achievement scores also increases but the various test scores in the provision of data in the study did not confirm this anticipation. It is also important to note that it was difficult to

determine if the correlation was between years of music participation and academic achievement or if the correlation was between years of quality music participation and academic achievement.

Recommendations and Suggestions

Basically, in recommendation, I suggest that music education should be included in the basic school curriculum, especial in the public schools in Ghana and be made a discipline of priority as it significantly and empirically enhances academic achievement among school children. This researcher sought only to discover whether or not a logical significance existed between the variables of music participation or none music participation with relation to academic achievement. For this reason more study should be conducted to understand the value or practical significance of having avenues of music participation in school. I linked this observation with what Kirk (1996) observed that practical significance is being concerned with whether or not the result of something statistically significant is useful in the real world.

Recommendations for Future Study

The study had concluded that music training enhances performance score among students with this study producing an alpha value of 0.05. It can be therefore recommended that in future studies, one could compare how music participation affects individual domains of various subjects taught in school such as Mathematics and English language as well as other subjects that have not been investigated in this study to correlate achievement or how it affects certain domains of other disciplines over others as taught in school. Also, only correlations were examined in this study. Future researchers should study how quantifiably music participation increases academic achievement. I believe that such a study would unify this work and previous correlations and provide a cause and effect relationship.

The future research agenda for phenomena of music training and its relationship with academic achievement linking with MI theory and intelligence is likely to encompass a multidisciplinary approach. Gardner (1999a) provided that intelligence is usually researched through the lens of psychology. For this reason future discoveries are likely to come from what is called cross-pollination or multidisciplinary approaches including ideas in neuroscience, cellular biology, genetics, and anthropology to name a few (Gardner, 1999a). Gardner (1999a) is of the view that the use of information processing techniques and computer simulations (replications) are other relevant approaches for gaining new insights into human intellectual capacities. However, other studies informed that in the use of music training and computer training as two variables for similar studies, participants with music training achieved higher scores as compared to computer generated variables.

Another recommendation for future enhancement related to these forms of investigations is that researchers including Ghanaian Music Educators should endeavour to take the challenge of investigation into these phenomena. This is because literature revealed that endeavours into such research studies in Africa are very scanty. Adding to these, I also recommend that future researchers can investigate into disciplines other than English Language and Mathematics only as explored in this study.

The focus of this study was on music training and performance score. However, the researcher did not differentiate by varying degrees of individual student achievement in musical activities or varying differences in the subject domains. Future research should be conducted to investigate how achievement in music affects individual performance scores. For example, does quality of music training have an effect on performance score or academic achievement? Future researchers should study whether, quantifiably, the extent at which music participation increases

performance score. For example, does quality of music instruction have an effect on academic achievement goals?

REFERENCES

Adolphs, R. (2009). The *Social Brain: Neural Basis of Social Knowledge*. Annual Review of Psychology. Retrieved on 2017, from www.ncbi.nlm.nih.gov/pubmed.

Akrofi, E.A. (1982). The Status of Music Education Programs in Ghanaian Public School. University of Illinois at Urbana-Champaign.

Akrofi, E.A. (2002). The teaching of music in Africa. University of Illinois at Urbana-Champaign, *Prospect vol. XXXII, no. 4*. pp. 491-503.

Albert, D. (2006). Socioeconomic status and instrumental music: What does the research say about the relationship and its implications? *UPDATE: Applications of Research in Music Education, 25*(1), 39-45.

Altheide, D., & Johnson, J. (1994). Criteria for assessing interpretive validity in *qualitative research.* In N. Denzin and Y. Lincoln (eds.) Handbook of Qualitative Research, Thousand Oaks, CA: Sage, pp.485-499.

American Psychological Association, Center for Gifted Education Policy (CGEP). Retrieved on 2nd November, 2017.

American Institute for learning and Human Development (2015). Retrieved on 3 November, 2016

Amuah, I.R. (1998).*Factor influencing secondary school students memory of music*. Oguaa Educator.

Amuah, I.R. (1994*) Memory for Music and its Relationship to Aspects of Musical Behavior and Environmental and Personal Factors.* Northwestern University, Evanston, Illinois, USA,

Apfelstadt, J. (1984) Effects of Melodic Perception Instruction on Pitch *Discrimination and Vocal Accuracy of Kindergarten Children*. *Journal of Research in Music Education 86.*

Armstrong, T. (1994).*The Foundations of the Theory of Multiple Intelligences*. New York: Basic Books,

Arul, L. (2013). *Relationship Between Study Habits and Academic Achievement of Higher Secondary School Student* School of Education, Tamil Nadu.

Barbara, B., & Tambra, P (2008*). Developmental Psychology: Piaget's and Vygotsky's Theories in Classroom*. Journal of Cross-Disciplinary Perspectives in Education. Volume 1

Beer, M. (1998). *How do Mathematics and Music Relate to Each Other?* Brisbane, Queensland, Australia: East Coast College of English.

Bergland, C. (2013).*Musical Training Optimizes Brain Function*. U.S. The Athlete's Way.

