PROBLEMS AND PROSPECTS ASSOCIATED WITH THE TEACHING AND LEARNING OF WESTERN ORCHESTRAL MUSICAL INSTRUMENTS: THE NNAMDI AZIKIWE UNIVERSITY EXPERIENCE

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ABSTRACT

The study was a survey of the teaching and learning of Western orchestral musical instruments in the Department of Music, Nnamdi Azikiwe University, Awka. The population of the study included all the lecturers (12) and students (126) of the Department of Music, Nnamdi Azikiwe University, Awka giving a total population of 138. Based on the number of lecturers and students (106), a study of the entire population was made. The instrument for data collection was the questionnaire structured to capture the four (4) - points modified likert scale and which was face-validated by two expert researchers in the field of music pedagogy. It was pilot-tested for reliability and internal consistency through the application of Spearman rank order correlation coefficient. The analysis for the seven research questions showed an average coefficient of 0.82. Seven research questions and hypotheses were raised and tested using mean rating and standard deviation as the statistical tools. All tests were carried out at 0.05 level of significance (P>0.05). Results showed that there exist only eleven Western orchestra musical instruments in the Department; the teaching and learning environment is inadequate for instrumental; students' attitude in learning the instruments is poor; and lack of specialists in teaching some of the instruments such as the violin, string bass, tuba, French Horn, Trombone, and euphonium. It was also found out that some of the students (about 10%) still showed competence on their orchestral instruments despite the challenges. The implications of the study include the need for the provision of more Western orchestral musical instruments, employing specialists in the affected instruments, the need for lecturers to seriously consider the psychological and physiological dispositions of students before assigning Western orchestral musical instruments to them and the need for students to improve their attitude towards learning musical instruments. It was recommended that adaptability tests should be run for students before approving orchestral instruments for them and that the University should equip the Music Department with a Departmental building equipped with acoustically treated practise rooms.

INTRODUCTION

Background of the Study

The history of Western orchestral instruments dates back to the Renaissance (1450-1600) when vocal music held sway. Then the orchestra was not given much attention because of its presumed role and use in pagan worship and rituals. But the coming of the Baroque period saw a revolution for Western orchestral instruments as some instruments were employed for the first time in the church to serve as instrumental combinations for doubling vocal lines (The New Harvard Dictionary of Music, 1986). Kamien (1988) expounds thus:

> Though still subordinate to vocal music, instrumental music did become more important during the renaissance. Traditionally, instrumentalists accompanied voices or played music intended for singing. Even in the early 1500s instrumental music was largely adapted from vocal music. Instrumental groups performed polyphonic vocal pieces, which were often published with the indication to be sung or played. Soloists used the harpsichord, organ, or lute to play simple arrangements of vocal works (Pp. 122-123).

The Renaissance, as it were, struck blows from which the Church was still reeling, freeing orchestral music from the age-long fetters of ecclesiasticism. The rise of opera, instrumental music, and in fact of secular music as a separate entity during the Baroque period gave a new complexion to the whole world of music. From this period, interest in musical instruments grew and witnessed remarkable improvement on the making, design, timbre, sophistication, and versatility. Versatility, as we shall see later, is a unique feature of Western orchestral musical instruments.

Western orchestral musical instruments have traversed a complex and dynamic history hence their sophistication, peculiarity, and versatility. The instruments come in families (string, woodwind, brass, percussion) but within some families (particularly woodwind and brass), there exist sub-classes or various types of each member of a given family due to the demand placed on the instruments by composers and performers with regard to transposition, tone color, versatility and their varied roles in the orchestra. For instance, within the woodwind family there are varieties or sub classes of the saxophone, for example, the E flat sopranino, B flat soprano, E flat alto, B flat tenor, E flat baritone, B flat bass, E flat contrabass, and B flat sub contrabass (The new Harvard Dictionary of Music, 1986:728). The trumpet also, which is

brass, comes in various species and named according to the pitch class of their fundamental. For instance, we have trumpets in B flat, C, D, E flat, F, and A. The B flat trumpet is used mostly in school bands and popular music. The C trumpet is the favorite among orchestral players and is non-transposing (The new Harvard Dictionary of Music, 1986:880).

These orchestral musical instruments with their respective families and species, though somewhat leaves a beginner with the advantage of choosing from a variety of instruments, somehow pose some difficulties and confusion for the beginner. Most undergraduate student learners most times spend a long time trying to figure out the orchestral instrument that best suits them. Also the intrinsic peculiarity and sophistication of these instruments raise some concern regarding the availability of genuine models and the genuineness of available ones. During the renaissance, there were few patented instrument makers but the plethora of instrument makers we have today has seriously compromised the originality of orchestral musical instruments. Historically, one can observe that the peculiarity, versatility, and sophistication of these instruments are features that have distinguished them and which instrument makers carefully maintained then. For instance, the intricacies and the acoustical precision of forming the tone holes, bell, mouthpiece, reed and the keys of the clarinet, for example, are highly technical issues that can disrupt the efficiency of the instrument if compromised.

On versatility mentioned earlier, an orchestral instrument like the trumpet has the capability of producing a series of notes and partials using just one valve or fingering. In fact, the range of any orchestral musical instrument has been technically defined as the compass of the notes (low and high) that can be produced by an average player. But a given instrument can yield almost an infinite range of notes in the hands of an advanced player. Kamien (1988:13) highlights this point thus, ‘While a trained singer’s range is about 2 octaves, many instruments command 3 or 4 octaves, and some have 6 or 7’. In fact, certain advanced trumpet players, for instance, have been known to produce pitches that are beyond annotated ranges. Nicolo Paganini (1784-1840), the virtuoso violinist, also was acclaimed for redefining the scope of the violin. Frederic Chopin (1810-1849) also, was renowned for making the piano sound very beautiful thereby creating the illusion that the piano sings (Kamien, 1988). If orchestral musical instruments are capable of these dimensions, the learning or teaching of these instruments with inadequate models frustrates the ardent learner and diminishes the scope of the instruments.

Orchestral musical instruments also, by virtue of their intrinsic nature, pose some difficulty to the learner. The violin, saxophone, or trumpet might look very easy to an enthusiastic learner but the actual learning and mastery of any of the instruments take time. Some individuals, unarguably, are born with native dexterity for musical instruments but mastering an orchestral instrument takes more time and concentration than one can envisage. Kamien (1988) submits that 'Natural gifts are not enough. A developing performer studies for years with fine teachers, practices many hours a day, and cultivates musical taste and a sense of style` (p.82). Even under the tutelage of a competent instrument teacher of, let's say the trumpet, the learner still faces the challenge of tonguing, fingering, breath control, sight-reading, daily practice, and a practice chamber or some remote place to curb interference. How many undergraduate orchestral learners therefore can brace up to such challenges and tenacity? So many of them find this very challenging and veer into learning the guitar, violin, clarinet, or saxophone believing they would find them less demanding. But there is no evidence from research that a given orchestral musical instrument is relatively easier than the other. The instrumental teacher, also, is not left out of the ensuing melee. He faces conditions different from those encountered by choral music teachers. Instrumental music teaching involves a conglomeration of fingerings, embouchures, bowings, and other specialized techniques and knowledge like the scraping of a bassoon reed, stopping notes on the French horn, pizzicatoon the violin, and the several fingerings for high G on the clarinet. All these are highly technical and demand skill and learning.

Most undergraduate music students completely avoid playing musical instruments despite the fact that mastering a musical instrument is a prerequisite to the completion of their studies. The attitude of most female undergraduate students in music is even more worrisome. They shy away from learning and practicing on any musical instruments believing it is not feminine to play instruments but to sing. This attitude appears to be the reason for the general poor enrolment, commitment, and performance by most female students. This attitude also appears to be the extension of our immediate society's ideology that the female folks should not play dominant or tasking roles in the society. Some have also erroneously designated some instruments as 'feminine` and others 'masculine` and this has led to too many female students embracing the violin and abandoning every other orchestral instrument to their male counterparts. Although some orchestral instruments like the trumpet and tuba prove quite tasking and energy-sapping but there is no evidence from existing research that the violin is more feminine than the trumpet or that playing the latter is detrimental to health.

Despite these numerous challenges to the effective teaching/learning of Western orchestral musical instruments and the demands it places on the instrumental teacher, evidence of the gains of learning a musical instrument or playing in the orchestra abounds from empirical research and personal experiences of orchestral players. The ability to play a musical instrument and interpret music was a mark of an educated person during the renaissance (Kamien, 1988). The Nigerian society places the same obligation on music students. Mbanugo (2006:1) observes that "previous investigations have noted that the Nigerian populace only understands music as a practical phenomenon. Consequently, high practical music competence is expected of the products of Nigerian music education programmes". Guiding music students through instrumental and orchestral experience has some specific advantages to their overall music education and it is on this background that Music Departments in higher institutions across the world incorporate orchestral ensemble as a basic feature of their curriculum. Among the proven gains of participating in instrumental/orchestral music are:

- Discipline
- Aesthetic fulfillment
- Cognitive and psycho-motor enhancement
- Self confidence
- Sense of belonging
- Social/peer recognition and relevance for accomplishments as performers
- Transfer of training/experience to other musical or life challenges
- Means of economic sustenance
- Group co-operation
- Career opportunities, etc.

Western orchestral ensemble as an aspect of the curriculum of music studies in Nigerian higher institutions may come with certain intrinsic challenges but the gains quite out-weigh the surging challenges. Currently in the Music Department of Nnamdi Azikiwe University, Awka, the teaching/ learning of these instruments is showing some prospects. This is attestable in the students' Individual Performance Studies (IPS) and their involvement in the chamber orchestra in the Department. The students commence learning of their respective orchestral instruments as early as possible within a given semester with the aid of an assigned teacher who furnishes the learner with appropriate pieces for his instrument at his level of playing. The entire experience culminates into a performance exam which requires the student to perform with his

instrument and with the chamber orchestra before a panel of adjudicators. Although there still persist some challenges to the effective teaching and learning of these orchestral instruments as mentioned earlier in this paper, nevertheless the writer believes that the proper implementation of the findings and recommendations of this research will improve the teaching and learning of the instruments and usher the Western chamber orchestra of the Department into international repute.

Statement of the Problem

The teaching and learning of Western orchestral musical instruments is a major feature of the curriculum of music studies in tertiary institutions and the mastery of a western orchestral instrument also, is a basic prerequisite for graduating in music. This ideology is based on the premise that, a graduate of music, irrespective of his cultural orientation and musical inclination, should be able to interpret and appreciate the music of other cultures through instrumental experience. Currently, there is a growing concern on the role university music graduates can play in the larger society such as teaching, raising a choir or orchestra, music directing, composition and music production etc., and such demands could be met through efficient instrumental experience. Unfortunately, there are challenges to these ideals in the Music Department of Nnamdi Azikiwe University, Awka. Although the general output of Western orchestral instrumental experience in the Department is gradually improving, there still exist certain areas that demand immediate attention for improvement. For example, the quality of some of the orchestral instruments; the attitude of students to learning musical instruments, the level of expertise of some of the instrumental teachers/lecturers in handling the orchestral instruments; the apparent aversion to some instruments (the brasses and winds) by students are all issues the research seeks to address.

Purpose of Study

The purpose of this study was to ascertain the problems and prospects in the teaching and learning of Western orchestral musical instruments in the Department of Music, Nnamdi Azikiwe University, Awka. To achieve this, the researcher intends to find out:

(i) The Western orchestral musical instruments that exist in the Department of Music, Nnamdi Azikiwe University, Awka.

(ii) The relationship between the nature of Western orchestral musical instruments and the challenges in teaching and learning them.

(iii) The criteria for assigning Western orchestral musical instruments to students in the Department of Music, Nnamdi Azikiwe University, Awka

(iv) The methods employed by the lecturers in teaching Western orchestral musical instruments in Nnamdi Azikiwe University, Awka

(v) The modes of evaluating performance in Western orchestral musical instruments in Nnamdi Azikiwe University, Awka

(vi) The prospects of teaching and learning Western orchestral musical instruments in Nnamdi Azikwe University, Awka.

(vii) The problems militating against the effective teaching and learning of Western orchestral musical instruments in Nnamdi Azikiwe University, Awka.

(viii) The possible solutions to the problems.

Significance of the Study

The findings of this research would be beneficial to music educators involved in the teaching of Western orchestral musical instruments and to undergraduate music students in Nigerian higher institutions who are confronted with the task of mastering their orchestral instruments. The findings will also inspire policy makers in music education, curriculum planners, and music educators in general and possibly serve as reference point in resuscitating and improving studies in Western Orchestral instruments in various Nigerian universities. Also, by furnishing the orchestral scheme with appropriate and relevant materials (music scores) from different musical genres for individual practice, general rehearsals and performance, the forum is created for cultural integration, interaction, music appreciation and the widening of the compass of instrumental learning, practice and performance among students.

Scope of the Study

This research specifically covered the teaching and learning of Western orchestral musical instruments in Nnamdi Azikiwe University, Awka. The University is located at Awka, Anambra state along the Onitsha-Enugu express road and sited on an area spanning over 502 hectares of land of the state capital. The undergraduate students of the music department are taken as the research sample and currently the Music Department has about 115 students ranging from Diploma to fourth 4^{th} year degree who are actively involved in the learning of the various orchestral instruments. Also the scope of Western orchestral musical instruments studied was limited to those in common use among students in the Music Department of the Nnamdi Azikiwe University, Awka such as the strings (violin, viola, cello); woodwinds (flute,

B flat clarinet, saxophones- soprano, alto, and tenor); brass (B flat cornet, B flat trumpet, trombone, French horn, tuba).

Research Questions

The following research questions were raised to guide the study:

1. What are the Western orchestral musical instruments that exist in the Department of Music, Nnamdi Azikiwe University, Awka.
2. Is there a relationship between the nature of Western orchestral musical instruments and the challenges in teaching and learning them?
3. What are the criteria for assigning Western orchestral musical instruments to students in the Department of Music, Nnamdi Azkiwe University, Awka.?
4. What are the methods adopted in teaching Western orchestral musical instruments in the Department of Music, Nnamdi Azikiwe University, Awka.?
5. What are the modes of evaluating the performance of the students in the learning of Western Orchestral musical instruments in the Department of Music, Nnamdi Azkiwe University, Awka?
6. What are the prospects of teaching and learning of Western orchestral instruments in the Department of Music, Nnamdi Azkiwe University, Awka.?
7. What are the problems militating against the effective teaching and learning of Western orchestral instruments in the Department of Music, Nnamdi Azikiwe University, Awka.?
8. What are the possible solutions to the problems?

Research Hypothesis

The following null hypotheses were postulated to guide the research:

1. The Western orchestral musical instruments existing in the Department appear to be relatively few.
2. There is no significant difference in the opinion of the respondents regarding the nature of Western orchestral musical instruments and the challenges in teaching and learning them.
3. The criteria used in assigning or approving Western orchestral musical Instruments to students appear not to be suitable.
4. There is no significant difference in the opinion of the respondents regarding the relevance of the methods adopted in teaching Western orchestral musical instruments in the Department.

5. The modes adopted in evaluating performances of the students in Western orchestral musical instruments appear not to be effective
6. There is no significant difference in the opinion of the respondents regarding the prospects of teaching and learning of Western orchestral musical instruments.
7. There is no significant difference in the opinion of the respondents on the perceived problems militating against the teaching and learning of Western orchestral musical instruments

LITERATURE REVIEW

Relevant literatures to the study were sourced and reviewed under the following subheadings:

- **Conceptual Framework**
- **Theoretical Framework**
- **Empirical Studies**
- **Summary of Reviewed Literature**

Conceptual Framework

The study of the teaching and learning process of Western orchestral musical instruments unavoidably presents a plethora of concepts that demand some clarification as they apply to the research. These concepts relate to the teaching/learning process, the definition and description of a musical instrument, the making/crafting of the instruments, classification of the instruments, tuning, harmonics, transposition, fundamental, partials/overtone series, range, register, embouchure, tonguing, breathing, fingering and the actual playing techniques. Hoffer (1991) captures this in his submission:

> Instrumental teachers face conditions different from those encountered by choral music teachers. Instrumental music involves a conglomeration of fingerings, embouchures, bowings, and other specialized techniques and knowledge. Scraping a bassoon reed, stopping notes on the French horn, spiccato bowing on the violin, the several fingerings for high G on the clarinet- these are all highly technical bits of skill and learning. Teachers of choral music face many challenges, but at least all human voices produce sound in the same way (p. 238).

These concepts shall be examined in detail as they relate to Western orchestral instruments generally and also to respective families and individual instruments of each family.

The Concepts of Teaching and Learning

The concepts of teaching and learning are two congruous concepts which represent the main thrust of educational psychology. Educational psychology is the study of how humans learn in educational settings, the effectiveness of educational interventions, the psychology of teaching, and the social psychology of schools as organizations (Child, 2004). Teaching has been defined as: 'An environmental arrangement which involves an organism mentally and/or physically in a set of organized activities, and where those activities are facilitated in consonance with a given goal (or lack of a goal)' (Onwuegbu, 1979). Leonhard & House (1972:275) see teaching as ''the organization and conduct of learning experiences''. Learning on the other hand refers to the process of acquiring new, or modifying and reinforcing existing knowledge, behaviours, skills, values, or preferences and may involve synthesizing different types of information (Child, 2004). Leonhard & House (1972:121) posit that, "Learning is growth; learning is development; learning is experience; learning is something new that has been added; learning is a process that results in change in behavior". A more operational definition of learning is that, 'Learning is a process which begins with a problem, progresses to the solution of the problem by the apprehension, clarification, and application of meaning and results in a change in behavior' (Leonhard & House, 1972). Child (2004) observes that "Whilst there is no complete agreement amongst psychologists about the nature of the learning process, they do accept the basic premise that learning occurs whenever one adopts new, or modifies existing, behavior patterns in a way which has some influence on future performance or attitudes". The purpose of teaching is to facilitate learning. Fundamentally, there can be no teaching unless learning takes place, but it must be recognized that learning often takes place without the formal guidance of a teacher.

Observing the congruous relationship existing between teaching and learning, Leonhard &House (1972) explain that:

> A crucial point in understanding the relationship between teaching and learning is that it is the student who learns and that every student must do his own learning. Teaching merely serves to arrange the learning environment for the student and to increase the efficiency of his learning (p. 276)

General Concepts Applicable to Musical Instruments

Though not all musical instruments employ to the peculiar concepts of tonguing, fingering, striking, bowing etc., but virtually all musical instruments have a history, distinctive features, range, and class. The following concepts, therefore, apply to all known Western musical instruments in general.

