

THE INTERNATIONAL JOURNAL OF HUMANITIES & SOCIAL STUDIES

Documentation of Metal Design and Fabrication Works in Wa Municipality of Ghana: Their Aesthetic, Educational Implications and Economic Prospects

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Abstract:

The study is on the subject of innovative, didactic connotation and money-making viability as a value of metal design and fabricated works in Wa Municipality of Ghana. Descriptive survey research method was used to examine and discuss the relationship between the study of aesthetics, educational and financial implications of the metal works produced. The researchers used questionnaire, interviews and observation as research instruments. A total population of 157 was used. Out of which 114 was sampled for the study. Metal works produced in Wa Municipality focus on value and exploration to meet the needs of the society. In the quest of exploring with metal, metal design and fabrication has now become a vocation as well as one of the main sources of income for the indigenes. The study recommended improvement in machinery as well as full and refresher courses at the tertiary level of education for metal fabricators and prospective metal fabricators.

Keywords: Aesthetics, metal, casting, welding

1. Study Area

The area of study is Wa Municipality. Wa Municipality is one of the nine District/ Municipal Assemblies that make up the Upper West Region (UWR) of Ghana. The UW region is located in the north-west part of Ghana and shares borders with La Cote D'Ivoire to the north -west, Burkina Faso to the north, Upper East to the east and the Northern Region to the south as shown in figure 1 and 2 respectively. The Wa Municipality shares administrative boundaries with the Nadowli District to the north, Wa East District to the east and south and Wa West District to the south. It lies within latitude 1^o40' N to 2^o45' N and longitude 9^o32', to 10^o20' W (Ghana census statistics, 2010). It has a land mass area of approximately 234.74 square kilometers, which is about 6.4% of the size of the region. The implication of the location of the municipality for development is, enhancing bilateral trade and commerce with Francophone countries. Wa township has the potential to grow and be upgraded into both an industrial and commercial hub for the north-western corridor of Ghana.

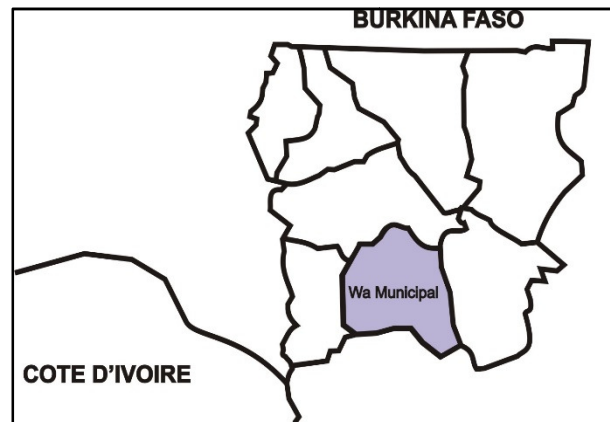
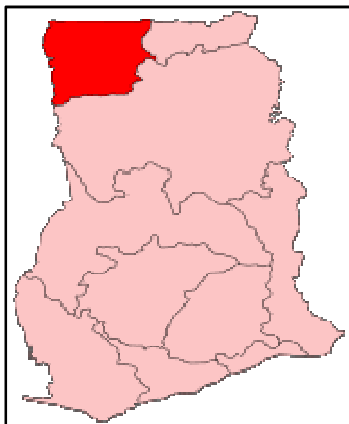


Figure 1: Location of Upper West Region on map of Ghana Figure 2: Location of Wa Municipality on map of Upper West Region

The Municipality is divided into three zones and 12 operational areas as depicted in the Table 1.

Busa zone	Bamahu zone	Wa Central zone
Busa, Jonga, Kperisi, Yibile	Bamahu, Sing, Boli, Kpongu	Charia, Nakore/Chansa, Wa North, Wa South

Table 1: Municipal division and operational areas

2. Introduction

Metalworking started in Wa municipality in the early 1900's by Mr. SeiduSabaa. He employed only forging techniques in producing the metal works. But in 1964 Arc welding method of fabricating metal into functional item was introduced in the municipality (A. Famina, personal communication, February 03, 2013). Since then many kinds of metalworks have been produced. But in as much as this venture has become an economic activity no attention has been given to the kind of metalworks produced in the region as well as the way forward to this viable economic activity. Documenting the types of metal design and fabricated works will give the trend of the kind of metalworks produced, the type of metal used, the skill and techniques employed by the fabricators, the aesthetic values of the works and the economic viability of the metalworks produced. The philosophy of this study is to explore the strength, weakness and future direction of the metal design and fabrication industry in Wa municipality. The role of documentation and aesthetics as a quality in art work were much considered.

3. Documentation in the Context of Art

The proper documentation of knowledge is very important to the cohesion and perpetuation of the society. Bradford (1953) affirms that without documentation, the recorded observations are merely scattered separately and are of little use, which get buried in a great mass of scientific literature, like needles in a haystack. It would perhaps be wrong not to document; in other words, one is giving away its culture which is the stability of every society worldwide.