Bertaux, B. (1989.) "*Teaching Children of All Ages to Use the Singing Voice, and How to Work With Out of Tune Singers." in Readings in Music Learning* Theory, edited by D.L. and C.C. Taggart, 92-104. Chicago: G.I.A., Walters.

Bilhartz T. D., Bruhn, R. A., & Olson, J. E. (2000). *The effect of early music training on childcognitive development.* United States of America: University of Illinois Press.

Block, D. (2012). Turning a spotlight on the creative process. *Music Educators Journal, 98*(3).

Borg, W. R. S. & Gall, M. D. (2007).*Education research. An Introduction* (4th Edition). New York: Longman Publishers.

Boyd, J.R. (2013). *The Relationship between Music Participation and Mathematics*

Achievement in Middle School Students. Liberty University, Lynchburg, VA, U.S.A.

Brewer, J., & Hunter, A. (2006). *Foundations of multimethod research*: Synthesizing styles. Thousand Oaks, CA: Sage.

Bridger, W.H. (2015*) Sensory Habituation and Discrimination in the Human Neonate*." American Journal of Psychiatry, USA.

Bridges, D. (1994) Music, *Young Children and You. New York: Holt, Rinehart and Winston*.

Burke, R. J., Onwuegbuzie, J.A. & Turner, L.A.(2007). Toward a Definition of Mixed Methods Research. Journal of Mixed Methods Research; Sage Publications,

Butzlaff, R. (2000). *Can music be used to teach reading?* United States of America: University of Illinois: Journal of Aesthetic Education.

Campbell, D. (1997). *The Mozart effect: Tapping the power of music to Heal the Body, Strengthen the mind and Unlock the Creative Spirit*. Avon Press.

Cohen, L., Manion, L. & Morrison, K. (2007). *Research methods in education*. London: Routledge Taylors & Francis

Costa-Giomi, E. (1999). *The effects of three years of piano instruction on children's cognitive development.* United States: Journal of Research in Music Education.

Buchanan, B. (2008). Beyond the basics. *American School Board Journal, 195*(5), 36- 40.

Costa-Giomi, E. (2000) *The nonmusical benefits of music instruction.* United States: Journal of Research in Music Education.

Cox, H. A., & Stephens, L. J. (2006). The effect of music participation on mathematical achievement and overall academic achievement of high school students. *International Journal of Mathematical Education in Science & Technology.*

Creswell, J.W. (2012). *Educational research: planning, conducting and evaluating quantitative and qualitative research* (4th Ed.). Boston: Pearson Education Inc.

Creswell, J.W. (2003). *Research design: Qualitative, quantitative, and mixed* Daniel, R. (2006). Exploring music instrument teaching and learning environments:

Video analysis as a means of elucidating process and learning outcomes. *Music Education Research approaches, 8*(2), 191-215. Thousand Oaks, CA: Sage

Deanne, K. (2015). *The Impact of Music on Mathematics Achievement*. United States of America

Diamond, M. & Hopson, J. (1998). *Magic trees of the mind: How to nurture your child's intelligence, creativity, and healthy emotions from birth to adolescence*. New York: Plume.

Diamond, A. (2013). *Executive functions*. Annu Rev Psychol. pp.135–168. PMC free article.

Dompreh, J.K.D. (2002). *Creative Music Abilities of Primary School Pupils of Hohoe and Jasikan Districts of Ghana*. Department of Music, Faculty of Arts, University of Cape Coast, Cape Coast, Ghana.

Douglas, S., &Willatts, P. (1994). *The relationship between musical ability and literacy skills*. U.K.: Journal of Research in Reading.

Davidson, L. (1985). Preschool Children's Tonal Knowledge: Antecedents of Scale," in The Young. *U.S. Child and Music*, edited by J. Boswell, 25-40. Reston: MENC.

Dzansi, M. (2004). Playground Music Pedagogy of Ghanaian Children; *Research Studies in Music Education*. Callaway Centre.

Elias, M. (2009). Use Music to Develop Kids' Skills and Character. *Collaborative Center for Community-Based Research and Service,* U.S.A.

Ewa, A. &Wiebke J. (2014).How musical training affects cognitive development: rhythm, reward and other modulating variables. Switzerland, Swiss Centre of Affective. Science.

Fagen, J., Prigot, J., Carroll, M., Pioli, L., Stein, A., & Franco, A. (1997). *Auditory context and memory retrieval in young infants*. Child Development. USA.

Fauvel J., Flood R., & Wilson R. (2006*). Music and Mathematics: From Pythagoras to Fractals*. Oxford: Oxford University Press.

Flohr, J.W., Miller, D.C., & Persellin, D. (1996). *Children's Electrophysiological Responses to Music.* Paper presented at the International Society for Music Education World Conference (22nd, Amsterdam, Netherlands) and at the International Society for Music Education Early Childhood Commission Seminar, Winchester, England, United Kingdom.

Flolu, J., & Amuah, I. (2003). *An introduction to music education in Ghana for Universities and Colleges.* Black Mask Limited, Cantonments, Accra.

