Journal of Arts & Humanities

Volume 08, Issue 04, 2019: 30-43
Article Received: 17-01-2019
Accepted: 29-01-2019
Available Online: 20-04-2019
ISSN: 2167-9045 (Print), 2167-9053 (Online)
DOI:http://dx.doi.org/10.18533/journal.v8i4.1575

Groundnut Shell (Powder) as an Alternative Sculpture Material for Fine Art: The case of Salaga Senior High School, Ghana

Kenneth Dam Sakoalia[1], Dr. Joe Adu-Agyem[2], Dr. Dorothy Akpene Amenuke[3], Benjamin Deffor[4]

ABSTRACT

The materials used for teaching sculpture in Salaga Senior High school (SHS) in Northern Ghana have mainly been clay, cement, and wood. Using only these materials comes with varied limitations. The harsh weather constraints, monotony in the use of the same materials over long periods and the inability to purchase other materials as they are expensive and inaccessible to students due to the inadequate funding in purchasing materials for studio work have been the main challenges to the effective teaching and learning of sculpture in the Salaga SHS. This necessitated an inquiry into groundnut shells which are abundant in the Salaga community and could be used as a viable sculpture material but is disposed of by burning or dumping with consequent environmental pollution. The researchers used the quasi experimental method of inquiry with selected binders to determine their suitability for modelling, casting and carving using groundnut shells. The groundnut shell powder was prepared by collecting, sorting, drying, and milling. They conducted a laboratory test for the chemical composition and toxicity of the groundnut shells. The researchers mixed the groundnut powder with selected binders in producing aesthetically pleasing modelled, cast and carved works. Findings revealed that groundnut shell (powder) is nontoxic and suitable for sculpture. Sculpture teachers and students of Salaga SHS and other Schools as well as Art tertiary institutions in Ghana are encouraged to use groundnut shell (powder) as alternate sculpting material.

Keywords: Groundnut shell (powder), modelling, casting, carving.

1. Introduction

According to archaeologists, groundnut cultivation began around 8000 years ago in the valleys of Paraguay (Nisha, (2015).South Americans started groundnut cultivation around 7500 years ago.

[1]Tutor and HOD, Department of Visual Arts, Salaga Senior High School, Ghana. Email: kdsako@yahoo.com
[2]Senior Lecturer and former HOD, Department of Educational Innovations in Science and Technology, KNUST, Ghana. Email: drjaa2@yahoo.com
[3]Lecturer, Department of Painting and Sculpture, KNUST, Ghana. Gmail: dorothyamenuke@gmail.com
[4]Tutor, WBM Zion Senior High School, Ghana. Email: Benjamin_deffor@yahoo.com

Groundnut plant reached Mexico in the first century where it spread to North America, China, and Africa (worldatlas, 2016).Ghana is ranked tenth and forth among the ten-top-biggest groundnut producing countries in the world and in Africa respectively as shown in Table 1 (Nisha, 2015; Carroll, 2016). The Northern Ghana produces more groundnuts than any other part of the country due to its climate conditions. Ninety-two percent (92%) of groundnut production originates from the Northern Ghana (Dakurugu, 2015). Salaga SHS is situated in the Northern Ghana where the climate conditions are very suitable for the cultivation of groundnuts.

Figure 1: Map of Northern Ghana showing the location of Salaga
Source: Dagbon net (2019)

Ghana is different from other groundnut producing countries such as China, Gambia and Senegal where groundnut shells are used for the production of high quality plywood and boards, fuel briquettes and high-quality charcoal respectively. In Ghana, especially Salaga and its environs, groundnut shells are usually burnt or thrown abundantly in the environment as waste which often results in environmental pollution. Similar findings have been recorded in groundnut producing countries where groundnut shell is normally burnt or dumped in the environment to deteriorate naturally (Heuzé, Thiollet, Tran, Edouard, Bastianelli, & Lebas, 2017). Some of the sculpture materials used at the Salaga SHS and other educational institutions across the country are imported and very expensive. It is also difficult transporting the materials from market centres in the cities to Salaga SHS and other schools in the Northern Ghana due to deprived road networks. Therefore, learners cannot easily afford them to practice sculpture as expected. Using materials such as clay, plaster of Paris (POP), cement and wood comes with their associated limitations. For example, clay, cement and POP works are very heavy or fragile. Also, wood carvings easily deteriorate due to weevil attack.