Documentation in academic context is an older term coined by Paul Otlet for the field of study now known as library science ("Documentation," n.d). It can also be termed as the placing together of relevant information for easy accessibility. This includes any communicable material such as letters or text, video and audio or a combination of these used to explain some attributes of an object, system or procedure. Upper West Region is the youngest of the ten regions in Ghana as demarcated in the year 1983. Its capital is Wa. For more than three decades now little or no documentation of metal fabrication works can be sighted for industrial development in the Region.

Anthropologists, ethnologists and ethnographers are generally interested in documentation that describes the daily lives of ordinary people and groups. Such information helps researchers to understand and to further describe the way a group of people function at any particular point in their history. It therefore becomes a medium used by researchers in their quest for the historical truth and reconstruction of the original context. Hanod (1977) and Harrison (1978) defined documentation as the act of collecting, classifying and making readily accessible the record of all kinds of intellectual activity.

Bradford (1953) as father of documentation, defines it as "the process of collecting and categorising all the records of new observations and making them available to the discoverer or the inventor" (p.48). The sum of the definition of the term documentation from various sources including the Webster Collegiate Dictionary (1914), and the LDCE (2007) identify it as the general activity of recording authentic knowledge as well as their source and the organisation (processing) of such recording into a systematic form for easy accessibility. The recording can be done mentally and reproduced orally (as happens in many indigenous societies), on paper, films, tapes, fabrics, on walls or even the skin of human beings. Such a record can be relied upon as the basis, proof or support of a research or study being undertaken. Documentation is a scholarly activity which in the modern times requires a very good training.

Documentation goes beyond just information that is written to include any means by which useful information can be organised and easily accessed. In the indigenous society, where knowledge was the prerogative of a privileged few, not much effort was exerted into their documentation because they were freely given out to the younger generation through storytelling, oral tradition, songs and folklores as well as proverbs and wise sayings, myths, legends, dance, the various rituals and appellation (Adu-Agyem, 1998).

Societies, ethnic groups, as well as an entire race stuck together due to the digenous and indigenous documentation of knowledge that has been gathered and kept. Such digenous and indigenous documented knowledge is developed from experiences gained over a long period of time. It is usually the practices of the societies which have been adapted as a useful tool for the socio-cultural as well as the political, educational and religious development. It is also a collectively owned idea that comes in very simple forms related to everyday activities of the people.

4. Concept of Aesthetic in Relation to Metal Artwork

Most of the metal design and fabricated works produced and used by the people in Upper West Region of Ghana precisely Wa municipality are not without aesthetic values and economic advantages. According to Danto (2009) aesthetics deals with the essence and perception of the beauty, ugly, and the sublime. It essentially deals with the nature of art and the criteria of artistic judgement involving taste and criticism. In the view of Bates (2000), art and aesthetics are universal. Hagar (1962) also asserted that aesthetics is the philosophy of the beautiful and its relation to the perception and enjoyment of the appearance of anything artistic. Wilson (1971), elucidated that aesthetic experience is an active and open confrontation with artistic as well as natural phenomena. To emphasize on the subject more, Tolstoy (1962), said that human life is filled with works of art of every kind that gives aesthetic pleasure. He again

explained that art and aesthetics are married, thus, cannot be divorced from each another and from human beings because humans make their daily routines nice-looking by surrounding themselves with pleasing forms and qualities of art.

Bridgwater and Kurtz (1963) however pointed out that there is a major problem in dealing with aesthetics concerning the nature of the beauty. They elaborated that there are two approaches to the problem of beauty - the objective, which asserts that beauty inheres in the object and that judgement concerning it may have objective validity, and the subjective which tends to identify the beautiful with that which pleases the observer. This means metal design and fabricated works produced and being patronized by the people in Wa municipality philosophically satisfies the objectivity and subjectivity of aesthetics as stressed by Bridgwater and Kurtz. Lowenfield and Brittain (1975) corroborates that aesthetics deals with questions pertaining to perception and understanding of a work of art.

Gyekye (1996) concedes that aesthetics is characterized by delight, interest, and enjoyment experienced by people in response to objects, events, and scenes. The concept of beauty is central to aesthetic experience and evaluation and is generally associated with works of art such as painting, sculpture, music and dance and of course metal design and fabricated works as discussed in this study.

In view of these claims, Adu-Agyem (1990) also indicates that aesthetics is an attempt to explain explicitly the interaction between an individual and the reaction towards what is perceived in a work of art, which provides a stimulating harmonious experience, known as aesthetic experience. Labi (2002) substantiates that indigenous craftsmen therefore consciously decorate most art forms of political, religious and social importance, so they can be subjected to aesthetic comments and judgements.