Fry, G., Chantavanich, S., & Chantavanich, A. (1981). *Merging quantitative and qualitative Research techniques*: Toward a new research paradigm. Anthropology and Education Quarterly, pp.145-158.

Gerber, T. G. (2007). Principles for principals: Why music remains important in middle schools. *General Music Today*, *21*(1), 17-23.

Gardner, H. (1983) Frames of Mind. *The Theory of Multiple Intelligences* New York: Basic Books

Gardner, H. (1993). *The Theory of Multiple Intelligences*. New York: Basic Books.

Gardner, H. (1997*). Is musical intelligence special?* In V. Brummett (ed.), Ithaca Conference '96 Music as Intelligence: A Sourcebook (pp. 1-12). Ithaca College Press. Ithaca, New York, USA:

Garland, T. H. & Kahn C. V. (1995). *Math and Music: Harmonious Connections*. Palo Alto, California, USA: Dale Seymour Publications.

Geringer, J.M. The Relationship of Pitch-matching and Pitch Discrimination Abilities of Preschool and Fourth-grade Students. Journal of Research in Music Education, 31:2 (1983): 93-100.

Gilbert, J.P. (1979*). Assessment of Motoric Skill Development in Young Children: Test Construction and Evaluation Procedures*. Psychology of Music, pp. 21-25.

Gordon, E.E. (1988.) *Learning Sequences in Music: Skill, Content, and Patterns*. Chicago: G.I.A.

Graziano, A. B., Peterson, M., & Shaw, G. L. (1999*). Enhanced learning of proportional math through music training and spatial temporal training*. United States of America: Neurological Research.

Greenberg, M (1974). "*The Development and Evaluation of a Preschool Music Curriculum for Preschool and Head start Children*." Psychology of Music, 2:1 (1974): 34-38.

Gromko, J. E., & Poorman, A. S. (1998). *The effect of music training on preschoolers' spatial-temporal task performance*. United States; Journal of Researchin Music Education.

Guilmartin, K. K. (1996). *Music and Your Child: A Guide for Parents and Caregivers*. Princeton, NJ: Music and Movement Center.

Halfon, N. (2001). *Brain development in early childhood. Building Community Systems for Young* Families Reports, 141, 1-28.

Hallam, S. (2000). *The power of music: its impact on the intellectual, social and personal development of children and young people*. Institute of Education, University of London.

Hanna-Plady, B. (2011).*Musicians Are Probably Smarter Than The Rest Of Us*. Parenting Science, USA.

Hanna-Plady, B. (2014). *Your Aging Brain Will Be in Better Shape If You've Taken Music Lessons.* National Graphic, USA.

Harder, H. G., Wagner, S., & Rash, J. (2014). Mental illness in the workplace: Psychological disability management. Burlington, VT: Gower.

Hargreaves, D.J. (1988). *The developmental Psychology of Music*. London, New York: Cambridge University press and T.W. Draper. New York: Springer- Verlag 1987.

Hedland, L. (2000a). *Listening to music enhances spatial-temporal reasoning: Evidence for the "Mozart Effect.*" United States: Journal of Aesthetic Education.

Hetland, L. (2000b). *Learning to make music enhances spatial reasoning*. Journal of Aesthetic Education. United States of America.

Holahan, J.M. (n.d). *The Development of Music Syntax: Some Observations of Music Babble in Young Children in Music and Child Developmen*t, edited by J.C. Peery, I.W. Peery.

Hornby, A.S. Oxford Advance *Learners Dictionary of Current English*. Sixth Edition.

Johnson, R. B., & Christensen, L. B. (2004). Educational research: Quantitative, qualitative, And mixed approaches. Boston, MA: Allyn & Bacon.

Johnson, R. B., & Onwuegbuzie, A. J. (2004). *Mixed methods research: A research paradigm whose time has come*. Educational Researcher, pp.14-26.

Journal of Aesthetic Education, (2015). United States of America: University of Illinois.

Kalmar, M. (1989).*The Effects of Music Education on the Acquisition of Some Attribute-concepts in Preschool Children* [special supplement, XIIth International Research Seminar in Music Education]. Canadian Music Educator, 30:2 (1989): pp.51-59.

Kamin, L. J. (1995). *The pioneers of IQ testing*. In Ressell Jacoby & Naomi Glauberman.

Kelley, J. & Sutton-Smith, P. (1987). "*A Study of Infant Musical Productivity," in Music and Child Development*, edited by J.C. Peery, I.W. Peery, and T.W. Draper. New York: Springer-Verlag.

Kihlstrom, J.F. & Barnhardt, T.M. (1993).*The Self-Regulation of Memory: For Better and For Worse, With and Without Hypnosis*. Hand book of Mental Control, Prince-Hall.

Kinet, J.H. (2013). *Cardiorespiratory Fitness and Motor Skills in Relation to Cognition and Academic Performance in Children* – A Review.

Kinney, D. (2008). Selected demographic variables, school music participation, and achievement test scores of urban middle school students. *Journal of Research in Music Education, 56*(2), 145-161.

