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THE USE OF INDIGENOUS SYMBOL DESIGN CONCEPT AS A TYPE STYLE FOR FABRICATION OF DISTINCTIVE JEWELLERY TOOL RACK

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Abstract

The contribution of tools in producing jewellery cannot be over emphasized. In the situation where tools used at the workshop lack the proper place to keep them, they get damaged easily and sometimes not in sight when in need. Production of jewellery items or other forms of work becomes difficult such as tool searching, wrong improvisation of tool usage, time wasting among others when tools are not kept in their proper place. This situation is no different from what the Industrial Art department of the Dr. Hilla Limann Technical University workshop is experiencing. In order to address this problem the study seeks to use Waala and Dagaare indigenous symbols as a source of design concept to produce a customized jewellery tool rack to serve as a jewellery tool keeping device and also enlighten the people on the culture of the Upper West region. This study aimed at identifying and discussing types of tool racks, designing a customized jewellery tool rack using indigenous symbols as the source of idea and producing a customized jewellery tool rack. Descriptive survey and studio-based research approaches were used to outline the processes and methods applied in the study. Purposive and simple random sampling techniques were used to sample jewellery and metal design students (30), technicians (5), lecturers (10), and metal design fabricators (20). A total of 65 participants responded to this study. There were five different indigenous symbols integrated in the final production. Doming, embossing, repousse, piercing, chasing, forging and welding were the fabrication processes employed in this study which were unique in terms of tool rack fabrication. The material used was a combination of aluminum sheet, ungalvanised square pipe and zinc sheet. The study recommends indigenous symbols from different cultures to be used for this type of jewellery tool rack and other much needed items in the workshop so as to give attention to the symbols and in return preserve our culture. Academic institutions should give attention to safe keeping of tools for efficient use by using tool racks purposely for specific tools. Exploration of other materials and techniques for new outcome was also recommended.

Keywords: Decorative, Finishing, Jewellery, Symbol, Tool racks

INTRODUCTION

Jewellery is admired for its aesthetics and the worth of its components (Guter, 2010). It is made by craftsmen including goldsmiths, silversmiths, metalsmiths, metal product designers, gemologists, lapidaries among others with the use of dedicated tools. McGrath (2005) described a tool as a device used to do a defined task, especially one that is held in the hand. Given their importance, tools must be stored securely. The tools used determine whether art creation turns out successfully or not. Regardless of size, effective jewellery tool storage is crucial for good production and well-organized workshop (McCreight, 2004). It can help save time and increase the tool's lifespan. One of the major means of keeping jewellery tools safe and secure is the use of tool racks. A tool rack is a container used to store or arrange tools such that they are easily recognized, retrieved, and

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maintained securely. A number of tools may be kept on a tool rack. It is thought that a resourceful sailor from the 18th century created the first racking. He created the most basic holding structure for a wide variety of tools. The designs of tool racks today are more complex and sophisticated than those from the 18th century. These are complete design works that enhance the area or workplace's aesthetics and usefulness (Diaconu, 2017).

When working on their artefacts, artisans, craftsmen, lecturers, students, and apprentices must practice good tool handling, and to do that, it is essential to constantly keep tools safely in the things that are readily available and will help to retain tools effectively safe (Nagyszalanczy, 2001). However, it has been noted that certain essential items, particularly tool racks, that could help students at Dr. Hilla Limann Technical University's (DHLTU) Industrial Art Department keep tools efficiently are not available. Based on this background, the researchers aimed to investigate how to produce unique jewellery tool rack by exploring ideas and concepts from indigenous Waala and Dagaaba symbols and using decorative techniques in metal product design to produce a finished jewellery tool rack usable in jewellery workshops.

Jewellery Tool Rack as the Bed Rock of Production

An exposed container used to store and arrange tools so they are simple to spot, find, and keep secure is termed tool rack. You can safely keep or store a range of tools on a tool rack (Sharmie, 2023). A tool rack may be wall-designed or a free stand. These free-standing or wall-mounted devices may be suited for general usage or intended for use with a particular tool type in mind. Additionally, tool racks may be made to accommodate a variety of tool types or be multifunctional. The shape, size, fabrication materials, and features of tool racks vary (Cacha, 1999). Tool racks come in a variety of sizes and forms, just like tool trays. With the help of garage and tool organizers, tools can be stored on wallboards rather than counters. Metal hooks, various panels, and plastic pegboards are among the features of tool organizer. The form, scale, colour, and hardware accents of tool rack organizers can also vary. J-hooks are wall-mounted hooks in the J form that are useful for storing wires, hoses, and portable equipment. U-hooks with extended arms may hold larger things and have feet to secure tools.

The installation of tool holders in the form of a funnel on a rail may cause them to slide. According to Snyder (2020), hammers and wrenches are kept on tool racks with wave hooks or slot hooks. These days, tool racks are created for a variety of practical reasons, including decoration, safety, space management, and tool maintenance (Bray, 2003). However, a variety of ideas can be derived from various concepts to produce a tool rack, and in this case, the researchers want to research into producing a unique jewellery tool rack driving ideas and concepts from the indigenous symbols of Waala and Dagaare by way of exploring them to make this production. The production is to serve decoration, tool safety, workbench space management and culture preservation purposes while giving a new trend of tool rack to the jewellery and art industry.

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Type of tool racks

A tool rack is a storage device that is often composed of a robust material. Similar to shelves, racks come in a variety of sizes and shapes. Bray (2003) suggested that racks are becoming more and more common in the industrial world because of how well they serve storage and industrial needs. The three main types of racks, which are utilized in a wide range of settings and circumstances, are listed below in Figure 1 to 3.

