

The Use of Skeletal System to Enhance the Understanding of the Concept of Parts of the Bones in Humans at Nana Asiamah Model Junior High School Basic Seven

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ABSTRACT

The main purpose of this study was to use teaching and learning materials to help basic seven pupils of Nana Asiamah Model Junior High school to identify parts of the bones in the human body. Some of the instruments used in collecting data and gathering information included interview, questionnaire and observation. One important thing about the study was that the various data collected were critically analyzed and the results were discussed. It was realized among other things that pupils are taught without the use of teaching and learning resources and this has been contributing greatly to the low performance in science and that after using the teaching and learning materials prepared by the researcher, the performance in the post test was better than the performance in the pre-test.

Based on the findings of the study, it was recommended that identification of parts of bones in the human body should be taught using concrete teaching and learning materials. Also parents should do their best to provide their wards with their educational needs in order to be motivated to learn hard.

Keywords: skeletal system, concept, joint, framework

Background of the study

The development of every country depends on the quality of education and training available to the people of that country. Integrated Science is therefore an important subject in the basics schools especially the upper primary and the junior high school levels. Science is a subject studied from the basic schools to the university level. For this reason, serious attention must be paid to the handling of science lesson in our schools in order to lay a good foundation for future professional competence. This is because it forms part of our daily live. To regard this subject as a very important in producing professional people in the country, a lot of task is required from the teachers in this subject area.

To ensure understanding and mastery over the integrated science, it is better to use teaching and learning materials to facilitate the learning of pupils as was cited by Saunders (2015) that “ learning and acquisition of skills, concept and ideas must start with the introduction of concrete materials, followed by semi- concrete materials before abstract materials are introduced to the learners”.

Van De Graft (2012), said that the skeletal system serves much important functions. It provides the shape and the form for our bodies in addition to supporting/ protecting, allowing bodily movement, producing blood for the body and storing minerals. The 206 bones form a rigid framework to which the softer tissues and organ of the body are attached. Vital organs of the body are protected by the surrounding skull as the heart and lungs are covered by the sternum and rib cage. Bodily movement is carried out by the interaction of the muscular and skeletal systems. Muscles are connected to the bones by tendons. Bones are connected to reach another bones by ligaments. Where bones meet one another is called a joint. Muscles which cause movement of a joint are connected to pull them together. According to Edith (2014), the human skeleton is divided into two distinct parts, which are the axial skeleton and the appendicular skeleton. The axial skeleton consists of bones that form the axis of the body, support and protect the organ of the head, neck and trunk. The appendicular skeleton is composed of bones that anchor the appendages to the axial skeleton. Also, Web M.H (2012) in his recent work said a joint or articulation is the place where two bones come together.

There are three types of joint classification by the amount of movement they allow. They are immovable, slightly movable and freely movable. Immovable joints are synarthrosis. In these types of joint, the bones are very close contact and separated only by a thin layer of fibres and connective tissues. An example is the suture in the skull between skull bones. Slightly movable joints are called amphiarthrosis, This joint is characterized by bones that are connected by hyaline cartilage. The rib that is connected to the sternum is an example of the movable joints

Nana Asiamah Model Junior High School is in Essam in the Bia West district in the Western North Region. The people in the district are predominantly farmers who are engaged in the production of crops such as cocoa, yam, maize, cassava, groundnut etc. Some of the people are also involved in animal rearing as supplementary occupation, animals such as goats, Sheep, cattle and poultry are reared in the area.

The school has one hundred and fifty-one (151) pupils of which fifty-three are boys and ninety-eight are girls. It also has eight teaching staff, which comprises five males and three females.

Purpose of the study

The purpose of the study is to:

- design and construct an improvised skeletal system of the human body.
- assist pupils to develop their logical reasoning and identification of the skeletal system of the human body
- draw the structure of the skeletal system.
- assess and analyze learners performance

Research questions

Below are the research questions generated to systematically guide and direct the study;

- Why do pupils in Basic seven of Nana Asiamah Model Junior High School find it difficult to list the parts of the bones in human?