Consequently, there was the need for the researchers to critically examine groundnut shell (powder) as an alternative material for modelling, casting and carving at Salaga SHS since it is common, inexpensive and light in weight. The study was conducted to experiment groundnut shell (powder) with selected binders which react positively and also model, cast a board and carve sculpture works with students. The study premised on two main research questions which were:

1. What are the reactions of groundnut shell powder with the selected binders?
2. How will the bond groundnut shell powder be used to model, cast board and carve a sculpture with students in senior high school?

Table 1: The ten-top-biggest groundnut producing countries in the world

Country	Rank	Production (million metric tons)

China	1st	18.7
India	2nd	6.8
USA	3rd	4.1
Nigeria	4th	3.8
Burma	5th	2.0
Indonesia	6th	1.9
Argentina	7th	1.1
Chad	8th	0.8
Senegal	9th	0.6
Ghana	10th	0.4

Source: Nisha, 2015 and Carroll, 2016

2. Literature review

1. The Nature of Groundnut Shell

Groundnut shelling is often the second activity when processing groundnut for food. Groundnut shell usually consists of split shells with flexible amounts of complete or broken seeds. Environmental alarms have directed to an awareness in using groundnut shell for fuel, mulch, manures and for several other purposes (Heuzé et al, 2017). However, AGICO (2012) explained that groundnut shell could be used in making pellet fuels for house fireplaces, industrial biomass stoves and high quality boards for furniture production. Groundnut shell is also used for the production of gum for high quality plywood and boards for furniture and other wooden tools. Also, Sanariya (2016),Sagarjawla (2016), andKingman (1992-2016) pointed out thatpeanut shells are made up of lignin, cellulose, proteins and carbohydrates. The percentage composition of the components is protein-8.2%, lignin -28.8%, cellulose -37.0%, and carbohydrate -2.5%. Moreover, groundnut shell briquettes are strong and will not disintegrate with time or crumble while on transformation (Ajobo, 2014).

2. Uses of Groundnut Shell in Ghana and Other Parts of the World

Scientist and educator, George Washington Carver commended the value of groundnut shells as early as the 20th century (Roberts, 2017).Nervertheless, many factories are using groundnut shells to generate biomass electricity which is cheaper than hydroelectricity power(Adikin, 2017).Besides, Chaix(2012) alleged that Anthony Tabbal used disposed groundnut shell from Groundnut industries in Gambia in producing fuel briquettes. As it happened inGambia, the people of Senegal produced a high-quality charcoal from waste peanut shells to replace a more traditional, wood-derived charcoal to combat deforestation and conserve their tropical forests (Pagett, 2013).Also, Bhatta(2008) indicated that the first discarded material which is highly effective for cleaning wastewater is groundnut shell which cleans about 95 percent of the copper ions.

3. Uses of Groundnut Shell for Art Production

Danielle Jones created birds by gluing and fixing groundnut shells on suitable materials (Jones, 2017).In Ideas (2015), it also statedthat beautiful decorative flowers can be made by fixing groundnut shells and sticks with glue. The groundnut shells are fixed in a rotating manner to get the shape of flowers. Single seeded groundnut shells are used for making the leaves as shown in figure 2.

Figure 2: Flower made from groundnut shell
Source: (Ideas, 2015)

Dawn (2013) and Kirkova (2014) said Steve Casino has created amazing statuettes of his favourite celebrities by painting their likeness onto peanut shells. Casino made about thirty (30) creations from peanut shells in just five months.