Open frame racks

These are open frames without sides or doors; however, they do have mounting rails. When the rack does not need to provide physical security or airflow, they are often used for simple tools as seen in Figure 1. Open frame racks work well for lightweight hand tools and other portable powered devices. This kind of rack can be installed on walls, the ground, or work surfaces like tables (Snyder, 2020).

Figure 1. Open frame type of tool rack with tools in it.

Rack enclosures

They typically include four adjustable vertical mounting rails (posts), front and rear doors, and removable side panels as seen in Figure 2. They go by the name rack cabinets as well. The front and back doors are often vented to promote enough circulation through any fitted equipment from front to back. According to Bray (2003) and Snyder (2020), rack enclosures are perfect for situations that call for larger tools or equipment.

Figure 2. A type of rack enclosure

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Wall-mount racks

They can fit in places where other racks cannot since they are made to be mounted to the wall, conserving space on the floor. See Figure 3. They might be closed cabinets or open frame racks. They typically do not sustain as much weight and are smaller than their floor-standing counterparts (Cho, 2013). The research focuses on wall-mount types of racks because of their characteristics, components, and advantages over the others, based on a fair understanding of the many forms of tool racks.

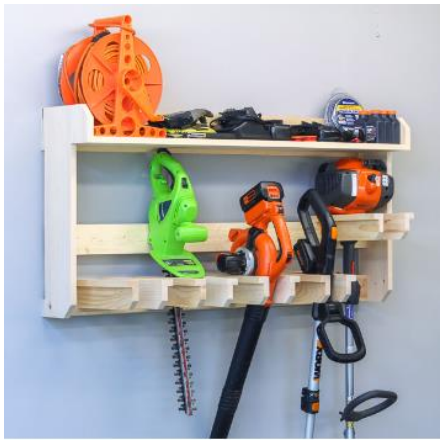

Figure 3. A type of wall-mount rack

Materials for tool rack production

Typically, tool racks are fabricated with wood, and or plastic and to some extent metal. The optimal material for ones purposes must be carefully considered because each of these materials has advantages and disadvantages. For instance, wood is strong and light, but it may need upkeep if exposed to certain elements. On the other hand, plastic is significantly more economical, but it could not be sturdy enough to support larger tools and equipment. Additionally strong and long-lasting, metallic racks can support the weight of various heavy and light tools and equipment (Ashby, Hugh & David, 2007).

Type of materials usable in fabricating tool rack

McCreight (2004) opines that metal is any member of a class of substances that exhibits strong electrical and thermal conductivity, as well as malleability, ductility, and highlight reflection. In addition to being ductile (able to be pulled into a thin wire) and fusible (able to be fused or melted), metals may also be crushed and hammered permanently out of shape without breaking or cracking. Metals come in two varieties: ferrous metals and non-ferrous metals (Russell & Lee, 2005). These properties and characteristics make metal one of the suitable materials to use in tool rack production.

On the other hand, Ek, Gellerstedt, and Henriksson (2009) argued that trees and other woody plants have wood in their stems and roots, which is a structural tissue. It is an organic substance made of naturally occurring cellulose fibers embedded in a lignin matrix that is resistant to compression and strong in tension (Hoadley, 2000). When it comes to

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tool rack fabrication, wood offers a few advantages over metal and plastic. Specifically, it may be worked with ease, is frequently reasonably priced, and has a pretty high thermal insulating property.

Polymers are the primary constituents of a broad variety of synthetic or semi-synthetic materials that are referred to as plastics. Plastics may be molded, extruded, or pressed into solid objects of a variety of shapes, thanks to their plasticity. Its extensive use is a result of its adaptability as well as a host of other qualities, including being lightweight, strong, flexible, and reasonably priced to create. Most plastics are produced using industrial human systems (Psillos & Kariotoglou, 2015). However, plastics are most commonly used as packaging materials, but they are also used in a wide range of other industries, such as electronics, consumer goods, textiles among others. Other materials such as cane, bamboo, leather, fabric, foam, plaster of paris among others can be integrated as complementary materials for tool racks (Binggeli, 2013). In this study, non-ferrous and ferrous metals were integrated to produce a modern jewellery tool rack.

Indigenous Symbols as a means of educating the public

Indigenous symbols as explained by Kquofi, Amate, and Tabi-Agyei (2013), portray popular sayings and maxims, historical occurrences, certain attitudes or behaviors associated with the figures they represent, or ideas specifically linked to abstract shapes. Indigenous symbols can be spiritual or religious, or they can stand for the ideology or tenets of a culture's language, customs, and values. Signs, emblems, firm motions, animals, and other natural items can all be used as sources of indigenous symbols. Majority of indigenous symbols are nonverbal depictions of proverbs, parables, and maxims that reflect the way of life and philosophical beliefs of a specific community (Tetteh, Dansieh, & Adom, 2022). People can make sense of the world using symbols including words, gestures, signs, objects, and signals. They communicate identifiable meanings that are shared by cultures, which offers hints for comprehending experiences (Adom, Chukwuere, Addo, Tabi-Agyei, & Thulla, 2021). Language is among the most widely used indigenous symbols. For instance, the sounds of a particular spoken language are represented by the letters in an alphabet. They make it possible for people to communicate ideas clearly and concisely without giving long explanations (Agbo, 2009). Indigenous symbols can make interpretation of signs and symbols thoughts and concepts simple to understand. They can aid in information simplification and aid in the retention of crucial knowledge.