- How effective will the improvised skeletal system of the human body will solve the problem?
- How will the teaching and learning materials help the pupils to improve or identify the skeletal system of the human body?

Meaning of teaching – learning materials/resources

Teaching –learning materials are the specific concrete objects to be provided for pupils to interact with in the course of the lesson to give them first-hand experience and help them to develop process skills. It also refers to specific items that the teacher should use during the lesson to explain concepts and information presented to pupils. They are relevant concrete objects and materials. For examples; chart, diagrams, gadgets, realia, etc. that the teacher and pupils should use in the course of the lesson to facilitate teaching-learning processes. With reference to Amodehene (2014), teaching and learning materials are items that can be seen and touched and are used to make teaching more easily understandable and to reinforce learning. They are materials that the teacher uses in addition to his/her voice in the teaching and learning process.

Fianu (2010) also revealed that teaching-learning materials are things or materials that both the teacher and pupils use during the teaching and learning. These materials can be classified into three main groups namely, the visual aids, audio aids and audio-visual aids. The visual aids are any teaching-learning device, which appeal to the sense of sight. Learning depends from 57% to 85% on the sense of sight. The sense of hearing is responsible for the remaining percentage. Examples of visual aids are chalkboard, a bulletin board, pictures, photos, diagrams, maps, charts, flash cards, models, textbooks, atlases, magazines periodicals etc. Audio-visual aids on the other hand are those teaching learning device that appeal to both the sense of hearing and sense of sight. Examples are the television set, the video set or tape, film projector etc. Lastly, is the audio or aural aids are any teaching device that appeal solely to the sense of hearing. Examples are tape recorder, radio, gramophone, record played, record changer, wireless etc. According to the Ministry of Education MOE (2014), teaching-learning materials are resources we use to help learners to acquire knowledge, skills and attitudes. They can be classified as primary, secondary and tertiary teaching –learning materials.

Significance of using teaching and learning materials

Teaching -learning materials offer a reality of experience, which stimulates self-activity on the part of the learners. Learners undoubtedly get more involved in the teaching-learning process through various activities, using the sense of man in one way or the other to enhance their understanding to the topic under discussion. Audio-visual materials for instance, can be screened and viewed by even between eighty and hundred learners at a go (if there is enough space) and yet they understand it because it would not be a mere lecture. It can be said that they make teaching simple because the teacher happens to use less communication. Both the teacher and the leaners talk and hear less. They see and

manipulate or operate the available audio-visual materials more and thereby understand better. In short, they provide variety in the teaching and learning of Integrated science in the junior high school.

Asafo-Adjei (2009) also stated some importance of teaching-learning materials which include:

- They help sustain pupils' interest; you know that the attention of children is always changing if there is nothing of interest to them. Teaching-learning materials such as flash cards, cardboards illustrations and the alike attract the interest of the pupils. For this reason, they pay attention to what you are teaching.
- They make pupils active participants in the lesson; when you present materials, you may ask pupil's questions based on it and pupils may also ask questions. This may lead to a discussion on it or pupils may do an exercise based on it. In all these cases, the teaching-learning materials have provided an opportunity for pupils to take part in the lesson.
- Pupils are provided with useful previous knowledge on which later learning can be based; After using good teaching-learning materials in lesson you would notice that several occasions would occur in later lesson whereby you can refer to the materials you used, to make pupils understand better. For instance, if you use a weighing scale once to teach, you would find later situation where you would continue to refer pupils to the teaching-learning materials. These significance tell you how vital teaching-learning materials are to teaching and learning. Do not forget that if you do not teach with them you would have a big problem with pupils getting bored and making class continue difficult for you.
- They help to know that, learning can be fun, real and exciting activity; This means that pupils could be encouraged to learn on their own. This is due to the act that first, they understand what they learn and re happy to practice. Second, if it involved manipulation they are curious to know more about it and this would encourage further learning.
- They save the teacher from the trouble of providing lengthy verbal explanation; once pupils can see what the teacher is talking about from a picture, diagram or in a demonstration using apparatus, the teacher has less explaining to do. Of course, this has added the advantage of saving time, so that the teacher can move on to teach other things.
- They also make it easier for pupils to understand what they are taught; Pupils in the Basic schools are mainly in the mental stage which Jean Piaget named as the concrete operational stage. This means that they learn best when we use concrete materials such as sticks for counting and performing mathematical operations. Also when pupils see, touch and hear what they are learning about, they understand it better.