Definition and Basic Operation

A musical instrument is a device created or adapted to make musical sounds. In principle, any object that produces sound can be a musical instrument. The history of musical instruments dates to the beginnings of human culture. Early musical instruments may have been used for ritual: such as a trumpet to signal success on the hunt, or a drum in a religious ceremony. Cultures eventually developed composition and performance of melodies for entertainment. Musical instruments evolved in step with changing applications (Campbell & Myers, 2004). Western orchestral instruments, therefore, are a select group of musical instruments which feature mainly in Western orchestra and among them are the Strings (violin, viola, cello, double bass); Woodwinds (clarinet, flute, piccolo, saxophone, English horn, oboe, bassoon); Brass (trumpet, trombone, French horn, tuba); the Percussion family (drums, bells, cymbals, triangle, timpani etc.), with the occasional inclusion of the keyboards (harpsichord, organ, piano, etc.).

The Construction/Invention of Western Orchestral Instruments

Musical instruments are constructed in a broad array of styles and shapes, using many different materials. Early musical instruments were made from found objects such as shells and plant parts. As instruments evolved, so did the selection and quality of materials. Virtually every material in nature has been used by at least one culture to make musical instruments (Montagu, 2007). This practice is still sustained today with the varied material make-up of modern musical instruments, particularly Western orchestral instruments where some instruments are made of wood (recorder, flute); brass (trumpet, trombone) fiber/plastic (recorder), metal (triangle, timpani) and sometimes with the combination of various materials (percussion instruments). There appears to be a scientific or acoustic basis for the material choice of musical instruments but this concept shall be discussed in detail under the body make-up of the respective instrumental families.

Organology and Classification

There are many different methods of classifying musical instruments. Various methods examine aspects such as the physical properties of the instrument (material, colour, shape, etc.), the use of the instrument, the mechanism of sound production, the range of the instrument, and the instrument's place in an orchestra or other ensemble. Most methods are specific to a geographic area or cultural group and were developed to serve the unique classification requirements of the group. The problem with these specialized classification schemes is that they tend to break down once they are applied outside of their original area. For example, a system based on instrument use would fail if a culture invented a new use for the same instrument. Scholars recognize Hornbostel-Sachs as the only system that applies to any culture and, provides only possible classification for each instrument (Kartomi, 1990; Sachs, 1940). The original Hornbostel-Sachs system classified instruments into four main groups thus:

- **Idiophones:** These are musical instruments which produce sound by vibrating the primary body of the instrument itself; they are sorted into concussion, percussion, shaken, scraped, split, and plucked idiophones, such as xylophone, drum, etc,.
- **Membranophones:** These are musical instruments which produce sound by a vibrating stretched membrane; they may be drums, which are struck by hand, with a stick, or rubbed.
- **Chordophones:** These are musical instruments which produce sound by vibrating one or more strings; they are sorted into according to the relationship between the string(s) and the sounding board or chamber. For example, if the strings are laid out parallel to the sounding board and there is no neck, the instrument is a zither whether it is plucked like an autoharp or struck with hammers like a piano. If the instrument has strings parallel to the sounding board or chamber and the strings extend past the board with a neck, then the instrument is a lute, whether the sound chamber is constructed of wood like a guitar or uses a membrane like a banjo.
- **Aerophones:** These are musical instruments which produce sound by a vibrating column of air; they are sorted into free aerophones such as a bullroarer or whip, which moves freely through the air; flutes, which causes the air to pass over a sharp edge; reed instruments, which use a vibrating reed; and lip-vibrated aerophones such as trumpets, for which the lips themselves function as vibrating reeds.

Musical instruments are also often classified by their musical range in comparison with other instruments in the same family. This system of classification is useful when placing instruments in context of an orchestra or other ensemble. The classifications are named after singing voice classifications thus:

- **Soprano Instruments:** flute, violin, soprano saxophone, trumpet, clarinet, oboe, piccolo, etc.,
- **Alto Instruments:** alto saxophone, French horn, English horn, viola, alto horn
- **Tenor Instruments:** trombone, tenor saxophone, guitar, tenor drum
- **Baritone Instrument:** bassoon, baritone saxophone, bass clarinet, cello, baritone horn
- **Bass Instruments:** double bass, bass guitar, bass saxophone, tuba, bass drum, euphonium.

The drawback behind this system of classification is that it is not completely precise. Some instruments fall into more than one category: for example, the cello may be considered tenor, baritone or bass, depending on the how its music fits into the ensemble, and the trombone may be alto, tenor, baritone, or bass and the French horn, bass, baritone, tenor, or alto, depending on the range it is played in. Some instruments have their range as part of their name: soprano saxophone, tenor saxophone, baritone horn, alto flute, bass guitar, etc. Additional adjectives describe instruments above the soprano range or below the bass, for example: sopranino saxophone, contrabass clarinet. When used in the name of an instrument, these terms are relative, describing the instrument's range in comparison to other instruments of its family and not in comparison to the human voice range or instruments of other families. For example, a bass flute's range is from C3 to F#6, while a bass clarinet plays one octave lower.

For Western orchestral instruments, the most commonly used system of classification divides the instruments into the Strings (violin, viola, cello, double bass); Woodwinds (clarinet, flute, piccolo, saxophone, English horn, oboe, bassoon); Brass (trumpet, trombone, French horn, Euphonium, tuba); the Percussion family (drums, bells, cymbals, triangle, timpani etc.), with the occasional inclusion of the keyboards (harpsichord, organ, piano, etc.).

Range of Musical Instruments

The range of a musical instrument is the "span of pitches between highest and lowest of the instrument (The New Harvard Dictionary of Music, 1988). An instrument is often made in different sizes that produce different ranges. For instance, the saxophone family includes

soprano, alto, tenor, baritone, and bass saxophones (Kamien, 1986). There are various forms of range applicable to Western orchestral instruments. They are, sounding range, written range, designated range, duration range, and dynamic range.

- **Sounding Range:** This refers to the pitches produced by an instrument.
- **Written Range:** This refers to the compass (span) of notes written in the sheet music, where the part is sometimes transposed for convenience. A piccolo typically has a sounding range one octave higher than its written range.
- **Designated Range:** This is a set of notes the player should or can achieve while playing.
- **Duration Range:** This is the difference between the shortest and longest rhythm used.
- **Dynamic Range**: This refers to the difference between the quietest and loudest volume of an instrument.

Although woodwind instruments and string instruments have no theoretical upper limit to their range (subject to practical limits), they generally cannot go below their designated range. Brass instruments, on the other hand, can play beyond their designated ranges. Notes lower than the brass instrument's designated range are called pedal tones. The playing range of a brass instrument depends on both the technical limitations of the instrument and the skill of the player. Classical arrangements seldom make woodwind or brass instruments play beyond their designated range. String musicians play the bottom of their ranges very frequently, but the top of a string instrument's range is rather fuzzy, and it is unusual for a string player to exceed the designated range. It is quite rare for wind musicians to play the extremes of their instruments. The most common exception is that in many 20th century works; pedal tones are called for in bass trombones. The concept of range influences the classification of some musical instruments as we have already mentioned earlier.

Transposition

Transposition is a musical concept denoting the rewriting or performance of music at a pitch other than the original one (The New Harvard Dictionary of Music, 1986). Transposition also refers to the process, or operation, of moving a collection of notes (pitches or pitch classes) up or down in pitch by a constant interval (Wikipedia Encyclopedia). Transposition affects instrumental music as much as vocal music. The player of an instrument at one pitch, for example, will be required to transpose in order to perform a part written at another pitch.

Transposing Instruments

A transposing instrument is a musical instrument whose music is notated at a pitch different from the pitch that actually sounds concert pitch). Playing a written C on a transposing instrument produces a pitch other than C, and that pitch identifies the interval of transposition when describing the instrument. For example, a written C on a B^b clarinet sounds a concert B^b. For the trumpet, music for all models is written as if they were C trumpets (written C sounds B^b for a B^b trumpet). This allows players to switch instruments without learning new fingerings. Those models other than the C are said to be transposing instruments. Rather than a property of the instrument, the transposition is a convention of music notation- however, instruments whose music is typically notated in this way are called transposing instruments. For some instruments (e.g., the piccolo or the double bass), the sounding pitch is still a C, but in a different octave; these instruments are said to transpose "at the octave".

Timbre/ Tone Colour of Musical Instruments

Tone colour refers to the character of a sound, as distinct from its pitch; hence the quality of sound that distinguishes one instrument from another. It is largely, though not exclusively, a function of the relative strengths of the harmonics and sometimes non-harmonic frequencies) present in the sound (The New Harvard dictionary of Music, 1986). Tone colour (sometimes called timbre) is intrinsic acoustic quality that distinguishes one instrument from the other. The concept of tone colour or timbre also distinguishes various orchestral instruments within a given family. For instance, the sound of a trumpet playing from a distance differs from that of a trombone even without seeing the player or the instruments themselves. An instrument's tone colour may vary with the register (part of the total range) in which it is played. A clarinet sounds dark and rich in its low register, but its high register is brilliant and piercing (Kamien, 1986).

Theoretical Review

The teaching/learning process, undeniably, has attracted one of the most extensive theoretical attention and discourse among other concepts in the field of education. History is generous with scholars, psychologists, sociologists, and philosophers that made relevant contributions regarding the various modes of instruction (teaching) and the acquisition of knowledge (learning) by man. Notable among them are, Aristotle, Plato, Socrates, Pythagoras, and numerous modern educational thinkers such as, Lev Vygosky (1896-1934), Jean Piaget (1896-1980), Ivan Pavlov (1849-1936), Jean-Jacques Rousseau (1712-1778), Seymour Papert (1928-…), Maria Montessori (1870-1952), Jerome Bruner (1915…), John B. Watson (1878-1958), John Dewey (1859- 1952), Benjamin Bloom (1913-1999), John Locke (1632-1704) etc. Certain scholars also left indelible marks in the field of music education, such as Shinichi Suzuki (1898-1998), Carl Orff (1895-1982), Zoltan Kodaly (1882-1967), Emile Jaques-Dalcroze (1865- 1950), Edwin E. Gordon, etc.

The Domains of Learning

Benjamin Bloom (1913-1999), an American psychologist, made contributions to the classification of educational objectives and to the theory of learning. In 1956, Bloom edited the first volume of Taxonomy of Educational Objectives: The Classification of Educational Goals, which outlined a classification of learning objectives that has come to be known as Bloom's Taxonomy and remains a foundational and essential element within the educational community as evidenced in the 1981 survey of significant writings that have influenced the curriculum (Anderson & Krathwohl, 2001). Bloom outlined the three domains of learning thus:

- **The cognitive Domain**

Skills in the cognitive domain revolve around knowledge, comprehension, and critical thinking on a particular subject. Traditional education tends to emphasize the skills in this domain, particularly the lower-order objectives. There are six levels in this particular domain, moving through the lowest order processes to the highest:

(i) **Knowledge**

Exhibiting memory of previously learned materials by recalling facts, terms, basic concepts and answers. For example, knowledge of specifics (terminology, specific facts); knowledge of ways and means of dealing with specifics (conventions, trends and sequences, classifications

and categories, criteria, methodology); knowledge of the universals and abstractions in a field (principles and generalizations, theories and structures).

(ii) **Comprehension**

Demonstrating understanding of the facts and ideas by organizing, comparing, translating, interpreting, giving descriptions, and stating the main ideas. For instance, translation, interpretation, and extrapolation.

(iii) **Application**

Using new knowledge. Solving problems in new situations by applying acquired knowledge, facts, techniques and rules in a different way.

(iv) **Analysis**

Examining and breaking information into parts by identifying motives or causes. Making inferences and finding evidence to support generalizations. For instance, analysis of elements, analysis of relationships, analysis of organizational principles.

(v) **Synthesis**

Compiling information together in a different way by combining elements in a new pattern or proposing alternative solutions. For instance, production of a unique communication, production of a plan, or proposed set of operations, derivation of a set of abstract relations.

(vi) **Evaluation**

Presenting and defending opinions by making judgments about information, validity of ideas or quality of work based on a set of criteria. For instance, judgments in terms of internal evidence judgments in terms of external criteria.

- **The Affective Domain**

Skills in the affective domain describe the way people react emotionally and their ability to feel other living things' pain or joy. Affective objectives typically target the awareness and growth in attitudes, emotion, and feelings. There are five levels in the affective domain moving through the lowest order processes to the highest:

(i) **Receiving**

The lowest level, the student passively pays attention. Without this level no learning can occur. Receiving is about the student's memory and recognition as well.

(ii) **Responding**

The student actively participates in the learning process, not only attends to a stimulus; the student also reacts in some way.

(iii) **Valuing**

The student attaches a value to an object, phenomenon, or piece of information. The student associates a value or some values to the knowledge he acquired.

(iv) **Organizing**

The student can put together different values, information, and ideas and accommodate them within his/her own schema; comparing, relating and elaborating on what has been learned.

(v) **Characterizing**

The student holds a particular value or belief that now exerts on his/her behavior so that it becomes a characteristic.

- **The Psychomotor Domain**

Skills in the psychomotor domain describe the ability to physically manipulate a tool or instrument like a hand or a hammer. Psychomotor objectives usually focus on change and/or development in behavior and/or skills. This domain has three levels:

(i) **Perception**

This is the learner's perception of his performance, whether quicker, better, more accurate, etc.

(i) **Adaptation**

Skills are well developed and the individual can modify movement patterns to fit special requirements. Examples: responds effectively to unexpected experiences.

(ii) **Origination**

Creating new movement patterns to fit a particular situation or specific problem. Learning outcomes emphasize creativity based upon highly developed skills.

These three domains of learning (cognitive, affective, and psychomotor) are not mutually exclusive. For example, in learning to play chess, the person will have to learn the rules of the game (cognitive domain); but he also has to learn how to set up the chess pieces on the chess board and also how to properly hold and move a chess piece (psychomotor). Furthermore, later

in the game the person may even learn to love the game itself, value its applications in life, and appreciate its history (affective domain) (Wikipedia Encyclopedia, 2013). Bloom's theory is very pertinent to the study for the understanding of the principles underlying the teaching and learning of Western orchestral instruments.

Theories of Learning

The experimental and pioneer works of several scholars have led to the evolution of theories of learning. These learning theories have also influenced the teaching process immensely. The theories are reviewed below:

The Behavioural Theory:

The behaviourist school (championed by Pavlov, Skinner, Thorndike, Tolma, and others) operates on the principle of "stimulus- response." All behavior is caused by external stimuli (operant conditioning). All behaviour can be explained without the need to consider internal mental states or consciousness. Behaviourism assumes a learner is essentially passive, responding to environmental stimuli. The learner starts off as a clean slate (i.e. tabula rasa) and behaviour is shaped through positive reinforcement or negative reinforcement. Both positive reinforcement and negative reinforcement increase the probability that the antecedent behaviour will happen again. In contrast, punishment (both positive and negative) decreases the likelihood that the antecedent behaviour will happen again. Positive indicates the application of a stimulus; negative indicates the withholding of a stimulus. Learning is therefore defined as a change in behaviour in the learner (Staats, 1963).

- **Operant Conditioning Vs Classical Conditioning**

The experimental works of Ivan Pavlov and B. F. Skinner led to two forms of conditioning in the behaviourist school. Operant conditioning (championed by B. F. Skinner) is a behaviourist theory based on the fundamental idea that behaviours that are reinforced will tend to continue, while behaviours that are punished will eventually end. Classical conditioning (championed by Pavlov) is a reflexive or automatic type of learning in which a stimulus acquires the capacity to evoke a response that was originally evoked by another stimulus. Operant conditioning is technically described as a process that attempts to modify behaviour through the use of positive and negative reinforcement. Through operant conditioning, an individual makes an association between a particular behaviour and a consequence. For example, I: Parents rewarding a child's excellent grades with candy or some other prize.

Example II: A school teacher awards points to those students who are most calm and well-behaved. Students eventually realize that when they voluntarily become quieter and better behaved, that they earn more points.

Example III: A form of reinforcement (such as food) is given to an animal every time the animal (example, a hungry lion) presses a lever.

The term "operant conditioning" originated by the behaviourist B. F. Skinner, who believed that one should focus on the external, observable causes of behaviour (rather than try to unpack the internal thoughts and motivations). Reinforcement comes in two forms: positive and negative.

(i) **Positive and Negative Reinforcers**

Positive reinforcers are favourable events or outcomes that are given to the individual after the desired behaviour. This may come in the form of praise, rewards, etc. negative reinforcers typically are characterized by the removal of an undesired or unpleasant outcome after the desired behavior. A response is strengthened as something considered negative is removed. The goal in both of these cases of reinforcement is for the behaviour to increase.

(ii) **Positive and Negative Punishment**

Punishment, in contrast, is when the increase of something undesirable attempts to cause a decrease in the behaviour that follows. Positive punishment is when unfavourable events or outcomes are given in order to weaken the response that follows. Negative punishment is characterized by when a favourable event or outcome is removed after an undesired behavior occurs. The goal in both cases of punishment is for a behavior to decrease.

What then is the difference between operant conditioning and classical conditioning? In operant conditioning, a voluntary response is then followed by a reinforcing stimulus. In this way, the voluntary response (e.g. studying for an exam) is more likely to be done by the individual. In contrast, classical conditioning is when a stimulus automatically triggers involuntary response (Baum, 1994).

2.2.2 (b) The Cognitive Theory

The cognitivist paradigm essentially argues that the "black box" of the mind should be opened and understood. The learner is viewed as an information processor (like a computer). The

cognitivist revolution replaced behaviourism in 1960s as the dominant paradigm. Cognitivism focuses on the inner mental activities of humans. The "black box" of the human mind is valuable and necessary for understanding how people learn. Mental processes such as thinking, memory, knowing, and problem-solving need to be explored. Knowledge can be seen as a schema or symbolic mental constructions. Learning is defined as change in a learner's schemata. Cognitivism, in response to behaviourism, reasons that people are not "programmed animals" that merely respond to environmental stimuli; people are rational beings that require active participation in order to learn, and whose actions are a consequence of thinking. Changes in behaviour are observed, but only as an indication of what is occurring in the learner's head. Cognitivism uses the metaphor of the mind as computer: information comes in, is being processed, and leads to certain outcomes (Shettleworth, 2010).

2.2.2 (c) Constructivism

Constructivism, as a perspective in education, explains how knowledge is constructed in the human being when information comes into contact with existing knowledge that had been developed by experiences. It has its roots in cognitive psychology and biology and an approach to education that lays emphasis on the ways knowledge is created in order to adapt to the world. Constructs are the different types of filters we choose to place over our realities to change our reality from chaos to order. The crux of constructivism is that learning is an active, constructive process. The learner is an information constructor. People actively construct or create their own subjective representations of objective reality. New information is linked to prior knowledge, thus mental representations are subjective. Constructivism has implications for the theory of instruction. Discovery, hands-on, experiential, collaborative, project-based, and task-based learning are a number of applications that base teaching and learning on consructivism (Gardner, 2006).