Humans are constantly trying to make sense of the environment around them, both consciously and unconsciously through indigenous symbols. Creating examples of indigenous symbols that could be used as decorations on buildings and other prominent locations in the community is one effective way to provide this kind of cultural education (Asante, Adom, & Arthur, 2017). These symbols have philosophical underpinnings that support the ideologies, norms, and beliefs (Agbo, 1999). The study found that the rich cultural legacy of Ghanaians, which is being rapidly supplanted and diluted by foreign culture, may be greatly enhanced by the display of Waala and Dagaare indigenous symbols as the source of idea for jewellery tool rack fabrication.

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Elements and principles of design used in jewellery tool rack composition

Amenuke (1995) elaborated design as a plan or specification for the creation of an object or system, or for carrying out a task, activity, or procedure. Design can take the form of a prototype, finished work, or method. The process of creating a design is expressed by the outcome of a finished work. In general, design must meet predetermined objectives and fabrication requirements; it may also consider aesthetic, functional, or socio-economic factors; and it must interact with its surroundings (White, 2011). In any form of design, two components must come together to bring out a representation. These components are elements of art and principles of design. Every artwork must be recognized by these components. In this study, these components were clearly defined and used or served as a guide in the production.

Shape, colour, space, form, line, dot, value, and texture are among the essential components of elements of art. According to Adom, (2014), the building blocks that a visual artist employs to create a successful composition is elements of art.

Principles of design serve as a designer's roadmap for producing an engaging and eye-catching composition (Adom, 2014). The fundamental principles of design include emphasis, proportion, contrast, balance, repetition, and movement.

Fabrication techniques applicable in producing jewellery tool rack

Three fundamental techniques such as cutting, bending, and assembling can be used to summarize the numerous fabrication processes involved in studio work or manufacturing in metal artwork (Higher Still, 1999). These are

Cutting: Metal sheet or metal must be cut in accordance with the production's exact specifications. Expert fabricators employ a variety of methods for this procedure. In this study, piercing, sawing, and chiseling were employed.

Bending: It can be necessary to bend a metal sheet into shape after it has been cut. One can use equipment or hands to bend. Methods such as folding, embossing, and repousse were used to bend the metal but also served as decoration techniques.

Assembling: The cut and formed metal sheet can be incorporated into a bigger assembly. This can be accomplished by soldering, welding, riveting, or by using alternative fasteners like glue, screws, or crimp seams. The first three methods were employed in this production.

Decorative and Finishing Techniques in fabricating Metal Sheet

McCreight (2004) defines metal surface decoration as the process of applying various techniques to a metal surface in order to enhance and protect it. He outlines some of the decoration techniques to be etching, embossing, repousse, chasing, and engraving. All these techniques are applicable in jewellery production and other metal product design. According to McGrath (2005) etching is the process of cutting a design intaglio into the exposed metal surface using a strong acid or mordant.

The use of a blunt point and hammer to depress the surface along a desired line without removing any metal is chasing, or to remove a narrow fillet of metal, using a

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cutting tool is called engraving. Repousse is described as a metalworking technique in which a flexible metal is hammered from the reverse side to create a low-relief design. Another technique used in the study is embossing. This metalworking process involves hammering the piece on the front side, which sinks the design's negative portions and leaves the image raised above the metal surface.

CBI Colofon (2014) brought to fore that finishing entails changing a manifested part's surface to give it the desired look, facilitate bonding, or increase durability. A complete jewellery or metal product design works are emphasized by the application of finishing techniques. Sanding, polishing, buffing, lacquering, painting, spraying are a few finishing processes.

Tools and Equipment used in tool rack fabrication

Bray (2003) and Sharmie (2023) define metal fabrication tools as instruments used to create metal products or parts. They can include things like metal cutting saws, beveling tools, shears, drills, punches, hammers, chisels, pliers, files, and many more, though they will vary depending on the material being fabricated (Cho, 2013). Any tangible object that may be utilized to accomplish a task—especially if it is not destroyed in the process—is considered a tool. Different names for tools that are employed in specific fields or occupations include instruments, utensils, implements, machines, devices, or apparatus. Equipment is the collection of tools necessary to accomplish a work. Technology is the expertise of creating, acquiring, and employing tools (Snyder, 2020). In this research, various tools and equipment were used to achieve the objective of the research. These include tape measure, cutter, brush, chasing tool, jeweller's saw and blade, hammer, mallet, hand file, chisel, square, hacksaw, magnetic square, hand drilling machine, riveting machine, cutting shear, oxy-acetylene machine, hand grinding machine, arc welding machine, bench vice, and anvil.

METHODS

Research Design

The tactics, procedures, and techniques used in the gathering of data or evidence for analysis in order to unearth new information or develop a deeper understanding of a topic are described as research design (Research Guides, 2023). Diverse research methodologies employ distinct instruments for gathering data. The study used a qualitative and quantitative research approach that included studio-based and descriptive survey research for both the production and population of the study (Creswell & Creswell, 2018). Studio-based research is a relatively new and emerging form of study that is usually carried out by individuals who are involved in artistic and creative undertakings (Given, 2008). It helps explain activities and examine how or why things have extents. Similar to any other type of research, studio-based research uses creative visual art to advance science. The two phases of the research process that are employed in the inquiry studio are the data generation phase and the artwork phase (Marshall, 2010). Descriptive survey research is a type of descriptive research that gives you accurate and relevant information by combining

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quantitative and qualitative data. Using a descriptive survey design puts the participants at the center of the research goal and saves a lot of time. It describes or examines characteristics of phenomena. It helps in gaining detailed information on particular subjects (https://www.voxco.com/blog/descriptive-survey-design).