Population, sample and sampling procedure

This research was based on pupils of Nana Asiamah Model Junior High School basic seven. Though the class has a population of fifty-seven pupils, the researcher used forty pupils in order to get a very clear and detailed research as well as to be able to work effectively within the limited time through random sampling. The forty pupils comprise twenty girls and twenty boys in order to maintain gender balance. The lottery approach of

random sampling technique was adopted. Twenty-five pieces of 10cm x 5cm identical papers were folded with five having no numbers and the rest numbered from 1 to 20. These 10cm x 5cm folded papers were mixed up and put into a container, and given to the boys to pick. Those who picked the numbered ones were selected. The girls were also given the same 10cm x 5cm identical folded papers in a container. They were then asked to pick the pieces of papers each and those who picked those numbers from 1 to 20 were for the study. Also the subject teacher of the pupils and twenty of the pupils from the part of the population in the research were used in finding information.

Interview

This is a planned sequence of questioning characterized by the fact that verbal questioning is used as a principal technique of data collection together with questionnaire for teachers. After the observation, the researcher thought it wise to interview some of the teachers and pupils to get a clear picture of certain issues which are relevant to the study. Four (4) of the teachers were interviewed. That is, the headmaster of the school and other four teachers who have taught in the school for some number of years. The reason for interviewing them was to clarify some of the possible causes and recommendations to the problem. Some of the issues pointed out by the teachers during the interview are:

Lack of parental care: Most parents do not care about their wards education. Such parents mostly do not provide their wards needs and whether their wards go to school or not, they don't care. Such parent does not also have time to ask their wards what their teachers taught them in the school to know whether their wards performances are good or poor. Due to all these, the pupils are sometimes worried and concentrate poorly in class hence their inability to read fluently. And some even dropout from school.

Secondly, they pointed out that the poor background of the pupils is also another factor. Most of the pupils are coming from illiterate homes where no one knows anything about education. Such pupils do not attach much seriousness to education. That is why some of them find it difficult to list the parts of the bones in humans.

Again, they pointed out that most of the teachers behave harshly towards them. There is no any better pupil-teacher relationship and so they do not feel free to express themselves when the subject teacher is teaching and this has also resulted to their inability to list the parts of the bones in humans.

Lastly, the pupils complained that most of their teachers do not use teaching and learning materials when teaching them and because of that, they sometimes find it difficult to understand some of the lessons taught by such teachers. This in one way or the other has also contributed to their inability to list the parts of the bones in humans.

The researcher used five days to interview the pupils as well as the teachers. He used two days to interview the teachers and in each of the days, he spent 45 minutes with them. The pupils were also interviewed using three days and in each of the days, the interview lasted for 30 minutes. The interview was purely carried out by the researcher himself to prevent any break in communication and misinformation.

The reasons for using this instrument are:

- It attracts a relatively high response rate.
- It can be adjusted to meet many diverse situations due to its flexible nature.

Meanwhile, interview does not stand independently of weakness. One of the weaknesses is that, it does not give the exact information sometimes. The questionnaires for pupils and teachers can be found in appendix A and B respectively.

Interview with subject teacher and parents

Since the problem was identified in the classroom, the researcher thought it wise to involve the subject teacher. The interviewer made it known to the subject teacher what he was after so he could get necessary information needed from the subject teacher. The researcher did not know where the problem of the pupils was coming from and therefore resorted to interviewing the parents of the pupils as well. He embarked on house-to-house interaction with the twenty pupils' parents. This was done immediately after school and in the evening. In administering of the interview with the parents, the researcher gave them early notice and information through their words. The researcher explained the purpose of the interaction to them so that they could bring out the necessary information needed

Questionnaire

Questionnaire was also employed by the researcher to gather information from both teachers and pupils. The researcher made use of two forms of designed questionnaires each made up four questions. The two set of question providing room for respondents' opinions and criticism while the close ended questions with options. Thus, true/false and questions alternative answers from which the respondents were to choose any one preferred answers.