Stage Theory of Cognitive Development (Piaget)

Piaget's stage theory of cognitive development is a description of cognitive development as four distinct stages in children: sensorimotor, preoperational, concrete, and formal. His model describes how the mind processes new information encountered. He posited that children progress through 4 stages and that they all do so in the same order. The four stages are described briefly thus:

- **Sensorimotor:** (Birth to 2yrs old).

The infant builds an understanding of himself or herself and reality (and how things work) through interactions with the environment. It is able to differentiate between itself and objects. Learning takes place via assimilation (the organization of information and absorbing it into schema) and accommodation (when an object cannot be assimilated and the schemata have to be modified to include the object.

- **Preoperational Stage** (ages 2-4)

The child is not yet able to conceptualize abstractly and needs concrete physical situations. Objects are classified in simple ways, especially by important features.

- **Concrete Operations** (ages 7-11)

As physical experience accumulates, accommodation is increased. The child begins to think abstractly and conceptualize, creating logical structures that explain his or her physical experiences.

- **Formal Operations**(11-15)

This is when cognition reaches its final form. By this stage, the person no longer requires concrete objects to make rational judgments. He or she is capable of deductive and hypothetical reasoning. His or her ability for abstract thinking is very similar to an adult.

Piaget's stage theory has enormous implications for education in the sense that the existence of a maturational unfolding of conceptual skills being linked with certain periods in the lives of learners has an obvious bearing on curriculum planning. Piaget is quite clear in his belief that neurological development and a progression of concept-forming skills must appear before full intellectual maturation is possible. The theory implies that certain periods are critical in mental growth. Teachers should, therefore, have some awareness of the range of possibilities in the concept formation of their learners (Child, 2004). That is, there exists a tender stage for cognitive development in which learning should not be delayed.

Teaching Principles and Methods

The general assumption in the congruous relationship between teaching and learning is that teaching precedes learning. This assumption is not always true owing to the existence of various types of learning which are independent of the teaching context such as informal learning, non-formal learning, discovery learning, intuitive learning, etc. This research also has avoided this general assumption by first reviewing the learning process before the teaching

process due to the fact that a thorough understanding of the complexities of the learning process can sufficiently inspire teaching. That is, as has been mentioned earlier in the preceding paragraph, learning theories inform instructional theories. Below is a review of some teaching methods:

- **Lecture**

A lecture is oral presentations intended to present information or teach people about a particular subject, for example by a university or college teacher. Lectures are used to convey critical information, history, background, theories and equations. Usually the lecturer stands at the front of the room and recites information relevant to the lecture's content. Though lectures are much criticized as a teaching method, universities have not yet found particular alternative teaching methods for the large majority of their courses. Critics point out that lecturing is mainly a one-way method of communication that does not involve significant audience participation. Therefore, lecturing is often contrasted to active learning. Lectures delivered by talented speakers can be highly stimulating, at the very least, lectures have survived in academia as a quick, cheap and efficient way of introducing large numbers of students to a particular field of study (Driscoll, 2004).

- **Demonstration**

Demonstration involves showing by reason of proof, explaining or making clear by use of examples or experiments. Put more simply, demonstration means to clearly show. In teaching through demonstration, students are set up to potentially conceptualize class material more effectively as shown in a study which specifically focuses on chemistry demonstrations presented by teachers. Demonstrations often occur when students have a hard time connecting theories to actual practice or when students are unable to understand application of theories (Mackie & Williamson, 2007). Teachers do not only demonstrate specific learning concepts within the classroom, they can also participate in demonstration classrooms to help improve their own teaching strategies, which may or may not be demonstrative in nature.

Empirical Framework

We shall review the various theoretical developments in this work thus far, their relevance to instrumental music and the contributions of various scholars to instrumental music pedagogy.

Some research findings and their Relevance to Instrumental Music

No one learning theory provides all the answers to the teaching/learning process. Also all the theories put together do not provide all the answers. The only course that can be justifiably taken is a pragmatic one, choosing from among the experimental findings the points of clear relevance to our task. In most cases, psychologists are not really arguing about the findings so much as the interpretations of those findings. The relevance of the various theories of learning to instrumental music is discussed briefly here:

- **Behaviourism**

Applied behaviour analysis, a research-based science utilizing behavioural principle of operant conditioning, is effective in a range of educational settings. For example, teachers can alter student behaviour by systematically rewarding students who follow classroom rules with praise, stars, or tokens exchangeable for sundry items. Despite the demonstrated efficacy of awards in changing behaviour, their use in education has been criticized by proponents of self-determination theory, who claim that praise and other rewards undermine intrinsic motivation. There is evidence from experience that tangible rewards decrease intrinsic motivation in specific situations, such as when the student already has a high level of intrinsic motivation to perform the goal behavior. But the results showing detrimental effects are counterbalanced by evidence that, in other situations, such as when rewards are given for attaining a gradually increasing standard of performance, rewards enhance intrinsic motivation (Baum, 1994).

Thorndike's and Skinner's behavioruist theory of operant (instrumental) conditioning which emphasizes the use of adequate apparatus that blends with the learning objective, content and method has obviously implications that 'learning depends on the nearness of stimulus and response' (Ojukwu, 2011: 42). Using appropriate musical instruments in teaching instrumental music is very essential. For instance, if a teacher wants his student to distinguish between stringed instruments and woodwinds, it is worthwhile presenting samples of the various instruments for proper distinction. They should be presented at the same time as learning is taking place.

Also, operant conditioning emphasizes that a response must be made by the learner for learning to occur. And so, activities that sustain and induce learners' active participation should always be provided (Ojukwu, 2011). Ikibe (2002:102) rightly submits that, 'active musical experiences are the only ways learners can get to understand what they learn in music'. Engaging students with their various orchestral instruments in instrumental classes always and with the direct involvement and supervision of the teacher can enhance orchestral instrumental learning a great deal. Skinner's reinforcement theory can also be useful in the instrumental class if the teacher can commend his students regarding their successful instrumentation of let's say, phrasing, embouchure, articulation, legato playing, or proper interpretation of ornamented passages, etc.

Furthermore, findings from Pavlov's behaviourist theory of classical conditioning can be applied to instrumental music education by pairing music theory or class singing with the actual instrumental lessons so that the later (instrumental lessons-which they may find tedious ([neutral response]) may elicit positive learning response with the former (music theory or class singing -which they may find more interesting [positive response]).

- **Cognitivism**

Among current educational psychologists, the cognitive perspective is more widely held than the behavioural perspective, perhaps because it admits causally related mental constructs such as traits, beliefs, memories, motivations and emotions. Cognitive theories claim that memory structures determine how information is perceived, processed, stored, retrieved and forgotten (Child, 2004).

The main thrust of the cognitive school is the perception, processing, storage, and retrieval of information. This theory has enormous relevance to instrumental music. The bulk of the theoretical basis of instrumental music relies on memorizing and rote-learning instrument's classification, ranges, transpositions, compass, clef, fingering techniques, systems and charts, bowing techniques and systems, etc.

Furthermore, Piaget's cognitive theory of stages in mental development raises the issue of 'critical period' which implies that learning after this sensitive or critical period can seriously be impaired. This has serious implications for instrumental music education in the sense that instrument teachers should be sensitive to learners who may not have had instrumental learning or formal musical learning at all. Every learner should be allowed to adapt to the instrumental class at his cognitive pace and ability.

- **The Developmental School**

Developmental psychology, and especially the psychology of cognitive development, opens a special perspective for educational psychology. This is so because education and the psychology of cognitive development converge on a number of crucial assumptions. First, the psychology of cognitive development defines human cognitive competence at successive phases of development. Education aims to help students acquire knowledge and develop skills which are compatible with their understanding and problem-solving capabilities at different ages. Thus, knowing the students' level on a developmental sequence provides information on the kind and level of knowledge they can assimilate, which, in turn, can be used as a frame for organizing the subject matter to be taught at different school grades. This is the reason why Piaget's theory of cognitive development was so influential for education, especially mathematics and science education. In the same direction, the neo-piagetian theories of cognitive development suggest that in addition to the concerns above, sequencing of concepts and skills in teaching must take account of the processing and working memory capacities that characterize successive age levels.

Also the psychology of cognitive development involves understanding how cognitive change takes place and recognizing the factors and processes which enable cognitive competence to develop. Education also capitalizes on cognitive change, because the construction of knowledge presupposes effective teaching methods that would move the student from a lower to a higher level of understanding. Mechanisms such as reflection on actual or mental actions vis-à-vis alternative solutions to problems, tagging new concepts or solutions to symbols that help one recall and mentally manipulate them are just a few examples of how mechanisms of cognitive development may be used to facilitate learning.

Furthermore, the psychology of cognitive development is concerned with individual differences in the organization of cognitive processes and abilities, in their rate of change, and in their mechanisms of change. The principles underlying intra and inter-individual differences could be educationally useful, because knowing how students differ with regard to the various dimensions of cognitive development, such as processing and representational capacity, self-understanding and self-regulation, and the various domains of understanding, such as mathematical, scientific, or verbal abilities, would enable the teacher to cater for the needs of the different students so that no one is left out (Bouton, 2007).

This theory applies constructively to instrumental music curriculum by implying that 'knowing the students level' on a developmental sequence provides information on the kind and level of knowledge they can assimilate, which, in turn, can be used as a frame for organizing the subject matter to be taught at different school grades. The instrumental and orchestral scheme should be designed to follow a developmental sequence encompassing all grades (from intermediate to advanced).

Furthermore, the cognitive developmental theory has great implications for instrumental music education by virtue of its emphasis on sensitivity to individual differences in the organization of cognitive processes. In teaching instrumental music, pieces and materials for individual studies should be presented with varying degrees of difficulty and technicality regarding the respective capabilities of the learners.

- **The Social Cognitive School**

Social cognitive theory is a highly influential fusion of behavioural, cognitive and social elements that was initially developed by educational psychologist Albert Bandura. In its earlier, neo-behavioural incarnation called 'Social Learning Theory', Bandura emphasized the process of observational learning in which a learner's behaviour changes as a result of observing others' behaviour and its consequences. The theory indentified several factors that determine whether observing a mode will affect behavioural or cognitive change. These factors include the learner's developmental status, the perceived prestige and competence of the model, the consequences to the learner's goals, and the learner's self-efficacy. The concept of self-efficacy, which played an important role in later developments of the theory, refers to the learner's belief in his or her ability to perform the modeled behaviour.

An experiment by Shchunk and Hanson, that studied grade 2 students who had previously experienced difficulty in learning subtraction, illustrates the type of research stimulated by social learning theory. One group of students observed a subtraction demonstration by a teacher and then participated in an instructional programme on subtraction. A second group observed other grade 2 students performing the same subtraction procedures and then participated in the same instructional programme. The students who observed peer models scored higher on a subtraction post-test and also reported greater confidence in their subtraction ability. The results were interpreted as supporting the hypothesis that perceived similarity of the model to the learner increases self-efficacy, leading to more effective learning of modeled behaviours.

It is supposed that peer modeling is particularly effective for students who have low self-efficacy.

Over the last decade, much research activity in educational psychology has focused on developing theories of self-regulated learning (SRL) and metacognition. These theories work from the central premise that effective learners are active agents who construct knowledge by setting goals, analyzing tasks, planning strategies and monitoring their understanding. Research has indicated that learners who are better at goal-setting and self –monitoring tend to have greater intrinsic task interest and self-efficacy, and that teaching strategies can increase academic achievement (Bransford, 2000).

. **Various Types of Learning and their Relevance to Instrumental Music**

The various types and forms of learning and their applicability to instrumental music are discussed below:

- **Associative Learning (classical/operant conditioning)**

Associative learning is the process by which an association between two stimuli or a behaviour and a stimulus is learned. The two forms of associative learning are classical and operant conditioning. In classical conditioning a previous neutral stimulus is repeatedly presented together with a reflex eliciting stimuli until eventually the neutral stimulus will elicit a response on its own. In operant conditioning a certain behaviour is either reinforced or punished which results in an altered probability that the behavior will happen again. Operant conditioning is simply the use of consequences to modify the occurrence and form of behaviour. Operant conditioning is distinguished from classical (Pavlovian conditioning) in that operant conditioning uses reinforcement/punishment to alter an action-outcome association. In contrast classical (Pavlovian conditioning) involves strengthening of the stimulus-outcome association. The typical paradigm for classical conditioning involves repeatedly pairing an unconditioned stimulus (which unfailingly evokes a reflexive response) with another previously neutral stimulus (which does not normally evoke the response) (Gazzaniga, 2010)..

Obviously, as mentioned earlier, learning depends on the nearness of stimulus and response (Ojukwu, 2011). Using appropriate musical instruments in teaching instrumental music is very essential. For instance, if a teacher wants his student to distinguish between stringed instruments and woodwinds, it is worthwhile presenting samples of the various instruments for proper distinction. They should be presented at the same time as learning is taking place.

Also, operant conditioning being the fulcrum of associative learning applies to instrumental music in the sense that the learner's response of handling or fiddling (an operant) with an orchestral instrument can progress (be conditioned) towards increased interest in learning the instrument as the instrument responds to simple manipulation by the learner even without direct influence of a teacher!

- **Observational Learning**

The learning process most characteristic of humans is imitation; one's personal repetition of an observed behaviour, such as dance. Recent research with children has shown that observational learning is well suited to seeding behaviours that can spread widely across a culture through a process called a diffusion chain, where individuals initially learn a behaviour by observing another individual perform that behavior, and then serve as a model from which other individuals learn the behavior (Bransford, 2000). Humans can copy three types of information simultaneously: the demonstrator's goals, actions, and environmental outcomes. Through copying these types of information, (most) infants will tune into their surrounding culture.

One can learn certain instrumental techniques by observing. Such instrumental techniques as proper posture, holding the instrument, bowing, fingering, embouchure, etc, can be learned by observing the instrumental teacher, colleague, or any experienced instrumentalist. For example, instruments of the string family (violin, viola, 'cello, and string bass) require a great deal of observation (proper posture with the instrument, hand placements on the instrument, holding the bow, fingering, and bowing) for effective learning of any of the instruments. Also such instrument as the transverse flute demand intensive observational learning (i.e., the transverse/horizontal placing of the instrument for proper embouchure).

- **Enculturation**

Enculturation is the process by which a person learns the requirements of their native culture by which he or she is surrounded, and acquires values and behaviours that are appropriate or necessary in that culture. The influences which direct or shape the individual, whether deliberately or not, include parents, other adults, and peers. If successful, enculturation results in competence in the language, values and rituals of the culture (Henry, 1988).

Music is a culture, and instrumental music is a sub-culture of music. If a learner does not receive enculturation regarding the norms of instrumental and orchestral music, he or she may have difficulties adapting. Such instrumental norms relate to the proper handling and packaging

of the instruments (e.g. the stringed instruments require carriage in their boxes, should not be held at the neck, the bow should always be left loose when not in use; the valves of brass instruments should always remain oiled and never be exposed to friction or abrasion; the reeds of woodwind instruments come in various specifications with regard to player-capacity and are always wetted 10 to 15 minutes before playing; a learner who has an underbite (i.e. lower teeth in front of upper) or crooked teeth should be guided away from brasses; small students should not try large instruments; learners who have thick fingers should avoid the violin because notes in the higher positions are too close together to allow for thick fingers (Hoffer, 1991). Furthermore, learners should be aware of the various and varied roles of instruments in the orchestra, sitting positions, and the capabilities and limitations of their various instruments.

- **Episodic Learning**

Episodic learning is a change in behaviour that occurs as a result of an event. For example, a fear of dogs that follows being bitten by a dog is episodic learning. Episodic learning is so named because events are recorded into the episodic memory, which is one of the three forms of explicit learning and retrieval, along with perceptual memory and semantic memory (Bransford, 2000).

Watching a symphony orchestra (live or recorded) or an orchestral concert could constitute episodic learning and foster interest in learning western orchestral instruments. Watching performances by some sections of the orchestra, or listening to peculiar rendition of a familiar tune, or even the virtuosity of an orchestral player can greatly motivate one towards learning an orchestral instrument.

- **Multimedia Learning**

Multimedia learning is where a person uses both auditory and visual stimuli to learn information. This type of learning relies on dual-coding theory (Mayer, 2001)**.**

Modern instrumental pedagogy employs multimedia learning a lot. There are now various audio-visual CDs that illustrate and guide learners through various stages of instruction and instrumental experience. Such audio-visual materials exist for the strings, brasses, woodwinds, percussion. Even video CDs of performances by some philharmonic orchestras around the world can serve for multimedia learning.

- **Rote Learning**

Rote learning means learning or memorizing abstract concepts in whole without immediate attention to meaning as opposed to learning them in bits or parts with attention to meaning. For example, teaching pupils to memorize numbers or letters of the alphabet is rote learning because there is no direct or immediate connection between the alphabets and their corresponding sounds or the immediate use of numbers. Child (2004; 134) explains that: "A theoretical debate surrounds the subject of whether it is better to learn by small steps (Skinner) or large chunks (Gestalt psychologists)". For the teacher, there is clearly a time and a place for both approaches. Although rote learning has its limitations, for it tends to preclude the logical acquisition of further meaningful knowledge (Child, 2004); it still has its place in learning. Child (2004) expounds that:

> Any symbolic form new to the child (learner) will require rote memorization. For example, the letters of the alphabet, numbers, musical notation and chemical symbols have to be learned by heart. Basic mathematical or physical equations, causes and outcomes in history, structure and functions in biology, etc., require a combination of straight memorization and logical build from previous knowledge (p. 135).

Rote learning is a technique which avoids understanding the inner complexities and inferences of the subject that is being learned and instead focuses on memorizing the material so that it can be recalled by the learner exactly the way it was read or heard. The major practice involved in rote learning techniques is "learning by repetition", based on the idea that one will be able to quickly recall the material (but not necessarily its meaning) the more it is repeated. Rote learning is used in diverse areas, from mathematics to music to religion. Although it has been criticized by some schools of thought, it is still a necessity in many situations (Child, 2004).

Instrumental learning obviously draws much on rote learning. For instance, memorizing note placement on staff for sight-reading and the various keys and their relative positions on the instrument are all forms of rote learning. On the place of rote learning in instrumental music, Hoffer (1991) avers:

> Rote teaching is useful in the early stages of study, because beginning students find it difficult to coordinate the mechanics of instrument playing with reading notation. Rote procedures allow the proper mechanics of playing to be assimilated without the distraction of notes. When there are no music stands, teachers can move about freely to

> help with fingering or playing positions. Sometimes difficult problems, such as crossing the break between registers on the clarinet, are best introduced by rote. Rote procedures are especially valuable in string classes because all string instruments are in concert pitch; all produce tone in the same manner (whether plucked or bowed), and all have most of their open strings in common (p. 243).

