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CULTURAL ARTEFACTS AND BIOLOGY INSTRUCTION IN PUBLIC SECONDARY SCHOOLS IN MERU SOUTH SUB-COUNTY, THARAKA- NITHI COUNTY, KENYA

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ABSTRACT

Biology education in Kenya has been characterized by persistent poor performance in national examinations. The persistent poor performance in Biology is attributed to lack of adequate and appropriate teaching and learning resources due to limited financial resources in most public schools. In the absence of adequate resources, Biology teachers have been encouraged to use community resources within their surrounding including cultural artefacts for instructional purposes. To date however, minimal empirical literature specifically has addressed the types of cultural artefacts on Biology instruction exist. This study therefore sought to address the existing knowledge gap by assessing the types of cultural artefacts on Biology instruction with a specific focus on public secondary schools in Meru south sub-county. The study was based on Constructivist learning theory and socio-cultural theory, and applied a descriptive survey research design. The target population was heads of Biology subject, Biology teachers and forms four Biology students. The sample size of 351 respondents was determined using the sample table developed by Krejcie and Morgan. Data collection instruments were a questionnaire and interview schedule for heads of Biology subject. Expert opinion was used to establish validity and reliability. Data obtained was analyzed using descriptive and inferential statistics with the aid of Statistical Package for Social Science (SPSS) version 26 computer software. The study findings showed that bones from skeletons of animals, beads and necklaces, wood carvings and skins, stones, mud huts, clay pots, baskets and basketry, music instruments and iron metal are some of the cultural artefacts that are available for used in Biology instruction with varying degree. It is therefore recommended that Biology teachers be encouraged to enhance the use of artefacts in instruction as well as teachers and students to be sensitized on the positive outcomes of using the artefacts as instructional materials.

Keywords: Cultural Artefacts, Biology Instructional.

INTRODUCTION

Biology instruction is a critical component of any comprehensive education system. It belongs to the family of Science, Technology, Engineering and Mathematics (STEM). This is significant for promoting socio-economic and technological advancement which for Kenya implies attainment of development target including vision 2030. As a process, Biology instruction entails preparation, presentation and evaluation of teaching and learning of Biology concepts. According to Chavan & Patankar (2018), the concepts are important in that they help in understanding the basics of Biology, appreciating the diversity of organisms, developing critical thinking skills and applying Biological principles to everyday life. Similarly, Ong'amo, Ondigi and Omariba (2017) contend that Biology concepts lay a foundation for careers in human medicine, public health, agriculture, veterinary medicine, animal husbandry and biotechnology. The overall assumption is that mastery of Biology concepts which is the main objective of Biology instruction is improved human and animal health as well as food

security. This means that Biology instruction is so important in the society for it touches on peoples' lives and their way of living.

However, and despite its importance, evidence shows that a majority of learners continue to face challenges in mastery of Biology concepts. This often results in poor performance in the subject both in internal and external examination in many parts of world (Joy & Dinah, 2014; Adewale, Nzewuihe, & Ogunshola, 2016). In agreeing with this observation, Wamukota and Masibo (2017) pointed out that performance of a majority of learners in Biology is poor despite the key role the subject plays in industrialization and other sectors of the economy environment. In South Africa (Ngema 2016) made a similar observation that there was poor performance in science subjects and more specifically and it became a threat to the country's development and the economy. Muga (2021) observed that in the last five years, students' performance in Biology has remained low nationally and at the sub county level in Meru South Sub-County (KNEC 2021).

Biology had the lowest percentage mean rating in 2017, 2018 and 2019 when compared to other STEM subjects. Specifically, mean rating of students' performance in the subject ranged between 18.93% in 2017 and 27.02% in 2021 implying that a majority of students transiting the secondary school phase failed to get the minimum grade of C (45 - 54%) grade in the subject required by Kenya University and Colleges Central Placement Services (KUCCPS) for placement in a Biology related career in higher institutions of learning. This means that not only do KCSE graduates fail to enroll to this important career options but also the country fails in attaining its Millennium Development Goals (MDGs) of having a highly trained and skilled workforce in specific STEM related areas such as Biological sciences and related areas. A similar trend in performance was observed for Biology subject in Meru South Sub County as seen in Table 1.