Adu-Agyem (1998) again notes that the Ghanaian art work shows a collection of unique items made out of durable materials with a touch of good craftsmanship, which gives a lot of aesthetic delight to onlookers especially foreigners. African cultures, based on what they term indigenous aesthetics, have their own philosophies and criteria for judging their art forms. Unlike Western art mostly measured in terms of the interplay of both element and principles of art, tribal art forms are mostly functional and symbolic, hence serving its aesthetic purpose. Onyewuenyi (1977) affirms that in most cases the general principles or standards of value of aesthetics are closely knitted together with the spirits and constitution of a people and are a factor in their life history and civilization (as cited in Coetzee & Roux, 1998). The arts of a people therefore explicate their ethics and serves as a means of aesthetically expressing and evaluating new elements of their lives. In relation to Onyewuenyi's notion, Antubam (1963) pointed out that African aesthetics consider the beautiful to include the concept of stressing on qualities of significance as a criterion of beauty and virtue.

It can be inferred from the various views that aesthetics deals with the most basic and important qualities of a thing and how that thing is perceived as beautiful, ugly or sublime in the perspective of objectivity and subjectivity in the mental faculty of the manufacturer and the consumer. It also asks questions on whether such qualities worthy of sustained contemplation and appreciation are objectively present in the things they appear to qualify or whether they exist only in the mind of the individual. What may seem beautiful or sublime to one person may be ugly to another and vice-versa but in all aesthetics is at play.

5. Methodology

Descriptive survey research was used in the study to ascertain the necessary findings of the study. The purpose of a descriptive survey research project according to Burns & Grove (1993) is to provide a picture of situations as they naturally happen and the inclinations of individual's behaviour. Descriptive Survey research also acquires information about one or more groups of people to identify trends in characteristics, attitudes, opinions, behaviours or previous experience by asking them questions and tabulating their answers (Leedy & Ormrod, 2005).

Although no description is free of interpretation, basic or fundamental qualitative description entails a kind of interpretation that is of low inference, and the description in qualitative descriptive studies entails presentation of the facts of the case in everyday language (Sandelowski, 2000). Metal design and fabricated works were selected and studied using the above mentioned research method.

The target population of the study was all metal fabricators in the Wa Municipality of which the accessible population was metal design and fabricators which comprised metal design and fabrication, metal mechanics and related metal fabricators called Garages, making a total of 157. Out of 157 identified, 114 were purposively sampled for the study (Leedy and Ormrod 2005). They were either masters/owners of the shop or the most senior apprentice at the shop and their works. The respondents responded to questionnaires and interviews. Questionnaire administered were 114 of which 91 were retrieved for the study. The number of respondents interviewed were 35 shop owners. The data obtained were assembled, described, analyzed, synthesized, interpreted and conclusions were later drawn and recommendations made for future studies.

Zone	Frequency	Percent
Busa zone	24	21.05
Bamahu zone	38	33.33
Wa Central zone	52	45.61
Total	114	100.0

Table 2: Area of Location of the metal design and fabrication workers and the number used for the study in Wa Municipality
Source: Field research 2013

Table 2 indicates three divisional zones in the Wa Municipality with their sub areas used for the study. Busa zone has Busa, Jonga, Kperisi and Yibile as suburbs of which 24 metal design and fabricators and their shops represent 21.05 % of the total population for the study. Bamahu Zone also consists of Bamahu, Sing, Boli and Kpongou with 38 metal design and fabricators and their shops representing 33.33 % of the total population for the study. The last zone is Wa Central made up of Charia, Nakore or Chansa, Wa

North and Wa South with the highest metal design and fabricators and their shops which is 52 representing 45.61 % of the total population for the study.

6. Results and Discussion

Upper West Region Metal Design and Fabrication has been in session since 1964 according to the President of the Garages Association in Wa, Mr. P. Botri (personal communication, February 6, 2013). The region has metal design and fabricators, metal mechanics and related metal fabricators. Variety of metal art works were investigated from all the three zones in the Wa municipality. Both in-use and non-use metal design works were all included in the study. Also 100% fabricated metal works in Wa and partly fabricated elsewhere works were all included in the study.

Gender Composition	Frequency	Percent
Male	114	100.0
Female	0	00.0
Total	114	100.0

Table 3: Gender composition of the study

Table 3 shows the total number of Metal Design and Fabricators who responded to the questionnaire in the municipality. One hundred and fourteen responded to the questionnaire of which none is female. This indicates that the interest of male in metal design and fabrication is absolutely higher as compared to the female counterpart. The environment and energy required for such works contributed to the statistics. All the 114 representing 100% were male.

Age Range	Frequency	Percent
10-20	9	7.89
21-30	26	22.80
31-40	48	42.10
41 above	31	27.19
Total	114	100.0

Table 4: Age range of Metal Design and Fabricators

Table 4 indicates the age range of the metal design and fabricators in the Wa municipality. Nine fabricators fall between the ages of 10-20, representing 7.89 percent of the total population. For those between the ages of 21-30 the research recorded 26, representing 22.80 percent of the total population. The research also recorded 48 of individual fabricators aged between 31-40 representing 42.10 percent; while 31 of the fabricators with age 41 and above represented 27.19 of the total population. These statistics speak favourably for the youth in the development of the economic sector of the country particularly the metalworks industry. Although majority of the respondents are of the school going age, they are working to cater for themselves and family. More importantly the masters or shop owners are getting out of the youthful bracket. This indicates that the younger one's learning must learn expediently to take up the mantle of the metal design and fabrication industry.