- **Meaningful Learning**

Meaningful learning is the concept that learned knowledge (e.g., a fact) is fully understood to the extent that it relates to other knowledge. To this end, meaningful learning contrasts with rote learning in which information is acquired without regard to understanding. Meaningful learning, on the other hand, implies there is a comprehensive knowledge of the context of the facts learned (Wade, 1997).

Employing meaningful learning to instrumental music involves applying the various abstract concepts and rudiments of music learned by rote to practical use in instrumentation. For instance, the ranges of the instruments should be played for emphasis, the various transposition equivalents of transposing instruments can be shown by playing the affected instruments, and attempts should be made on interpreting some of the tunes scored on for the various orchestral instruments with proper attention to and application of musical dynamics, phrasing, and expression marks. The instrumental teacher plays a crucial role here for he serves as the bridge between concepts learned by rote (rote learning) and their actual interpretation and application to instrumentation (meaningful learning).

- **Modeling**

Modeling has been defined as ‘learning by imitation’ (Mager, 1968: 61). Mager pointed out that: students learn more by imitation if the model has prestige. Modeling is both a factor in learning as well as an aspect of instruction. In educational psychology, modeling refers to the demonstration of a way of behaving to a learner in order for that behavior to be imitated. It is by modeling that we learn how to behave in most unfamiliar situations. Regarding modeling, Mager (1968) avers that:

- Students learn more by imitation if the model has prestige (for the student)
- The student will perform more of what he has learned if he has seen the model being reinforced rather than punished for that performance.

- When a student sees a model being punished, the student will tend not to engage in the kind of behaviour that was punished.
- When a student sees a model doing things he should not do (transgressions) and there is no aversive consequence to the model, there is an increase in the probability that the student will do those undesirable things (p. 635).

Modeling tells us that if we would maximize subject matter approach tendencies in our students, we must exhibit those behaviours ourselves. Obviously modeling can enhance instrumental learning greatly if instrumental teachers can exploit its enormous advantage. The young student of an orchestral instrument can be motivated towards a successful instrumental experience if the teacher can do more than just flipping learning charts and pieces across to the student to work out. Does the instrumental teacher actually know his instrument? Does he interpret scores efficiently with the instrument? Does his student see him rehearse or perform with the instrument? Does the instrument teacher preserve some dignity and respect among people? These are just few of the factors and attributes that can influence a learner.

- **Formal Learning**

Formal learning is learning that takes place within a teacher-student relationship, such as in a school system. The term formal learning has nothing to do with the formality of the learning, but rather the way it is directed and organized. In formal learning, the learning or training department set out the goals and objectives of the learning (Bruner, 1960).

Formal learning, as the name implies, involves a formal setting, curriculum and scheme, plan, teaching-learning process, and evaluation. Although learning can still take place without these formal arrangements, they still serve their value in teaching and learning. In instrumental music for example, the following factors and principles guide the instrumental learning/teaching process: learning environment suitable for instrumental music, age of the learner and the suitable instrument, his entry behaviour (prior knowledge that may or may not be useful), learner's attitude to musical instruments and music in general, learner's health history and condition in order to avoid musical instruments that might pose health risks (some blown instruments), teacher qualification, specialization, and competence regarding orchestral instruments, appropriate materials for instrumental instruction, adequate instrumental curriculum and scheme , instrumental instructional procedures and techniques, and evaluation in individual performance studies (IPS) and orchestral.

- **Non-formal Learning**

Non-formal learning is organized learning outside the formal learning system. For example learning by coming together with people with similar interests and exchanging viewpoints in clubs, or in (international) youth organizations, workshops, concerts, etc. People can learn and even master orchestral instruments outside the confines and formalities of school or university. Churches, clubs, youth fora, band groups, music studios etc, are among the various places where non-formal learning of western orchestral instruments can take place (Wade, 1997).

Several music students are known to have shown competence in various orchestral instruments in band playing and churches before their forage into formal instrumental learning in the university.

- **Active Learning**

Active learning occurs when a person takes control of his learning experience. Since understanding information is the key aspect of learning, it is important for learners to recognize what they understand and what they do not. By doing so, they can monitor their own mastery of subjects. Active learning encourages learners to have an internal dialogue in which they are verbalizing their understandings. This and other meta-cognitive strategies can be taught to a child over time. Studies within metacognition have proven the value in active learning, claiming that the learning is usually at a stronger level as a result. In addition, learners have more incentive to learn when they have control over not only how they learn, but also what they learn (Bonwell & Eison, 1991).

Active learning of Western orchestral instruments can manifest in students who have had a rewarding instrumental exposure in their secondary schools and who consequently become music students in their tertiary learning. Having gone through the rudimentary stages of instrumental pedagogy- proper holding of the instrument, fingering, basic embouchure, tonguing, bowing, sight reading, etc. - the enthusiastic learner can actively take control, engage and guide himself through an effective learning experience even without much dependence on the teacher. The obvious drawback to active learning is that proper teacher-guidance and evaluation may be completely lost and the entire endeavour might end up unproductive.

- **Distributed Learning**

Educational psychologists have found that it is far more efficient to learn a skill in numerous short sessions than it is to learn the same thing in a few long sessions. Some psychologists refer

to this principle as ‘distributed effort’, others as ‘distributed practice’ or ‘spaced practice’ (Hoffer, 1989). So it is many times more efficient to practice an instrument for one hour each day of the week than it is to practice seven hours in one day. More learning takes place in the first ten minutes of practice than takes place in the next ten, and with each additional amount of study there is a corresponding reduction in the amount learned. Hoffer, (1989) captures further more reasons for advocating distributed learning/practice in instrumental music:

> There are several other reasons for encouraging distributed effort in teaching. First, fatigue and boredom set in during long practice sessions, and the desire to improve is diminished. Second, mistakes are more likely to be repeated in a long session and become fixed in the response pattern. Third, forgetting is a learning experience because it shows what elements have been inadequately learned. If there are additional practice sessions, these weaknesses can be overcome. Fourth, a person tends to resist immediate repetition of an act, and this resistance continues as the repletion continues. Fifth, incorrect acts are forgotten more quickly than correct ones, and spaced practice allows incorrect responses to be dropped (p. 89).

- **Discovery Learning**

Discovery learning is a technique of inquiry-based instruction and is considered a constructivist based approach to education. It is supported by the work of learning theorists and psychologists such as Jean Piaget, Jerome Bruner, and Seymour Papert, mentioned earlier in the work. Jerome Bruner is often credited with originating discovery learning in the 1960s, but his ideas are very similar to those of earlier writers (e.g. John Dewey). Bruner argues that “practice in discovering for oneself teaches one to acquire information in a way that makes that information more readily viable in problem solving” (Bruner, 1961). This philosophy later became the discovery learning movement of the 1960s. The mantra of this philosophical movement suggests that we should ‘learn by doing’. A discovery learning task can range from implicit pattern detection, to the elicitation of explanations and working through manuals to conducting simulations. Discovery learning can occur whenever the student is not provided with an exact answer but rather the materials in order to find the answer themselves. Discovery learning takes place in problem solving situations where the learner draws on his own experience and prior knowledge and is a method of instruction through which students interact with their environment by exploring and manipulating objects, wrestling with questions and controversies, or performing experiments.

Instrumental learning may not survive without discovery learning. What the orchestral instrument teacher may discuss in the instrumental class cannot always suffice for a successful instrumental experience for the learner. There is still need for the learner to further explore his instrument and make more discoveries in the privacy of his study. The essence of individual practice comes into play here, for one rarely makes discovery as a group but during personal search. Certain instrumental techniques, dispositions and individual disabilities, which may not be evident during general instrumental classes, may be discovered during individual practice sessions. For example, some violin players quite often discover they possess natural vibrato even without any formal effort to learn it. Some brass players somehow discover, early or late, that they lack the physical abdominal strength to sustain notes for long or notes in the high registers of their instruments. Western orchestral musical instruments also are so dynamic and versatile that they demand some intricate discovery of their mechanism for mastery. For instance, the trumpet student may not completely understand the function of the tuning slide until he plays certain notes using rapid combination of valves and discovers the distuning effect of rapid combination of valves which the tuning slide helps to correct.

- **Co-operative Learning**

Co-operative learning is an approach to organizing classroom activities into academic and social learning experiences. It differs from group work, and it has been described as "structuring positive interdependence". Students must work in groups to complete tasks collectively toward academic goals. Unlike individual learning, which can be competitive in nature, students learning to co-operate positively capitalize on one another's resources and skills (asking one another for information, evaluating one another's ideas, monitoring one another's work, etc.). Furthermore, the teacher's role changes from giving information to facilitating students' learning. Everyone succeeds when the group succeeds. Successful co-operative learning tasks have been described as intellectually demanding, creative, open-ended, and involve higher order thinking tasks (Slavin, 1990; Gilles, 2003).

Co-operative learning, evidently, is the idea behind the tradition of grouping students (of various backgrounds and levels of study) into ensemble groups, which also include Western orchestral ensemble group, where every individual in each group is expected to work with the ideology that, 'everyone succeeds when the group succeeds' thereby, capitalizing on one another's resources and skills, evaluating one another's ideas, and monitoring one another's work. Although 'group work' or 'collaboration' is still present in co-operative learning, the

difference lies in the fact that collaboration can take place formally or informally, that is, advisedly or not, but co-operative learning is usually designed to take place in certain learning experiences in order to foster positive interdependence among learners.

- **Collaboration**

Collaboration is working with each other to do a task. It is a recursive process where two or more people or organizations work together to realize shared goals, (this is more than the intersection of common goals seen in co-operative ventures, but a deep, collective, determination to reach an identical objective)- for example, an endeavour that is creative in nature- by sharing knowledge, learning and building consensus. Most collaboration requires leadership, although the form of leadership can be social within a decentralized and egalitarian group. In particular, teams that work collaboratively can obtain greater resources, recognition and reward when facing competition for finite resources. Structured forms of collaboration encourage introspection of behaviour and communication. These methods specifically aim to increase the success of teams as they engage in collaborative problem solving. Forms, rubrics, charts and graphs are useful in these situations to objectively document personal traits with the goal of improving performance in current and future projects (Spence, 2006).

The theory of group practice or collaborative learning is a relevant one in learning instruments for the obvious reason that it fosters motivation. This fact is sustained by Hoffer's submission that 'There is also motivation when students work together to learn (Hoffer, 1991: 240).

- **Transfer of Learning**

Transfer of learning/training is the extension of acquired knowledge or skill from one field to another. Hoffer (1989) explains it thus: "if you study one subject, and what you learn in that subject contributes to your understanding of a second subject, transfer of learning has taken place" (p. 37). On factors that facilitate transfer of learning, Child (2004) avers that, "The most significant finding is that where there are common factors in the content or in the procedures adopted in carrying out two tasks, transfer is possible" (p. 170). Relating the phenomenon of transfer to music, Leonhard & House (1972) assert that, "Learning may transfer if generalization takes place. The question of transfer is of crucial importance in musical learning, because unless transfer does take place, musical independence can never result" (p. 166).

The concept of transfer of learning is a major factor in instrumental learning. Students who had 'good' instrumental experience in their primary education easily adapt to instrumental learning

in the higher tiers of learning. For instance, playing the recorder in the primary school can facilitate transfer to Western orchestral instruments such as the clarinet, saxophone, flute, and even the brasses (trumpet, trombone, etc, if the learner is well guided). The fact is that the recorder, being a woodwind, offers the same learning principles and playing techniques intrinsic to all woodwinds such as, holding and playing posture for the instrument, embouchure, tonguing, breathing and breath support, fingering, etc. transfer of learning, also, is the idea behind Carl Orff's approach to childhood music teaching/learning by laying emphasis on using pre-band or rhythm instruments such as the marimba, vibraphone, xylophone, etc. Orff's method facilitates a sense of rhythm in young learners which can prove beneficial or 'transfer' during musical exercise in later life.

As a matter of fact, all the various learning types already reviewed may not be applicable to instrumental music without 'transfer'. For instance, rote learning cannot apply to instrumental music if proper transfer of part of the learner's bulk of theoretical knowledge does not take place.

Learning Difficulties/Disorders and Their Implications for Instrumental Music

Learning difficulties and disorders have been described as problems which impede learning. They stem from numerous factors which tend to disrupt human physiological, neurological, biological, psychological, or emotional equilibrium. Child (2004) reports that these learning difficulties and disorders usually manifest "when learners are physically disabled, emotionally disturbed or culturally deprived, exhibit some degree of intellectual or mental disability where scholastic performance is below the average expected of a learner's age group" (p. 242). Most teachers who deal with average and below-average pupils, especially in infant and primary schools, meet children who do not seem to profit from the usual educational methods and content provided in the curriculum. Intellectual disability in the present context is being reserved for those who are slow learners. Where learners are not coping with the work normally expected of their age group, they are said to be slow learners. Child (2004) further draws attention that "teachers have, understandably, been worried about their abilities to cope with any form of special need as their training and experience have largely been devoted to normal school settings" (p. 283). The commonest learning difficulties and disorders are retardation, dyslexia (difficulty with words), autism (disability in interpreting sensory experiences, particularly hearing and seeing). Other physical disabilities that can also impair learning are muscular dystrophy, spasticism, spinia bifida, poloio, cerebral palsy, arthritis and delicacy

(Child, 2004). Certain physical conditions seriously impede learning such as, epilepsy, asthma, cystic fibrosis, haemophilia, sickle cell anaemia, congenital heart disease, diabetes, renal failure, eczema, rheumatoid disorders and lukaemia and childhood cancers. There are also mental health problems which can constitute learning disorders and difficulties such as, eating disorders, substance abuse, neurotic (depression and obsession, suicidal behaviour, excitability- apathy, hysteria and amnesia, phobias) and psychotic disorders (hallucinations, schizophrenia, delusions, bizarre behaviour which are few and far between (Child, 2004).

The implications of learning disorders and difficulties to the educational process in general is that, provision for learners with special educational needs should be part of the daily work of most teachers. Also, in the early years, any signs of decline in achievement should be monitored with an eye to some causes requiring special provision. Regarding the teaching and learning of orchestral musical instruments, the implications are numerous. For instance, learners with hearing difficulty will find it difficult adapting to normal instrumental rudiments of tone, pitch discrimination, and timbre. Learners with aphasia- a language problem which manifests as an impairment in comprehending or formulating messages probably due to central nervous system damage or dysfunction (Kirk & Gallagher (1983)- will find it very difficult reading music graded for an orchestral musical instrument. Learners with dyscalculia- unable to add or subtract ('arithmetic disorder') (Kirk & Gallagher, 1983) - will find it difficult to interpret the rhythmic values of notes in a given piece of music. Learners with aphonia (a complete loss of voice, Kirk & Gallagher, 1983) cannot adapt well to instrumental intonation that is, producing distinct tones on woodwinds and brasses. This is a factual phenomenon in music for there is a relationship between speech and intonation. Kirk & Gallagher (1983) explain further that, "the failure to produce adequate breath pressure to generate speech is usually considered to be a psychological problem rather than a physical one" (p. 300). Learners with cerebral palsy- a disorder of motor function due to brain dysfunction that, in most cases, is present at or near the time of birth (Kirk & Gallagher,1983)- have a major problem in holding and handling things (objects, gadgets, etc) and often have a variety of other problems in hearing and intellectual functioning, and consequently, social adaptation difficulties. This particular group of learners would find it very difficult holding and handling orchestral musical instruments if they were to learn them.

Teaching Methods and Principles Applicable to Instrumental Music

The general assumption in the congruous relationship between teaching and learning is that teaching precedes learning. This assumption is not always true owing to the existence of various types of learning which are independent of the teaching context such as informal learning, non-formal learning, discovery learning, intuitive learning, etc. The fact is that a thorough understanding of the complexities of the learning process can sufficiently inspire teaching. That is, as has been mentioned earlier in the preceding paragraph, learning theories inform instructional theories. Below is a review of the various teaching methods and principles which relate to instrumental music:

- **Motivation**

Motivation has been defined as consisting of internal processes and external incentives which spurs us on to satisfy some need (Child, 2004). He reasons further that:

> It would be safe to say that all theorists in the field of learning either explicitly or by implication argue that a motivated creature is more likely to learn than one which is not. Pavlov has to starve his dogs and Skinner his rats and pigeons to ensure they would learn (p. 132).

A study of motivation, therefore, is crucial for a teacher. Without a knowledge of the ways and means of encouraging children's (learners') learning, knowing about their 'appetites' in the widest sense of the word, being sensitive to their interests, the teacher's task would be impossible for this purpose, most teachers place an understanding of motivation very high on their list of priorities.

- **Teacher Enthusiasm**

Since teachers can affect how students perceive the course content, it has been found that teachers who showed enthusiasm towards the course materials and students can affect a positive learning experience towards the subject. On teacher/course evaluations, it has been found that teachers who have a positive disposition towards the course content tend to transfer their passion to receptive students. These teachers do not teach by rote but attempt to find new invigoration for the course materials on a daily basis. Students who had enthusiastic teachers tend to rate them higher than teachers who did not show much enthusiasm for the course. Teachers that exhibit enthusiasm can lead to students who are more likely to be engaged, interested, energetic, and curious about learning the subject matter. Recent research has found

a correlation between teacher enthusiasm and students' intrinsic motivation to learn and vitality in the classroom. Teacher enthusiasm may contribute to a classroom atmosphere full of energy and enthusiasm which feed student interest and excitement in learning the subject matter. Controlled, experimental studies exploring intrinsic motivation of college students has shown that nonverbal expressions of enthusiasm, such as demonstrative gesturing, dramatic movements which are varied, and emotional facial expressions, result in college students reporting higher levels of intrinsic motivation to learn. Students who experienced a very enthusiastic teacher were more likely to read lecture material outside of the classroom (Child, 2004).

- **Engaging the Learner**

Scholars have argued that learners should constantly be challenged with tasks that refer to skills and knowledge just beyond their current level of mastery. This captures their motivation and builds on previous successes to enhance learner confidence (Gagne, 1977). This is in line with Vygotsky's concept of ZPD, which can be described as the distance between the actual development level (as determined by independent problem-solving) and the level of potential development as determined through problem-solving under adult guidance or in collaboration with more capable peers) (Vygotsky, 1978).