Population for the study

A group taken into account for a study or statistical analysis is known as the study population. The human population is not the only population under study. It is a collection of features that have similar characteristics (Leedy & Ormrod, 2005). There can be several things inside a group, such as measures, creatures, objects, etc. The study's target demographic consisted of students, technicians, lecturers, and metal design fabricators within the Wa Municipality who utilize tools in their daily operations. The participants in the study were sixty-five (65) in number.

Sample and Sampling Procedure

The Dr. Hilla Limann Technical University and other metal design fabrication departments in the Wa Municipality provided the students, technicians, lecturers, individuals and organizations that made up the sample and sample size for this study. The indigenous insignia of the Waala and Dagaare, (Tetteh, Dansieh, & Adom, 2022), received a lot of attention in the process of sampling and data collection. Purposive and simple random sampling were the methods of sampling applied. The overall number of DHLTU industrial art department students sampled was thirty (30), technicians five (5), the total number of lecturers ten (10), and the total number of fabricators in town that the researchers contacted for information was twenty (20).

There were 65 possible participants in all for this study. Out of 35 students, a sample size of 30 was determined using the Raosoft Online Sample Size Calculator with a 95% confidence level and a 5% margin of error. The same process was used once more to produce a sample size of 5 technicians out of a total of 7 technicians, 10 lecturers out of a total of 12, and 20 masters of metal design fabricators out of 40. The samples had a margin of error of 5% and a confidence level of 95%. The sample for the study was chosen using a combination of non-probability (purposive) and probability (simple random) sampling procedures. Purposive sampling was employed to sample students, technicians, and lecturers, whereas simple random sampling was utilized to choose metal design fabricators.

Data Collection Instrument

The research included a combination of questionnaires, interviews, and observations as data-gathering methods (Leedy & Ormrod, 2005). Close ended questionnaire was used to get the perspectives of students in respect of the role of jewellery tool rack in producing jewellery items and how indigenous symbols can be used as a source of idea in designing a jewellery tool rack. It was also used to solicit how a customized jewellery tool rack be produced with distinction. Unstructured interviews were conducted by the researchers on technicians, lecturers and metal design fabricators, in addition to participation observation

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in the processes employed in the study. Every respondent expressed a willingness to communicate with the researchers and provide pertinent information related to the study. Interviews were done with each respondent at their place of work and studio. There was a translator for those who could not read and write. The interviews were recorded on a cell phone. In addition, notes were made to document the important points.

Pilot Testing of Research Instrument

The questionnaire was pilot tested with some of the students before it was administered. When the data were analyzed using the Pearson Correlation Coefficient, a reliability coefficient of 0.77 was obtained, indicating that the items were cohesive in defining the study's framework. The interview guide was not pilot tested because the findings from the questionnaire's pilot testing formed the basis for evaluating the value of the interview instruments.

Data Analysis Procedure

To help with the research, descriptive statistics of means, percentages, and frequencies were used. The Statistical Package for Social Sciences (SPSS) was utilized to assess statistical significance through the Pearson Product Moment Correlation. Microsoft Excel was utilized to create tables appropriately to show the data. Vivid descriptions of the pertinent topics that arose in the study were utilized in the content analysis of the qualitative data.

Questionnaire answered by students

To obtain tangible information about tool racks and how important they are to every workshop, Industrial art department students of the Dr. Hilla Limann Technical University were taken through a series of strategized questions to seek their opinion about tool racks as stated in the research question of the study.

Table 1. Socio-Demographic Characteristics of Respondents

Variables		Frequency	Percentage %	Valid
Gender of respondent	Male	23	77	77
	Female	7	23	23
Total		**30**	**100**	**100**

Source: *Field Survey, 2023*

Table 2.1 shows the gender distribution of students who took part in the research. The total frequency was 30 students of which 77% were male with a frequency of 23. The female respondents sum up to a total number of 7 out of 30 which is 23%. The data indicated that male students were the dominating respondents among the students.

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Table 2. Are you okay with the ways tools are kept in the Industrial Art Department?

Variables		Frequency	Percentage %	Valid
Respondent	Yes	2	7	7
	No	28	93	93
Total		**30**	**100**	**100**

Source: Field Survey, 2023

Table 2.2 contains data about the number of students who responded to the above question in which 7% with the frequency of 2 of the total respondents, which is 30 responded yes. The students who said no recorded 93% with a frequency of 28 of the total respondents.

Table 3. Indigenous symbols can be used as a source of idea in designing a tool rack?

Variables		Frequency	Percentage %	Valid
Respondent	Yes	30	100	100
	No	0	0	0
Total		**30**	**100**	**100**

Source: *Field Survey, 2023*

Table 2.3 shows data on the number of students who agreed that indigenous symbols can be used as a source of idea in designing a tool rack. 100% with the frequency of 30 of the total respondents said yes. No students said no representing 0% with the frequency of 0 of the total respondents which is 30.

Table 4. Customized tool rack can be produced with a distinction?

Variables		Frequency	Percentage %	Valid
Respondent	Yes	29	97	97
	No	1	3	3
Total		**30**	**100**	**100**

Source: *Field Survey, 2023*

Table 2.4 represents the data collected from students who responded yes or no to whether or not customized tool rack can be produced with a distinction. Twenty-nine (29)

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students responded yes representing 97% of the total number of students which is 30 while 1 student out of the 30 said no representing 3%.