Table 1: Meru South Sub County KCSE STEM Subjects

<u>Year</u>	<u>Biology</u>	<u>Chemistry</u>	<u>Physics</u>	<u>Mathematics</u>
2018	2.94	3.19	4.10	2.98
2019	3.03	2.73	3.89	3.01
2020	2.77	2.26	3.73	2.29
2021	3.14	2.09	2.83	2.46
2022	2.62	2.38	2.77	1.79

(Mean Rating out of 12 Points). Source: Meru South Sub County Director of Education Office (2022).

Table 1 shows that similar to the national averages, Biology performance of Meru South students in KCSE exam within the same period ranged between mean rating of 2.62 in 2022 to 3.14 in 2021. Findings show that a majority of students failed to score the minimum grade required for placement in Biology related careers thus jeopardizing their future career prospects. Data obtained illustrated that there was need for studies not only highlighting the causative factors for the persistent poor performance but also probable remedial action whose implementation could provide a remedy to the problem.

Empirical evidence attributes persistent poor performance to a number of reasons that hinder mastery of Biological concepts during Biology instruction thus resulting in poor performance. Almuammria (2015) revealed that there are a range of factors affecting academic performance such as learner factors, family factors and school factors. However, Ndayambaje, Bikorimana & Nsanganwimana (2021), attributed the poor performance in Biology as abstract Biological concepts, learner characteristics, attitude towards the subject, inappropriate teaching methodology, insufficient teaching, poor learning facilities and materials among others. Similarly, Atilla (2012) identified nature of topics, teachers' style of teaching, students' learning and studying habits, students negative feeling and attitude towards the subject and lack of resources. Ibrahim (2022) identified content related factors, teaching methodology, teacher related factors, learner related factors and inadequate instructional resources for Biology subject.

As a matter of fact, a majority of public secondary schools still find themselves constrained in providing quality teaching due to limited teaching and learning resources since provision of such resources adequately requires sufficient funding. In the absence of adequate resources, teachers are increasingly being encouraged to improvise by designing and developing instructional resources especially from locally available materials (Ibrahim, Mohammed, Abdullahi, Uzoma, & Bizi, 2021). Additionally, teachers are encouraged to use community resources available within their immediate vicinity for instructional purposes. Some of these materials are cultural artefacts which are unique and have a cultural meaning to a particular community within which the school exists (Sharma & Orey,2017).

Cultural artefacts are objects that are of importance to a cultural group. They are uniquely identified with a cultural group, usually because they are a product of culture (Mackey, Drew, Nicoll-Senft & Jacobson, 2023). According to Wartofsky (2022), cultural artefact is a term used in social sciences, particularly anthropology, ethnology and sociology for anything created by humans which gives information about the culture of its creator and user. It offers an insight into technological processes, economic and social structure of the cultural group. They are of critical importance to the study of humans and civilization over the course of history. Artefacts are the concrete items cultures leave behind. Cultural artefacts are anything such as objects, writing and artwork which give information about people and the culture by which the artefacts was used. Cultural artefacts create engagement in various levels, even in school that might have limited funding or materials. Cultural artefacts can be used in any lesson activity, pre or post assessment to further develop an idea or topic, to make real life connections to a lesson topic or even to engage students in a lively discussion or a small group activity. There is a pool of cultural artifacts at the fingertips of any willing teacher to learn how they can best use artefacts in a lesson or unit activity. By bring hands on learning tools into classrooms the leaners have a chance to change how they perceive their own education and the school environment as a whole. Hocking (2020) in the study of Australian Biology curriculums using artefacts, students were able to make sense of their own and families' development. DeVries (2022) also observed that cultural or students made artefacts create a synthesis of qualitative and quantitative approaches. Hocking (2020) found out that, the amount of artefacts pupils encounter every day is almost endless. Besides that, the educational effort made to make them understand those artefacts would soon be outdated, as new artefacts constantly enter our lives. DeVries (2022) also observed that without an understanding that exceeds the individual artefact, each bit of knowledge about a particular artefact soon becomes less relevant because new artefacts have taken the place of old ones. DeVries (2022) and Hocking (2020), concluded that the way artefacts are presented in education should be such that pupils learn to recognize characteristics of the artefact that are not specific for one specific artefact, but that relate to the very nature of all technical artefacts. Although the above studies were conducted in different cultural setting and learning environment, the above observations can be replicated in the study scope to make Biology concepts interesting.

