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Exploration of How Geometry is Linked to Learners' Daily Life Activities Using the Akan Culture

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Abstract
The study examined how Akan culture affects senior high school geometry instruction. The Akan people live in Ashanti, the study area. The study targeted experienced mathematics teachers and Akan traditional art experts. Purposive and snowball sampling were used to recruit Ten participants, including seven experienced mathematics teachers and three craftsmen. Participants were interviewed using a semi-structured interview guide to gather detailed data. Data was thematically analysed. The analysis showed that there are a lot of interconnections between the Akan culture and school geometry in the area of Akan Games, Akan Architecture, Akan art, Akan vocation and Akan traditions. Therefore, incorporating Akan culture into geometry instruction helps students grasp the concepts and apply them to solve real-world problems. The authors concluded that the Akan culture can be applied to the teaching of geometry to enhance student active participation and promote conceptual understanding.

Keywords: Culturally Responsive Curriculum, Ethnomathematics, Akan, Ethnomathematics

Introduction

Culturally Responsive Curriculum (CRT) as defined by Gay, (2018) is utilizing cultural knowledge, prior experiences, frames of reference, and performance styles of culturally diverse students to facilitate learning encounters that are more relevant to and effective for them. Gay (2018) believes that curriculum content can empower students if the knowledge they gain is relevant to their lives outside of school. Content about histories, heritages, contributions, perspectives, and the experiences of various ethnic groups and individuals, taught in various ways, are critical. The goal of culturally responsive mathematics instruction is to invite all students to participate in mathematics because their methods of thinking and reasoning are valuable. It is about ensuring that each and every student not only achieves mathematical success but also views mathematics as a tool for examining the world (curriculumassociates.com). There is a unique connection between communication, education, teaching, and culture. How teachers interact with students in mathematics has a huge impact on the cultural responsiveness of learning environments (Gay, 2018). We cannot assume that there is only one appropriate mode of communication across all situations, audiences, and contexts. How teachers communicate with students is important, as it is the means through which they establish relationships and convey compassion, love, encouragement, and learning. Hence, language and communication styles are components of cultural systems through which students expressly transmit and embody meaning and ideas.

The link between culture and language is far too complicated to be reduced to an English-only mentality (BAUTISTA et al., 2020). This depth of linguistic information is sometimes seen as a weakness rather than a strength that can be utilized to position students as clever and capable learners. Instead of concentrating on perceived deficiencies, there is the need to give students culturally appropriate aids to improve their material access and mathematics knowledge, as well as capitalize on their strengths. Teachers must evaluate language and consider how to communicate with students. This can be done by supplementing verbal explanations with visual aids. In attempting to model and make sense of the current scenario, in the classroom, students are able to create

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mental images or movies that help them to see the mathematical concepts holistically as something tangible and worthy. This significantly expands the possibility for actual and direct modelling in mathematics classes.

Students who lack the cultural expertise to negotiate the implicit culture and customs of the school are more likely to fail as a result of this miscommunication, misunderstanding, and lack of cultural harmony (Dowker, 2021). Students who succeed academically contribute values to the school that the administration deems suitable. Students who are unable to adapt to the school's prevailing culture or assimilate will be more likely to fail. (Gay, 2018) expresses a similar opinion when she notes that there is sometimes a disconnect between the cultures of schools and various ethnic groups. This disconnect can hinder students' academic progress because some ethnically diverse people typically use different processes for intellectual processing, self-presentation, and task performance than do schools. Therefore, to reduce tensions and close gaps between various cultural systems, teachers must comprehend the intersections and incompatibilities of other cultures.