Kombo, D.K. & Tromp, D.L.A (2006). *Proposal and Thesis Writing: An Introduction.* Nairobi: Pauline's Publications Africa.

Kraus, T. (2013), *Music Training for the Development of Language Skills*. Changing Braining, U.S.A.

Kraus, S. (2011*). Playing Music for a Smarter Ear. Cognitive, Perceptual and Neorological Evidence.* Music Perception.

Lamb, S. J., & Gregory, A. H. (1993). *The relationship between music and reading in beginning readers.* United States: Center for Education Psychology. pp.13.

Lichtenstein Creative Media (2002). *The infinite mind: Music and the mind*. Retrieved: December 30, 2005, from http://www.lcmedia.com/mind 250.htm

Leng, X. & Shaw, G.L. (1991). *Toward a neural theory of higher brain function using music As a window*. Concepts in Neuroscience, 2, 229-258.

Liljequist, C.K., (2002). *Does Music and Lyrical Content Influence Human Behaviour?* Technical Publications, U.S.A.

Longman Dictionary of Contemporary English (2001). Cayfosa-quebecor, Barcelona, Spain.

Lund Research Ltd (2013). *Measures of Central Tendency*. United States of America Policy Analysis Archives.

Merriam, A. (1964). *The anthropology of music*. Chicago, IL: Northwestern University Press.

McGee, A.D. and Hantla, B. (2012). *An Intelligent Critique of Multiple Intelligences*: A Christian Review for Leaders. Journal of Biblical Perspectives in Leadership 4, no. 1 School of Business & Leadership, Regent University ISSN 1941-4692.

McKelvie, P., & Low. J. (2002). Listening *to Mozart does not improve children's spatial ability:* Final curtains for the Mozart effect. Britain: British Journal of Developmental Psychology. pp. 241-258.

McLeod, S. (2008).*Correlational Studies in Psychology*: Examples, Advantages & Types. Research Methods in Psychology. Homework Help Resource. USA.

McPherson, D. (2000). Child development. *Journal of Family Therapy, 28*(4), 42-58

MENC: *The National Association for Music Education* (1998).

Miller, L. K. (2013*). Using Music to Close the Academic Gap*. New studies on the cognitive advantages of learning instruments at early ages. Boston Public Library/flickr.

Morse, J. M. (2003). *Principles of mixed methods and multi-method research design*. In Tashakkori, A & Teddlie, C. (Eds.), Handbook of mixed methods in social and behavioral research (pp. 189-208). Thousand Oaks, CA: Sage.

Murillo, F. J. & Martinez-Garrido, C. (2012). Influence of the environmental conditions and academic performance in the Primary Education classrooms of Iberoamerica. Education.

Nketia, J.H.K. (1999). *A Guide for the Preparation of Primary School African Music Teaching Manual.* African Publications Ghana Limited. Accra, Ghana.

Nketia, J.H.K. (1997*). Cultural diversity and music education in Ghana*. A paper read at the Congress of the International Music Council, UNESCO, Arhus, Denmark.

Nolen, J. (2003). Multiple intelligences in the classroom. *Education, 124*(1), 115-120.

Norman, W. (2000). *The Mozart effect*. The Music and Science Information Computer Achieve Information. Vol. VII

Olson, C. (2012). Music students who think more critically may learn more. *Music Educators Journal, 98*(3), 24.

Orodho, A.J. (2003). *Essential of Education and Social Sciences Research Methods*. Nairobi: Pauline's Publications Africa.

Pantev, C., Oostenveld, R., Engelien, A., Ross, B., Roberts, L.E., & Hoke, M. (1998). *Increased auditory cortical representation in musicians*. Nature, 392: pp. 811-814.

Paediatrics (2002). *Exposure to Degrading Versus Non Degrading Music Lyrics and Sexual Behaviour Among Youth*. U.S.A.

Paediatric and Adolescent Medicine (2008). *Content Analysis of Tobacco, Alcohol and other Drugs in Popular music*.USA.

Peretz, I. &Morais, J. (1993). Specificity for music. In F. Boller& J. Grafman (Eds.), Handbook of Neuropsychology, (8). Amsterdam: Elsevier Science Publishers.

Phillips, K.H. (1992) *Teaching Kids to Sing*. New York: Schirmer.

Phil, R. (2015) *How to Conduct Research*: An Overview. University of Kansas, United States.

Piaget, J. (1973). *Memory and intelligence.* London, UK: Routledge and Kegan Paul.

Psych Central. (2013*). Memory and Mnemonic Devices*. *Psych Central*. Retrieved on June 22.

Rauscher, F. H., & Shaw, G. L. (1998). *Key components of the Mozart effect. Perceptual and Motor Skills*, (pp.835-841).

Rauscher, F. H. (2000, August*). Is the Mozart effect "debunked*"? Poster presented at the biannual meeting of the International Conference on Music Perception and Cognition, Keele University, Keele, UK.

Rauscher, F. H. (2002). *Mozart and the mind: Factual and fictional effects of musical enrichment*. In J. Aronson (Ed.), Improving academic achievement: Impact of psychological factors on education. New York: Academic Press. pp. 269-278.