Processes used for production

This section was centered on the practical innovation aspect of the study. This includes identification of already existing tool rack, identification of the Waala and Dagaare indigenous symbols, sketches of the composed designs, prototype construction, embossing, cutting, assembling, welding and spraying techniques and methods that the researchers used to complete the finished work of the customized jewellery tool rack.

Identification of already existing tool rack

A study was conducted to determine the many kinds of tool racks that are now in use, as well as their characteristics, materials of construction, manufacturing processes, and final product appearance. Seen Figure 4. These made it possible for the researchers to produce a metallic jewellery tool rack that differs greatly from the previous models in terms of features and components.

Figure 4. Types of tool racks available

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Identification of the Waala and Dagaare indigenous symbols

The various types of Waala and Dagaare indigenous symbols were identified. This helped the researchers to consider the shapes and forms of those that could best suit the design of a tool rack. The researchers considered 14 indigenous symbols as seen in Figure 5 to 18 but selected 5 of the symbols to use for the production.

Figure 5. Paahibu maŋ waani taabɔ (Inclusiveness)

Figure 6. Kanyiri kye be (Impatience)

Figure 7. Yelmeŋa ba soɔgla (truth cannot be hidden)

Figure 8. Ba-esiri (unexpected)

Figure 9. Su-di (Forgiveness)

Figure 10. Belinbu (deceit)

Figure 11. Yelkpeeŋaa (Difficulty)

Figure 12. Dannyetaa maŋ wuli yenyelbagu (Experience)

Figure 13. Daaŋ nyaataa (experience)

Selected indigenous symbols used as a source of idea for design composition

Shapes, lines, dots, texture representation, aesthetic outlook, and philosophical meaning influenced the choice of the indigenous symbols selected in Figure 14 to 18.

Figure 14.Baŋ-emeŋa (carefulness)

Figure 15. Daŋ-taa (life is not a race)

Figure 16. Su-beu (Bad temper)

Figure 17. Yel zaa ni o san yɔɔ la (Whatever you do comes with reward)

Figure 18. Saanbu (Danger is looming)

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Drawings of the composed design

Drawings were made out of the selected Waala and Dagaare indigenous symbols to compose a customized jewellery tool rack. This is visible in Figure 19 to 21

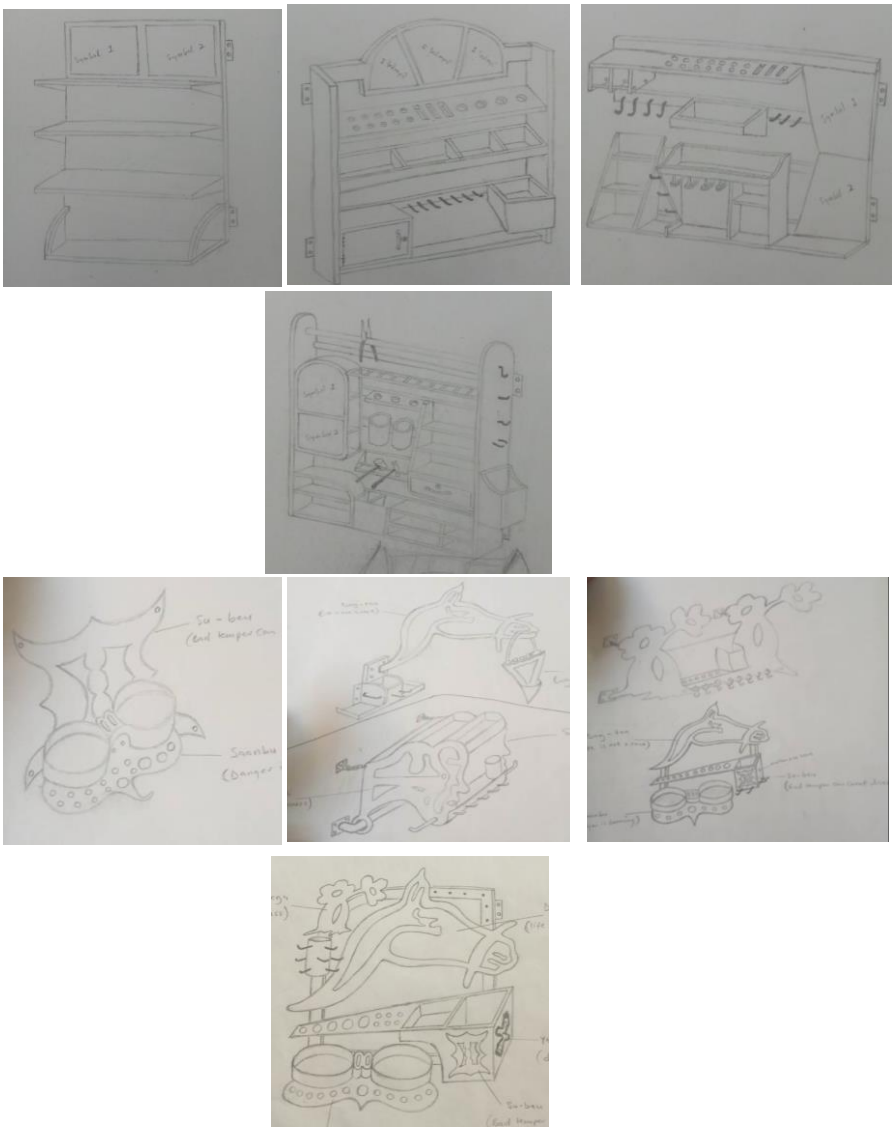

Figure 19. Drawings of tool rack design composed from from Waala and Dagaare indigenous symbols