Ethnomathematics is an approach to teaching of mathematics that is fast gaining currency around the globe is. Some scholars define ethnomathematics as a type of mathematics practiced by certain ethnic groups, while Albanese (2021) defines it as the study of the link between culture and mathematics. Ethnomathematics seeks to develop mathematical and cultural knowledge in a way that can result in a mutual respect of the two (Meaney et al., 2021). Around 1997, Brazilian mathematician and educator Ubiratan D'Ambrosio used the word "ethnomathematics" in a presentation for the American Association for the Advancement of Science. Historical evidence of a deliberate devaluation of the mathematics created and developed by non-European civilisations prompted the emergence of ethnomathematics as a topic of study (Chahine, 2013). At the time, people believed that Western civilisation was the only source of mathematical knowledge. In order to challenge the idea that Western mathematics was superior to the contributions made by other cultures to the development of mathematics, the study of ethnomathematics was established. According to Kurniawan et al. (2023) and Rodríguez-Nieto & Alsina (2022), early researchers such as Powell and Frankenstein (1987), Bishop (1990), Frankenstein (1997), and D'Ambrosio (1999) all agreed that Western mathematics was a useful instrument that the West used to force its culture on others.

Shapes, spatial relationships, and space are all studied in the mathematical field of geometry (Atta & Bonyah, 2023a). Originating from Greek terms meaning "Earth measurement," geometry is one of the earliest areas of mathematics and was created to address real-world issues such as surveying (Baah-Duodu et al., 2020). Later, it was found that even the most abstract ideas and pictures could be developed and represented using geometry. Different branches of geometry are covered by Euclidean geometry, analytic geometry, projective geometry, differential geometry, non-Euclidean geometries, and topology. Due to its practical applications, geometry dominates Ghana's mathematics curriculum.

Social Constructivism

The research bears a resemblance to the theory of social constructivism. This theory examines the ways in which individuals' interactions with others influence their comprehension of the world. Social constructivists acknowledge that individuals may exhibit varying responses and develop distinct perspectives regarding the same events and circumstances. They are particularly interested in the ways in which identity, family, community, and culture influence these responses (Altaftazani et al., 2020; Bada & Olusegun, 2015; Ertmer & Newby, 2013). For example, Vygotsky posits that the cognitive development of children is systematically and voluntarily provided by adults in a given society. Vygotsky posits that it is crucial for adults to engage children in activities that are meaningful and that will enhance their mental development and enable them to succeed in these activities. According to Social Constructivist Theory, the comprehension of meaning is enhanced when individuals collaborate rather than working independently (Pathan et al., 2018).
The difference between a child's development level as determined by independent problem solving and the child's prospective development as determined through problem solving under the guidance of an adult or in collaboration with a capable peer is known as ZPD (Pathan et al., 2018). This is the discrepancy between the capabilities of an individual infant and those that can be achieved with assistance. The common trove of information and beliefs is enriched by the interactions between individuals and groups. This enables them to establish a shared understanding of the genuine nature of reality, knowledge, and identity (Lasmawan & Budiarta, 2020; Qiquan, 2021).

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Collaborative and Cooperative Learning

Cooperative and collaborative learning are two critical instructional strategies that are derived from social constructivism and are based on a problem-solving approach. Research has shown that cooperative learning leads to a greater effort to attain, more positive relationships, and better psychological health than competitive or individualistic learning efforts. In addition to the advantages of cooperative learning, (Adu et al., 2017) assert that learners are able to investigate, organise, and integrate their thinking when they are encouraged and obligated to communicate mathematically with the teacher, other learners, and themselves. Ardiyani et al. (2018) have defined collaborative learning as the collective effort of learners to achieve shared objectives and optimise the potential of themselves and others through the use of small groups. In the context of collaborative learning, it is also articulated that learners are accountable for their own learning and the learning of their peers, and that the success of one student contributes to the success of others. Students who engaged in collaborative learning demonstrated substantially superior performance on the critical-thinking test when contrasted with those who studied independently. Additionally, it has been determined that the drill and practice test was conducted equally well by both groups. The peer support system enables the learner to internalise both external knowledge and critical thinking skills, transforming them into instruments for intellectual functioning (Abramczyk & Jurkowski, 2020; Amir MZ et al., 2021; Okumus et al., 2020).