Lucrative	Frequency	Percent
Yes	86	75.43
No	28	24.56
Total	114	100.0

Table 5: Is it lucrative?

Table 5 shows how lucrative the metal design and fabrication is for a number of people engaging in metal design fabrication as a means of earning income in the municipality. The population of the study who responded yes to making profit were 75.43 percent while 24.56 percent indicated different view on profit-making which was no. The vocation in which the respondents find themselves is economically self- reliable juxtaposing it to the statistics in Table 5. Metal design and fabrication worth investing in the municipality to augment the unemployment situation in the country. It means there is an assurance in metal design and fabrication in Wa municipality for prospective metal design fabricators.

Types of works	Frequency	Percent
Agricultural and hound equipment	14	12.28
Cuisine and Food processing machine	11	9.64
Edifice and Security complement	47	41.22
Fun equipment	3	2.63
Temporary Office/ Shade and Storage Structure	31	27.19
Working tool	8	7.01
Total	114	100

Table 6: Specialized trend of the kind of works metal design and fabricators produce in Wa municipality

Table 6 shows the types of metal design and fabrication works produced in Wa municipality. There were six types of metal design and fabrication work identified in the municipality. They include agricultural and hound equipment, cuisine and food processing machine, edifice and security complement, fun equipment, temporary office/ shade and storage structure and working tool. The study identified 12.28 %, 9.64%, 41.22%, 2.63%, 27.19% and 7.01% respectively of the types of works produced in the municipality out of the total population of the study.

The data shows that the people of Wa municipality patronize metalworks that complement their buildings and give respite of security. This trend has given specialized area for the metal design fabricator. Most of them are good in producing edifice and security metal design works as indicated in Table 6. It therefore means that the strength of the metal design and fabricator lies in designing and fabricating edifice and security complements which is economically viable since man will continue to put up buildings both private and institutional. Another important area to invest is the temporary office/shade and storage structure. In this category works are harbor. They are metal design and fabricated products that accommodate human beings and other products as office or sale point or accommodate liquid substances for domestic and industrial use. This group is related to the edifice and security complement. Analytically the two most produced works in Wa municipality by metal design and fabricators are relatively huge metalworks.

This data points out that huge works mostly fabricated with arc welding and oxy acetylene joining and forging processes are the most patronized in the municipality and as such specializing in these areas should be one of the major focus of potential metal design and fabricators. Agriculture particularly farming which is the major work for the people in the region and the municipality according to 2010 census, had its implements being the third highest produced by the metal design and fabricators. It seems the metal design fabricators have little interest in releasing stress, since works related to fun are the least produced. The metal design fabricators also fabricate cuisine and food processing machines as well as working tools but they are on the average rate. The study shows that certain areas of metalworks are lacking in the municipality. This include jewellery works, furniture and interior decorative works. This implies that works seen in Wa municipality in the form of jewellery works, furniture and interior decorative works are mostly imported. A diversity by metal design fabricator into these areas of metalworks would add to the lucrativeness of the metal design fabricators since the municipality is now accommodating all persons from different parts of the world with different taste of metalworks.

Metals	Frequency	Percent
Ferrous (cast iron, wrought iron, carbon steel, stainless steel, flat bar, galvanized sheet metal)	73	64.03
Non-ferrous (Aluminum, copper, lead)	4	3.50
Both ferrous and non-ferrous	37	32.45
Total	114	100.0

Table 7: Type of metals used

The type of metals the fabricators used in producing the types of works discussed in the study is exhibited in Table 7 above. From this table, 73 individuals representing 64.03 % of the total population indicated that they use ferrous metals in their production. Only 4 uses non-ferrous metal representing 3.50% of the total population and 37 individuals stated they use both the ferrous and non-ferrous metal in their production. Dominant metal used by the metal design and fabricators in the municipality are ferrous metals. They are mostly specialized in this type of metals. This can be attributed to the most known technique that they do apply which is arc welding which can be more applicable to ferrous metal than nonferrous. The use of nonferrous metal is less which does not include gold which is mined in the municipality. Silver is also absent in the few nonferrous metals used. Technically all these metals have their properties and its common knowledge thus, as a metal artist you work with metal you are familiar with. A lot of attention must be given to the nonferrous metal to assist the metal design and fabricators to add value to the precious metal available in the municipality.