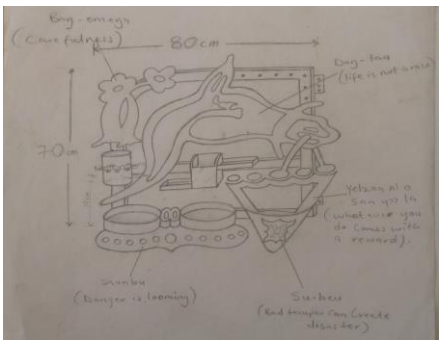

Figure 20. Final tool rack design selected

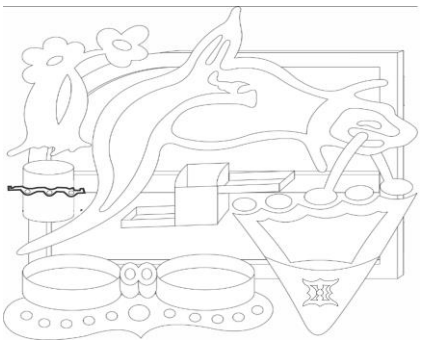

Figure 21. Computer rendered work of the selected design to be fabricated

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Prototype construction

Hard cards were used to replicate a three-dimensional prototype of the selected design of the jewellery tool rack in the required dimension. The most important advantage of making this prototype was to simulate the real and future product and improve the overall understanding of the design as seen Figure 22 and 23.

Figure 22. Prototype completely assembled

Figure 23. Complete prototype of the tool rack

Metal Fabrication of Jewellery Tool Rack

The actual rendering of the work in metal followed the creation of the prototype which served as the basis for this segment. The prototype was used to obtain the measurements for each component, which were then used to create the metallic jewellery tool rack using a variety of processes such as cutting, bending, and assembling.

Material preparation and transfer of design on its surface

The required sizes of the main material which is aluminum sheet was prepared for the production by straightening and filling the edges. The elements and components of the design of the tool rack were transferred on paper using the required sizes taken from the prototype and glued onto the prepared aluminum sheet to get outlines for embossing and cutting. Areas that needed to be embossed were indented to appear in relief form on the metal surface by the use of chasing tools. See Figure 24 to 29 for pictorial data.

Figure 24. Preparation of the aluminum metal plate

Figure 25. Application of the glue on the metal surface

Figure 26. The paper containing the drawing was pasted on the metal by the researchers

Figure 27. Indenting areas to embosse the symbol

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Figure 28. Embossing the design on the metal surface

Figure 29. Chasing around the embossed areas

Cutting, folding and bending of the aluminum sheet

The embossed shapes and other areas of the design were cut out from the aluminum sheet using tools such as, chisel, jeweller's saw, hammer and cutting shear. After the parts were cut, folding and bending was applied to the containing parts of the unfinished tool rack to get their required shapes as seen in Figure 30 to 35.

Figure 30. Creating outline around the Baŋ-emeŋa for cutting

Figure 31. Marking around the Daŋ-taa symbol for cutting

Figure 32. Cutting out the embossed Daŋ-taa symbol from the parent material

Figure 33. Cutting of the cup-like parts

Figure 34. Cut out shape of the Daŋ-taa symbol

Figure 35. Cut shape of the Baŋ-emeŋa symbol

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Joining and welding

The separate parts of the containers were joined using the acetylene welding method. The edges were filed after the welding process to ensure a smooth surface. Unwanted holes and dents of the entire components of the work were filled with filler and carefully sanded. See Figure 36 to 39.

Figure 36. Soldering to connect the various parts of the central container

Figure 37. Soldering the joint of the circular parts of the Saanbu symbol

Figure 38. Welding the various parts of the Saanbu symbol

Figure 39. Soldering the back of the cup-like container

Frame Construction

A 1-inch by 1.5 inches rectangular ungalvanised square pipe was selected for the construction of the frame of the tool rack. Accurate dimensions were taken from the prototype and marked on the square pipe to facilitate accuracy for cutting. The sized square pipes were assembled by bending and folding to their required angles and curves and welded to permanently join them. Filler was applied to cover and fill pores, holes and dents on the metal frame and sanded to ensure a smooth surface as shown in Figure 40 to 47.

Figure 40. 1’ x 2’’ metal square pipe for the frame

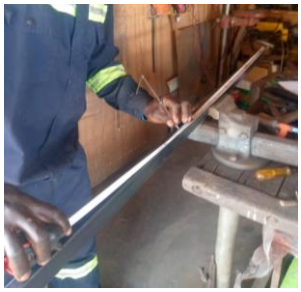

Figure 41. Measuring and marking areas to be cut

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Figure 42. Cutting the marked parts of the frame

Figure 43. Separate parts of the frame

Figure 44. Using a magnetic tool to hold the angles of the frame accurately for welding

Figure 45. Welding to join the joints

Figure 46. Welding the curved part of the frame

Figure 47. Sanding the curved part of the frame

Covering the back of the fabricated work

The general components of the tool rack were assembled on the frame. The researchers noticed that the embossed metal parts would not be strong enough without a cover at their backs. In this case, the researchers used zinc sheet to cover the back of the embossed work. The zinc metal was less costly and lightweight. The embossed parts were placed on the straightened zinc sheet and traced to get outlines to be cut and riveted onto the back of the embossed metal parts.