Statement of the Problem

The notion of culturally responsive pedagogy, commonly referred to as culturally sensitive pedagogy, holds that one of the key factors influencing students' academic progress is the discontinuity between their home and community cultures and the school culture. students' academic achievement will rise as a result of bridging the gap between their home and school cultures through reflection and appropriation of these kids' cultural practises (Gay, 2010). This was referred to as culturally relevant pedagogy by Ladson-Billings (1994). This is a kind of teaching approach that uses cultural allusions to impart knowledge, abilities, and attitudes to pupils while also empowering them politically, socially, emotionally, and intellectually. Additional approaches to culturally sensitive pedagogy include cultural restorative and regenerative teaching. The goal of culturally regenerative pedagogy is to restore educational practises that indigenous people have lost. Disregarding students' cultures shows a lack of regard for them and implies that their education should be handled separately from their 40 roles as citizens, which require them to use their education to benefit society. This presupposes that pupils are deprived of the opportunity to make a significant contribution to the advancement of their society because they are unable to learn from their culture.

Therefore, culturally responsive pedagogy emphasises the significance of clearly recognising that culture already exists and expanding the centre of educational practises to make it culturally pluralistic rather than homogenous, or of putting culture at the centre of the analysis of strategies for improving the performance of underachieving students. The effects of innovations that seem to be producing the desired results may not endure over time if the innovative programmes try to address academic performance by isolating it from other factors that affect achievements, such as culture, ethnicity, and personal experience.

Ghana has implemented several reforms as a nation in an effort to raise productivity through bettering student performance. Nonetheless, student performance is still declining, especially in mathematics. For example, the Basic Education Sector Improvement programme (BESIP), which included free compulsory and Universal Basic Education (fCUBE) as a main component, was introduced in 1996 as a follow-up to the New Educational Reform Programme of 1987 (MOE, 1996). The three main goals of the fCUBE programme were access and participation, efficient and effective management, and high-quality teaching and learning. The Free SHS Policy was also introduced in 2017 to ensure Quality, Access and Equity in our education delivery yet, academic achievement in mathematics at the senior High Schools has not improved significantly. The bulk of our students continue to perform poorly on our national exams, the Basic Education Certificate Examination (BECE) and the West Africa Senior School Certificate Examination (WASSCE), especially in mathematics. Studies have proven that topics like Geometry can be taught with the aid of diverse artefacts and cultural imprints found in the Akan communities (Dasini, 2022; Fantinato & Leite, 2020; Meaney et al., 2021; Owusu-Darko et al., 2023). Understanding mathematics as a cultural construct facilitates meaningful and exploratory learning that is based on prior knowledge and culturally imparted knowledge hence the need to investigate the link between school geometry and the Akan culture