Figure 3: Celebrities by Steve Casino
Source: (Dawn, 2013)

However, Steinhardt (2015) confirmed what Dawn (2013) and Kirkova (2014) said by affirming that Casino transforms groundnut shells into amazing things through a delicate painting and posing process. Casino shells groundnut without causing any damage to the shells, which he then uses as tiny canvases. The final work was finally preserved in a glass dome.

Figure 4: Boxer by Steve Casino
Source: (Steinhardt, 2015)

4. Modelling, Casting and Carving

Britannica (2017) defines modelling as the process of adding materials like clay, wax etc. bit by bit to create a model. Spatulas, scoopers or knives are used to shape the materials into desired forms. Also, the lost wax technique which was usedby pre-historic people in producing metal sculptures has to do with a special method of modeling(Encyclopædia Britannica, 2017).Lost-wax casting is a process of filling a mould from wax model with hot metal. The mould is made in such a way that the wax model is removed by means of fire leaving a hollow to be filled with hot metal substance (Britannica, Lost-wax process, 2017).Besides, Group (2017) explained casting as an act of reproducing a sculpture piece by means of pouring a slurry material into a mould. Plaster of Paris, resin, metal and plastics are the common materials used in casting. Kissi, Fening and Adom (2016) stated that African countries such as Nigeria, Ghana, and

La Côte d'Ivoire have a rich historical record for the production of artistic products using the Lost-wax technique. Agyen (2013) contends that any material can be used for carving provided it has properties that make it workable. Africans carve their works according to their beliefs and customs. In Ghana, carvings are produced for domestic, religious, social, economic, political and educational purposes. Carving tools include carving knives, gouges, chisels, mallets, and adzes (Amoh, 2009).

5. Conceptual Framework for the Study

Conceptual framework can be defined as a model adapted or adopted from an existing theory or constructed by a researcher(s) to suit a study (Adom, Hussein and Adu-Agyem, 2018). Regoniel and Patrick (2015) who also have similar opinion said conceptual framework is the researcher's understanding of how the variables in a study connect with each other. Thus, a researcher can design a suitable conceptual framework for his or her study in cases where there is no existing conceptual framework he/she can adopt or adapt for the study. The conceptual framework in this study shows how the groundnut shells were processed and used as an alternative sculpture material. The groundnut shells were processed into powder form before bonding with the selected binders for modelling, casting and carving of the sculpture works.