A study by Arop, Umanah and Effiong (2015) in Nigeria, focused on teaching students the 21st century skills. The study examined the role of instructional materials in the science classroom and how instructional materials have affected the teaching and learning of Basic Science. The result showed that the use of instructional materials has a favorable effect on students' achievement in science concepts. In a related study in Nigeria, Nnorom and Okoli (2014) and Ghumdia (2016) found that artefacts teaching materials had a distinctive importance for the teachers to design effective and interactive teaching environments for the individuals to gain qualifications required. Nevertheless, concrete objects could help students gain access to concepts and processes that might otherwise remain inaccessible. It was recommended that inquiry strategy could improve achievement taking into cognizance the mental ability and gender of students concerned.

Mukagihanna, Nsanganwimana and Aurah (2020) study on Biology instructional resources availability in Rwanda schools and extent of their utilization in teaching pre-service Biology teachers. The study indicated that people from Rwanda have vibrant cultural artefacts extremely rich in diversity which may be used in Biology instruction for better concepts understanding. The findings revealed that Biology instructional resources like classroom chairs, chalkboards, laboratories, microscopes, centrifuge, slide projectors, Biology textbooks were available while resources like a class whiteboard, classroom overhead projectors, electrophoresis unit, recorders, Polymerase chain reaction machines, among others, were absent. The findings also revealed low-level use of available Biology instructional resources in teaching pre-service Biology teachers. The implication is the likelihood of producing less competent future Biology teachers (Krohs & Kroes, 2019). Comparatively, it is possible that these artefacts can be presented in the classroom and analyzed by learners and teachers together to come up with Biology subject concepts in secondary schools in Meru South Sub County.

According to Orodho, Waweru, Getange and Miriti (2013), as pertains to the effects of instructional tools on students' performance at KCSE in Subukia Sub-District, Nakuru County, artefacts had great impact on performance. The study showed that, it is somehow evident that the education systems in Kenya may be raising individuals who are not well equipped due to lack of instructional materials. The issue can be remedied by relying on cultural artefacts instead of IT tools for education purposes. Further, Ong'amo, Ondigi and Omariba (2017), undertook a study on effects of utilization of Biology teaching and learning resources on students' academic performance. The study was carried out in public secondary schools in Siaya District and used a sample of twentythree schools that was drawn from ninety- two public secondary schools. The findings were that educational artefact tools in Kenya may include objects used in classroom such as cultural regalia, artefacts made by teachers, curriculum materials and learner's products. The resources were mainly bought by the head teachers and very few improvised by teachers. The textbooks in schools were inadequate and had to be shared by students who could not buy their own or borrow from friends. It was also observed that schools that were endowed with abundant resources were performing much better than those schools with few resources. The study therefore sought to assess the types of cultural artefacts on Biology instruction with a specific focus on public secondary schools in Meru south subcounty as contribution to the existing knowledge gap.

Biology instruction, just like other subjects require the use of a variety of resources for quality instructional outcome. Sharma and Orey (2017) in a study of application of cultural artefacts state that people generally remember; 10% of what they read, 20% of what they hear, 30% of what they see, 50% of what they hear and see, 70% of what they say and 90% of what they say as they do a thing. This is the reason instructional materials in teaching are paramount for they ensured more effective learning since learners not only hear but also see and act. Learning being an active process should involve many different kinds of interconnected artefact resources. Nilsen and Gustafsson, (2016) advocate for instructional material acquired or locally produced with instructional content or function that can be used for formal or informal teaching and learning purposes. Cultural artefacts used in instruction of STEM subject such as Biology includes; bones, beads and beadwork, skins, temples and huts, jewelry among others are possible resources that can be used in teaching and learning process. Though, these artefacts have been used in certain topic of particular subjects, a replica of the same can be applied in other fields. These cultural artefacts are used across the world with great success in making learning more realistic, practical and interesting.

Hocking, Holding and Schönlieb (2020) did a study of Australian Biology curriculums using artefacts. Their study used mixed research design; with a target population 121 school teachers with a sample size of 56 respondents. The study applied systematic sampling design. Learning using cultural artefacts made learners learn best when they are able to connect new learning with what they already know and can do. And they also learned best when they felt their culture and identity is valued and acknowledged. Although the study was done in a developed country, the findings would also be replicated in teaching and learning Biology subject in Meru South Sub County.