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Materials and Methods

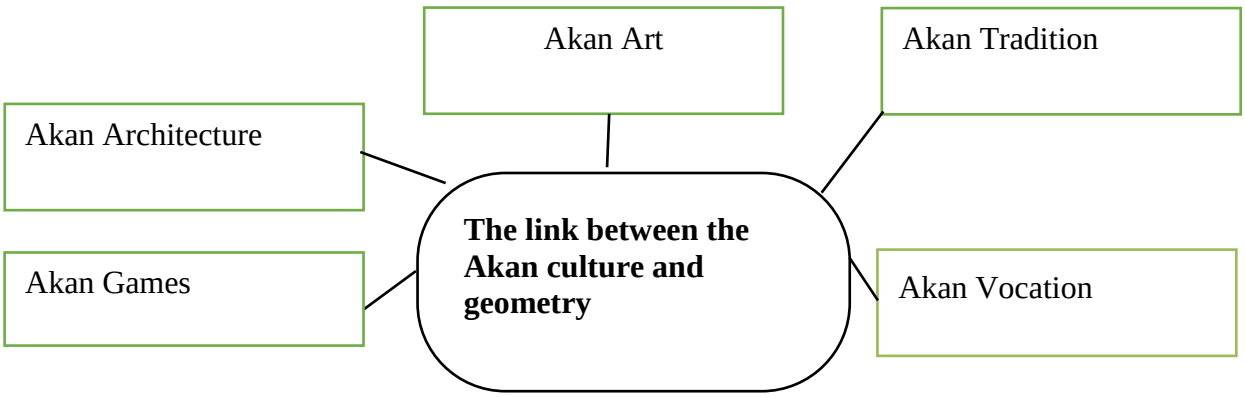
This study utilised the case study method, entailing a comprehensive analysis of a particular situation, event, agenda, or procedural activity. The interpretive paradigm, which enabled qualitative research, was utilised to gather and analyse data (Kothari, 2017). The research was carried out in the Ashanti Region of Ghana, the country's third-largest region. The region is located in the central belt of the country and is distinguished for its gold and cocoa output. The study's target demographic comprised individuals engaged in curriculum revisions in Ghana, experienced mathematics educators, and experts in Akan traditional culture. We utilised purposive and snowball sampling techniques to guarantee that all participants in the target group had sufficient experience and expertise (Hu & Chang, 2017). Ten individuals were chosen to participate, consisting of seven experienced mathematics educators and three artists proficient in Akan culture. All participants possess in excess of five years of expertise.

Interviews were utilised to collect data and acquire responses from participants. The researcher engaged in dialogue with all participants. We employed a semi-structured interview methodology to determine the integration of Akan cultural traditions in mathematics education, specifically in the teaching of geometry. This strategy guarantees that all participants partake in identical talks while also exploring intriguing topics. The Department of Mathematics at the Akenten Appiah-Menkah University of Skills Training and Entrepreneurship Development (AAMUSTED) adhered to ethical standards by acquiring the requisite ethical clearance and authorisation, obtaining informed consent, and ensuring confidentiality during interviews. Pseudonyms were utilised to protect the identities of the participants. Participants were given time to evaluate their readiness to continue and were allowed to choose the schedule of the interview. The key attributes that established the rigour of this study were credibility, transferability, reliability, and confirmability. Initially, four participants were interviewed as a preliminary assessment to ensure the clarity of the questions.

The responses were given in both English and the local language (Asante Twi); however, the researcher then had them translated into English with the aid of a translator to guarantee data integrity was preserved. The interview transcripts were later reviewed, organised, and classified using thematic analysis. The data analysis employed an updated iteration of Braun and Clarke's (2006) technique, consisting of six stages: data familiarisation, initial code generation, topic identification, theme review, theme definition and naming, and report composition (Byrne, 2022; Kothari, 2017).

Results

Figure 1: Main theme and sub-themes



The study asked respondents insightful questions in relation to the relationship between Akan culture and geometry, how geometry influenced Akan art and architecture, geometric shapes that are commonly used in Akan designs, how contemporary Akan artists incorporated geometry into their work, how the use of geometry in Akan culture has evolved over time and how the integration of Akan culture promote conceptual understanding of geometry. These questions were geared towards achieving the objective of finding out how the Akan culture is linked to geometry in the Senior High Schools.

Participants indicated that there are several *linkages with Akan traditional* culture and the teaching of geometry. This is evident in how the Akan Games, Akan Architecture, Akan Arts, Akan traditions and Akan Vocations. In original Akan settings, when they are roofing their houses, it takes certain shapes. Also, when you look at the

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dresses that the Akan wear, they embody certain forms of geometrical shapes. A look at the cocking pot they use, the earthenware that they use for grinding, all contain certain geometrical shapes.

Interview data from participants revealed the first sub-theme under the link between the Akan and geometry through games. All the seven mathematics educators shared that there is a link between some Akan traditional games with the school geometry.