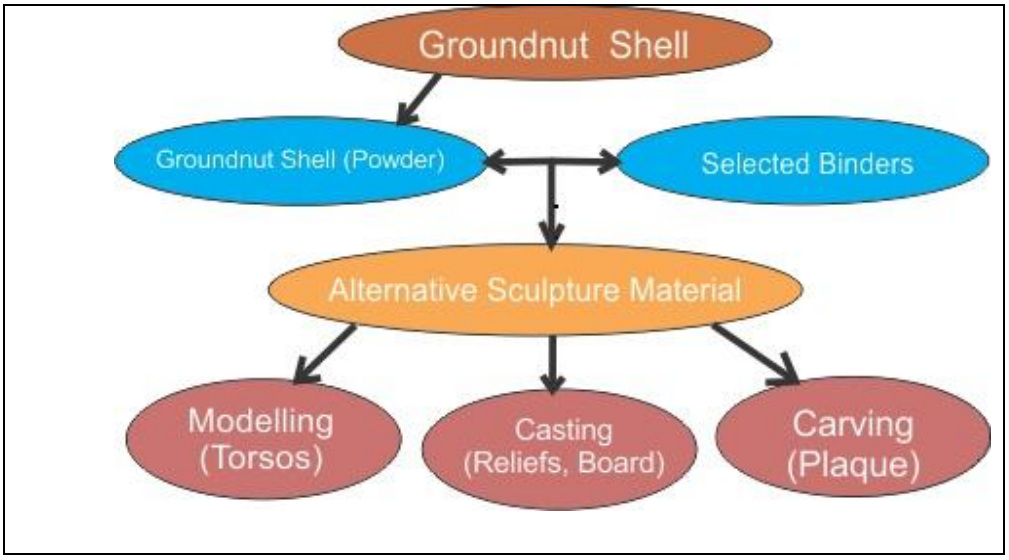

Figure 5: Conceptual Framework, source: authors' construct

3. Methodology

The researchers adopted quantitative and qualitative research approaches which provided both numerical and text data for the study. Quasi experimental, descriptive, action and project-based methods were employed for the study. Quasi experimental helped the researchers to experiment groundnut shell (powder) with selected binders to determine its suitability for modelling, casting and carving in sculpture. Action research was used because Ferrance (2000) stated that the method works well for studies stepped in a school setting aimed at improving instruction and increasing student performance. The researchers employed descriptive research to help them observe and describe the processes and results of the experiments conducted on groundnut shell powder. Koh and Owen (2008) explained that descriptive help researchers to observe and describe things in detail. According to them, descriptive research is a study that is used in education to solves problems and improve practices through observation, analysis, and description. Through active engagement in projects, first-hand learning experiences, and learning by doing, students gain fun and motivation(Makafui, 2015).Project based research enabled the researchers to provide the requisite tools and guide respondents to plan and execute sculpture works in bond groundnut shell powder. According to Zohrabi (2013), interview and observation are instruments that can complement each other to increase data validity or dependability. Therefore, interview and observation were used for collecting the data for the study.

Table 2: Research Design, Research Methods and Data Collection Instruments

Research Design	Research Methods	Data Collection Instruments

• Qualitative • Quantitative	• Quasi experimental • Descriptive • Action • Project-based	• Observation • Interview

3.1 Population and Sample size

The researchers used quota sampling technique to select the sample (44) out of the population (145 students) in the Department of Visual Arts, Salaga SHS. Population is a broader set of people to whom researchers anticipate to generalize the results of a study whiles a sample is a set of individuals who actually participate in a study and researchers may interview them. Sample is always a subset of a population (David, 2019).

Table 3: Population and Sample Size

Class	Accessible Population (number of students)	Sample Size (quota sampling 30%)
Form One	65	20
Form Two	34	10
Form Three	46	14
Total	**145**	**44**

Processes

1. Acquisition of Groundnut Shell

The researchers obtained groundnut shells from groundnut farmer-households and at the site of groundnut shelling machine at Salaga. At the shelling machine, the researchers collected the needed quantity for the project without monetary charges because the people seem to have difficulty disposing it. Groundnut shells from the shelling machine were broken whiles those gathered from individual farmers shelled manually were whole shells.

2. Treatment of Groundnut Shell

The researchers together with students mixed the groundnut shells together, washed and dried them for milling. They removed impurities such as leaves, sticks, stones or sand that were found in the groundnut shells. They then washed the shells with clean water and dried them. After drying them under the sun, the groundnut shells were milled into powder form using an electronic milling machine. Some of the powder was sieved to get fine powder. The fine and coarse powders were kept in sacks ready for use.

Washing DryingMilling Milled powder

Figure 6: Treatment of Groundnut Shell

3. Laboratory test for the chemical composition of groundnut shell (powder)

The researchers conducted a test at the Chemistry Laboratory, KNUST to find out whether groundnut shell was toxic or not before using for modelling, casting and carving with students. See the results in Table 4. The results revealed that the groundnut shells were non-toxic and safe to be used for the production of the sculpture works.

Table 4: Chemical Composition of Groundnut Shell (powder)

SN	Parameter		Value
1	Calcium Carbonate		90%
2	Heavy Metals	Cadmium	0.0567mg/l
3		Iron	0.0489mg/l
4		Lead	BDL
5		Copper	BDL
6		Arsenic	0.0217mg/l
7	Mineral Element	Sodium	5300mg/l
8		Potassium	1200mg/l
	BDL-Beyond detection limit		

4. Obtaining moulds for the experiments

The researchers guided the students to model five soft clay relief models depicting an arm holding spear which represents Ndewura Jakpa (the founder of Gonja kingdom) from which plaster moulds were made for the experiments.