Taylor (2012) carried out a study of inquiry based approaches using artefacts in Biology teaching in United Kingdom. The study used descriptive research design, and the target population was 101 pupils in junior schools in North Agra with a sample size of 62 schools sampled using convenience sampling procedure. Learners were requested to make two-dimensional instructional artefacts for teaching Biology which included flat pictures, graphs, chart, and diagrams posters, comics using cartoons, slides, and films trips. The researcher observed that it was easy to make these artefacts and students were able to apply them when learning Biology subject for they made them with purpose. He further observed that it is of utmost importance to create a learning environment in which students can comprehend and enjoy learning Biology. Hence students become more interested when cultural artefacts were used. The applied materials for making the above learning artefacts are readily available in the study scope area to make Biology subject more interesting to learners in Meru South Sub County.

Dean and Hubbell (2012) did a study in France based on classroom instruction that works, which was researchbased strategies for increasing student performances. The study used difference-in-difference estimation. The study used mixed methods of data collection. The collected data (qualitative and quantitative) were then tabulated, transcribed and analyzed using SPSS. Various customary artefacts such as resources including bones, beads and beadwork, sanctuaries items, huts, jewelry among others were collected from France's former colonial states such as Mali, Madagascar and Benin that had a wide variety of concepts. The study found out that those cultural artefacts had varying shapes and elements which made learners appreciate the need of their cultural heritage while learning different subjects. As a result, they were of conclusion that learners do not have to depend on rote learning of cognitive concepts that are alien to them, but they can depend on locally produced instructional artefacts. Although the example of the above artefacts is from West and Southern Africa, some of these artefacts are available in Meru South Sub-County. However, such resources found can be replicated in teaching Biology Subject locally, an aspect that this study seeks to explore.

Pradhan Jaya (2021) undertook a study on the link between cultural artefacts and mathematics in relation to home and school environment in India, Tribhuvan Province. The study applied constructivist theory and was a descriptive research design in nature. Students were encouraged to explore mathematical ideas through observation of different artefacts surrounding the temples. They were provided with measuring tape, paper, pencil, and other instruments by which they would explore and verify different mathematical properties. This required physical materials like measuring tapes, ropes, markers, etc. which were provided to the group. They sorted out the concepts of concentric circles, transformation, reflection, rotation, symmetry, pattern, and tessellations. The identification of concentric circles used to form such impressive artefacts also give hint on how these mathematical ideas were created at that time which was far from today's formal studies based on bookish knowledge. This approach provides students with the opportunity to learn mathematics in their own way and to develop mathematical ideas without the textbook and beyond the classroom. The above learning concept in mathematics can also be applied in teaching and learning of Biology.

Cooper (2021) did a study on ultraviolet detecting beads in Canada. The study was on electromagnetic spectrum which was perceived to have difficult concepts among the learners. The learners were requested

to bring ultraviolet detecting beads in order to make bracelet. They wore them and watched how they changed colour. The beads changed color very quickly into pink, orange, yellow, blue and purple when exposed to sunlight, on cloudy days the color changed slower and when not exposed to ultraviolet light the beads turned opaque white. They were fascinated to see white beads change color when taken outside the buildings and return back to white when back into the building. The question that disturbed their minds was the cause of the change; they thought it may have been humidity, temperature or fresh air. According to Keith (2021), the teacher had to elaborate that beads contain pigments which react with ultraviolet light from the sun, even on a cloudy day. They also changed with most classroom UV light sources. Use of such beads can be replicated in the study of Biology for there is a great similarity in application of the same. Students can make their own UV light detecting bracelet by stringing the beads on a pipe stem or on a strip of rawhide to study various topics in Biology lessons. Lesson activities can be included for they can be interesting to learners. However, UV rays from the sun may cause skin cancer and is harmful to our eyes.