> Even certain games that are played in the Akan settings, depicts certain shapes. For instance, in the "Ampe game", there are different sides, so when you are able to identify the characteristics among the two sides, you are able to differentiate them (**Maths Educator)**

> There is a particular game common to the Akan children in which they use Turkey berries known among them as "Kwahu Nsusaa." One will kick a berry and where it reaches, he/she will use his/her fingers as a measuring tool to measure the distance it reached. This game teaches them how to find the distance between shapes arbitrary which is also taught in schools under geometry using standard unit and measuring tools **(Boat, Mathematics Educator)**.

In order to get more information, the researcher review some documents on Aka games to ascertain the linkage as demonstrated in table 1

Table 1 list of Akan Games and the connection with basic geometric concepts

Game	Name and Description	Geometric Concept
	Dame is played on a 10-by-10 board with dark and light squares. Play is on dark squares, thus only 50 of 100 are available. Each person starts with 20 wooden squares or circles. Players are on opposing boards. The twenty black squares of the four rows nearest each player receive the twenty troops. Pieces are moved in turns. Destroy all opponent pieces. It can grab any diagonally opposite piece if the square behind a piece is unoccupied.	Quadrilaterals Area of Plane Figures Perimeter Diagonal Angles
	**Ludo** Ludo is one of the most played classic board games. It is a game for 2-4 players that requires rolling a die to move colored tokens across the board. The goal is to move every token you have to the center of the board before your rivals do.	Quadrilaterals Area of Squares Perimeter Angles Probability

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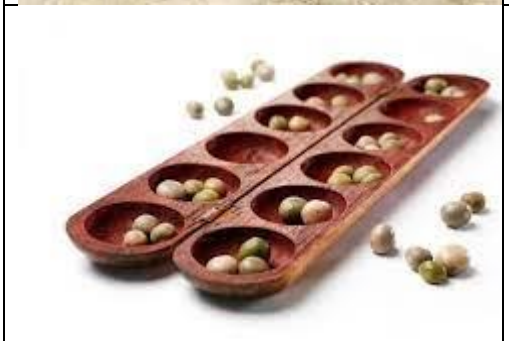
	**Ampe** Ampe is a classic outdoor game that two or more players (typically females) play. It requires rapid reactions, leaping, and rhythmic clapping. Players alternately leap over lines put on the ground, imitating certain gestures and clapping rhythms	Straight Lines Angels Probability Point
	Oware On a board with shallow holes, players use stones or seeds to play this strategic game. The goal is to carefully move your opponent's seeds about the board in order to collect them.	Probability Circle Points
		Probability Circle Pints
	Football	Lines Line Segment Circle Square Rectangle Point Ray Angles