Modelling Soft clay model Mould making Mould

Figure 7: Obtaining moulds for the experiments

5. Experimenting groundnut shell (powder) with selected binders

In a desirable quantity, the researchers and the students mixed the groundnut shell powder with selected binding materials which include white glue (Top bond), cassava starch, styrofoam dissolved in petrol, contact adhesive type-99 glue and resin with hardener and accelerator. It was mixed with each binding material in an even consistency and poured into each mould one after the other. After setting and hardening of the casting material (bond groundnut shell powder), the moulds were removed leaving the cast pieces.

Bonding the powder CastingBreaking of mould Cast piece

Figure 8: Experimenting groundnut shell powder with selected binders

6. Modelling with bond groundnut shell powder

The researchers guided the students to make sketches of what they intended to produce which depicted nude female torsos. Armatures were formed with binding wires. The groundnut shell powder was mixed with white glue (Top bond) in a workable state for direct modelling. It was not plastic like clay but the researchers guided the students to model the torsos little by little onto the armatures. Spatulas, knives, and other modelling tools were used.

An armatureModelling Modelled torsos

Figure 9: Modelling with bond groundnut shell powder

7. Casting a board in bond groundnut shell (powder) for carving

The researchers used wood, saw, hammer, and nails to form a mould and cast groundnut shell board for the carving. Inside the mould was covered with plastic sheet before filling it with groundnut shell powder bond with white glue. A wooden board was used to press the top to increase compression. After setting, the mould was removed. The cast board was very strong and ready for carving.

Mould **Casting** **Cast board**

Figure 10: Casting a board in bond groundnut shell powder

8. Carving of the cast board in groundnut shell (powder)

After sanding the board, the design which was on paper was transferred onto it with the aid of white glue (Top bond). A cutter was used to cut the outlines of the letters before scooping the unwanted parts with chisels and gouges.

Sketch transferred onto board Carving process Final carved work

Figure 11: Carving of the cast board in groundnut shell (powder)

9. Finishing and Finishes of the sculptures in groundnut shell (powder)

Different kinds of finishes, finishing methods, materials and tools for sculpture works in other materials especially wood were used. An electric grinder and sand papers were used to smooth the works before applying lacquer, varnish, acrylic paints etc.

Smoothening of work Applying finishes onto works

Figure 12: Finishing and finishing of the sculpturesin groundnut shell (powder)

Presentation and Discussion of Findings

1. Experimenting groundnut shell with selected binders which react positively

Observation of experiment one: The reactions of groundnut shell (powder) bond with cassava starch

It was observed that groundnut shell (powder) was not toxic as fowls were eating the bond powder and the researchers had to either stay around or keep the work inside. As a result, it took several days for it to set and cure. It developed some cracks after curing but the cast piece was strong and light in weight.

Observation of experiment two: The reactions of groundnut shell (powder) bond with styrofoam and petrol

The bond groundnut shell (powder) was highly plastic and flexible. The work was kept outside to set. It took a longer time to set and cure because of its nature. Due to the flexibility of the material, the mould was removed without causing any damage to it. The cast piece came out with all the details in the mould and was very strong. It set and hardened slowly like cassava but the cast piece was very strong and durable.

Observation of experiment three: The reactions of groundnut shell (powder) bond with white glue (Top bond)

The researchers observed that the material did not cure well before the mould was removed which resulted in some casualties on the cast piece. After curing, the work was strong.It set a little bit faster than cassava starch and styrofoam.

Observation of experiment four: The reactions of groundnut shell (powder) bond with contact adhesive type-99 glue

It set fast but the fine details in the mould did not come out as expected after the casting. The cast work was light in weight and its surface was a bit rough. It set and hardened faster but the cast piece was not strong as compared to other binders.