Therefore, it is good to take precaution during the research. On making artefacts, South African have a very colorful style of making geometrical walls with eye catching decoration mostly by the Ndebele women (Nhlangwini, 2018). On other hand Tonga women also are well known with constructing and decorated round huts using different shape in Zimbabwe (Sunzuma, Zezekwa, Zinyeka, & Chinyoka, 2013). The shapes of the Tonga and Ndebele houses have been motivating learners in calculations of the area and perimeters. As such if teachers and students can as well apply such cultural artefact in learning Biology subject, the general achievement in the subject would be enhanced. In similar observations, Brian and Hilda (2017) study in South Africa observed young boys making toy cars using copper wires. The scholars in the process documented that the shapes the young boys were making were additionally developed or observed from school learning. The finding from South Africa indicate that, if women and young boys can make exemplary structures, then teachers and students in secondary schools in Meru South Sub County can make better artefacts which would be used learning Biology subject. Affum (2019) did a study on impact of using beads from the Krobo community cultural artefacts in teaching and learning science subjects in Ghana. The method adopted qualitative research method. The descriptive method was used in describing the process of producing glass beads, their uses and symbolism in learning science subjects such as mathematics and Biology.

The findings of the study pointed out that beads and other related artefacts were easy to make and they were available in the community which made the learners more interested in the subjects for their culture was gaining meaning in the learning process. Melil (2018) in a study on the traditional use of leather as dress in Keiyo, Kenya, observed that preservation of leather allowed for insight into the attire of the ancient societies. The research applied a case study method which was qualitative in nature and used an interview guide and observation for data collection. The results were analysed using thematic analysis and classification approach. The study sought to analyze various types of skins used by Keiyo ethnic group of Kenya. Such skins were goat skin, ship skin and Columbus monkey. Goat skin performed a major role in the arena of dressing to make dresses (kesenet) for ladies which acted as a wrapper cloth for carrying babies. The study suggested that the skin were the earliest means of dressing among the Keiyo during the precolonial period. It further concluded that the skin had multiple utility among the Keiyo, such as dressing, beddings, baskets, shields, cloaks for ceremonial functions and aesthetic purposes. The study findings can help students of Biology in the study of evolution and to understand how the clothing's have evolved over time. An analysis of the cottage industry among the Tharaka people of Tharaka south sub-county, Tharaka Nithi county, Kenya (1907-1963) indicated that Tharaka people were making a variety of indigenous items such as pots, mats, bee hives, boats, baskets, swords and hoes to sustain their livelihood (Muga, 2021). The coming of the European colonialists negatively affected these traditional cottage industries. The target population for this study was 75250 people but the study purposely sampled and interviewed 50 respondents. The study was carried out in Marimanti, Karocho, Chiakariga and Gituma location. Data collected was analyzed and interpreted qualitatively and quantitatively and employed descriptive research design. The study found out that iron working, weaving; pottery, traditional beer production, flour and gruel production, wood-works, cloth making, snuff production, herbal medicine production and salt production were major cottage industries that existed in the area. The frequency to which such resources could be utilized to enrich the teaching and learning of Biology, remains largely unknown, an aspect that this study sought to explore.

Studies reviewed show that different types of cultural artefacts have been used in instruction of STEM subjects across the world. Majority of these studies have been conducted in Europe and Asian countries and a few in African countries with varying learning outcomes. Findings of such studies may or may not be directly applied to Kenyan educational situations. Additionally, most of the studies focused more on general instructional tools, without much emphasis on cultural artefacts which the current study aims at identifying. In most of the studies, beads and beards were mostly searched artefacts in regard to the rich collection of artefacts which can be used in teaching and learning science subjects. They were also mainly used in Mathematics, and thus, there is a need to identify cultural artefacts which can be used in Biology as a stand-alone subject. This study therefore sought

to establish types of cultural artefacts which are used in teaching and learning Biology in secondary schools in Meru South Sub County in an attempt to bridge the existing knowledge gap.

THEORETICAL FRAMEWORK

The study applied two theories, first was constructivist learning theory advanced by Vygotsky, Dewey, Piaget, Gagne, and Bruner (1978) and the second was Sociocultural theory by Lev Vygotsky in (1923).