Vygotsky (1978) further claimed that instruction is good only when it proceeds ahead of development. Then it awakens and rouses to life an entire set of functions in the stage of maturing, which lie in the ZPD. It is in this way that instruction plays an extremely important role in development. To fully engage and challenge the learner, the task and learning environment should reflect the complexity of the environment that the learner should be able to function in at the end of learning. Learners must not only have ownership of the learning or problem-solving process, but of the problem itself. It is also important for instructors to realize that although a curriculum may be set down for them, it inevitably becomes shaped by them into something personal that reflects their own belief systems, their thoughts and feelings about both the content of their instruction and their learners. Thus, the learning experience becomes a shared enterprise. The emotions and life contexts of those involved in the learning process must therefore be considered as an integral part of learning.

- **Modelling**

Modelling has been defined as 'learning by imitation' (Mager, 1968). It should also be observed that modeling is both a form of learning and an instructional principle. Modeling as

an instructional approach has proven effective in pre- school violin teaching courtesy of Dr. Schininki Suzuki of Japan. This approach emphasizes the direct imitation of the young learner's (3yr olds) mother for rudimentary violin learning/playing.

Physiological Factors in Learning Instruments

Child (2004) observes that, "Because learning takes place as part and parcel of body-mechanisms, any learning theory should be capable of incorporating physiological and ethological findings". On physiological considerations for learning and assigning musical instruments, Hoffer (1991) advises that:

> Only general guides can be offered regarding what instruments should be assigned to individual students. If a youngster faces a lengthy session with braces on his or her teeth or has an underbite (lower teeth in front of upper) or crooked teeth, the student should be guided away from brasses (cornet, trumpet, trombone, French horn, euphonium, tuba). Generally, small students should not try large instruments. Students who have thick fingers should be encouraged to try instruments other than violin, because notes in the higher positions are too close together to allow for thick fingers without some kind of compensatory movement, which is difficult. Students whose pitch sense is below average should especially avoid strings, French horn, and trombone (p. 239)

The string bass, as a rule, is usually discouraged for people with shorter arms and smaller hands due to the big note gaps and the thick strings (Hoffer, 1991). Leonhard & House (1972) appear to have a different view regarding the choice or assignment of western orchestral instruments to students:

> Teachers should not recruit, in the sense that they select students on the basis of some test and prescribe the instruments which will later assure for proper instrumentation later… The choice of instruments should be on the basis of student preference… (p. 254).

Although there is no rule of thumb or generally accepted procedure in prescribing Western orchestral instruments to students, but Hoffer's suggestion on physiological considerations for choosing and learning Western orchestral instruments appears more tenable than Leonhard & House's recommendation that selection of orchestral instruments by students should be by choice. Obviously Leonhard & House seem to neglect the intricacies and complexities of

human physiological make-up as a sensitive factor in learning musical instruments. For instance, allowing a student with thick fingers to learn the violin or ignoring the choice of the trumpet or trombone by a student with under-bite may amount to misguided learning, wasted efforts, frustration and apathy towards Western orchestral instruments.

Summary of Reviewed Literature

Several concepts, theories, ideologies, and empirical principles have been explored thus far regarding the nature of the teaching/learning of Western orchestral musical instruments. The congruous concepts of teaching and learning have been found to be highly complex processes which require proper comprehension of their intrinsic nature before effective learning/teaching can occur. For instance, when a teacher engages the learner in the teaching-learning process, so many factors (biological, psychological, physiological, and environmental, etc) come into play and network for effective learning on the part of the learner. The brain, memory, intelligence, attitude, motivation, health condition, and the learning environment all contribute to learning. Memory is fundamental to learning in the sense that, to show that learning has taken place, we have to rely on a person's ability to remember something by either mental or physical means. Learning can also take place without formal teaching or a formal setting. Various types of learning exist and some of them bear relevance to instrumental music. For example, rote learning (learning by memorizing), meaningful learning, discovery learning, collaboration, distributed learning, etc. Several learning theories also which support instrumental teaching and learning have also been analyzed. Some of those learning theories are behaviorism (operant/classical conditioning), which were championed by Skinner and Pavlov respectively. The behaviourist school upholds instrumental teaching/learning by virtue of the fact that a learner of an orchestral instrument comes with certain potentialities that can be molded (conditioned) through the instrumentality of instruction (teaching/conditioning). The cognitive school also in rejecting the behaviourists position of the mind as a tabla rasa 'clean slate' reasoned that the mental workings and dynamics of the human brain can be effectively studied. Cognitivism uses the metaphor of the mind as computer: information comes in, is being processed, and leads to certain outcomes. The cognitive theory has offered insight and the explanation to the concept of rote or rote learning, which explains the ability of the brain to memorize abstract concepts and retain them even without an immediate meaningful application or implication. Rote learning is exhibited in instrumental learning through the memorization of pitch classes of notes, instrumental ranges, transposition ranges and equivalents of orchestral instruments, an entire piece or score of music for sight-playing, etc.

Several learning disabilities and disorders have been discovered which impair instrumental learning. For example, learners with hearing difficulty will find it a problem adapting to normal instrumental rudiments of tone, pitch discrimination, and timbre. Learners with aphasia- a language problem which manifests as an impairment in comprehending or formulating messages probably due to central nervous system damage or dysfunction (Kirk & Gallagher (1983)- will find it very difficult reading music graded for an orchestral musical instrument.

Several instructional methods have also been explored along with various specialized methods of teaching music and their relevance to instrumental music. Lecture method of teaching has been criticized as being too 'detached' (non-interactive) for instrumental music. It does not suffice to address the instrumental or orchestral class on the rudiments, organology, or techniques of playing Western orchestral instruments without some practical tips. Some other instructional methods have been found to be more interactive and effective in handling instrumental music. For example, demonstration, modeling, engaging the learner, motivation, etc. Some specialized methods of teaching music with their significance to instrumental music have also been explored. Such specialized methods are the Suzuki, Orff, and Kodaly. Dalcroze, etc. These methods all emphasize solmization as a precursor to successful musical experience and this is beneficial to learning musical instruments as it enhances pitch discrimination as early as possible. The peculiarity of the Suzuki method is quite appreciable in violin instruction. Orff's insistence on using pre-band or rhythm band instruments such as vibraphone, xylophone, marimba, and various other percussion instruments as early as possible in learning music can prove very beneficial to the young leaner as he can easily transfer his skill and knowledge in these instruments to Western percussion instruments such as the, timpani, glockenspiel, snare drum, etc. Kodaly's insistence on using singing as a tool can prove beneficial in playing musical instruments, particularly melodic instruments. First, singing develops aural sensitivity and proper pitch discrimination and intonation, which are rudimentary to learning and playing orchestral instruments. Also, good singing entails memorizing melodic lines of songs, vocal parts and lines using in solfege syllables (solmization) and this can easily transfer to playing the melodic lines of same songs using melodic orchestral instruments such as violin, trumpet, flute, saxophone, etc. Drawing from the Dalcroze model, one recognizes that a successful instrumental experience should start with proper aural training that builds ear sensitivity and proper pitch intonation. Jaques-Dalcroze believed that people were musical when they came to possess an ensemble of physical and spiritual resources and capacities comprising the ear, brain, and body (Cambell & Sott-Kassner, 2010).

Several concepts relating to the organology and playing techniques of the various Western orchestral musical instruments with their intrinsic complexities have also been highlighted. Such concepts as bowing techniques (pizzicato, spiccato, double stop, vibrato, arco, martelle, tremolo etc), proper embouchure for each blown instrument, tonguing techniques (simple tonguing, double tonguing, triple tonguing, flutter tonguing, split tone, etc) and several others relating to other Western orchestral instruments were also explored.

The various 'products' of musical learning (as suggested by Leonhard & House, 1972) have been highlighted as they relate to instrumental music. For instance, one aspires to possess or is expected to manifest these musical qualities after his instrumental learning at least: musical appreciation, musical knowledge, musical understanding, musical initiative, musical skill, etc.

Certain physiological factors and exercises which affect instrumental learning were also identified. For instance, if a student faces a lengthy session with braces on his or her teeth or has an underbite (lower teeth in front of upper) or crooked teeth, the student should be guided away from brasses (cornet, trumpet, trombone, French horn, euphonium, tuba). Generally, small students should not try large instruments. Students who have thick fingers should be encouraged to try instruments other than violin, because notes in the higher positions are too close together to allow for thick fingers without some kind of compensatory movement, which is difficult. Students whose pitch sense is below average should especially avoid strings, French horn, and trombone. These physiological considerations obviously support the idea of instrumental teachers guiding students in choosing orchestral instruments. Regarding the actual playing of Western orchestral instruments, various exercises that enhance physiological flexibility and dexterity have been recommended by scholars. For instance, for a strengthening of muscles for breath support, Stein (1958) suggests this simple exercise, which can be done at home: "Lying on the back, feet together, toes pointed away from the body, slowly raise stiffened legs to a 90-degree angle with the body, then slowly lower again" (p. 20). Generally, as in singing, playing a good tone requires a relaxed and open throat and a slow, controlled airstream. Tension should be maintained in the abdominal muscles as the sound is produced. Advanced players may not require a great amount of abdominal muscle tension because they know precisely which muscles to use and how much to use them. It is usually more difficult to maintain breath support when the player's attention is diverted to fingerings or rhythmic figures. Breath support therefore must become a habit.

Practice has been identified as an indispensable factor in learning and mastery of Western orchestral instrument. A successful instrumental experience invariably depends on consistent practicing. Specific practice strategies designed to improve performance have been advocated and recommended by many scholars. Such strategies have included practicing in a place without distractions (Allgood, 1983; Pedrick, 1998), mentally preparing (Raab, 1980), practicing at a regular time each day (Allgood, 1983), singing (Jarvis, 1980), practicing a pattern using a variety of rhythms (Grieve, 1989), using the metronome, tuner, and tape recorder (Allgood, 1983), and setting goals, warming-up, and practicing slowly until the section is error free (Pedrick, 1998). In fact, the nature, sophistication, and versatility of western orchestral instruments place much demand on the learner for constant practicing.

Finally, the success of the entire Western Orchestral instrumental teaching/learning process somewhat depends on teacher-competency. How competent is the instrumental teacher on the instruments? Modern instrumental pedagogy recommends specialized instrumental teaching, thereby creating room for mastery and specialization. That is, each instrumental teacher is expected to teach one instrument on which he shows a reasonable level of competency. This approach is professionally sound due to the difficulties and challenges Western orchestral instruments pose owing to their sophistication and versatility. Quite often have instrumental programmes failed in schools and institutions due to teacher-incompetency. Teacher-competency is not just an index of virtuosity on a musical instrument but should include a thorough grasp on the intricacies of the teaching/learning process (of concepts, theories, methodologies, etc.).

As we have observed thus far, the teaching/learning of Western orchestral musical instruments is a complex process that requires a thorough comprehension of the plethora of concepts, theories, principles, methodologies, and standard practices surrounding the instruments and their actual teaching/learning before a successful instrumental experience can be achieved. Western orchestral instruments due to their intrinsic sophistication, dynamism, and versatility pose some difficulty in their teaching and learning. The clarinet (a woodwind), for example, has been found to possess up to three registers (chameau, clarion, and altissimo), each with different timbres. The trumpet (a brass) and the saxophone (woodwind), for example, are so dynamic that it is usually evasive to delimit their respective ranges appropriately. Defining the top end of these instruments is usually difficult because many advanced players can produce notes well above the highest notes commonly found in method books. To produce different notes on the horn, for example, one must do many things- the seven most important are pressing

the valves, holding the appropriate amount of lip tension, raising the soft palate, positioning the tongue, lowering the larynx, blowing air into the instrument, and placing the hand in the bell. More lip tension and faster air produces higher notes. Less lip tension and slower air produces lower notes. The right hand, usually cupped at a "three o-clock" position in the bell, can lower the pitch; depending on how far into the bell the player puts it, by as much as a semitone in the instrument's midrange. These are some of the issues that make the teaching and learning of Western orchestral instruments a unique and challenging endeavour.

RESEARCH METHODOLOGY

This section discusses the procedures and methods employed in carrying out the research. The discussions were done under the following sub headings: research design, population of the study, sample and sampling technique, instruments for data collection, validation of instrument, reliability of instrument, method of data collection and method of data analysis.

Research Design

The study was a survey. Survey research design is one in which a group of people or items is studied by collecting and analyzing data from people or items considered to be representative of the entire population (Nworgu, 1991). Surveys employ a variety of data gathering instruments or techniques such as the questionnaire, interviews, observation, tests, etc. The Survey design was adopted because of its suitability for the research- The teaching and learning of Western orchestral musical instruments in Nnamdi Azikiwe University, Awka.

Area of Study

This study was carried out in the Music Department of Nnamdi Azikiwe University, Awka situated in Anambra State of Nigeria. Anambra State is one of the thirty-six (36) states of the federation situated in the South-East Geo-Political Zone and shares boundries with Enugu, Ebonyi, Kogi, Delta, Rivers, Imo and Abia states.

Population of the Study

The population involved all members of the academic staff and undergraduate students of the department of music, Nnamdi Azikiwe University, Awka. This includes all students involved in learning Western orchestral instruments (that is, diploma, undergraduate). Currently the music department has twelve (12) members of the academic staff and about 126 undergraduate students (diploma and regular students). The tables below show the population distribution of the academic staff and students of the Department:

Sample and Sampling Technique

The sample of the study includes twelve (12) lecturers and all undergraduate students (spreading from year 1 diploma students to final year students). This was done due to the small number of the total population of lecturers and students in the Department of music. Students in Masters and Ph.D levels were not included as part of the sample because learning Western orchestral instruments is not a fundamental feature of their curriculum of music studies. Based on the number of lecturers and students (138), the entire population was studied. The number of the population also formed the sampled size. Therefore, there was no need for sampling.

Instruments for Data Collection

The instrument for data collection was the questionnaire based on modified (4) points likert scale of Strongly Agree (SA), Agree (A), Disagree (D) and Strongly Disagree (SD) popularly called four (4) points modified likert scale. It was used to elicit information from the respondents. These points were reflected in the questionnaire which was shared to the respondents. The questionnaire was adopted because of its appropriateness for the research. There were two sets of the questionnaires: one for the lecturers and the other for students in order to capture the views of both categories of the research population.

The questionnaire for the lecturers has seven (7) sections titled: A, B, C, D, E, F, G and some open-ended questions. Section 'A' is on the personal data of the respondents and their teaching experiences and it contains about ten (10) items. Section 'B' is on the nature of Western orchestral instruments and it contains ten (10) items. Section 'C' is on the criteria for assigning Western orchestral instruments to students and it contains fifteen (15) items. Section 'D' is on the challenges of teaching and learning Western orchestral instruments and it has thirteen (13) items. Section 'E' is on the relevance of some teaching and learning methods in the teaching and learning of Western orchestral instruments and has twelve (12) items. Section 'F' captures the modes of evaluating performance in Western orchestral instruments in Nnamdi Azikiwe University, Awka and it contains eleven (11) items. Section 'G' is on the prospects of teaching and learning Western orchestral instruments in the University.

The questionnaire for the music students has the same structure as that of the lecturers and also reflects similar ideas as found in that of the lecturers but differs by the nature of questions posed. The questions were carefully designed to capture the opinions of students who are the

focus of the entire teaching and learning experience. Section 'A' is on the personal data of the respondents and their learning experiences and it contains about twelve (12) items. Section 'B' is on the nature of Western orchestral instruments and it contains ten (10) items. Section 'C' is on the criteria for choosing Western orchestral instruments by students and it contains fifteen (15) items. Section 'D' is on the challenges of learning Western orchestral instruments in Nnamdi Azikiwe University, Awka and it has eleven (11) items. Section 'E' is on the relevance of some teaching and learning methods in the teaching and learning of Western orchestral instruments and has twelve (12) items. Section 'F' captures the prospects of learning Western orchestral instruments in Nnamdi Azikiwe University, Awka and it contains ten (10) items. The research also employed oral interviews in sourcing the opinions of several respondents regarding the subject matter.

Validation of Instrument

The questionnaire was designed to reflect the research questions. It was given to the project supervisor and two other research experts along with copies of the title of study, purpose of study, scope of study, and research questions for critical examination in order to ensure that they contained all necessary information as well as to ensure that no irrelevant information were included. The corrections and comments from the validators were reflected in the final draft of the instrument.

Reliability of Instrument

The reliability of the instrument was determined through a method known as test re-test. It was achieved by administering twenty copies of the instrument on a group of people outside the target population. After an interval of two weeks, the same instrument was administered a second time on the same group of people and responses of the first and the second exercise were analyzed through the application of Spearman rank order correlation coefficient. The analysis returned coefficients of 0.8, 0.78, 0.90, 0.77, 0.76 and 0.91 for the six research questions thus, showing an average coefficient of 0.82. This implies that the instrument is 82% reliable.

Method of Data Collection

The researcher adopted direct questionnaire administration method for obvious reasons. One, it afforded the researcher the opportunity of direct contact with the respondents so that clarifications or explanations may be made where necessary. Two, it minimized the magnitude of non-response which is often associated with surveys of this nature. Three, it enabled the researcher to know immediately whether the study was succeeding or failing. It involved issuing out the questionnaire to the respondents directly and waiting for its collection after it might have been completed. The researcher was assisted in this regard by his research assistants. Out of the 138 questionnaire distributed 106 were completed and returned thus showing a response rate of 84% which was considered adequate for the study.

Method of Data Analysis

The data generated in this study were analyzed using the following statistical tools: mean rating and standard deviation, t-test for small sample, t-test for independent large sample that is, (n >/ 30). All tests were carried out at 0.05 level of significance. This being the probability level at which we are willing to risk type 1 error. The points of the scale were as follows:

Strongly Disagree (SD) = 1 point

Disagree (D) = 2 points

Agree (A) = 3 points

Strongly Agree (SA) = 4 points

DATA ANALYSIS

In this chapter, all data collected for this study were presented and analyzed using appropriate statistical tools of analysis. The analysis was done in two sections namely, answer to research questions and test of hypotheses. All tests were done at 0.05 level of significance which is the probability at which we were willing to risk type I error.

Demographic Features of the Respondents

The lecturers and students of the music Department, Nnamdi Azikiwe University, Awka were interviewed in this study for their opinions on problems and prospects of teaching and learning of western Orchestral musical instruments in the department. The personal data of these respondents were presented on Tables 1 and 2 as shown below:

Table 6: Demographic Characteristics of the Lecturers

Sex	Rank	Length of service (in years)				Sum	Total	%
		0-5	6-10	11-15	16+			
Male	Graduate Assistant Assistant lecturer Lecturer II Lecturer I Senior lecturer Associate professor Professor	1	1	1	1	1 2 1	(4)	50.0
Female	Graduate Assistant Assistant lecturer Lecturer II Lecturer I Senior lecturer Associate professor Professor	1 1		1	1	1 1 2	(4)	50.0
	Total	3	1	2	2		8	100

Source: field Survey, 2014.