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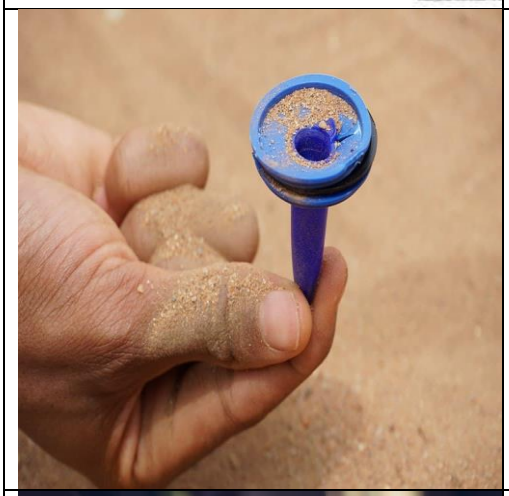
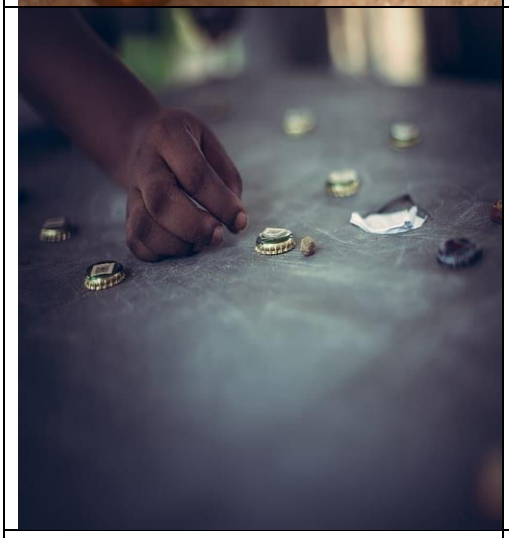
	AMA NKRUMA (TOMATU)	Lines Line Segment Square Rectangle Parallel Lines Rays Points Angles
	ALIKOTO Size D battery covers and pen covers are needed for Alikoto. These two may be combined to make a basic spinning toy known as a "alikoto." Players are supposed to spin the "alikoto" and use the side of their hand to strike its bottom in an attempt to flatten it on its head. The player(s) who manage to flip the "alikoto" on its head will strike the one who is unable to do so with it.player(s) who successfully managed to do it.	Point Centre Circle Lines Right Angle
	COUNTERS BALL With the exception of replacing certain goal posts and using bottle caps for football players and any tiny round item for the ball, Counters Ball is a recreation of a football game. On the ground, lines are placed to represent a football pitch. In order to get the ball into the goal post of the opposition, players alternately strike their counterattack.	Square Rectangle Circle Centre Angle Collinear
	Chaskele Cricket is similar to chaskele. The game takes three items: a flattened can (like milk cans to reproduce a ball), a vehicle tyre (as a goal post) and a bat (which can be recreated using sticks). This game requires a minimum of two players. The idea of the game is for one player to successfully toss the flattened object into the tyre hole, while the other players' job is to stop them from doing so.	Point Center Circle Line

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The next sub-theme was about the Akan architecture. The question asked was how geometry influenced Akan architecture? All the ten participants believed that the Akan culture has some symbols and artefacts that they use in their daily life activities which were made based on the ideas of "modern day geometry" unconsciously since geometry has been a part of the Akan.

> Certain clans, Oyoko, Asenee, Asona and the others use symbols that are related to geometry. If you look at their clothes, they have symbols in it that are geometrical but sometimes they use them unconsciously so far as school geometry is concerned. These symbols and artefacts existed prior to the colonial times which brought about the introduction of schools and curriculums of which geometry was part **(Ruf, Mathematics Educator)**

> The designs are indigenous, the means of measurement are also arbitrary and not standard. For instance, designers in the Akan setting use calabash (krowa), the tick one to do their measurements. Woodcarvers make designs (Adwini) on the artefacts they make without having knowledge of geometry. So, geometry has been with them from the onset without knowing of it until the introduction of modern education systems **(Doctor, Adinkra works)**

> …..It is rather the Akan art and architecture that have influenced and shaped geometry in our part of the world and our understanding of things. That is how I see it, because before you come to school, if you lived in a typical Akan community and you have related with some of these artefacts, then when geometry is being taught you realize that the experiences you have in the community will influence your understanding of what geometry is all about. I do not see it as what we are being taught is influencing the Akan culture and architecture, because if you don't have an idea about something and you are taught, it can hardly influence you but rather if you have experience of something and given a formal teaching then one can really relate, oh these are the things that I see around, when I go to farm, when I go to the market, these are the things that I see, indeed there is some form of mathematics in it. In my view, the Akan culture rather influences our understanding of geometry but not geometry influencing the Akan culture **(WAB, Mathematics Educator)**.

> ….Looking at the shapes of things found at homes of the Akan communities, how they measure things, through the use of fingers, they are all geometry inclined. School geometry is only adding more to the Akan culture because it was already there. Geometry has been with them but school geometry is adding finishing touches, and also bringing out things that even though were in existence, but we could not associate with mathematics, so school geometry brings into existence things that were never documented and standardize what Akan culture was doing arbitrary **(Boat, Mathematics Educator)**.