6.1. Selected Metal Design and Fabricated Works Used for the Study

1. Edifice and Security Complement



Figure 3: Polished Design Metal Gate



Figure 4: Burglarproof metal

Figure 3 shows a finished designed metal gate fabricated in the municipality. With the dimension of 15 by 5 ft., the fabricator used circles, squares, love symbols and butterfly as the fundamental designs. Square pipe metal and ungalvanised metal sheet as well as cast metal symbols, yellow and black paint were combined for the materials used for the work. The work exhibits variation, emphasis, proportion and balance. Aesthetically it reflects beauty, which is subjective. Welding and casting was used to fashion the work. Figure 4 is a 12 by 4 ft. finished burglar-proof made of square pipe metal used to protect facilities including houses, offices, shops and many others. A brown oil paint colour was applied to add beauty and to protect the metal from vagaries of the weather. Welding and riveting were used to produce this metalwork. The work portrays different types of shape, lines, and texture. It shows good proportion and balance. The aesthetic qualities of this work are more or less in its usage. The movement and reshaping nature of its look while in use makes it aesthetically pleasing.



Figure 5: Balustrade



Figure 6: Fence décor

Balustrade as seen in figure 5, is a 4 by 2.3 ft. metal work fabricated by metal design and fabricators in the Wa municipality. Adinkra symbol was used as the integral design. Iron rod, square pipe and golden brown oil paint colour formed the materials used. The balustrade is used in parts of the buildings such as terrace, stairs and balcony as barricade and to some extent hand-rest. Both elements of art and principles of design are evident in the work. Form, shape, line, colour, texture and volume can be seen in the balustrade. Rhythm, balance, proportion, contrast, emphasis and harmony can be appreciated in the metalwork, making it aesthetically pleasing. Meanwhile, figure 6, is a fence decoration metal design work used mostly in block constructed walls fencing a building. It is purely square pipe, iron rod and cast iron design metals fabricated work with golden brown and black oil pigment spray. The fabrication was done through welding, casting and forging orientation. It measures 4 by 4.3 ft. The use of curve lines, straight lines, thin and thick lines to form various shapes bring out the beauty of the work. Different symbols of love, adinkra symbol such as sankofa, agyinduwura, akoma and asase ye duru and geometry shapes; oval, rectangle, have projected the standard of the design in the work adding aesthetic value to it.

2. Cuisine and Food Processing Machine



Figure 7: Metal Coal pot for charcoal



Figure 8: Metal Coalpot for charcoal

The image in figure 7 is what Ghanaians call coal pot made of scrap metal, iron rod and square pipe metal. The coal pot is measured 14 inches by 12 inches designed to contain charcoal used for cooking. In figure 8 is another coal pot made of car tyre rim, scrap, iron rod and angle iron used for cooking. This type of coal pot is improvised to accommodate both charcoal and fire wood. It is measured 2 by 1.05 ft. One distinctive aspect of these types of metalwork are their unpolished nature that gives it a natural colour. The research reveals that because of its ability to contain fire and most often its exposure to other forms of metal and hard materials like metal pot, sauce pan, wood, charcoal and stone, it is difficult if not impossible to polish or give it a finished touch with colour application. The creative use of tyre rim, re-organisation of waste metals including iron rod, square pipe and flat bar metal brings to bear the

explorative abilities of the people in Wa. The work also depicts aesthetic qualities such as principles of design; variety of shapes, dimensions are proportional, contrast in composition, balance in the design, opposition in composition, rhythm, movement, repetition, dominance, unity, harmony and emphasis. Element of art such as shape, space, form, colour, line and texture are visible in the work; although a formalist form of work, are representational and functional across the country.



Figure 9: Food stuff milling machine



Figure 10: Palm nut crusher machine

Figure 9 is a food stuff milling machine specially used for milling cereals, vegetables, groundnut and many others. Meanwhile the metalwork in figure 10 is a palmtree crusher machine purposely used for palm nut crushing to squeeze out of the nut oil and paste for cooking. They are all made of cast iron, square pipe and ungalvanised metal sheet. They are measured 4.8 by 3.2 and 4 by 3 ft. respectively. Coloured green and wine respectively, these types of metal works are used for commercial purposes. The food stuff milling machine has a triangular funnel chamber, cylindrical mid-container that accommodate the grinding machine. These two compartments are seated on four braced stands protruded outside. The wheel handle is proportionally divided into four parts. The food stuff milling machine is designed with shapes including circles, triangles, square, and rectangles. There are adinkra symbols such as dame-dame and fofoo that can be visible in the design of the food stuff milling machine. Similarly, the metalwork in figure 10 shows that the work consists of cylindrical shape that contains the palm nut for crushing and a rectangular shape that collects the chaffs of the nut. It has a wheel handle which consist of six parts created with iron rods. Techniques applied in fabricating these artworks included welding, riveting, bolt and nut. Forging and forming were not excluded.

Inferring from the description above both figure 9 and 10 possess aesthetic qualities including repetition, variety, proportion, contrast in composition, balance, rhythm, dominance, movement, unity, harmony opposition and emphasis. Element of art such as shape, space, form, colour, line and texture are also visible in the works. The works are both technologically and aesthetically pleasing and therefore has served its purpose and function.