The analysis on Table 3 above shows that four male and female lecturers each were contacted during the field work. Out of the eight lecturers contacted, three of them are professors, two senior lecturers, one lecturer I and two lecturers II. The Table also shows that three out of the lecturers interviewed have lectured in the department between 0 and 5 years, one between 6 and 10 years, two between 11 and 15 years and 2 for 16 years and above. Thus, showing that about 62.5% have lectured in the department for at least 6 years and above.

Regarding the number of students under lecturers' instrumental supervision, some level of lopsidedness was observed. Whereas some lecturers said they have one or five students under their supervision, some said they are supervising as much as fifteen and twenty-one students. The orchestral musical instruments available for use in the department include clarinet, tenor sax, violin, viola, 'cello, trumpet, Euphonium and French Horn. It was also found that most of the lecturers meet with the students under their supervision once every week for the instrumental supervision. Also, some personal data of the students were collected and analyzed; the results are presented on Table 2 below:

Table 7: Personal Data of the Students

Sex	Early Music Experience (Nur/Pri/Sec)	Level of study					Total	(%)
		Diploma	100	200	300	400		
Male	Yes	2	2	7	3	5	19	20.2
	No	10	7	11	5	5	38	40.4
Female	Yes	-	2	2	3	4	11	11.7
	No	4	5	8	7	2	26	27.7
	Total	16	16	28	18	16	94	100

Source: Field Survey, 2014

The analysis on Table 4 above shows that 19 (20.2%) of the students interviewed who are male across all levels of study at the undergraduate level, have had early music experience before being admitted into the university to study music. On the other hand, 38 (40.4%) of them have not had any pre-knowledge of music before being admitted into the university. as for the female students, 11 (11.7%) have had pre-knowledge of music as a subject while 26 (27.7%) have not had any. Thus, showing that overall, 31.9% of the entire music students at the undergraduate levels are those that have had pre-knowledge of music as a course of study before being admitted into the university to study music.

In a related development, about 70% of the students said they chose music as their course of study in the university because of their passion and drive for the subject.

Weights and Class Limits of the Likert Scale

Statistically speaking, the class boundaries of each class represent the actual limits of the class both the lower and the upper limits. It is also usual in statistics to use the class boundaries in computing statistical averages rather than the absolute values. For example, the weight attached to 'strongly agree' as a response option as shown in Table 5 below is four (40 points but statistically, it is the tradition to treat the 4 points as starting from 3.5 to 4.5 as the actual lower and upper class boundaries respectively (Spiegel and Stephens, 2006).

Table 8: Weights and Class Limits of the Likert Scale

Response Option	Weight	Class Limit
Strongly Agree	4	3.5-4.5
Agree	3	2.5-3.5
Disagree	2	1.5-2.5
Strongly Disagree	1	0.5-1.5

Average: 2.5

From the modified Likert Scale presented on Table 5, any item that did not measure up to 2.5 is rejected while those that measure up to 2.5 and above are accepted.

Research Questions

In this section, efforts were made to answer the research questions raised to guide the study. The statistical tools used in this regard were the mean rating and standard deviation as well as simple summary statistics of percentages. Data resulting from Research Question One (RQ1) did not require any statistical analysis and thus was presented the way it came from the source.

Research Question One (RQ1)

What are the Western orchestral musical instruments that exist in the Department of Music, Nnamdi Azikiwe University Awka?

This research question sought to find out the types, number and adequacy of the Western orchestral musical instruments that exist in the Department so we can determine if they are

relevant factors in the teaching and learning of Western orchestral musical instruments in the department. The data is presented on Table 5 below:

Table 9: Western Orchestral Musical Instruments existing in the Department of Music Nnamdi Azikiwe, University, Awka.

Class of Instrument	Number of Adequate Ones	Total
Strings	1 Violoncello, 1 viola	2
Woodwinds	2 Alto Sax, 1Tenor sax	3
Brass	2 Trumpets, 1Trombone,1French Horn, 1 Euphonium	5
Percussion	Nil	0

Source: Inventory of Musical Instruments (Department of Music, Nnamdi Azikiwe University, Awka). 2014.

From the table above, it is remarkable that very few Western orchestral musical instruments exist in the Department. There are no violins and string basses in the string family. Flutes, oboes, piccolos, clarinets and soprano saxophones are missing in the woodwinds. The brass family is lacking in cornets, tuba and bassoon, among others. There is no existence of any Western orchestral percussion instrument such as cymbals, kettledrums, triangle, bass drum, snare drums etc.

Research Question Two (RQ2)

Is there a relationship between the nature of Western orchestral musical instruments and the challenges in teaching and learning them?

This research question sought to determine whether there is any significant difference in the opinion of the respondents (lecturers and students) on the nature of Western orchestral musical instruments in order to make both teachers and learners more knowledgeable on the peculiarity of the instruments. The responses are presented in Table 6.

Table 10: Mean Rating and Standard Deviation of the Respondents on the Nature of Western Orchestral Musical Instrument.

S/N	Items	Students $\bar{X}_1$			Lecturers $\bar{X}_2$		
			SD_1	Decision		SD_2	Decision
1	Western orchestral musical instruments are highly sophisticated musical instruments	3.10	1.56	Agreed	3.00	1.42	Agreed
2	As a result of their sophistication, some orchestral instruments pose serious difficulty in learning	3.50	1.48	Strongly agreed	3.21	1.39	Agreed
3	Some orchestral instruments are more suitable for female students than for male students	3.70	1.68	Strongly agree	3.50	1.59	Strongly agreed
4	Some orchestral instruments are more suitable for male students than for female students	3.41	1.62	Agreed	3.61	1.52	Strongly agreed
5	It is proper for students to study the acoustics of any orchestral instrument as a prerequisite to learning it	3.56	1.49	Strongly agreed	3.52	1.38	Strongly agreed
6	The scientific precision in the acoustics and design of Western orchestral instruments demand that the student must begin with a genuine copy.	3.92	1.84	Strongly agreed	3.41	1.62	Agreed
7	Genuine Western orchestral instruments are hardly affordable	3.08	1.42	Agreed	3.04	1.24	Agreed
8	The dynamic ranges of some Western orchestral instrument are inexhaustible and this factor poses a challenge in mastering the instruments.	3.04	1.24	Agreed	3.00	1.42	Agreed
9	Western orchestral instruments come in various pitch categories (soprano, alto, tenor, baritone, and bass) and this feature makes the instruments suitable to learners of different pitch preferences.	2.91	1.19	Agreed	2.51	1.17	Agreed
10	Most Western orchestral instruments are transposing and this sometimes poses some problems in interpreting pieces in various keys.	3.88	1.77	Strongly agreed	3.42	1.52	Agreed

$X_1 = 3.41$; $SD_1 = 1.53$; $n_1 = 94$: = 3.22; SD_2 1.43; $n_2 = 8$

The mean ratings of the respondents showed that students strongly agreed with 5 items namely, 2, 3, 5, 6 and 10 and merely agreed with other items, while the lecturers strongly agreed with

3 items namely, 3, 4 and 5 and merely agreed with others. It is remarkable that no item was disagreed with on the average.

Research Question Three (RQ3)

What are the criteria for assigning Western orchestral musical instruments to students? This research question is about the suitability of the criteria for assigning Western orchestral musical instruments to students. Respondents opinion presented in form of mean ratings and standard deviation are shown on Table 7.

Table 11: Mean Ratings of the Respondents Concerning the Suitability of Criteria for Assigning Western Orchestral Musical Instruments to Students

S/N	Item	Lecturers		
		Mean	SD	Decision
1	The most important point to consider in assigning an instrument is the students desire	3.67	1.62	Strongly agreed
2	It is proper to administer physical check, drill or adaptability test on the students before approving orchestral instruments for them	3.96	1.84	Strongly agreed
3	Orchestral instruments should be approved for students using random sampling to ensure no instrument is left out	2.04	1.21	Disagreed
4	Students with thick fingers should avoid playing the violin	2.00	1.22	Disagreed
5	Students with an underbite (lower teeth in front of upper) or crooked teeth should not choose any of the brasses.	3.04	1.24	Agreed
6	Small students should not try large instruments	3.49	1.45	Agreed
7	Students whose pitch sense is below average should especially avoid strings, piccolo, French horn, and trombone	1.79	1.55	Disagreed
8	Lecturers should guide students in instrument selection but should not require that a student take a particular instrument or none at all.	3.08	1.56	Agreed
9	A student can become proficient on an instrument while appearing to defy all the physical criteria	2.95	1.62	Agreed
10	The number of students encouraged to begin on each instrument should be in proportion to instrumentation needs of the Music Department	3.39	1.47	Agreed
11	There is usually a high incidence of dropping out among students who begin on an instrument other their first choice	3.11	1.48	Agreed
12	Sometimes a student who shows little promise or motivation turns out to be a fine instrumentalist a few years later	3.38	1.81	Agreed
13	Students with shallow breaths should avoid the woodwinds and brasses	3.47	1.52	Agreed
14	Students with short arms should not choose from the cello and string bass.	3.21	1.19	Agreed
15	Students should first attempt every other Western orchestral instrument before choosing one	2.15	1.48	Disagreed
	Average	2.98	1.48	Agreed

The mean ratings of lecturers presented on Table 7 shows that they strongly agreed with the statements of items 1 and 2 and merely agreed with items 5, 6, 8,9,10,11,12,13 and 14. However, they disagreed with the statement of items 3, 4, 7, and 15. On the average, the

respondents agreed with all the items with an average mean score of 2.98 and 1.48 standard deviation. The statements strongly agreed with include the following: the need to consider the students desire before assigning an instrument to him or her and the need to administer physical check, drill or adaptability test on the students before assigning or approving orchestral instruments for them. On the whole, the responses indicate that the criteria are quite suitable and are focused on producing competent students in Western orchestral musical instruments.

Research Question Four (RQ4)

What are the methods adopted in teaching Western orchestral musical instruments in the Department? This research question is concerned with the relevance of the methods adopted in teaching Western orchestral musical instruments in the department. The responses obtained are presented in Table 8.

Table 12: Mean Ratings of the Respondents on Relevance of Teaching Methods Adopted

S/N	Items	Students $\bar{X}_1$			Lecturers $\bar{X}_2$		
			SD_1	Decision		SD_2	Decision
1	Poor teaching and learning methods hamper effective teaching and learning of Western orchestral instruments	3.75	1.71	Strongly agreed	3.20	1.62	Agreed
2	The first approach to effective teaching and learning of Western orchestral instruments is to provide the 'right environment'(instrument rooms and practice chambers with proper acoustics)	3.91	1.81	Strongly agreed	3.31	1.73	Agreed
3	Carl Orff's emphasis on pre-band instruments (recorder, harmonica, marimba) to weed out the less talented and less interested students should be applied in the Music Department of Nnamdi Azikwe University, Awka	3.69	1.68	Strongly agree	2.25	1.23	Disagreed
4	Teaching musical Instruments should involve rhythmic activity, rudiments of music, record listening, aural training, sight reading, and sight playing	3.02	1.48	Agreed	3.97	1.91	Strongly agreed
5	Rote learning (learning or memorizing abstract concepts in whole without immediate attention to meaning) has little or no relevance in learning orchestral instruments	3.51	1.47	Strongly agreed	3.48	1.56	Agreed

6	It is possible to master an orchestral instrument informally without any formal teacher-student setting	3.10	1.62	Agreed	3.46	1.49	Agreed
7	The Suzuki approach of commencing string teaching from infancy (3years) may not be applicable in teaching Nigerian undergraduate music students	3.40	1.56	Agreed	3.11	1.38	Agreed
8	Instrumental music teaching can be considered successful only if it produces students who can play their instruments expressively, read music readily, play by ear, and who have musical understanding	2.97	1.50	Agreed	2.40	1.21	Disagreed
9	Lecturers should not give students so much attention on their orchestral instruments but should teach the basics of the instruments and allow them to take control of their learning experiences (Active learning)	2.31	1.40	Disagreed	2.46	1.42	Disagreed
10	Students should be left on their own with their orchestral instruments so they can make personal discoveries on their instruments (discovery learning)	2.28	1.21	Disagreed	2.40	1.14	Disagreed
11		2.47	1.42	Disagreed	1.96	1.08	Disagreed

$\overline{X}_1 = 3.13$; $Sd_1 = 1.53$; $n_1 = 94$. $X_2 = 2.91$; Sd_2 1.91; $n_2 = 8$

Mean ratings of the respondents (students and lecturers) showed that students strongly agreed with items1, 2, 3 and 5 and merely agree with items 4, 6, 7 and 8 while disagreeing with items 9, 10 and 11. On the other hand, the lecturers strongly agreed with item 4 only, merely agreed with items 1, 2, 5, 6 and 7. They disagreed with items 3, 8, 9, 10 and 11. The result showed further that on the average, both students and the lecturers agreed with all the items with mean ratings of 3.13 and 2.91 respectively. Issues raised in research question include: the negative effect of poor teaching methods on learning Western orchestral instruments, the need to provide the 'right environment' for the teaching and learning of the instruments, the need to involve rhythmic activity, rudiments of music, record listening, aural training, sight reading and sight playing exercises among others.

It is worth mentioning that the opinion of the students did not differ significantly on what should be the proper teaching methods as the mean ratings and standard deviation has revealed.

It was agreed by both the students and the lecturers that the need for right environment for the teaching and learning of the instruments should not be neglected.

Research Question Five (RQ5)

What are the modes of evaluating the performance of the students in the learning of Western Orchestral musical instruments in the Department? Research question four is on the effectiveness of modes of evaluating the performance of the students on Western orchestral musical instruments in the department. Respondents' opinions are presented on Table 9.

Table 13: Mean Rating and standard deviation of Respondents on Effectiveness of Modes of Performance Evaluation in the use of Western Orchestral Instruments.

S/N	Item	Lecturers		
		$\bar{X}$	SD	Decision
1	It is proper to assess or evaluate students' performance on their orchestral instruments periodically	3.92	1.81	Strongly agreed
2	There appears to be no standard mode of evaluation for students' performance on their orchestral instruments in Nnamdi Azikiwe University, Awka	2.21	1.41	Disagreed
3	Generally students should be assessed on their orchestral instruments based on these fundamental criteria: fingering, articulation, phrasing, accuracy, attack, and sightreading	3.67	1.62	Strongly agreed
4	The aformentioned modes of evaluation are not always reliable in assessing students' competence	1.95	1.23	Disagreed
5	Lecturers can assess their students' performance using other modes of evaluation of their choice	3.08	1.56	Agreed
6	Even when there are acceptable modes of evaluation among adjudicators in a panel of evaluation or examination, the respective assessments of the adjudicators become too subjective to yield a reliable result	2.59	1.25	Agreed
7	The lack of a standard mode of evaluation and the unreliability of the respective adjudicators assessments pose serious difficulties in grading students' performance on Western orchestral instruments in Nnamdi Azikiwe University, Awka	3.10	1.48	Agreed
8	Enthusiastic students can still improve on their orchestral instruments irrespective of evaluation	3.75	1.68	Strongly agreed
9	Monitoring supervisor-student contacts and ensuring inter-adjudicator objectivity during final evaluation should be taken seriously	3.50	1.48	Strongly agreed
10	The impressions gathered by lecturers of individual student's progress during periodic scheduled contacts does not properly reflect the semester's continuos course assessment (CA) score for the student's performance on his orchestral instrument	1.47	1.09	Disagreed

11	Each lecturer should provide the continuous assessment (CA) score for each student assigned to him for final computation of evaluation grades based on the student's performance while in contact with him as scheduled and not by the panel of adjudicators	3.79	1.71	Strongly agreed
	Average	3.00	1.48	Agreed

Mean rating of the respondents shown on Table 7 indicate that they strongly agreed with five items, namely: items 1, 3, 8, 9 and 11; merely agreed with items 5, 6 and 7. They disagreed with items 2, 4 and 10. On the average, the respondents agreed with all the statements with a mean rating of 3.00 and 1.48 standard deviation. Highlights of the items under consideration include the need to evaluate students' performance on the orchestral instruments periodically, the perception of absence of standard mode of evaluation for students' performance and the impression that the modes of evaluation are not always reliable in assessing students' competence among other issues.

Research Question Six (RQ6)

What are the prospects in the teaching and learning of Western orchestral instruments in the Department? Research question five seeks to know whether there are prospects of teaching and learning Western orchestral musical instruments in the department. The respondents' opinions are presented on Table 11.

Table 14: Mean Ratings of the Respondents on the Prospects in Teaching and Learning Western Orchestral Instruments.

S/N	Items	Students			Lecturers		
		$\bar{X}_1$	SD_1	Decision	$\bar{X}_2$	SD_2	Decision
1	Every student can adapt to learning a Western orchestral instrument	3.13	1.43	Agreed	3.52	1.43	Strongly agreed

2	Sometimes a student who shows little promise or motivation turns out to be a fine instrumentalist a few years later	3.67	1.62	Strongly agreed	3.25	1.39	Agreed
3	Students still forge ahead in learning and mastering their Western orchestral instruments despite the challenges	3.96	1.84	Strongly agreed	3.11	1.28	Agreed
4	Although there are no instructors for some Western orchestral instruments in the Music Department, but there is improvement in the handling of some of the available ones	3.96	1.84	Strongly agreed	3.27	1.41	Agreed
5	Students should be encouraged to take up voice, piano, or any Western orchestral instrument for their stress area to foster mastery	3.88	1.75	Strongly agreed	3.47	1.49	Agreed
6	Students will improve quite well in their orchestral instruments if they are provided with adequate practice rooms with sound proof cubicles and recordings for playback of their given pieces	3.79	1.68	Strongly agreed	3.92	1.61	Strongly agreed
7	Students will not improve on their orchestral instruments if there is no motivation and scheduled contact with their respective tutors	3.87	1.77	Strongly agreed	3.84	1.58	Strongly agreed
8	Some students can do well on their orchestral instruments if they change their negative attitude toward learning	3.50	1.48	Strongly agreed	3.67	1.67	Strongly agreed
9	The University can aid the teaching and learning of Western orchestral instruments if provision is made for the unavailable Western orchestral instruments and employ lecturers specializing in those instruments	3.75	1.68	Strongly agreed	3.71	1.59	Strongly agreed
10	The Music Department can facilitate students' improvement on orchestral instruments by engaging them in concerts and performances within and outside the University	3.67	1.42	Strongly agreed	3.89	1.48	Strongly agreed

The mean ratings of the respondents show that respondents (students and lecturers) strongly agreed with most of the items. The students agreed with nine items, namely: items 2, 3, 5, 6, 7, 8, 9 and 10 and merely agreed with item 1 only. Also, the lecturers strongly agreed with six items namely, items 1, 6, 7, 8, 9 and 10 and merely agreed with items 2, 3, 4 and 5. Overall, the respondents strongly agreed with all the items with an average of 3.72 and 1.65 standard deviation for the students and 3.57 with standard deviation of 1.49 for the lecturers. This is an

indication that there are prospects for the teaching and learning of Western orchestral musical instruments in the department.