> … even the way they put up their buildings and the kind of structures they have been using, it tells that the Akan has the concept of geometry long before geometry came into existence. Who taught our forefathers that if you want to make Apotoyowa, you have to make it in such a way that you get a very good circumference, the inner circumference and outer circumference? But they do it and it looks so perfect. If you look at their Kukuo (Pot) that they use to boil their herbal medicines and other things, in their homes they have a very big Pot (Cooler) used for water storage, they have been doing this for a very long time, who even taught them? The way they prepare their Bukyea (Akan traditional stove) look at the concept, Triangle, tripod, three stands, who taught them? The oven (Fononoo) they used for baking all had the concept of geometry. Thus, they have it but it lacked proper documentation in books or in texts long before the Westerners brought the formalized term geometry into existence (**Pablo)**

On the Akan Art, the data revealed the following;

> In order to make certain shapes and symbols among the Akan, such as "Adinkrahene", "Gyenyame", the Moon (bosome) and star (Nsoroma), circles, spheres, rectangles and squares are drawn arbitrary before these shapes and symbols are cut out. This indicates that there is a relationship between Akan culture and geometry **(Doctor, Adinkra works)**

> …Oh well, with the Akan culture, I can see that there are a lot of Akan traditional symbols and some diagrams that are related to plane geometry and of the diagrams, the symbols are in the shape of quadrilaterals, some are in the shape of circles and others. The Akan "Sankofa" symbol is curvature, it's almost like a Semi-circle. Most of the shapes of the "adinkra" symbols can be related to geometry even

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though they are used unconsciously among in the Akan Setting. For instance, the stool is carved in such a way that the topmost part is like a semi-circle and the other sides are also curved supported by the base. If you look at the staff that the chiefs use, the top has a shape that depicts the traditional setting of the locality. These all have their geometric resemblance in the school setting **(Ruf, Mathematics Educator)**

Among the Akan tradition, the study had revealed that certain cultural practices among Akan in terms of the houses they build, the dresses they wear, their cooking wares, their means of measurement, the symbols they use to communicate and the games they play are in relation to the geometry being taught in schools. For instance, some respondents shared that;

"Slit and Kaba" for female and full piece of cloth for men are the dress code among Akan during occasions or gatherings. These dresses are sewn in the form of curves, circles (flair), angles and lines and some cloths have symbols (Adinkra) embossed in them in the form of geometric shapes **(AFA K, tailor)**

Geometry is evident in a variety of forms when one visits their local scene, where they perform their art. For example, the focal point for the earthenware basin (apotoyowa) is the centre around which the clay is to be moulded to create a three-dimensional shape. For the purpose of determining the size, they assess the distance from the centre to the outer layer (circumference). For Kente weaving, it is necessary to commence at a specific angle in order to create the desired shape, whether it be a parallelogram or a triangular shape. Therefore, they implement the geometry that we instruct in the classroom, which has a substantial influence, despite their lack of awareness ***(REV, Mathematics Educator).***

…Yeah, there is some kind of relationship between the Akan culture and the geometry, some aspect of geometry we teach in school, not all areas of geometry, but most of the aspects geometry we teach in school, there is a relationship with the Akan culture. A typical example I normally use in my teaching when I am talking about circumference of a circle Mortar (Waduro). The circumference of the Waduro is something that we also use in our mathematics. We talk about circumference which is the total distance round a circle which of which sculptures craftly carve the mortar using arbitrary measurements. The Earthenware (Apotoyowa) that the Akan use has its edge looking like an inner circumference and outer circumference. The calabash (Koraa), used to serve water or palm wine (Nsa fufuo) also has a spherical shape which has something to do with the geometry that we teach in school **(WAB, Mathematics Educator)**.