Finishing of the jewellery tool rack

The finishing processes applied in the fabrication of the jewellery tool rack were grinding, filing, sanding, spraying and drying.

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Grinding, filing and sanding

The various parts of the components were grinded to do away with the protruded solder and electrode build-up at the edges of the work during the soldering and welding processes. Filing process was then used to give a smooth surface before sanding. Filler material was used to fill in holes and surface imperfections and sanded to ensure a smooth surface. Pictures that describe the grinding, filing and sanding processes are seen in Figure 48 to 53.

Figure 48. Grinding of the central component

Figure 49. Grinding of the Saanbu symbol

Figure 50. Filing to ensure a smooth surface

Figure 51. Mixture of the filler

Figure 52. Application of the filler

Figure 53. Sand papering of the filler

Spraying and drying

After thorough grinding, filing and sanding to achieve a smooth surface good enough to accommodate paint, the various components of the jewellery tool rack were sprayed and allowed to dry thoroughly. This can be referred to in Figure 54.

Figure 54. Spraying and drying of components

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Arrangement of components for fixing

The components of the jewellery tool rack were finally assembled and riveted onto the frame as clearly seen in Figure 55 to 58. Figure 57 and 58 shows the finished customized jewellery tool rack.

Figure 55. The researchers discussing the proportional arrangement of components on the frame for marking before riveting

Figure 56. Riveting of the various components

Figure 57. Complete jewellery tool rack

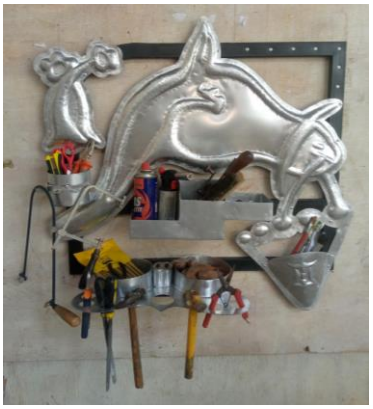

Figure 58. Mounted jewellery tool rack containing jewellery tools

Evaluation of Finished Work

The finished work was mounted on the wall and testing was conducted to verify the efficiency of it by placing variety of jewellery making tools used at the workshop on it. It was identified and observed that, the tool rack was firmly held to the wall, 4 feet from the ground as seen in Figure 58. Its placement was to make it easy to reach when working on the bench. Open frame and wall-mount rack techniques were used in the production. Over 50 hand-held jewellery tools can be accommodated on the tool rack. Although barely three months in use, observation comments from users at the Industrial art workshop border on 1) well-organized tools for jewellery making, 2) aesthetically attracting the attention of workshop users and 3) drawing attention to the design composition. The researchers believe the potential of this research work goes beyond the jewellery industry but also to promote concepts of design using indigenous symbols in promoting our culture.

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Appreciation of fabricated jewellery tool rack

Appreciation entails bringing to light the elements and principles of design in an artwork as well as the cultural and historical settings in which artistic creations were made (Gustlin & Gustlin, 2021). It is the knowledgement and understanding of the qualities that an artwork exhibits (Stecker, 2010). The jewellery tool rack under discussion in Figure 58 is made up of six components mostly derived from the Waala and Dagaare symbols and geometry shapes.

The first component to talk about is the symbol called Saanbu. Saanbu is a Waala and Dagaaba indigenous symbol which means danger is looming. This literally means the wrong approach can result in disaster. This is very much associated with jewellery making. It is believed that one must strive to do the right thing to avoid wrong outcome in jewellery production. This influenced the choice of selecting this symbol. The circular, oval shape of the symbol also created room for the researchers to develop it as a container to carry tools.

Baŋ-emeŋa (carefulness) is the second component to discuss. The literal meaning of this symbol is where your treasure is, there lies your heart. One needs to be careful with what you associate yourself with. The elements of art such as its curved shape, lines and dots aesthetically informed the researchers to identify with this symbol as a source of inspiration for the work.

Figure **59.** Daŋ-taa, Yel zaa ni o san yɔɔ la and Su-beu symbols

Figure 59 is a combination of three different symbols. The symbol Daŋ-taa (Life is not a Race). Highlights the journey of life is pursued by everybody and the final destination for both journeys is the same. This is illustrated by the horse that might run faster than the donkey. Hanging at the mouth is the symbol yel zaa ni o san yɔɔ la (Whatever you do comes with reward). This literally means what goes around comes around. On top of this symbol is the Su-beu which means if you live in a glass house do not throw stones. Bad temper can create disaster. The selection of these three symbols in-one was based on their philosophical meaning which is associated with jewellery making and also the form, shapes, texture they present, volume and shades of colour that their integration brought on board. It also gave room for creating a container to hold tools.

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Figure 60. Rectangular container

Figure 61. Cylindrical container

Figure 62. Holding frame

The selection of these three components were based on geometry shapes which was influenced by the shapes of the Waala and Dagaare indigenous symbols (Diaconu, 2017). In Figure 60 is the rectangular-shaped container made in two steps. The edges have been shaped in order not to hurt the user. Each of the containers can accommodate jewellery tools with short length. Cylindrical shaped container was fabricated as seen in Figure 61 to add to the variety of shapes and to create accommodation for all-around tools used in jewellery. Figure 62 shows the shape of the metal frame on which the components were fixed before attaching to the wall. The shape, size and division were influenced by the indigenous symbols used. The symbols together with the shapes brought on board variety, harmony, proportion, contrast, balance, movement, emphasis, repetition in lines, form, texture, colour, dot, space and shape.