Observation of experiment five: The reactions of groundnut shell (powder) bond with synthetic resin

The work set within 10 minutes and the mould was removed. All the details in the mould came out well. The cast piece was stronger than the works in other binders. It had the highest setting speed and the cast piece was very strong and durable.

Figure 13: Cast works from the experiments conducted

2. Modelling in bond groundnut shell (powder)

Groundnut shell powder bond with white glue (Top bond) is good for direct modelling. Armatures and spatulas were used with the bond groundnut shell (powder) to produce direct models. The texture was not very fine and the plasticity was also less as compared to clay but the researchers and students added the bond groundnut shell powder onto the armatures bit by bit to produce the torsos. Three female torsos were produced. The models were stronger and lighter than cement, POP or clay works.

Figure 14: Students using armature to model, researcher with students modelling and a finished modelled torso in three different angles

3. **Casting with Bond Groundnut Shell (powder)**

Wooden frame and a plastic sheet were used to cast a board for the carving. Soap and oil mixture was used as separating agent. Groundnut shell powder was bond with white glue (Top bond) from which the board was cast. Like wood, the cast board was strong and suitable for carving a plaque or any other relief sculpture. Works that were cast through the experiments on groundnut shell were also strong and durable.

Wooden frame Casting Cast board

Figure 15: Casting of board in groundnut shell (powder)

4. Carving of the cast board in groundnut shell (powder)

Groundnut shell bond with white glue (Top bond) resulted in a board that was hard but soft enough to be carved manually. Unlike wood, the grain groundnut shells board had no direction but it was also easy to carve. The groundnut shell board resembles wood in colour, texture and weight. The tools and procedures for carving wood were employed in carving a plaque in groundnut shell board.

Carving process Students carving Finished relief carving

Figure 16: Carving the cast board in groundnut shell powder

5. Feedback after Activities:

Hundred percent (100%) of the respondents agreed that groundnut shell powder reacted positively with the selected binders. Also, 72.7% agreed while 27.3% disagreed that they enjoyed using groundnut shell (powder) for modeling, casting and carving. Thirty-two (32) respondents representing72.7% could model, cast, and carve sculpture works in bond groundnut shell (powder) without any trouble. The remaining twelve (12) respondents representing (27.3%) had a little difficulty with the direct modelling because the bond groundnut shell (powder) was not plastic as compared to clay that they usually used. However, they could use it to model.

4. Conclusions

Groundnut shell (powder) reacted positively with cassava starch, Styrofoam, white glue (Top bond), contact adhesivetype-99 glue and synthetic resin. It was used for modelling, casting and carving of sculpture works. The finished works were strong and easy to transport. Using groundnut shell as an alternative sculpture material to some large extent, will reduce environmental pollution, deforestation and improve groundnut cultivation in the Northern Ghana. To the best of the knowledge of the researchers, this study has made a significant contribution to knowledge, since it is a pioneering project in Ghana.

5. Recommendations

1. Sculpture teachers, lecturers, students and industries in Ghana should use groundnut shell as an alternative sculpture material to reduce cost, deforestation, environmental pollution and improve groundnut cultivation in the country.

2. Curriculum Research and Development Division of Ghana Education Service should include groundnut shell as an alternative sculpture material in the Sculpture teaching syllabus for Ghanaian Senior High Schools since it is very common and inexpensive.

3. Future researchers should conduct further studies on other waste materials that can bind groundnut shell powder for sculpture production.

References

Adikin, A., 2017. *Daily monitor 25.* [Online].Available at: http://www.monitor.co.ug/Magazines/Farming/Electric-power-from-groundnut-shells/689860-3862830-10bttmlz/index.html[Accessed 11 September 2017].

Adom, D., Hussein E.K., Adu-Agyem J., 2018. Theoretical and conceptual framework: mandatory ingredients of a qualitative research, International journal of scientific research: volume 7, Issue-1, p. 440. [Online].Available at: https://www.researchgate.net/publication/322204158_theoretical_and_conceptual_framework_mandatory_ingredients_of_a_quality_research[Accessed 11 September 2017].