Observation

According to the encyclopedia, Observation is the method of data collection that employs visions as its main means of data collection. In observational studies, the researcher collects data on the current status of subjects by watching them and listening and recording what he observes rather than asking questions about them. It was in this view that the researcher used observation as one of the instruments to receive valuable information about pupils' performance and behaviour from the teacher so as to identify the strengths and weaknesses of the teaching and learning in the classroom. In addition to this, the researcher also observed the teacher's behaviour such as his questioning techniques, logical organized teaching and learning activities, adequate evaluation exercise and systematic and sequential presentation adopted to the level of pupils in the classroom during his lesson delivery on the topic the skeletal system of the human body which is under study. Furthermore, the researcher also observed pupils active participation and involvement in the teaching and learning process as the lesson on the topic under study was in progress. It must be stated that the researcher was non-participant during the observation.

Pre- intervention stage

The researcher after he had observed the teaching of the topic "the skeletal system of the human body" realized that the pupils were unable to answer questions concerning the

lesson, decided to conduct a test of four items to actually find out the problem of the pupils for performing poorly after the lesson. Some few pupils performed well.

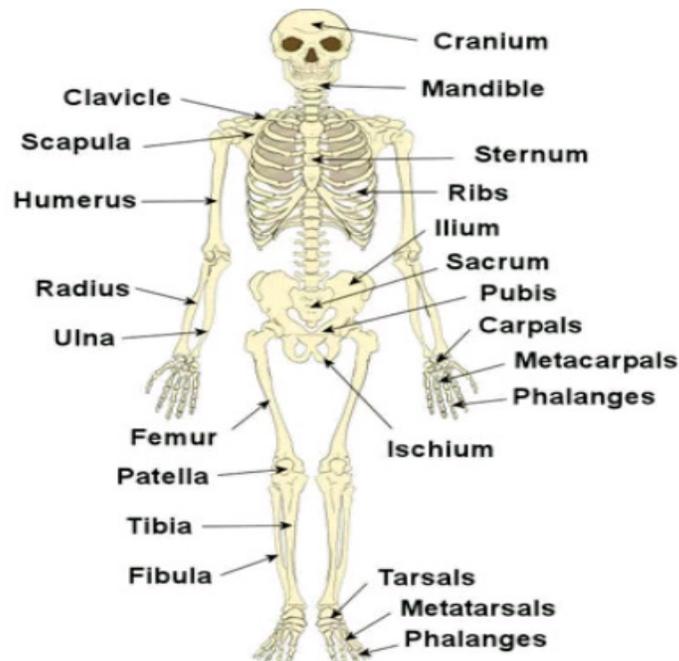
Intervention stage

In order to find a lasting solution to the problem, the researcher adopted the following strategies. Firstly, the researcher used a learner centred technique of teaching by making his lesson on the problem identified and more practical. With this, the researcher made use of teaching and learning materials which is an improvised drawing drawn on plywood which had been brightly coloured and labeled correctly. The following stages are the description of how the intervention was designed and the necessary tools and materials used.

Stages involved in designing teaching-learning materials

- Use the rip saw to cut the plywood into required size (100cm x 60cm)
- Use sand paper to smoothen the surface and edges
- Paint the plywood with background colours and sketch the human skeleton on the plywood with the use of pencil and eraser for corrections.
- Paint the skeleton with the use of paintbrush and oil paint.
- Use the ruler to draw straight arrows on the plywood leading to the various parts and label the parts pointed by the arrows as illustrated below.