3. Agricultural and Hound Equipment



Figure 11: Pick axe



Figure 12: Hoe

Figure 11 is a pick axe and figure 12 is hoe. They are farm tools made of cast iron and mango tree wood. All of them are used for tilting soil in farming and harvesting farm products. Casting and riveting are the major processes applied in this type of metal work. In Wa municipality most of these works are left in their natural state without polishing. This is a normal practice due to the purpose and the way the works are used in the municipality and nationwide. The works are measured 2.5ft and 2ft respectively. The principles of design shown in these works include emphasis, variety, proportion, graduation, balance, movement, symmetry, dominance, rhythm,

harmony, and unity. This is evident in the spotted brown-reddish colour of the handle of the two works show variety of colour at play. The rough look on the handles depicts texture. The handles show straight and curve lines. The blades show black look and tapered triangle shape for the pick axe and rectangle shape for the hoe. The twist in the handles shows movement. Symmetry between the blades is good. There is harmony between the use of the metal blade and the wooden handles. The wood is dominant in colour and length for both works. The material aspect shows the metal dominates the wood in figure 14. The reverse can be seen in figure 15. They are well combined to exhibit their aesthetic look. Aside the principles of design, elements of art too were employed. These were colour, line, shape, space, form and texture. These two art components were combined by the metal design and fabricators in Wa municipality to produce these art works.



Figure 13: Trap for huge animal



Figure 14: Trap for small animal

Figure 13 depicts trap for huge animals such as grass cutter, antelope, rabbit and many others. It is a cast iron formed into trap. It is not polished and used by hunters in the municipality. Though it has natural looks, it possesses aesthetic qualities. Its rough looks, texture on the cast iron, square and rectangle shapes, lines, form, volume, colour adds more value to its aesthetic qualities. Process used in fabricating this artwork include casting, forging, riveting, bolt and nut. Figure 14 shows another animal trap meant for small animals like mouse, fowls, porcupine, just to mention a few. It is made up of iron rods and metal plate welded together with loop lockers. There are different sizes of such trap for the small animals depending on the type of the animal in question. Its creative design is made up of variety of rectangle shapes and blue oil paint colour. The art work can boost of aesthetic values similar to what was ascribed to the work in figure 13 such as texture, lines, form, variety, harmony, balance, proportion, emphasis, unity and many others.

4. Temporary Office/ Shade and Storage Structure



Figure 15: Metal containers



Figure 16: Metal containers

Figure 15 is a 21 by 10 ft. sheet metal designed into rectangular shape called "container" used as a temporary office for all kinds of work in Ghana. Although this one has not been sprayed with colour, before it will be used for the office work the "container" would have been roofed and desired colour applied. The metal sheet is designed in such a way that parts are embossed at an interval. This has created a wavy movement in the shape. Furthermore, it is has formed a vertical rectangular shape. There is a door at the front view edged roundabout with a flat bar metal. There are four projected square pipes at each of the top corner of the artwork. The square pipes show lines, likewise the embossed design in the metal sheet. The tarnished metal colour dominates the whole artwork. Figure 16 is of the same measurement but half covered with designed metal into the rectangular shape which also serves the same purpose. Similarly, no colour has been applied to this metal design and fabrication work. Aesthetic dimension can be realized in this works too; fascinating natural colour, balanced between the uncovered part of the work, proportionally division of the design lines created on the metal sheet, emphasis created at the bottom part of the art work, variety in shapes and design, rhythm in movement of lines, and contrast between form and volume. The metal artist used different lines, shapes, texture and forms all adding up to the aesthetic qualities.



Figure 17: Cabinet and shelves



Figure 18: Tent frame

Figure 17 is a cabinet-shelve made of square pipe and ungalvanized metal sheet. The fabrication process includes welding, riveting and chasing. With variety of dimensions the one in focus is measured 5 by 4 ft. and is not polished. The artwork consists of five different compartment created with square pipe and ungalvanized sheet metal. An outline of the letter X is designed using chasing method. Although visible shapes are square and rectangle, there are lines created by square pipe and the edges of the sheet metal. The corrosive look on the metal is serving as colour of the artwork. The artwork in figure 18 is measured 14 by 10 ft. used for providing shade for different purposes. The basic materials used are round galvanized metal pipes which are manually joined and can be removed and re-fixed anywhere at any time. The round metal pipes are joined to form variety of shapes. This include triangle, rectangle, 90° angle, letter T and L shapes. The aesthetic values of these works include the careful use of lines in the form of chasing and the type of metals used. Again shapes, colours, texture, space and forms were exhibited in the work. Principles of art like unity, harmony, emphasis, movement, dominance, repetition, balance, transition and contrast were applied in the works to add to its aesthetic qualities (Bates, 2000).

5. Fun Equipment



Figure 19: Merry-Go-Round



Figure 20: Playground slide

Figure 19 and 20 show playing equipment of which the first one is rotational merry-go-round and the second one static playground slide. They are mainly used by children. They are measured 6 by 5 feet and 6.3 by 7 feet respectively. This equipment is made of cast iron rods, square pipe and ungalvanized metal sheet. Method applied were riveting, welding, chasing, casting and embossing. Finishing processes such as grinding, filling, emerging and spraying were employed to beautify the artworks. The artwork in figure 19 shows variety of shape created by lines. Shapes formed in the artwork include circles, triangle, rectangle and oval. The artwork is designed in a cone form with six stands and four seats. The arrangement of the stands gives the artwork its balance on the floor. There are two circles centered in the artwork which are located at the upper and lower part of the artwork. They fall in place to each other in a balanced and symmetry order. The upper circle is bigger than the lower circle. The green oil paint applied on the artwork makes it more attractive.