Research Question Seven (RQ7)

What are the problems militating against the effective teaching and learning of Western orchestral instruments in the Department? This research question seeks to determine whether there is any significant difference in the opinion of the respondents concerning the problems that militate against the teaching and learning of Western orchestral musical instruments in the department. The mean rating of the respondents are presented in Table 10.

Table 15: Mean Ratings of the Respondents on Problems Militating against the Teaching and Learning of Western Orchestral Musical Instruments in the Department.

S/N	Items	Students			Lecturers		
		$\bar{X}_1$	SD_1	Decision	$\bar{X}_2$	SD_2	Decision
1	Instrumental teachers face conditions different from those encountered by choral music teachers	3.50	1.41	Strongly agreed	3.42	1.56	Agreed
2	Instrumental music involves a conglomeration of fingerings, embouchures, bowings, and other specialized techniques and knowledge	3.71	1.59	Strongly agreed	3.68	1.49	Strongly agreed
3	The string teacher must be familiar with these bowing techniques for efficacy: *pizzicato, spiccato, vibrato, detache', staccato,tremolo, portato, col legno, sul ponticello,*double stop etc.	3.74	1.69	Strongly agreed	3.70	1.50	Strongly agreed
4	The brass teacher should be familiar with these techniques before he can effectively motivate his students: embouchure, tonguing, breath control, double tonguing, triple tonguing, flutter tonguing, transposition, range, split tone, pedal tone, microtones, and overtones	3.09	1.43	Agreed	3.74	1.58	Strongly agreed
5	Teaching woodwinds demands similar knowledge in the brasses but for reed types and their relative sizes,	3.48	1.54	Agreed	3.63	1.40	Strongly agreed
6	In teaching the percussions, one should be knowledgeable in all orchestral percussion instruments such as, timpani/kettledrums, glockenspiel, xylophone, celesta, chimes, cymbals, mallets, bass drum, snare drum etc.	3.44	1.15	Agreed	3.40	1.50	Agreed
7	Each orchestral instrument should be taught by a lecturer who specializes in that.	3.91	1.26	Strongly agreed	3.00	1.31	Agreed
8	When there is no teacher for a given orchestral instrument, the instrument should be handled by any other teacher	3.21	1.45	Agreed	3.01	1.37	Agreed
9	Any lecturer can teach any orchestral instrument provided it is of the family of his specialized	2.71	1.17	Agreed	2.58	1.49	Agreed

	instrument. That is, the trumpet teacher can teach trombone or tuba, and the violin teacher can also teach viola, cello, or string bass.						
10	Teaching Western orchestral instruments in the University is usually very difficult because most students had no instrumental learning in their primary and secondary schools	3.19	1.29	Agreed	3.11	1.30	Agreed
11	Instrumental instruction should be conceived as a continuous process from nursery school and kindergarten on to the completion of tertiary education	3.10	1.38	Agreed	3.51	1.31	Strongly agreed
12	Audition tests should be run for students applying for music in Nnamdi Azikiwe University, Awka to weed out untalented students	3.79	1.58	Strongly agreed	3.66	1.33	Strongly agreed
13	Some of the lecturers are not competent on their Western orchestral instruments	3.61	1.45	Strongly agreed	2.96	1.42	Agreed

$\overline{X}_1 = 3.42$; $\overline{X}_2 = 3.34$
$Sd_1 = 1.42$; $sd_2 = 1.43$
$n_1 = 94$; $n_2 = 8$

Table 10 shows that students strongly agreed with six items, namely: items 1, 2, 3, 7, 12 and 13 and merely agreed with items 4, 5, 6, 8, 9, 10 and 11. Also, the lecturers strongly agreed with items with items 2, 3, 4, 5, 11 and 12 and merely agreed with items 1, 6, 7, 8, 9, 10 and 13. It is however worthy of note that no item was disagreed with. Issues raised in the items include the following: the difference in conditions and challenges faced by choral music teachers and instrumental music teachers, and the components of instrumental music which involve highly specialized techniques among others.

Overall, the average mean rating for the students is 3.42 with a standard deviation of 1.42 while that of the lecturers is 3.34 and a standard deviation of 1.43. Thus showing no variation between the opinions of the two categories of the respondents.

Research Question Eight (RQ8)

What are the possible solutions to the problems? The responses to this research question are presented in Chapter six under recommendations.

Test of Hypotheses

All null hypotheses formulated to guide this study were tested in this section. The statistical tools used for the tests were the t-test for large independent sample that is ($n \geq 30$) and the t-test for small sample of ($n < 30$) (see explanations in the appendix). All tests were done at 0.05 level of significance, the probability at which we are willing to risk type I error.

Hypothesis One: The Western orchestral musical instruments existing in the Department appear to be relatively few.

There was no need for any statistical testing of this hypothesis because of the nature of data gathered on it. The inventory of Musical instruments from the Department of Music, Nnamdi Azikiwe University Awka (2013) showed that there exist few Western orchestral musical instruments in the Department (1 'Cello, 1 viola, 2 Alto Sax, 1 Tenor Sax, 2 Trumpets, 1 Trombone, 1 French Horn, and 1 Euphonium).

Hypothesis Two

Hypothesis two sought to establish whether there is any significant difference in the opinion of the respondents concerning the nature of Western orchestral musical instruments and the challenges in teaching and learning them. Accordingly, the null and alternative hypotheses were set as follows:

H_0: There is no significant difference in the opinion of the respondents regarding the nature of the Western orchestral musical instruments that exist in the department.

H_1: There is a significant difference in the opinion of the respondents regarding the nature of the Western orchestral musical instruments that exist in the department.

To test the hypothesis, the result of the respondents' mean ratings and standard deviation presented on Table 4 were used. The statistical tool for the test was t-test for difference of means. The level of significance and degrees of freedom (df) were respectively 0.05 and 100.

Table 16: Summary of T-test Result for Hypothesis II

Source of variation	N	$\bar{X}$	SD	DF	Standard error	Cal. t	Crit. T	P < 0.05
Students	94	3.41	1.53	100	0.281	0.359	1.960	

Lecturers	8	3.22	1.43					Not significant

N=102; P<0.05

Decision Rule: Summary of the t-test result shown above indicates that at 0.05 level of significance and 100 degrees of freedom (df), the calculated t-value (0.359) is less than the critical t-value (1.960). Consequently, the null hypothesis which suggests that there is no significant difference in the opinion of the respondents was accepted while the alternative was rejected. The result would have been doubtful if it had been otherwise given the results of the research question.

Hypothesis Three

This hypothesis sought to determine the suitability or otherwise of the criteria used in assigning or approving Western orchestral musical instruments for students. Accordingly, the null and alternative hypotheses were outlined as stated below:

H_0: The criteria used in assigning or approving Western orchestral musical instruments to students appears not to be suitable

H_1: The criteria used in assigning or approving western orchestral musical instruments to the students appear to be quite suitable.

To test the hypothesis, the result of the mean ratings and standard deviation presented on Table 5 were used. The statistical tool applied was the t-test for independent small sample that is, (n< 30). The level of significance chosen for the test was 0.05 and the degrees of freedom (df) was 7.

Table 17: Summary of t-test Result for Hypothesis III

Variable	N	$\bar{X}$	SD	S(e)	t.cal	t-tab	Population mean (m)	Sig. level (α)	Decision rule
Respondents	8	2.98	1.480	0.223	2.150	1.895	2.50	0.05	Significant

N= 8; Df=7; P< 0.05

Decision Rule: From the results presented on Table 13, it is easy to see that 0.05 level of significance and 7 degrees of freedom (df), the calculated t-value (2.150) is greater than the critical t-value (1.895). Therefore, the null hypothesis was rejected while the alternative which suggests that the criteria being used in assigning or approving Western orchestral musical instruments to the students appear to be quite adequate was accepted.

Hypothesis Four

Hypothesis four was formulated to assess whether there is any significant difference in the opinions expressed by the respondents on the relevance of methods adopted in teaching the use of Western orchestral instruments in the department. Accordingly, the null and alternative hypotheses were stated as follows:

H0: There is no significant difference in the opinion of the respondents regarding the relevance of method adopted in teaching Western orchestral musical instruments.

H_1: There is a significant difference in the opinion of the respondents regarding the relevance of methods adopted in teaching Western orchestral instruments.

To test the hypothesis, the results of mean ratings and standard deviation presented on Table 6 were used. The statistical tool was the t-test for large independent sample that is, ($n \geq 30$)the degree of freedom (df) was 100 at 0.05 level of significance.

Table 18: Summary of t-test Result for Hypothesis IV

Source of variation	N	$\bar{X}$	SD	DF	S (e)	Cal. t	Crit. t	P < 0.05
Students	94	3.13	1.53	100	0.530	0.415	1.960	Not significant
Lecturers	8	2.91	1.43					

N= 102; P< 0.05

Decision Rule: As could be seen from Table 12, the calculated t-value (0.530) is less than the critical t-value (1.960). Therefore, we do not reject the null because there was no weight of evidence against it. We conclude that there is no significant difference between the opinions expressed by students and the lecturers regarding the relevance of the methods adopted in teaching Western orchestral musical instruments in the department. The result would have been doubtful if it had been otherwise given the result of the research questions.

Hypothesis Five

This hypothesis sought to determine the effectiveness of modes of evaluating students' performance on Western orchestral musical instruments in the department. Accordingly, the null and alternative hypotheses were stated as follows:

H_0: The modes adopted in evaluating performance of the students in Western orchestral musical instruments appear not to be effective.

$H_{1:}$ The modes adopted in evaluating students' performance in Western orchestral musical instruments appear to be effective.

To test the hypothesis, the data on Table 9 were used. The statistical tool used was the t-test for small sample that is, (n< 30). The degrees of freedom and significance level were respectively 7 and 0.05.

Table 19: Summary of t-test Result for Hypothesis V

Variable	N	$\bar{X}$	SD	S(e)	DF	t-cal	t.crit	Pop. Mean (M)	Sig. level (α)	Decision rule

Respondents	8	3.00	1.48	0.523	7	0.956	1.895	2.50	0.05	Not. Sig.

Decision Rule: The result of the t-test presented on Table 15 shows that the calculated t-value 0.956 is less than the critical t-value (1.895). Consequently, the null hypothesis which suggests that the modes of evaluating performance of the students in Western orchestral musical instruments appear to be ineffective was accepted.

Hypothesis Six

Hypothesis six was formulated to determine the prospects in teaching and learning Western orchestral musical instruments in the department. Accordingly, the null and alternative hypotheses were stated as follows:

H_0: There is no significant difference in the opinion of the respondents regarding the prospects of teaching and learning of Western orchestral musical instruments in the department.

H_1: There is a significant difference in the opinions of the respondents regarding the prospects of teaching and learning of Western orchestral musical instruments in the department.

To test the hypothesis, t-test for independent large sample was applied on the results' mean rating and standard deviation of the respondents presented on Table 9. The significance level and the degree of freedom (df) at which the test was carried out were respectively, 0.05 and 100.

Table 20: Summary of t-test Result for Hypothesis VI

Source of variation	N	$\bar{X}$	SD	DF	S (e)	Cal. t	Crit. T	P < 0.05
Students	94	3.72	1.65	100	0.554	0.271	1.960	Not significant
Lecturers	8	3.57	1.49					

N=102; P< 0.05

Decision Rule: The result of hypothesis six as presented on Table 20 shows that the value of calculated 't' is less than the value of critical 't'. Consequently, the null hypothesis was accepted and we conclude that there is no significant difference in the opinion of the respondents regarding the prospects of teaching and learning Western orchestral musical instruments in the department. The result would have been doubtful if it had been otherwise given the answers obtained from the research questions section.

Hypothesis Seven

This hypothesis seeks to determine whether there is significant difference in the opinion of the students regarding the perceived problems that militate against the effective teaching and learning of Western orchestral musical instruments in the department. Accordingly, the null and alternative hypotheses were stated as outlined below:

H_0: There is no significant difference in the opinion of the respondents on the perceived problems that militate against the teaching and learning of Western orchestral musical instruments.

H_1: There is a significant difference in the opinion of the respondents on the perceived problems that militate against the teaching and learning of Western orchestral musical.

To test the hypothesis, the data on Table 21 was used. The statistical tool used was the t-test for difference in two means. The degrees of freedom and significance level were respectively 100 and 0.05.

Table 21: Summary of t-test Result for Hypothesis VII

Source of variation	N	$\bar{X}$	SD	DF	S (e)	Cal. t	Crit. T	P < 0.05
Students	94	3.42	1.42	100	0.523	0.152	1.960	Not significant
Lecturers	8	3.34	1.43					

N= 102; P< 0.05

Decision Rule: The result of hypothesis seven shows that there is no significant difference in the opinion of the respondents regarding perceived problems that militate against effective teaching and learning of Western orchestral instruments in the department. Therefore, the alternative hypothesis which suggests significant difference in their opinions was rejected.

Summary of the Data Analysis

It is significant that the analysis of the research questions agreed substantially with the result of the hypothesis of the study in many respects. Highlights of these were the relatively few Western orchestral instruments existing in the Department, the difficulty in learning Western orchestral musical instruments owing to their sophisticated nature, administering adaptability tests to students as a major criterion for assigning Western orchestral instruments to them, and the inadequacies emanating from the methods of teaching and the modes of evaluating students on their orchestral instruments.

Discussion, Conclusion and Recommendations

The preceding chapter dealt with the presentation and analysis of data generated in this study. In this chapter, the findings arising from the answers to the research questions and results of the test of hypothesis formulated for the study were discussed.

The Western Orchestral Musical Instruments that Exist in the Department of Music, Nnamdi Azikiwe University, Awka

Eleven (11) Western orchestral instruments (1 'Cello, 1 viola, 2 Alto Saxophones, 1 Tenor Saxophone, 2 Trumpets, 1 Trombone, 1 French Horn, and 1 Euphonium) were found to exist in the Department. This finding is worrisome considering the number of orchestral instruments required of a standard Music Department and the population of people (12 lecturers and 126 students) who are supposed to be engaged in teaching and learning with the instruments in the Department. Where there is a dearth of teaching and learning materials, education becomes haphazard. The need for the provision of enough and adequate Western orchestral instruments for teaching and learning in the Department is imperative.

The Relationship between the Nature of Western Orchestral Musical Instruments and the Challenges in Teaching and Learning them.

The result of hypothesis one indicates that there is no significant difference between the opinions of the respondents regarding the nature of Western orchestral musical instruments and the challenges of teaching and learning them. The result would have been doubtful if it had been otherwise given the answers to the research question two in which average mean scores for the students and that of the lecturers were respectively 3.41 and 3.22. The finding that some Western orchestral musical instruments are sophisticated and pose some difficulty in teaching and learning raises the need for both lecturers and students to study the nature and acoustics of the instruments as a prerequisite mastering them.

Suitability of the Criteria used in Assigning or Approving Western Orchestral Musical Instruments to Students

The finding that some Western orchestral instruments attract gender bias is consistent with the results from the work of Hal (2009) when he investigated difference in sex-by-instruments distribution. He found that girls play predominantly flutes, violins, and clarinets, and most boys play drums, trumpets and trombones. Also, there were some evidence that in band settings,

girls were likely to play non-conforming gender instruments than were boys. In a related development, O'Neill and Boultona (2009) found in their study of the extent to which boys' and girls' preferences are based on the gender stereotyped associations that girls showed a significant stronger preference for piano, flute and violin than boys, whereas boys expressed a stronger preference for the guitar, drums and trumpet than girls. The study found further from the log-linear analyses that boys and girls have similar ideas about which instruments should be played by members of each sex.

The implication of this is that the Western orchestral instrument teacher must as a matter of necessity identify the choice of his/her student in Western orchestral musical instrument before the assignment to the students. This position agrees with the submission by Umezinwa (2004: 20) that 'a student may choose an instrument because of the influence of another player or because of affordability or availability'. This will facilitate quick and easy learning of the musical instrument by the student. Therefore, it could be deduced that the most important point to consider in assigning an instrument is the student's choice or desire. It is also general opinion that physical check, drill or adaptability test be administered on the students before approving orchestral musical instruments for them.

The finding that small students should not try large instruments and that students whose pitch sense is low should especially avoid strings, piccolo, French horn and trombone is consistent with what obtains elsewhere. For instance, the performing Arts Handbook (2014) while writing on criteria for choosing an instrument noted that there are many physical characteristics that are closely connected to a student's success on a specific instrument. Those features are said to include: length of the arms, overall height, and shape of the face, lips and teeth. In addition, strong aural skills are necessary for string and some brass instruments (trombone and French horn) require fine motor control. Also, Students with shallow breaths should avoid the woodwinds and brasses just as students with short arms should be guided away from the cello and string bass.

However, it was found also that a student who appears not to pass these physical criteria may still become proficient on an instrument with serious practice. Sometimes a student who shows little promise or motivation turns out to be a fine instrumentalist a few years later. The opinion that there is usually a high incidence of dropping out among students who begin on instruments other than their first choice is not a very popular opinion among the respondents, just as many did not believe that students should first attempt other Western orchestral musical instrument

before choosing one of them. In his contribution on what factors should inform students' instrument selection, Bayley in Kauffman (2014) found that music teachers take active part in guiding their students' choice of instruments. Bazan in Kauffman (2014) found that the directors of the beginning bands develop their selection process through personal experience. The participants in the study indicated they felt students' instrument selection is influenced more through peer pressure, timbre and family input. Students' physical characteristics as well as proper guidance from the music teachers are quite necessary in selecting orchestral musical instruments.

The Relevance of the Methods Adopted in Teaching and Learning Western Orchestral Musical Instruments in the Department.

The result of test of hypothesis in this section indicates that there is no significant difference in the opinions shared by the lecturers and the students as regards the relevance of methods of teaching western orchestral musical instruments in the department. The opinions are that poor teaching and learning methods hamper effective teaching and learning of Western orchestral instruments and the first approach to effective teaching and learning of these instruments is to provide the 'right environment' (instrument rooms and practice chambers with proper acoustics). The study revealed the need to apply Carl Orff's emphasis on pre-band instruments (recorder, harmonica, marimba, etc) to' weed out' the less talented and incompetent students in the Department. Also, teaching musical instruments should involve rhythmic activity, rudiments of music, record listening, aural training, sight reading and sight playing exercises. In this section, it was revealed that rote learning (learning or memorizing abstract concepts in whole without immediate attention to meaning) does not have much relevance in learning western orchestral musical instruments. In the same vein, the Suzuki approach of commencing string teaching from infancy (3 years) may not be applicable in teaching Nigerian undergraduate music students. But instrumental music teaching can be considered successful only if it produces students who have musical understanding, who can play their instruments expressively, read music readily, and play by ear.