RESULTS AND DISCUSSION

This section was discussed based on the objectives of the study. Greater majority of the study participants were male as shown in Table 2.1. This data is a true representation of how many males (93%) are into jewellery and metal design compared to females (7%). All the participants who were interviewed were all male. The students who responded to the questionnaire expressed dissatisfaction with the type of tool rack they are using, making it difficult for them to work effectively (See Table 2.2). The respondents believed that their indigenous symbols could be used to produce a unique jewellery tool rack that would have many advantages (see Table 2.3 and 2.4). This result enabled the researchers to search for available tool racks and afterward proceeded to the studio for practical work.

Identification and discussion of type of tool racks as the first objective made researchers had the intent to dig out available tool racks from various perspectives. The study focused on the production of a jewellery tool rack, delved into various types of existing tool racks and identified three major tool racks namely; open frame racks, rack enclosures and wall-mount racks. The identified tool rack served as the source of idea development which guided the composition of the new jewellery tool rack to bring out a new outlook which is purposeful. Basically, all the existing tool racks identified within the scope of this study are made from either wood, plastic, or metal. The study could not identify any jewellery tool rack made using indigenous symbols as a source of inspiration

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for the design. The selected materials used for this study due to their properties were aluminum sheet, ungalvanised square pipe and zinc sheet.

Objective two which was to design a customized jewellery tool rack using indigenous symbols as the source of inspiration of the study extracted its bases from the existing tool racks available as identified in objective one. The existing tool racks identified are mostly designed with regular shapes such as squares, rectangles, triangles and circular shapes. The design is either with a close lock or a non-close lock. The existing ones also aligned their design to the type of tools to be contained in the rack. Analysing the existing ones stressed the fact that a conscious effect is missing in designing a tool rack to embrace indigenous symbols and also improve its aesthetic attraction. The concept of the design was to use the visualization of the finished work to impart knowledge of the indigenous symbols (Shastri & Buza, 2017). The design of the jewellery tool rack components was drawn using the indigenous symbols of Waalas and Dagaabas. The six components of the jewellery tool rack were designed with symbols namely, Daŋ-taa, Baŋ-emeŋa, Yel zaa ni o san yɔɔ la, Su-beu and Saanbu which made the finished work to be completely different from those in existence. The design considered the fundamentals of art by using the elements and principles of design (Amenuke, 1995).

The third objective looks at how to produce a unique jewellery tool rack. To be able to come out with a successful study, the various processes, techniques, materials and tools involved in the production of a tool rack were identified. The selected materials used for this study were due to their properties such as ductility, malleability, hardness, stress response, applied force, compression, and tension. In this regard aluminum sheet, ungalvanised square pipe and zinc sheet were used. It was observed that the techniques utilized for the jewellery tool rack production were; cutting, bending and assembling. These techniques comprise piercing, sawing and chiseling; embossing, repousse, chasing and forging; soldering, welding, grinding, filing, sanding, riveting, spraying and drying. It came to light that the research work was completely different from the already existing ones in terms of techniques application at the production level and shape, form, space, symbolic features and aesthetic characteristics of the finished work.

CONCLUSION AND RECOMMENDATION

One of the main ways of improving the organization of a workshop is by using a tool rack. As a concern, responses from the research participants pointed to the fact that a jewellery tool rack is a necessity at the workshop. The study emphasizes the use of Waala and Dagaare indigenous symbols to create a unique jewellery tool rack suitable for jewellery workshops and for the safe keeping of jewellery tools. In designing the jewellery tool rack, ideas were sought from indigenous symbols and the three distinct types of tool racks identified in the study; namely open frame racks, rack enclosures and wall-mount racks. A combination of five Waala and Dagaare indigenous symbols; Daŋ-taa, Baŋ-emeŋa, Yel zaa ni o san yɔɔ la, Su-beu and Saanbu were used to design the finished work bearing in mind their philosophical meaning which will serve as enlightening users on the cultural background of the people (Shastri & Buza, 2017). This made the work different

from existing ones. The workability nature of aluminum sheet to accommodate techniques such as doming, embossing, repousse, piercing, chasing, and forging assisted in fabricating the indigenous symbol-oriented jewellery tool rack. Welding was used to fabricate the frame of the work. A close look at the finished work compared to existing ones in Figure 1 to 4 shows the uniqueness of the jewellery tool rack produced not only in outlooks but in production techniques as employed in cutting, bending and assembling.

The study recommends that academic institutions such as universities, second cycle institutions and basic education institutions that equip students with technical and vocational training should give much attention to safe keeping of tools for efficient use by using tool racks purposed for specific tools. Indigenous symbols from different cultures such as the Akans, Ga-Adangme, Ewes among others should be explored for attention-driven artwork as such tool rack, cabinet, clock just to mention a few using different techniques to serve multifaceted purposes. It is the view of the researchers that both metal, wood and plastic should be explored for the production of jewellery tool rack of this nature so as to widen the scope of techniques and methods specialization.

CONSENT

Firstly and foremost, the study placed a high priority on the secrecy of the data provided by the respondents, and considerable effort was taken to ensure that their identities remained hidden. Secondly, the respondents had access to all the information they required. A thorough explanation of the study's goal and how it will benefit them was given. As a result, the question of dishonesty was avoided. Lastly, the interview and questionnaire were conducted in a friendly environment without any form of coercion or influence.

COMPETING INTERESTS

The authors declared that there are no conflicting interests.

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