Figure 20 also shows artwork that has three parts. The first part is the stairs made of square pipe and ungalvanized metal sheet joined at an interval to form movement and rhythm with a balustrade at both sides. The second part is a rectangular shape seater made of square pipe and ungalvanized metal sheet. It has a balustrade at both sides to prevent falling. The third part is a slope outlet channel constructed using square pipe and ungalvanized metal sheet. The artwork allows climbing, sitting and sliding down for fun.

Aesthetic values and pleasure can be appreciated in how the seat is balanced in the middle of the artwork. The use of the square pipe creating lines and shapes. The oil paint colour and the triangular form of shape all adds to what the artworks look like.

Aesthetically the works possesses variety of qualities that talks about aesthetics and what makes artworks look good based on a philosophy worth understanding by the society.

6. Working Tool



Figure 21: Axe, chisel and claw spanner

Figure 21 displays images of an axe, chisel and claw bar. They are all cast iron metal fabricated to help the purpose of tooling. Forging and casting were the processes used in producing the tools in Figure 21. They measure 1.2 by 0.8 ft., 1.4 by 0.1 ft. and 1.8 by 0.3 ft. respectively. Carpenters, masons, steel benders, metal fabricators and technical vocation workers are those that make most use of these tools. Aesthetic value of these works lies in their usage and shaping of the tools, its natural colour, their forms and textures seen in the works. Proportional location of the claws at both end, movement in the spiral design that is run on the trunk of the spanner, harmony between the usage of the tool and the cast iron material and balancing in the material distribution of the axe which are wood and cast iron were some of the aesthetic qualities that were exhibited in the artworks.

7. Specialized Metal Fabrication Processing Areas

Three metal design and fabrication processes were uncovered as the most applied metal forming technique used by the metal design and fabricators in the Wa municipality. These are: casting process, welding process and simple application of mechanical force or non-application of heat process.

According to (*"Metalcasting," n.d.*) casting is the process in which molten metal flows by gravity or other force into a mold where it solidifies in the shape of the mold cavity. The term casting also applies to the part made in the process. Steps in casting seem simple: melt the metal, pour it into a mold and let it freeze. In Wa municipality, 7 respondents constituting 6.14% of the population of study use casting processing in fabricating their metal design and fabrication works. Metal design works produced under this process include metal pot, metal pan for grinding, improvised tools, farm implement and others.

Welding was also identified as one of the most applied fabrication process in Wa municipality. Langland (1999) characterized welding as a process used to assemble pieces of metal together. It is also used to fill holes and build up depressed areas. Welding is a fabrication process that joins materials, usually metals or thermoplastics, by causing coalescence. This is often done by melting the work pieces and adding a filler material to form a pool of molten material that cools to become a strong joint, but sometimes pressure is used in conjunction with heat, or by itself, to produce the weld (Allen, 2009). The study recorded 84.21% making up of 96 respondents who produce metal design and fabrication work by using welding process. Key among items produced are gates, burglarproof, water tanks, shelves, coal pots just to mention a few.

There are other ways of forming metal into finished product without applying heat. In this process riveting, bolting and adhesive substance like epoxy resins, anaerobic or acrylic adhesives play major role. McGrath (1995) identifies riveting as a permanent mechanical fastener. It is a useful way of joining pieces of metal with another piece of metal, wood or plastic. Before being installed, a rivet consists of a smooth cylindrical shaft with a head on one end. The end opposite the head is called the buck-tail.

On installation the rivet is placed in a punched or drilled hole, and the tail is upset, or bucked (i.e., deformed), so that it expands to about 1.5 times the original shaft diameter, holding the rivet in place. To distinguish between the two ends of the rivet, the original head is called the factory head and the deformed end is called the shop head or buck-tail.

Bolting is a fastening method using a threaded pin or rod with a head at one end (bolt), designed to be inserted through holes in assembled parts and secured by a mated nut, that is tightened by applying torque (*"Metal joining processes," n.d.*) Adhesive is to coat with glue, paste, mastic, or other sticky substance: adhesive bandages or sticking fast; sticky; clinging (Dictionary.com). By this process of simple application of mechanical force which is non-application of heat, 9.64% making up of 11 respondents engaged in it. They produced metal design and fabricated works like pans for pastries and other baking accessories, funnel and non-liquid containers.