Agyen, K., 2013. The use of bonded saw dust as a substitute material for carving (Master of Arts thesis, Department of General Art Studies, Faculty of Art Kwame Nkrumah University of Science and Technology, Kumasi), pp. 15-18.[Online].Available at: http://ir.knust.edu.gh/bitstream/123456789/6290/1/Kwadwo%20Agyen.pdf[Accessed 11 September 2017].

Ajobo J.A., 2014. Densification Characteristics Of Groundnut Shell. *International Journal of Mechanical and Industrial Technology,* Volume Vol. 2, Issue 1, pp. 150-154.[Online].Available at: file:///C:/Users/SAKOALIA/Downloads/DENSIFICATION%20CHARACTERISTICS%20OF%20GROUNDNUT%20SHELL-579%20(26).pdf[Accessed 11 September 2017].

Amoh E., 2009. Ahwiaa wood carving industry: New trends and their implication for art education (Master of Arts thesis, Department of General Art Studies, Kwame Nkrumah University of Science and Technology, Kumasi), pp. 8-11. [Online].Available at: http://ir.knust.edu.gh/bitstream/123456789/259/1/elizabeth%20amoh.pdf[Accessed 11 September 2017].

Bhatta, 2008. *Peanut shells can clean water.* [Online] Available at: http://www.downtoearth.org.in/news/peanut-shells-can-clean-water-3996 [Accessed 26 October 2017].

Britannica, T. E. o. E., 2017. *Encyclopaedia Britannica.* [Online] Available at: https://www.britannica.com/art/modeling-sculpture[Accessed 14 September 2017].

Britannica, T. E. o. E., 2017. *Lost-wax process.* [Online] Available at: https://www.britannica.com/technology/lost-wax-process[Accessed 14 September 2017].

Carroll, N., 2016. *List of Top Largest Peanuts Producing Countries in the World.* [Online] Available at:http://www.countrydetail.com/list-top-largest-peanuts-producingcountries-world/[Accessed 23 May 2018].

Chaix, J. K., 2012. *NEWS: Fuel briquettes from groundnut shells.* [Online] Available at: http://www.charcoalproject.org/2012/10/news-fuel-briquettes-from-groundnut-shells/ [Accessed 25 March 2018].

Dakurugu, Z., 2015. *feed the future.* [Online] Available at:https://www.spring-nutrition.org/sites/default/files/spring_groundnut_production_northern_ghana.pdf [Accessed 10 February 2018].

David, 2019. *Statistics Solutions.* [Online] Available at: https://www.statisticssolutions.com/what-is-the-difference-between-population-and-sample/ [Accessed 12 March 2019].

Dawn, R., 2013. *Today.* [Online] Available at: https://www.today.com/popculture/aw-nuts-artist-turns-peanut-shells-detailed-celebrity-caricatures-1C8903446[Accessed 17 September 2017].

Encyclopædia Britannica, I., 2017. *Sculpture.* [Online] Available at: https://www.britannica.com/art/sculpture/Methods-and-techniques[Accessed 14 September 2017].

Ferrance, E., 2000. *Action Research,* 222 Richmond Street: rown University.[Online].Available at: https://www.brown.edu/academics/educationalliance/sites/brown.edu.academics.education-alliance/files/publications/act_research.pdf[Accessed 11 September 2017].

Group, H. C., 2017. *Sculpture House.* [Online] Available at: https://www.sculpturehouse.com/s-160-mold-making-and-casting.aspx[Accessed 14 September 2017].

Heuzé V., Thiollet H., Tran G., Edouard N., Bastianelli D., Lebas F., 2017. Peanut hulls. Feedipedia, a programme by INRA, CIRAD, AFZ and FAO. [Online].Available at: http://www.feedipedia.org/node/696 Last updated on February 1st, February 2017. 11:31 [Accessed 11 September 2017]. [Accessed 13 September 2017]. [Accessed 11 September 2017].