Parts of the human skeletal system



Post- intervention stage

The researcher constructed and administered a post-test to help solve the problem of the pupils. The researcher presented the labeled skeleton to the class during a science lesson on the topic ‘parts of the bones of the human body. The researcher systematically led the pupils to identify the various parts of the skeleton. The researcher then lets pupils explained the functions of the skeletal system and finally made hem to draw and label the parts of the human skeleton. The pupils being able to perform all these activities correctly meant that pupils understood the concept well. After the delivery of the lesson, a post-test was conducted to see the pupils’ performance when the teaching and learning materials were used. The researcher gave out ten questions to the pupils based on the skeletal system of the human body.

Analysis of the pre-intervention test

The researcher conducted a pre-test for the pupils on the lesson they learnt. This was done especially to find out the performance of the pupils. The table 1 below shows the marks of pupils at the pre-intervention test.

Table 1.1: Results of pupils pre – intervention

Number of pupils	Marks scored	Population (%)
-	10	-
-	8	-
-	6	-
10	5	30
15	4	45
10	3	20
5	2	5
Total	40	100

From **table 1.1**, it is clear that a majority 30 (70%) out of 40 pupils scored marks below 5 out of 10 with 10 (30%) scoring 5 marks that is, 10 pupils representing 30% scored five out of ten (5/10), 15 pupils representing 45% scored 4 out of ten (4/10), another 10 pupils representing 20% also scored three out of ten (3/10) and 5 pupils representing 5% scored two out of ten (2/10) while nobody scored marks above 5. Hence the researcher thought it wise to conduct another test (post- intervention test) to help solve the pupils problem of not being able to identify the parts of the bones in humans which rendered them in scoring 5 marks and marks below 5.

Analysis of the post-intervention test

The researcher conducted another test after the intervention on the lesson they had already learnt with the same questions. This was done to find out if the performance of the pupils had improved.

Table 1.2: The result marks of pupils in post intervention test.

Number of pupils	Marks scored	Population (%)
5	10	20
8	9	12
15	8	40
12	7	28
-	5	-
-	3	-
-	2	-
Total	40	100

Taking a look at the **Table 1.2**, it is realized that the performance of the pupils have improved remarkably. 5 of the pupils scored 10 out of 10 representing 20% of the population. 15 representing 40% of the population scored 8 out of 10 and 12 pupils scored 7 out of 10 while no pupil scored 5 marks and marks below 5 showing a massive improvement in the performance of the pupils in the post test which also indicates that the problem of the pupils not being able to identify the parts of the bones in humans has been solved based on the pupils performance.

Analysis of pupils' response in the interview

Table 1.3: Report on whether or not pupils have interest in integrated science.

Response	Frequency	Percentage (%)
Yes	24	68
No	16	32
Total	40	100

As indicated in **Table 1.3**, out of the total number of 40 pupils interviewed on whether or not they have interest in Science, 24(68%) said yes while 16(32%) said they do not have interest in Science. The pupils' responses therefore show that most of them do have interest in Science.

Table 1.4: Responses on whether pupils come to school regularly

Response	Frequency	Percentage (%)
Yes	18	40
No	22	60
Total	40	100

The table 1.4 has shown that a greater number of pupils do not come to school regularly. The table has revealed that 22 out of the pupils interviewed do not come to school regularly and this represent 60% of the pupils interviewed. Again, 18 (40%) pupils out of those interviewed come to school on regular basis.

Analysis of the teacher's response during interview

The researcher involves the teacher who does not use teaching learning materials in lesson delivery. He also added that he normally finds it difficult to make teaching learning materials on his own. This, he said was the reason he does not use teaching learning materials in teaching. Response as to whether the class teacher encourages pupils to learn integrated science also proved negative. The reason he explained was that science in its natural state is a difficult subject and that pupils everywhere usually find it difficult to solve questions on science topic such as the skeletal system of the human body and therefore is not the fact of the pupils for feelings reluctant to learn the subject.

Analysis of parents' responses during interview

Table 1.5: The responses on whether parents provide basic educational needs for their wards.