Rauscher, F. H., &LeMieux, M. T. (2003).*Piano, rhythm, and singing instruction improve different aspects of spatial-temporal reasoning in Head Start children*. Poster presented at the annual meeting of the Cognitive Neuroscience Society, New York.

Reimer, B. (1989). *A Philosophy of music education*. Englewood Cliffs, New Jersey: Prentice Hall.

Robinson, R. (2007). Junior high/middle school choirs. *Choral Journal*, *48*(3), 41-48.

Rouse, M. (2014). *Statistical Mean, Median, Mode and Range*. Master Print, U.S.

Sivak, M. & Schoettle, B. (2012). *Eco-driving: Strategic, tactical, and operational decisions of the driver that influence vehicle fuel economy.* Transport Policy, U.S.A.

Sally, R. (2015). *What is Gray Matter. News Medicals*; Life Sciences and Medicine. U.S.A.

Sandelowski, M. (2003). *Tables or tableaux*? The challenges of writing and reading mixed methods studies. In Tashakkori, A. &Teddlie, C. (Eds.), Handbook of mixed methods in social and behavioral research (pp. 321-350). Thousand Oaks, CA: Sage.

Santos-Luiz, C. (2007) *The learning of music as a means to improve mathematical skills*. Department of Music, College of Higher Education of Coimbra, Portugal.

Scheib, J. W. (2006). Lindy's story: One student's experience in middle school band. *Music Educators Journal, 92*(5), 32-36.

Schlaugh, G., Norton, A., Overy, K., Winner ,E. (2005). *Effect of Music Training on Child's Brain and Cognitive Development*. Department of Neurology, Music and Neuroimaging Laboratory, Harvard Medical School.

Schools in Ghana. (1955) establishments in Gold Coast (British colony).

Science Daily. *The definition of Intelligent Quotient*. An excerpt from the Wikipedia Article. Retrieved on November, 2015.

Shaw, G. L. (2004). *Keeping Mozart in mind* (2nd ed.). San Diego, California: Elsevier Academic Press.

Simpson K., &. K. (2010). Teaching young children with autism graphic symbols embedded within an interactive song. *Journal of Developmental & Physical Disabilities, 22*(2), 167-177.

Shaw, G. (2003). *Keeping Mozart in mind* (2nd ed.). St. Louis, MO: Academic Press.

Siribhakdi, K. (2006). *Family matters; Mozart for your toddlers.* Retrieved June 30,

2006

Sloboda, J.A. (1985). *The musical mind. The cognitive psychology of music*. Clarendon Press, Oxford.

Smith, M. L., & Glass, G. V. (1987*). Research and evaluation in education and the social sciences.* Englewood Cliffs, NJ: Prentice Hall.

Strickland, S. (2002). *Music and the brain in childhood development*. Childhood Education.

Tavakol, M. &Dennie, R. (2011). Making sense of Cronbach's alpha. *International Journal of Medical Education; vol. 2: 53-55.* DOI: 10.5116/ijme.4dfb.8dfd

Temmerman, N. (2000). An *investigation of the music activity preferences of pre- school children*. Cambridge University Press. Cambridge.

The British Library Board (2015). *Qualitative and Quantitative Research*. Business & IP Centre. The British Library 96 Euston Road London NW1 2DB.

Umar, F. (2013). *Types of Hypothesis, Null, Empirical, Complex and Logical Hypothesis.*

Valek, S. (2015). What is musical intelligence? Conjecture Corporation, USA.

Vaughn, K. (2000). Music and mathematics: Modest support for the oft-claimed relationship. *Journal of Aesthetic Education*, University of Illinois, United States of America.

Wallace, W. T. (1994). *Memory for music: Effect of melody on recall of text. Learning, Memory, & Cognition,* Journal of Experimental Psychology pp. 1471-1485.

Waller, G.D. (2007). T*he impact of music education on academic achievement, Attendance rate, and student conduct on the 2006 senior class in One Southeast Virginia Public School Division*. Virginia Polytechnic Institute and State University, Blacksburg, Virginia.

Weikart, P.S. (1987). *Round the Circle*. Ypsilanti, Michigan: High/Scope Press.

Webster, P.R. (1989). *Creative Thinking in Music*; The Assessment Question. Department of Education; Educational Resource Information Center, Suncoast Music Education Forum; U.S.A.

Weikart, P.S. (1987). *Round the Circle*. Ypsilanti, Michigan: High/Scope Press.

Yoon, J.N. (2000). *Music in the classroom: its influence on children's brain development, academic performance, and practical life skills*. Department of Education, U.S.A.

Zentner, M. & J. Kagan ((1996*). Perception of Music by Infants*."Nature: pp.383.

Zepol, T.J. (2014). *Environmental Influences on Young Children's Behavior*. Pearson Allyn Bacon Prentice Hall.