Constructivist Learning Theory

Constructivism learning theory states that people develop their own knowledge and understanding of the world, through the interaction of things and reflecting on experiences (Houkes & Vermaas, 2010). The constructivist theory is based on the idea that learners are active participants in their learning journey, while knowledge is constructed based on experiences (Ergazaki, 2016). As events occur, each person reflects on their experience and incorporates the new ideas with their prior knowledge. Learners develop *schemas* to organize acquired knowledge. This model was entrenched in learning theories by Vygotsky, Dewey, Piaget, Gagne, and Bruner. It further says that when learners experience something new, they harmonize it with their past experiences and ideas, which may lead to either changing what they believe or cast aside the new information as having no meaning (Miettinen & Virkkunen, 2015). The constructivism theory was found relevant for the study on a dependent variable which is Biology instruction. As such, through constructivism theory cultural artefacts can be prepared by students through active participation which would instill the required knowledge as instructional tool in Biology. In a constructivism classroom, students often work in groups. This helps students to learn and support each other's in learning process valuing each other's opinion and input. Further through constructivism application, learners can prepare and identify artefacts through active participation which can influence knowledge acquisition in Biology lessons. And such reconstruction of cultural tools gives students opportunity for adequate experience on subject matter as instructional tools. Through constructivism, students are also assumed to accelerate learning based on students' explorations which is prerequisite in Biology lessons. Constructivist engages the students' initiatives and personal involvement in physical models, artistic representations which can be of any kind of objects in learning Biology subject. The students are also more likely to retain and transfer the new knowledge to real life from applied objects making constructivism more applicable in Biology instruction.

Sociocultural Theory

Sociocultural theory of learning explains that learning occurs during social interactions between individuals and their environment. The proponent of Sociocultural theory of learning was Lev Vygotsky in 1923. The main desire of Vygotsky was to design a new way to look at and come up with a solution to educational and social problems of the time. He believed other factors, besides biological instincts, caused humans to act the way they do. He was the first modern psychologist to suggest a way in which culture plays a part in each person's nature. Vygotsky believed the inclusion of sign systems from a child's culture changes behavior and connects early and later forms of individual development. Thus, Sociocultural theory of learning one of the dominant theories of education today which posits that learning happens first through social interaction and second through individual internalization of social behaviors. In the sociocultural theory, students and teachers form relationships in the classroom to help the student learn. The relationships help facilitate social interaction and active participation in the learning tasks. Students learn through observation, listening and talking through their tasks. The theory assumes that human minds do not develop by virtue of some predetermined cognitive structures that unfold as one matures, but sociocultural theory informs that human mind develop through interaction with materials in the learning process where people learn from each other and use their experiences to successfully make sense of the materials they interact with. More so, sociocultural theory is valuable for the study because it focuses on the learners learning within their social, cultural, and historical context which is critical in learning, especially science subjects.

Vygotsky found that in order to understand a student's cognitive development, one must first understand their social, cultural, and historical background. Razzaq (2021) also argues that sociocultural theory "reflects the view that learning and development is not just a process of increased mental sophistication but is also mediated through social and cultural interactions. Cultural artefacts are materials that exist in the socio-cultural environment of the learner and these resources can help learners better acquire specific knowledge and skills in solving specific problems and, in the process become competent in a given topic in Biology. In reference to the sociocultural theory relative to classroom instruction, cultural artefacts can be in form of picture, models or regalia with patterns for solving a problem. Most often however, such cultural artefacts are combinations of elements of different orders, and multi-level tool par excellence, combining culturally evolved arrangements of meanings. Learning by using such cultural tools helps the mind to develop and leads to new and more elaborate forms of mental functioning among students.

Sociocultural theory insists that cultural resources should allow for a synthesizing of teaching, learning, and cognitive development, thinking through the tools which are paramount in teaching and learning Biology concepts. Further, Sociocultural

theory assumes that cultural artefacts as instructional materials have the capacity to develop in students the highest order of intellectual skills as they illustrate clearly, step by step how to follow which is a requirement in Biology subject concepts. According to Ramdani, Jufri, Gunawan, Fahrurrozi and Yustiqvar, (2021) instructional material can be used to develop higher learning abilities to the learners through self-teaching or guided learning. As students collaborate and engage with the material, the teacher becomes a coach and guides students along the process. Through both authentic activities and anchored instruction, learning takes place in a social setting, encouraging students to develop, share, and implement creative solutions to complex problems as collaborative teams. This theory was found applicable in explaining the independent variable (Cultural artefacts) which in STEM subjects which are important for practical engagement for better performance.

METHODOLOGY

The study applied a descriptive survey research design. The target population was heads of Biology subject, Biology teachers and forms four Biology students. The sample size of 351 respondents was determined using the sample table developed by Krejcie and Morgan. Data collection instruments were a questionnaire and interview schedule. Expert opinion was used to establish validity and reliability. Data obtained was analyzed using descriptive and inferential statistics with the aid of Statistical Package for Social Science (SPSS) version 26 computer software.