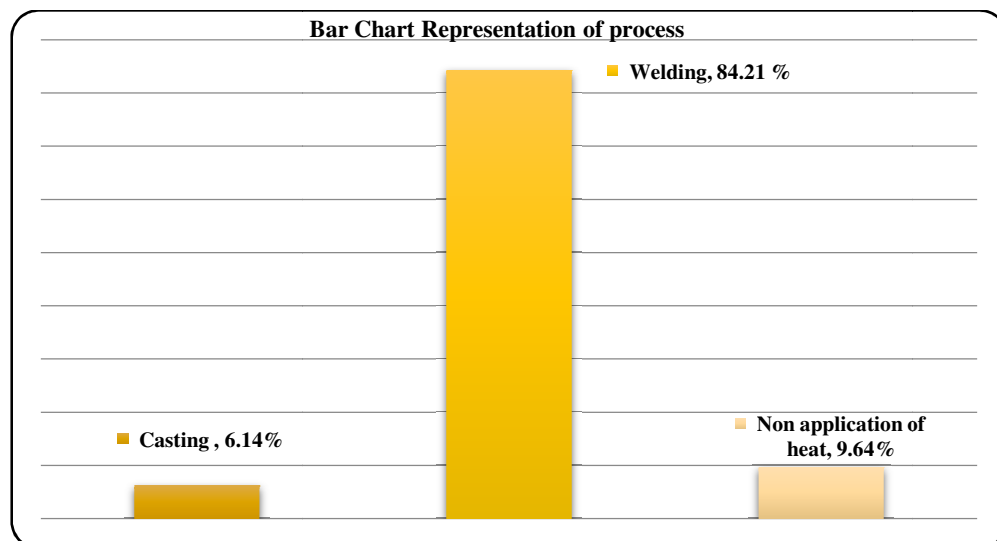


Figure 22: Bar chart representation of identified process used by metal design and fabricators in Wa Municipal

The research discovered 6.14% of the artworks as casting or had casting component on them. The research also identified 84.21% welding artworks and 9.64% of non-application of heat artworks (were also identified) as can be seen in figure 22.

8. Implications for Art Education

The best way to reach out to a group of people in order to help preserve their culture for posterity is by deciphering their art forms, particularly their metal design and fabrication works as in this study. Through this, the researchers have been able to unearth valuable information on the cultural practices of the people particularly in the area of the kind of metalworks they appreciate. The interpretation of the information will also help the modern day artists to produce metal design and fabrication works for the said societies by incorporating the essence of their culture although a slightly different material and technique will be used.

Art Education is the process of learning about one's environment through the senses of touch, feel, sight, smell and taste. In other words, it teaches one's cognitive skills to enable them appreciate the art forms and help them to make reasonable judgements about them. Tolstoy (1962), emphasized that human life is filled with works of art of every kind that gives aesthetic pleasure. In a situation where there is a lack of adequate information, especially on metal design and fabrication in the Upper West Region of Ghana, documenting metal design and fabrication works have positive implications for art education because it provides students, teachers and researchers the opportunity to learn about the various art forms, the principles of design such as balance, contrast, rhythm, variety, proportion, contrast, composition, opposition, movement, repetition, dominance, unity, harmony and emphasis. There are also elements of art such as shape, space, form, colour, line and texture. It also provides the public exposure in the proper use of the elements of design such as lines, dots and space in order to come out with their own designs in art work.

Students in Wa Polytechnic, University of Development Studies (UDS), and other institutions as well as researchers in the Upper West Region and across the country offering art and art related courses would have the opportunity of learning various art facets, the kinds of art works produced, materials employed and the purpose they serve.

9. Conclusion

There are variety of metal design and fabrication works produced across the globe. Ghana has had her fair share of these numerous types of metal design and fabrication works. In Ghana the business industries are concentrated mostly in the southern sector of the country. This is no different from the metal design and fabrication industries in Ghana.

The southern areas of Ghana like Accra and Kumasi can boast of enormous metal design and fabrication works and high categorical level of machinery. The situation is far different in the northern part of the country specifically, the Upper West Region. Respectively and distinctively the study unveils six different categories of works. The researchers appreciated the fact that certain elements of metal design and fabricated works are missing in the study due to the production orientation in Wa municipality particularly jewellery fabrication. The study can state that irrespective of tools and machinery deficit, metal design and fabricators have an excellent chance of meeting high standard of works produced internationally. Metal fabricators are specifically familiar with Edifice and Security complement, Agricultural and hound equipment and Temporary Office/ Shade and Storage Structure but not in the area of body adornment such as jewellery works which is a major area of the metal design and fabrication industry and more so when the region has a lot of gold mining sites.

10. Recommendation

The study recommended improvement in machinery and a high level of knowledge in the area of work. With the introduction of Industrial Art programme which includes Metal Design and Fabrication, the department should be holding a full and refresher courses for all the metal design and fabricators and prospect metal design and fabricators in the Upper West Region. Fabricators should endeavour to produce decorative art works for body adornment such as jewellery, offices, homes and the environment. Choice of

metal materials must be widened to meet recommended new area of works. Government support should be provided to assist formal structuring of the administrative work of the Metal Design and Fabrication Association and their works in the region.

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