Response	Num. of response	Percentage (%)
Yes	2	25
No	6	75
Total	8	100

Table 1.5, indicates that majority of the parents of the pupils do not provide their wards with the necessary educational needs. Out of the total (8) parents interviewed, only 2 of them claim they provide their wards with school needs. This number of parents represents only 25% of the total population interviewed. 6 of the parents also claimed that they do not provide their wards with basic school needs and this also represent 75% of the total number of parents interviewed.

Analysis of parents' responses during questionnaire

Table 1.6: Responses on whether pupils are encouraged to learn science at home by parents

Response	Num. of response	Percentage (%)
Yes	2	25
No	6	75
Total	8	100

In **table 1.6,** eight parents were interviewed as to whether they encourage their wards to learn science at home after school. Out of this six revealed that they do not encourage their children to learn at home after school which represents 75% of the parents population. Most of the parents also claimed they do not see it as part of the household duties.

Analysis of the intervention

As a way of finding a lasting solution to the problem under study, the researcher used a demonstration and brainstorming method of teaching. He again resorted to child-centred method of teaching. With this, pupils were involved in most of the activities during lesson delivery and were helped to solve questions by the researcher. He further urged the subject teacher to make use of teaching and learning materials in teaching. He also encouraged

pupils to learn science. The researcher also urged the parents to provide their wards with the necessary educational needs and encourage their wards to learn at home.

Discussion of the result

Following the analysis of the result of intervention, the researcher can say confidently that the measures put in place were successful and that his project objectives have been achieved. The project work undertaken has also brought a great change in the lives of the pupils as it has made their performance improved. It has also brought great change in lives of teachers in the school where the project work was carried out.

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

From the finding it is evidently clear that the poor performance of the pupils stems from the following factors;

- The subject teacher's reluctance to use teaching learning materials in lesson delivery.
- Pupils' lack of general interest in learning integrated science.
- Teachers' inability to encourage the pupils to learn science.
- Parents' inability to provide their wards with basic educational needs and giving encouragement to pupils to learn science at home.

Following the necessary measures put in place, a solution was found to the problem which brought a positive impact on the lives of pupils. This was due to the fact that teaching learning materials are now used by teachers. In other words, teachers now use the recommended approach in teaching as far as integrated science is concerned. In addition to the above, parents now know and understand the fact that one of their fundamental responsibility is to provide their wards with the basic educational needs that will help or encourage them to learn science. To add to it, parents have again seen it as a responsibility to help and also encourage their children to learn science at home. The pupils, with whom the research was also carried, have now greatly developed interest in learning integrated science as they can identify and name part of the skeletal system correctly.

Conclusions

Based upon the analysis and discussion of the result from the study, the following conclusion could be made. Firstly, children are happy and learn effectively when they interact with teaching and learning materials. Therefore, teachers should try as much as possible to make teaching and learning materials available in the lessons so that the children can interact with it and learn effectively. Also, when teaching and learning materials are used during teaching, pupils' interests are aroused and sustained. But if it is done in abstract, it makes things difficult for them to understand. In this case, teachers should do their best to use teaching and learning materials effectively during their time of teaching. Another conclusion made is that school heads should also make sure that all the necessary teaching and learning materials are made available in the school for the preparation of the pupils to ensure better performance in the school. Teachers should learn to be resourceful and innovative to create teaching and learning materials out of local materials.

Recommendations

Following the research carried out by the researcher based on pupils' poor performance in identifying parts of the skeletal system of the human body at Nana Asiamah Model basic school, the following suggestions were made in order to rectify the problem:

- Ghana Education Service (GES) which is the main stakeholder of education in this country is urged to supply schools with relevant and most current teaching learning aids or materials and also make sure teachers use them to improve upon teaching and learning in the classroom.
- Since they say education has no limit, and as such is needed by every individual to function well in our day to day activities, the researcher suggests that, parents should be well educated on their duties and responsibilities especially towards the provision of their wards educational needs.
- On the part of teachers, the researcher will like to suggest that they use teaching learning materials in teaching and also make sure pupils use them.
- All Science teachers should make their lessons very interesting and this could be done by using the child centered method of teaching in which pupils are involved more in lesson presentation.

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