Electronic Reference

http://www.listeningandspokenlanguage.org/Music_as_a_Teaching_Tool/#sthash.mdFIQW83.uf

http://psychcentral.com/lib/memory-and-mnemonic-devices

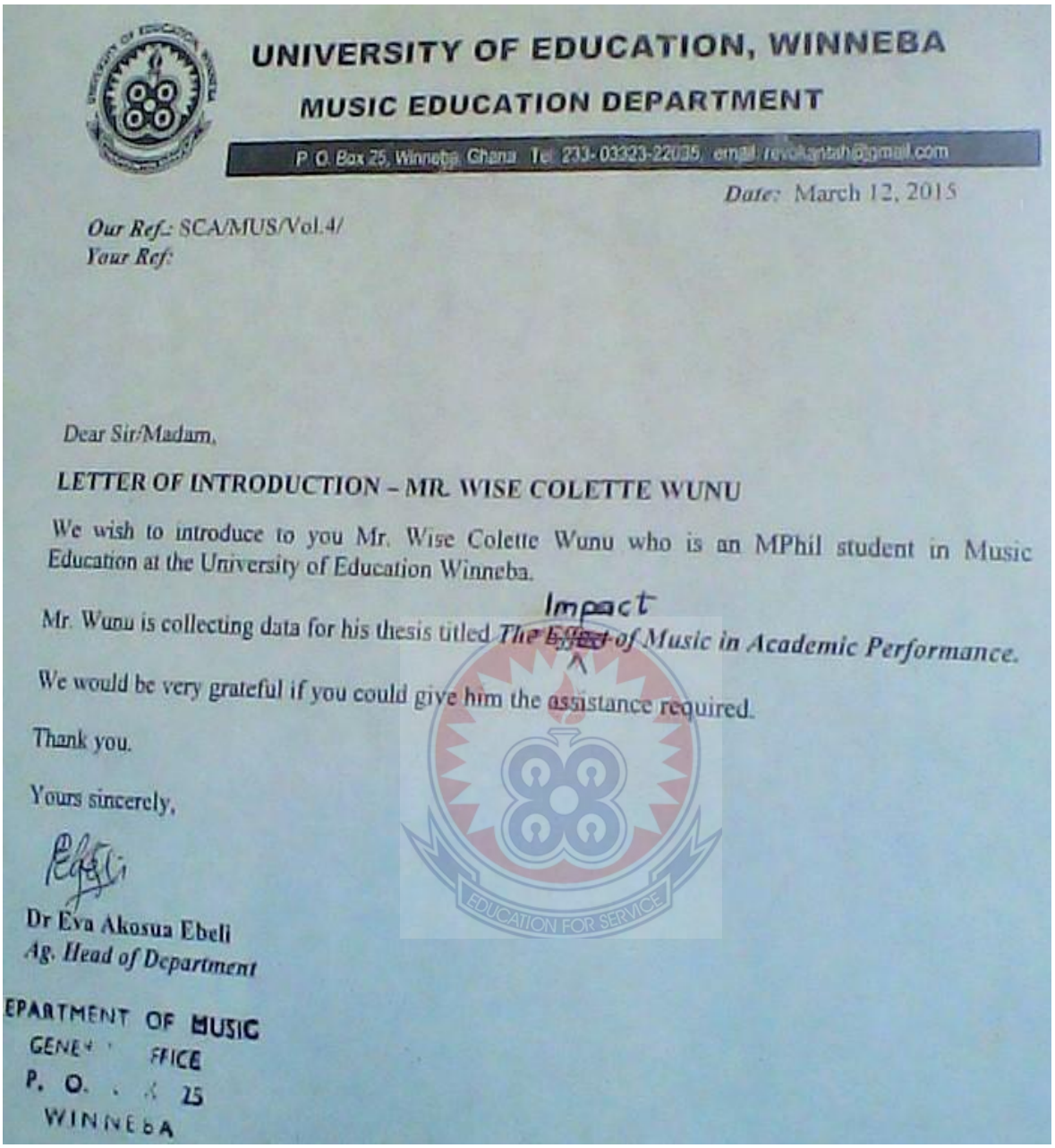
http://www.mindpowernews.com/MindOverBody.htm

http://global.factiva.com.ezproxy.lib.vt.edu:8080/ha/default.aspx.

APENDICES

APENDIX A

A copy of an introductory letter for data collection



UNIVERSITY OF EDUCATION, WINNEBA

MUSIC EDUCATION DEPARTMENT

P. O. Box 25, Winneba, Ghana Tel: 233-03323-22035, email: revokantah@gmail.com

Date: March 12, 2015

Our Ref.: SCA/MUS/Vol.4/

Your Ref:

Dear Sir/Madam,

LETTER OF INTRODUCTION – MR. WISE COLETTE WUNU

We wish to introduce to you Mr. Wise Colette Wunu who is an MPhil student in Music Education at the University of Education Winneba.

Mr. Wunu is collecting data for his thesis titled *The Impact of Music in Academic Performance.*

We would be very grateful if you could give him the assistance required.

Thank you.