The study further sought answers on the geometric shapes that are commonly used in Akan designs, how contemporary Akan artists incorporated geometry into their work, and how the use of geometry in Akan culture has evolved over time. Popular geometrical shapes are lines, circles, spheres, triangles, rectangles, squares which are being inscribed in others or are having portions removed to suit the intended design.

*"I'm going to talk about circles. If you look at the pot, you'll notice that the tip is round, the earthenware is round, and even some of the symbols are round. Since most Akan symbols have circular shapes, circles are the main shapes used." (****Boat, Teacher of Mathematics).***

There are a variety of forms, including squares, rectangles, and circles. However, depending on the specific design they desire, parts of the square may be taken off, but the measurements will indicate that it is a square and that, like "Adinkrahene," it is round that is a circle ***(Doctor, Adinkra works).***

You can say with confidence that they use geometry frequently, albeit subconsciously, because they primarily use straight lines or circles, though occasionally they will inscribe a circle with a triangle. "Adinkra" symbols like the adinkrahene, the Akyikyidee akyi, and the gye nyame are geometric symbols ***(Ruf, Mathematics Educator****).*

*As you can see, we have curves, circles, angles, straight lines, and other shapes, but we modify them in that sequence since the human body is not straight. Similar to women's clothing, flair is a rounded shape that resembles a circle. However, most of the time, a single piece of clothing will include straight lines, circles, and angles, but you typically don't get a name based on the shapes that are present in the final product (****Afa K, Tailor).***

They make frequent use of circles because they are found in numerous hemispheric objects such as "apotoyoa" and "kodoo" for grinding, spherical objects such as pots for cooking and fetching water,

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straight lines used in crop growing and the construction of tents and dwellings, and other polygons that are used to carve various objects **(Pablo, Mathematics Educator)**

Discussion

The study has demonstrated that the Akan culture has several links with school geometry. This is seen in their games, architecture, vocations and traditions. The social constructivism is demonstrated here since the environment becomes a learning platform. Students interact with the environment and with their peers to construct their own learning. The teacher's role is then shifted from providing information to a facilitator of learning. Studies like Owusu-Darko et al., (2023) have demonstrated how the adinkra Symbols and some other artefacts and practices of the Akan are connected with mathematical concepts especially geometry. Researcher across Africa have also come up with similar studies in their jurisdictions where local practices were linked to mathematics concepts (Nur et al., 2020; Turugari, 2022). These studies have all indicated that that the culture of the learner play crucial role when it come learning mathematics concepts. It's quite clear that if teachers intend to maximise on their students understanding of geometry then Akan culture should set the basis of instruction. This is what is referred to as learner centred teaching with the focus on the environment. If the learner is conscious about their environment, they will be better positioned to apply all the logical reasoning, critical thinking, creativity and problem-solving skills acquired through mathematics learning to solve humanity problems like unemployment, corruption, environmental degradation among others. learning in Akan setting is by practice, hence incorporating their way of teaching and learning especially into the concept of geometry which is an antient concept will enhance students conceptual understanding. A couple of studies in Ghana have touted student's mathematics interest (Arthur, 2019; Arthur et al., 2022) as critical component for student mathematics academic achievement. More so, students' environment has been proven to be a major catalyst for student interest when it comes to learning. Arthur, (2019) in their conclusion statement remarked Student motivation was determined by their perceptions and background and student interest is a function of their perception, motivation, and background. The paper recommended that teachers should focus on attaining student mathematics interest. It is therefore clear that the findings of this paper are in the right perspective.

Conclusion

All the participants agreed that Akan practices have a lot of mathematical implications and connections, again the local artisans learn complex calculation with ease because it purely practical. The apprentices learn consciously and unconsciously and once they acquire the concept or the skill it sticks in the brains forever. Unlike school mathematics that are mostly theoretical and abstract. Adopting the learning styles of the Akan artisans in the classroom will enhance conceptual understanding of geometry. We therefore conclude that the Akan culture has several connections with geometry at the senior high School.

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