Ideas, T. F., 2015. *Simple Craft Idea.* [Online] Available at: http://www.simplecraftidea.com/groundnut-shell-flower/[Accessed 13 September 2017].

Jones, D., n.d. *National Wildlife Federation.* [Online] Available at: https://www.nwf.org/Kids/family-fun/crafts/birds-made-from-peanut-shells.aspx[Accessed 13 September 2017].

Joomla Art, 2019. Dagbon net. [Online] Available at:https://www.dagbon.net/[Accessed 5th February, 2019].

Kingman, 1992-2016. *KMEC.* [Online] Available at: http://www.woodbriquetteplant.com/news/Peanut-Shell-Briquette-Press.html[Accessed 28 Setember 2017].

Kirkova, D., 2014 |. *mail.* [Online] Available at: http://www.dailymail.co.uk/femail/article-2618740/He-nuts-Man-spends-hours-creating-tiny-statues-celebrities-PEANUTS.html[Accessed 17 September 2017].

Kissi, S. B., Fening, P. A. and Adom, D. (2016). Beeswax in Asante Castings: The Then, Now and the Way Forward. *International Journal of Arts and Technology*, Vol. 5, Issue 10, pp. 7-22[Online] Available at: https://www.researchgate.net/publication/310064417_Beeswax_in_Asante_Castings_The_Then_Now_and_the_Way_Forward[Accessed 13 September 2017].

Koh, E.T. and Owen, W.L., 2008.Descriptive research and qualitative research. Introduction to Nutrition and Health research, pp 219-248. [Online] Available at: https://link.springer.com/chapter/10.1007/978-1-4615-1401-5_12[Accessed 13 September 2017].

Makafui, T.R., 2015. Exploring natural latex for mould making in teaching Sculpture (Master of Philosophy thesis, Department of General Art studies, Kwame Nkrumah University of Science and Technology, Kumasi), pp. 11-12.[Online] Available at: http://ir.knust.edu.gh/bitstream/123456789/8791/1/Final%20Thesis.pdf[Accessed 13 September 2017].

Nisha, 2015. *Top Ten Peanut Producing Countries in the World.* [Online] Available at: http://www.perfectinsider.com/top-ten-peanut-producing-countries-in-the-world/[Accessed 3rd february 2017].

Pagett, D. R., 2013. *Senegal: Peanut Shell Briquettes.* [Online] Available at: http://carbonbrake.com/senegal-peanut-shells/ [Accessed 3rd february 2017].

Regoniel, Patrick A., 2015. Conceptual Framework: A Step by Step Guide on How to Make One. In SimplyEducate.Me. [Online] Available at: https://simplyeducate.me/2015/01/05/conceptual-framework-guide/[Accessed 17 September 2017].

Roberts, S., 2017 . *Sciencing.* [Online] Available at: http://sciencing.com/uses-peanut-shells-6023398.html[Accessed 17 September 2017].

Sagarjawla, 2016. *Quora.* [Online] Available at: https://www.quora.com/What-is-the-chemical-composition-of-a-peanut-shell[Accessed 28 September 2017].

Sanariya, Y., 2016. *Quora.* [Online] Available at: https://www.quora.com/What-is-the-chemical-composition-of-a-peanut-shell[Accessed 28 September 2017].

Steinhardt, S., 2015. *Viralnova.* [Online] Available at:http://www.viralnova.com/peanut-art/[Accessed 17 September 2017].

worldatlas, 2016. *Top Peanut(Groundnu) Producing Counteries.* [Online] Available at: www.worldatlas.com/articles/top-peanut-groundnut-producing -countries.html[Accessed 3rd February 2017].

Zohrabi, M., 2013. Theory and Practice in Language Studies. *Academy Publisher,* Vol. 3, No. 2(Mixed Method Research: Instruments, Validity, Reliability and Reporting Findings), pp. 254-262.[Online]

Available at: http://www.academypublication.com/issues/past/tpls/vol03/02/06.pdf[Accessed 28 September 2017].