Yours sincerely,

Dr Eva Akosua Ebeli

Ag. Head of Department

EPARTMENT OF MUSIC
GENE FFICE
P. O. . 25
WINNEBA

APENDIX B

A Questionnaire for Students Music Background

Date:_ /_ /_ Background of Music Training Questionnaire for School Children

1. Class.....
2. Age.....

Background of Music Training

3. Do you learn or have had any music training? Yes ☐ No ☐
4. If yes, indicate the very kind of music training below with a tick (✓)
   a) Music theory ☐
   b) Piano lessons ☐
   c) Trumpet lessons/ any wind instrument ☐
   d) Guitar lessons ☐
   e) Violin lessons/ any string instrument ☐
   f) Drumming ☐
   g) Any other (Specify).....
5. How long have you been having music training?
   a) Less than one year ☐
   b) One year ☐
   c) Two years ☐
   d) More than two years ☐

APENDIX C

Mathematics Test

Class: Primary Six **Duration 1hr.**

Instruction: Answer all questions.

1. Find the missing numbers in the set{10,15,__,25,__’__,40}
   a. 20 and 30 b. 30 and 35 .c. 20, 35 and 35 d. 20, 30 and 35

2. What are the values of the underlined digits in the number 32 2̲13 4̲38?
   _____
   _____

3. A car is travelling at 40km per hour. How far does travel in $2\frac{1}{2}$ hours?
   a. 16km, b. 80km, c. 90km d. 100km

4. The sum of three numbers is 28,542. Two of the numbers are 10,250 and 9,750. Find the other number.
   a. 8,452 b. 9,452 c. 8,542, d. 9,542
5. Subtract 233 871 from 3 483 763_____ _

---

6. Simplify $\left(\frac{2}{3}-\frac{1}{2}\right)\div\frac{1}{2}$
   1/3 b $\frac{1}{12}$ c. 1 d. 6

7. Write numerals for this number name:
   Nine million, four hundred and eighty-six_____

---

8. Which of the following fractions is the greatest?
   $\frac{1}{6},\frac{1}{4},\frac{1}{2},\frac{1}{5}$

   $\frac{1}{6}$, b. $\frac{1}{2}$, c. $\frac{1}{4}$, d. $\frac{1}{5}$

9. By how much is $\frac{5}{6}$ greater than $\frac{3}{4}$?
   a. $\frac{1}{12}$, b. $\frac{1}{6}$ c. $\frac{5}{12}$ d.. $\frac{2}{3}$

10. What is the value of the digit 7 in the number 87902

a. 7 ten thousand, b. 7 hundred, c. 7 thousand d. 7 ten

11. Find the sum of 248365, 701532, and 1027
    a. 247338, b. 702559 c. 950924 d. 949894
12. Round 8921465 to the nearest hundred
    a. 8921000 b. 8921400 c. 8921460 d. 8921500

13. If $72 \div n = 12$, what is n
    a. 12, b. 6 c. 3 d. 1

14. Which of the following is not a factor of 18?
    a. 3, b. 4, c. 6, d. 9
15. Simplify $\frac{1}{3} + \frac{1}{9} + \frac{1}{27}$
    a. $\frac{5}{27}$ b $\frac{7}{27}$ c $\frac{11}{27}$ d $\frac{13}{27}$
16. If $n \times 12 = 72$, what is n ?
    a. 12 b 6 c 3 d 1
17. The list common multiple (LCM) of 16, 30 and 36 is:
    a. 3 b. 6 c. 240 d. 720
18. Write 98 as the product of its prime factor.
    2×7 b. $2^2 \times 7$ c. 2×7^2 d. $2^2 \times 7^2$
19. Find the highest common factor of 48, 60 and 96
    a. 12 b. 24 c.36 d. 48
20. Which of the following is the set of prime factors of 12?
    a. {1, 3}
    b. {2, 3}
    c. {2, 4, 6, 12}
    d. {2, 3, 4, 6}

APENDIX D

English Test

Class: Primary Six **Duration: 1 hr**

Date: _/ _ /_

Rewrite the sentences changing the underlined verbs to the simple past.

1. The man **shoots** birds on the tree.
   .....
2. The sun **will rise** from the east.
   .....

Rewrite the sentences using the correct form of adjective in the bracket.

3. That was the (strange) story I ever heard. .....
   .....
4. The (fast) means of travel is by air.
   .....
5. I wore a (good) costume last year.
   .....
6. Rob is (helpful) than the others.
   .....

Fill in the blanks with the missing letter.

7. Bel _ _ ve
8. For _ _ gn
9. Ba _ kg _ _ es
10. N _ _ ghbour

Change the verbs in bracket to the past perfect.

11. We_____ when the children came (pray).
12. The school_____when the rain started (close).
13. The rich man_____before his wife delivered (die).
14. Samuel_____the classroom when the girls fought (leave).

Write the plural of these nouns

	Singular	**Plural**
15	valley	
16	activity	
17	play	
18	family	
19	thrush	
20	belief	

APENDIX E

Marking Scheme

Each question has five (5) marks.

Mathematics Test

Class: Primary Six **Duration 1hr.**

Instruction: Answer all questions.