The opinion that lecturers should not give students so much attention on their orchestral instruments but should teach the basics of the instruments and allow them to take control of their learning experiences (active learning), is a popular one among the respondents. According to the respondents, students should be left on their own with their orchestral instruments after preliminary contacts with their instructors so that they can make personal discoveries on their instruments (discovery learning). This finding is supported by a study done by Maclead (2010)

whose purpose was to compare the instructional strategies used by experienced band and orchestral teachers when teaching a first year class an unfamiliar music excerpt. In the study, twelve teacher-behaviours were identified and operationally defined: echoing technique, question and answer, verbal instruction, co-verbal instruction, modeling without instrument during student performance, conducting, pedagogical touch, classroom management etc. Significant differences were found for nine out of the twelve behaviours. In general, band teachers used verbal instruction, conducting, question and answer techniques, and student performance with greater frequency than orchestral teachers, while orchestral teachers used echoing technique, co-verbal instruction, modeling, modeling with instrument during student performance and pedagogical touch with greater frequency. However, no significant difference was observed between the two groups for classroom management, modeling without an instrument during student performance. It is worth mentioning too that many did not subscribe to the idea that one can ignore teaching and learning methods and still improve on his orchestral instrument if he/she concentrates on his talent and giftedness. This is expected because no matter how talented or gifted somebody is, the need for proper guidance cannot be ignored.

Effectiveness of Modes Adopted in Evaluating Students' Performance in Western Orchestral Musical Instruments

The result of test of hypothesis in this section suggests that the modes adopted in assessing students' performances in Western orchestral instruments appear to be ineffective. This result represents the opinion of the majority of the respondents. For instance, while agreeing that it is proper to assess or evaluate students' performances in their orchestral instruments periodically, there is a feeling that there is no standard mode for the evaluation in the Department. The popular opinion is that students should be assessed on their orchestral instruments based on these fundamental criteria: fingering, articulation, phrasing, accuracy of pitch, breath control, attack and sightreading.

Nevertheless, the study revealed that despite the shortcomings in modes of evaluation or assessment, enthusiastic students can still improve on their orchestral instruments irrespective of assessment. It was equally agreed that monitoring supervisor-student contacts and ensuring inter-adjudicator objectivity during final evaluation should be taken seriously to facilitate quick and better understanding of orchestral musical instruments. This is because the impression gathered by lecturers of individual student's progress during periodic scheduled contacts does not adequately reflect the semester's continuous course assessment (CA) score for the student's performance on his/her orchestral instrument. This situation has provoked the thinking that

each lecturer should provide the continuous assessment (CA) score for each student assigned to him for final computation of evaluation grades based on the student's performance while in contact with him as scheduled and agreed by the panel of adjudicators.

Prospects in Teaching and Learning Western Orchestral Musical Instruments in the Department.

The result of the test of hypothesis indicates that there is no significant difference in the opinion of the respondents (lecturers and students) concerning the prospects of teaching and learning Western orchestral instruments in the Department of music. The lecturers and students interviewed in the department agreed that there is prospect for Western orchestral musical instruments in the Department. The study revealed that every student can adapt to the learning of his instrument if he develops a positive attitude and if there is adequate motivation from his teacher. The study also revealed that the students still forge ahead in learning and mastering their Western orchestral instruments despite the numerous challenges they face, particularly poor learning environment, lack of background in instrumental music, and lack of teachers in some orchestral instruments like the violin. In the opinion of the majority of the respondents, students would improve significantly in their orchestral instruments if they are provided with adequate practice rooms with sound proof cubicles and recordings for playback of their given pieces. However, it will be difficult to make desired progress in the teaching and learning of Western orchestral musical instruments if there is no motivation and scheduled contact with the respective instructors.

It was found from the study that students can improve on their instruments if they are encouraged to change their mindsets and negative attitudes toward learning the use of the orchestral instruments. It was also found that the university can aid the teaching and learning of Western orchestral instruments by adequately funding the department to facilitate the procurement of unavailable orchestral instruments and employing lecturers that specialize in those instruments that lack manpower. Essentially, music is a highly specialized area as recognized by the National Policy on Education 2004. The respondents are also of the opinion that the music Department can facilitate students' competence on their orchestral instruments by engaging them in concerts and performances within and outside the shores of the University.

Perceived Problems that Militate Against Effective Teaching and Learning of Western Orchestral Musical Instruments in the Department.

The result of test of hypothesis shows that there is no significant difference between the opinions of the respondents regarding what constitutes constraints to teaching and learning Western orchestral musical instruments in the department. Some of such challenges include the following: instrumental teachers face conditions that are different from those encountered by choral music teachers and instrumental music involves a conglomeration of fingerings, embouchures, bowings and other specialized techniques and knowledge. Others are that the string teacher must, as a matter of necessity, be familiar with these bowing techniques for efficacy: *staccato, tremolo, portato, col legno, sul ponticello, double stop,* etc. The brass teacher also must be familiar with these brass techniques before he can effectively motivate his students in: embouchure, tonguing, breath control, double tonguing, triple tonguing, flutter tonguing, transposition, range, split tone, fundamental pitch, pedal tone, microtones, and overtones.

The study revealed further that in teaching the percussion, one should be knowledgeable in all orchestral percussion instruments such as timpani/kettledrums, glockenspiel, xylophone, celesta, chimes, cymbals, mallets, bass drum, snare drum, etc. The problem here is that not all the instructors who handle these highly specialized areas have the competence and the required knowledge for them. For example, popular opinion from the study is that each orchestral instrument should be taught by a lecturer who specialized in them with the requisite skill. But the available manpower within the Department does not guarantee that, rather what obtains is that where there is no specialist for a given instrument, the instrument is usually handled by any other teacher who has some knowledge about the instrument. This improvisation approach creates serious limitation to teaching and learning of Western orchestral instruments owing to the sophistication of the instruments and the special skills required in teaching them.

In a related development, the presumption that any lecturer can teach any orchestral musical instrument provided the instrument belongs to the family of his specialized instrument seems to be a wrong one. The argument is straight: if the trumpet teacher can teach trombone or tuba and the violin teacher can also teach viola, cello or string bass, what then is the essence of specialization. If there is no adequate number of specialized lecturers for the various instruments, it then becomes a challenge which requires urgent solution. Teaching western orchestral musical instruments in the university comes with peculiar challenges particularly where most of the students who find themselves in the Department of music have had little or

no background in instrumental music in their formative years in school (nursery/primary/secondary). This foundational problem makes it difficult to effectively learn the orchestral instruments. In the opinion of the respondents, instrumental instruction should be conceived as a continuous process from kindergarten on to the completion of tertiary education. Also the idea that audition tests should be run for students applying for music in the University appears to be a popular one as a means of screening the students not necessarily to screen out untalented ones but to have standard and maintain some level of seriousness which will go a long way in reducing the rate of dropouts from the Department.

Another problem to the teaching and learning of Western orchestral musical instruments in the Department was found to be individual- based. What leads to students' dropout from the instrumental learning according to Stjern (2011) are: scheduling or time conflicts, perceived lack of achievements, loss of interest, and issues with the teacher. This was found from a study conducted to determine the factors that contribute to students' attrition in school music programmes. More than seventy percent of those interviewed gave the reasons enumerated above as cause of their withdrawal from their school music programme. The implication of this is that instrument teachers should gear towards motivating their students for an effective instrumental experience. The respondents were all affirmative that motivation is a powerful tool in the employ of a dedicated teacher.

Implications of the Findings

The implications of the various findings of the study as they relate to the teaching and learning of Western orchestral musical instruments in the Department are discussed in this section.

The finding that very few Western orchestral musical instruments exist in the Department calls for the immediate overhauling of the old existing instruments and the provision of new instruments that will be enough for teaching and learning experience. This also agrees with Umezinwa's (2004: 52) submission regarding the Department that, 'there is a serious lack and insufficiency of the facilities, equipment and musical instruments (African and Western) expected of a music department'.

The finding that some Western orchestral musical instruments are sophisticated and as a result, pose some difficulty in learning has obvious implications in teaching and learning the instruments in the Department. This fact raises the need for students to first take time in learning the acoustics, peculiarity and functionality of those instruments before choosing them

as their Western orchestral instrument. Some of such instruments are the violin, clarinet, flute, saxophone, trumpet, tuba, French horn etc.

The finding that some Western orchestral musical instruments generate some gender bias places the responsibility on the instrumental teachers to disabuse the minds of the students from such notions as 'feminine' or 'masculine' instruments. However, the teacher should also be sensitive to the choices of his/her students regarding western orchestral instruments before assigning any to the students. Also, in approving orchestral instruments to students, the lecturer should be consistent with the finding that small students should not try large instruments; that students whose pitch sense is low should especially avoid strings; and that students with shallow breaths should avoid the woodwinds and brasses. Ignoring this finding may result in raising students who may handle their orchestral instruments with conspicuous limitations.

Poor teaching and learning methods have been found to be one of the major problems to the effective teaching and learning of Western orchestral musical instruments in the Department. This shifts the responsibility to the various instrument teachers in particular to find the best approaches towards teaching and learning the instruments. Any teaching endeavour that neglects methodology will surely encounter problems. Although there appears to be no perfect method of teaching instrumental music, but the study has revealed that teaching musical instruments should involve rhythmic activity, rudiments of music, record listening, aural training, sight reading and sight playing exercises.

Learning music, particularly instrumental music, in 'any' environment can be frustrating. The study revealed that students in the Department learn their orchestral instruments in unconducive environment and this has posed serious problems in the learning of the instruments. Western orchestral musical instruments are usually studied in instrument rooms and practice chambers with appropriate acoustics.

Students should be assessed periodically by their respective instrument teachers using some fundamental criteria. But the study observed that this practice is hardly maintained in the Department. Even where there exists such periodic assessing, there appears to be no standard or agreed criteria for the grading. If there is no periodic evaluation of the performance of the students on their orchestral instruments, it would be difficult to monitor their growth. If there exists no standard criteria for assessing the students periodically, the results of the respective evaluations by the lecturers become haphazard. The study has revealed that students should be

assessed on their orchestral instruments periodically based on these fundamental criteria: fingering, articulation, phrasing, accuracy, attack, and sight reading.

The study observed that there are no lecturers in the Department to teach some of the Western orchestral musical instruments even though the students still engage in learning them. The affected instruments are: flute, violin, string bass, French Horn, Tuba, trombone, euphonium, etc. This is a major setback in the teaching and learning of the instruments in the Department. Some lecturers have tried to bridge this gap by attempting teaching some other instruments that fall within the family of their instrumental specialization. For instance, the assumption is that the alto sax expert can still teach the basics of the flute, oboe, or tenor sax since all are woodwinds. Or that the trumpet specialist may try teaching the tuba, French Horn, trombone, or euphonium. This presumption may sound interesting but the sophistication of these instruments obviously defeats this idea. If the trumpet teacher can teach trombone or tuba and the violin expert teaches viola, cello or string bass, what then is the essence of specialization? The lack of specialists in some of these orchestral instruments is a problem requiring immediate solution. Currently in the Department, there is no expert on the violin even though the violin is considered a major Western orchestra instrument.

Despite these challenges, the study revealed that the students still forge ahead in learning their Western orchestral instruments. Even the impact of the unavailability of teachers for some of the instruments could not deter the students as they have continued to make improvements as a result of team work and careful study. For instance, in the violin where there is no teacher at all for the instrument, yet the instrument is the most patronized instrument by the students.

Recommendations

The following recommendations are made to help enhance productivity in the teaching and learning of Western orchestral musical instruments in the Department of Music, Nnamdi Azikiwe University, Awka.

Provision of More Western Orchestral Musical Instruments in the Department

The Music Department should be provided with funds to furnish the instrument room with adequate Western orchestral musical instruments as a matter of urgency. This would make the teaching and learning of the instruments a fulfilling experience.

The Difficulty in Learning Western Orchestral Musical Instruments

The nature and sophistication of Western orchestral musical instruments have been established as a major challenge in learning them. It is therefore recommended that:

- Students should be exposed to these instruments early in their formative years (nursery/primary/secondary) education in order to ease this problem. Going by Piaget's theory of the 'critical period', if formal learning does not commence early enough, learning becomes difficult.
- The government should not take up this challenge alone; music educators and experts in the field of music education should also take it as a responsibility and an emergency to do something about music education at the grassroots.

Approving Western Orchestral Musical Instruments for Students

The nature of Western orchestral musical instruments also raises some caution with regard to assigning them to students. Some of the instruments are relatively light, small; some are long, some are large and thereby requiring more energy in carrying and playing them. Some also demand highly technical approaches in playing them such as embouchure, tonguing, breathing techniques, fingering, etc. These factors constitute challenges in learning the instruments considering the fact that students, just like all humans, come with various physical capabilities and limitations. It is therefore recommended that these factors should be taken into account while assigning or approving Western orchestral instruments to students:

- Small students should not try large instruments.
- Students whose pitch senses are low should especially avoid the strings
- Students with shallow breaths should avoid the woodwinds and brasses.
- Student with short or thick fingers should also avoid the strings
- Generally, there should be physiological and adaptability tests or drills on students before approving any orchestral instrument to them.

Ignoring these suggestions may result in making the teaching and learning of the instruments a frustrating task.

Teaching and Learning Methods for Western Orchestral Musical Instruments

For the effective teaching and learning of Western orchestral musical instruments in the Department, these approaches should be considered:

- A good foundation in rudiments of music

- Rhythmic activity
- Aural training
- Record/CD listening
- Sight reading and sight playing exercises.
- Discovery learning (students should be encouraged to spend time alone on their instruments periodically in order to make personal discoveries)
- Modeling (The lecturers should teach by example. Students learn better when they watch their teachers playing on their respective Western orchestral instruments).
- The lecturers should meet with their respective students as scheduled.

Employing Specialists for the Orchestral Instruments

There are not enough lecturers or specialists to teach all the orchestral instruments in the Department and this creates problems. Some of the affected instruments are the violin, string bass, flute, French horn, soprano sax, oboe, trombone, tuba, and piccolo. These suggestions are proffered to tackle this problem:

- The University should employ, as a matter of urgency, lecturers whose specialties should include the affected instruments.
- Lecturers should avoid teaching Western orchestral instruments that are not their specialty because this negates standard practice.

Adequate Environment for the Teaching and Learning of Western Orchestral Instruments

A proper environment for the teaching and learning of Western orchestral instruments is the first factor to consider before venturing into the practice. Unfortunately, standard practice rooms do not exist in the Department and this is a serious drawback. In fact, the Department has no standard befitting building for a Department of music. For effective teaching and learning of western orchestral instruments in the Department, these recommendations should be considered:

- The University should first, as a matter of urgency, provide the Department with a Music Department building
- The building should house, among other things, practice rooms or chambers with appropriate acoustics for learning orchestral instruments
- Each Western orchestral musical instrument should have its peculiar practice chamber.

Limitations of the Study

The fundamental limitations of the study are delineated below:

(a) The area of study was Nnamdi Azikiwe University situated in Awka. Some other Universities across the Nation and beyond would have been included for variability.
(b) Use of the questionnaire as the only mode/instrument for data collection. Some other modes of data collection, like interviews would also have been employed. However, the researcher considered the questionnaire adequate for the study.
(c) Not all Western orchestral musical instruments were studied. The oboe, piccolo, String bass, and the percussions were not studied because they do not exist in the Department.

Suggestions for Further Research

The researcher suggests for further studies the following investigations:

(a) Gender prejudice in learning Western orchestral musical instruments
(b) Advancing studies in African Orchestral instruments
(c) The fusion of Western and African orchestral instruments in ensemble.
(d) Employing Western orchestral musical instruments in extra musical functions.
(e) Replication of the current study from time to across tertiary institutions around the world.

Summary and Conclusion

The objective of this research was to find out the problems and prospects in the teaching and learning of Western orchestral musical instruments in the Department of Music, Nnamdi Azikiwe University, Awka. The study was inspired by the various challenges encountered by the students in learning and mastering their Western orchestral musical instruments as observed by the researcher. The scope of the Western orchestral musical instruments studied included the strings (violin, viola, 'cello, and the string bass); the woodwinds (flute, saxophones, clarinet); and the brass family (trumpet/cornet. trombone, tuba, French horn).

In carrying out the research, literatures relevant to the study were reviewed under the subheadings of conceptual framework, theoretical framework, and empirical studies which were finally summarized under 'summary of reviewed literature'. Data for the research were further sourced through questionnaire and interviews by the respondents which included all the lecturers and undergraduate students of the department. An item structured instrument

developed by the researcher to reflect such options as strongly agree (SA), agree (A), disagree (D) and strongly disagree (SD) popularly called four (4) points modified likert scale was used to elicit information from the respondents. These points were reflected in the questionnaires which were shared to the respondents. The questionnaire was adopted because of its appropriateness for the research. There were two sets of the questionnaire: one for the lecturers and the other for students in order to capture the views of both categories of the research population. The data generated through the questionnaire were analyzed using the following statistical tools: mean rating and standard deviation, t-test for small sample and t-test for independent large sample that is, (n >/ 30). All tests were carried out at 0.05 level of significance. Six (6) research questions and hypotheses were set up, tested and analyzed.

The findings of the research show that: the major challenges encountered by students in learning Western orchestral musical instruments emanate from the facts that: a few Western orchestral instruments exist in the Department; the sophisticated nature of the instruments; lecturers assign orchestral instruments haphazardly without recourse to any physical or physiological tests; poor teaching and learning methods hamper effective teaching and learning of Western orchestral instruments in the Department; there are not enough lecturers or specialists to teach all the orchestral instruments in the Department; and that the proper environment for the teaching and learning of Western orchestral instruments in the Department is lacking. The implications of the findings were highlighted and relevant recommendations made which would improve the teaching and learning of the instruments in the Department

Finally, there are prospects in the teaching and learning of Western orchestral musical instruments in Nnamdi Azikiwe University, Awka despite the many challenges highlighted from the research. Learning Western Orchestral Musical instruments is a major aspect of the curriculum of studies in the Music Department and therefore should be allowed to grow along with other areas of musicology like music history, theory and composition, African music, musicianship studies, keyboard studies etc. Moreover, a student who becomes competent on his orchestral instrument can live a fulfilled life after graduating and can easily fit into the larger world. The researcher, therefore, strongly believes that studies in Western orchestral musical instruments in the Department could be enhanced if the findings and recommendations of the research were considered**.**

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