RESULTS AND DISCUSSION

The study sought to determine the types of cultural artefacts used in Biology instruction in Meru South Sub-County. Biology students and their teachers were provided by a set of types of cultural artefacts to select the ones they integrated in the course of Biology instructional process. Findings were as presented in Table 2.

Table 2: Types of Cultural Artefacts used in Biology Instruction

Resources with local "Chuka" names	Teacher		Students	
	Yes	No	Yes	No
Wood carvings (Miatu, Nkimi, Miburo, Muro etc)	45.2	54.8	12.9	87.1
Bones from skeletons of animals	16.1	83.9	16.9	83.1
Earth paints (Mwanyo, Iraa, muhu)	12.9	87.1	19.2	80.8
Stone work (Nthio, ithiga ria kuthia, kanoro)	9.7	90.3	14.6	85.4
Houses (mud huts)				
Baskets & basketry (Ciondo)	3.2	96.8	0.0	99.7
Marts & waved materials (Mathithu)	0.0	100.0	0.0	100.0
Clay pots (Nyngu, Nthiri, Ngio)	45.2	54.8	9.6	90.4
Bows and Arrows	3.2	96.8	5.5	94.5
Beads & necklaces (Ciuma, mikathi, Nyenje)			6.6	93.4
Music Instruments (Mwinjiro, coro, ciigamba, Nguri, Kithithi etc)			8.8	91.2
Iron metal works (matumo, rangani, nthuku, ruoro, etc)	3.2	96.8	10.9	89.1
Skins (ndarua, ng'athi, masks)	35.5	64.5	13.2	86.8

Data obtained from Biology teachers indicate that bones from skeletons of animals (87.1%) is the cultural artefacts integrated by a majority of teachers in Biology instruction. Other moderately integrated cultural artefacts include Beads & necklaces (45.2%), wood carvings (45.2%) and skins (35.5%). Artefacts such as stones (12.9%), mud huts (9.7%), clay pots (6.5%), baskets & basketry (3.2%), music Instruments (3.2%) and iron metal works (3.2%) were integrated by fewer teachers in Biology instruction. Findings from Biology Students also identified bones from skeletons of animals (71.9%) as the most commonly integrated cultural artefacts. Findings thus confirm use of different cultural artefacts in Biology instruction in public secondary schools in Meru south sub-county. Nilsen and Gustafsson, (2016) advocated for instructional material acquired or locally produced with instructional content or function that can be used for formal or informal teaching and learning purposes. According to the researchers, cultural artefacts used in instruction of STEM subject such as Biology includes; bones, beads and beadwork, skins, temples and huts, jewellery among others are possible resources that can be used in teaching and learning process. Similarly, Keith (2021) in his study noted that Biology teachers used beads that contain pigments which react with ultraviolet light from the sun, even on a cloudy day to explain biological concepts. Such beads also change with most classroom UV light sources.

Qualitative data obtained from Biology HOS indicated Biology teachers' use of cultural artefacts in the teaching and learning of Biology in their schools. Interviewee A for instance indicated that their Biology teacher have access to *bones and skin* as Biology instruction tools. This observation was supported by interviewee B, C, H and J. Interviewee D and E noted that other cultural artefacts integrated by their Biology teachers besides the bones and skins include *beads and teeth* which were readily available as also observed by (Brian & Hilda, 2017; Nilsen & Gustafsson, 2016).

CONCLUSION

The study concluded that cultural artefacts such as bones, beads and necklaces, wood carvings and skins, stones, mud huts, clay pots, baskets and basketry, music instruments and iron metal are some the cultural artefacts that are available for Biology instruction in Meru South sub-county.

RECOMMENDATIONS

- i. There are many cultural artifacts within the locality of schools in Meru South which can be used for teaching and learning Biology.
- ii. Biology teachers should identify and use more types of cultural artefacts in Biology instruction.
- iii. Biology teachers should enhance the integration of cultural artefacts such as beads and necklaces, wood carvings and skins, stones, mud huts, clay pots, baskets and basketry, music instruments and iron metal to facilitate better conception of the abstract concepts that are being imparted.

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