1. Find the missing numbers in the set{10,15,__,25,__,__,40}
   b. 20 and 30 b. 30 and 35 .c. 20, 35 and 35 d. 20, 30 and 35
   Answer is **d**

2. What are the values of the underlined digits in the number 32 213 438?
   Answer is 2 = hundreds of thousands and the 4 = hundreds

3. A car is travelling at 40km per hour. How far does travel in $2\frac{1}{2}$ hours?
   b. 16km, b. 80km, c. 90km d. 100km
   Answer is **d**

4. The sum of three numbers is 28,542. Two of the numbers are 10,250 and 9,750. Find the other number.
   b. 8,452 b. 9,452 c. 8,542, d. 9,542
   Answer is **c**

5. Subtract 233 871 from 3 483 763_____
   Answer is 3,249,892

6. Simplify$\left(\frac{2}{3}-\frac{1}{2}\right)\div\frac{1}{2}$
   a. 1/3 b $\frac{1}{12}$ c. 1 d. 6
   Answer is **a**

7. Write numerals for this number name:
   Nine million, four hundred and eighty-six_____
   Answer is 9,000, 486

8. Which of the following fractions is the greatest?

$\frac{1}{6}, \frac{1}{4}, \frac{1}{2}, \frac{1}{5}$

a. $\frac{1}{6}$, b. $\frac{1}{2}$, c. $\frac{1}{4}$, d. $\frac{1}{5}$

Answer is **b**

9. By how much is $\frac{5}{6}$ greater than $\frac{3}{4}$?

a. $\frac{1}{12}$, b. $\frac{1}{6}$ c. $\frac{5}{12}$ d.. $\frac{2}{3}$

Answer is **a**

10. What is the value of the digit 7 in the number 87902

b. 7 ten thousand, b. 7 hundred, c. 7 thousand d. 7 ten

Answer is **c**

11. Find the sum of 248365, 701532, and 1027

b. 247338, b. 702559 c. 950924 d. 949894

Answer is **c**

12. Round 8921465 to the nearest hundred

b. 8921000 b. 8921400 c. 8921460 d. 8921500

Answer is **d**

13. If $72 \div n = 12$, what is n

b. 12, b. 6 c. 3 d. 1

Answer is **b**

14. Which of the following is not a factor of 18?

b. 3, b. 4, c. 6, d. 9

Answer is **b**

15. Simplify $\frac{1}{3} + \frac{1}{9} + \frac{1}{27}$

b. $\frac{5}{27}$ b $\frac{7}{27}$ c $\frac{11}{27}$ d $\frac{13}{27}$

Answer is **d**

16. If $n \times 12 = 72$, what is n?

b. 12 b 6 c 3 d 1

Answer is **b**

17. The list common multiple (LCM) of 16, 30 and 36 is:

b. 3 b. 6 c. 240 d. 720

Answer is **d**

18. Write 98 as the product of its prime factor.

a. 2×7 b. $2^2 \times 7$ c. 2×7^2 d. $2^2 \times 7^2$

Answer is **c**

19. Find the highest common factor of 48, 60 and 96

a. 12 b. 24 c.36 d. 48

Answer is **a**

20. Which of the following is the set of prime factors of 12?

a. {1, 3}
b. {2, 3}
c. {2, 4, 6, 12}
d. {2, 3, 4, 6}

Answer is **d**

English Test

Every question is awarded five marks

Class: Primary Six **Duration: 1 hr**

Date: _/ _ /_

Rewrite the sentences changing the underlined verbs to the simple past.

1. The man **shoots** birds on the tree.

Answer: The man **shot** the birds on the tree.

2. The sun **will rise** from the east.

Answer: The sun **rose** from the east.

Rewrite the sentences using the correct form of adjective in the bracket.

3. That was the (strange) story I ever heard.

Answer: That was the s**trangest** story I ever heard.

4. The (fast) means of travel is by air.

Answer: The **fastest** means of travel is by air.

5. I wore a (good) costume last year.

Answer: I wore the **best** costume last year.

6. Rob is (helpful) than the others.

Answer: Rob is **more** helpful than the others.

Fill in the blanks with the missing letter.

7. Bel _ _ ve

Answer: Bel**ie**ve

8. For _ _ gn

Answer: For**ei**gn

9. Ba _ kg _ _ es

Answer: B**ac**kg**at**es

10. N _ _ ghbour

Answer: N**ei**ghbour

Change the verbs in bracket to the past perfect.

11. We_____ when the children came (pray).

Answer: We **prayed** when the children came.

12. The school_____when the rain started (close).

Answer: The school **closed** when the rain started.

13. The rich man_____before his wife delivered (die).

Answer: The rich man **died** before his wife delivered

14. Samuel_____the classroom when the girls fought (leave).

Answwer: Samuel **leaved** the classroom when the girls fought

Write the plural of these nouns

	Singular	**Plural**
15	valley	**valleys**
16	activity	**activities**
17	play	**plays**
18	family	**families**
19	thrush	**thrushes**
20	belief	**beliefs**

The figure shows one of the Primary 6 classes in University of Ghana Basic School.

The picture showed a student practicing on an Atenteben.

The picture showed some of the Primary School children rehearsing in the school brass band.