

Science Education in Schools of Meghalaya

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Abstract

Science teaching in schools offers students great opportunity to know about facts and improves students logical reasoning abilities. Students gain critical understanding and therefore they are able to make new concepts, come up with generalizations, make informed decisions, and pursue new interests.

Meghalaya has been an educational hub in the North East India. Science has been an important part of the curriculum. Studies have shown that there are less number of trained teachers in teaching science. New concepts, curriculum, methods are required to keep pace with the new knowledge system.

Use of constructivist approach is emphasized in the schools. This paper will portray on the aims and objectives, certain facts and methods used in teaching science in schools of Meghalaya will be highlighted.

KEYWORDS- Science teaching, Schools, Meghalaya, Teachers

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Science does not imply as to sit down and pray for things to happen, but seeks to find out why things happen. It experiments and tries again and again. The modern world is ours and is very different from the ancient world and the great difference is due to scientific discoveries.

My preferences are all for science. The world is a narrower place now and there is little to discover in it. Science has opened up tremendous new vistas which wait to be explored, and of adventure there is no lack, especially in India today. – Pandit Jawaharlal Nehru

About Meghalaya

The term 'Meghalaya' is known as 'the Abode of Clouds'. Located in the North-Eastern part of India, the state of Meghalaya was separated from Assam as an autonomous district on the 2nd of April, 1970 and later became full fledged State of India on 21st January, 1972. Meghalaya falls between 25°02' and 26°07' N Latitude and longitudes of 89°49' and 92°50'E. It has a geographical area of 22,429 sq. Km with an elevation of 60 m to 1961 m as the highest peak at Laitkor. It shares national boundaries with a neighbouring state like Assam on the East & Northern side and in the West and the South, it shares an international border with Bangladesh of 496 km long. The capital of the state is Shillong, East Khasi Hills district, and is also known as the Educational hub of North-East India.

Education in Meghalaya

The formal system of education in the states of Meghalaya can be traced back to Rev Thomas Jones belonging to Welsh Missionary, who is credited for the formation of the Khasi Alphabet during 1842. Again, during 1902 the American Missionaries with the help of the Roman Script developed the Garo Alphabet. Therefore, it can be stated that the formal system of education emerged in Meghalaya during the British period in which the Missionaries played a huge role.

Meghalaya has been a hub for education in the North East. In Meghalaya no provisions were made for collegiate education till the beginning of the 20th century. In 1972 Meghalaya attained statehood and facilities for school education in Meghalaya improved with much flexibility. At present Meghalaya has 1170 schools. A lot of issues and challenges are also faced by the educational institutions in Meghalaya and also the implementation of government schemes.

Science in school curriculum

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Considering the subject from the intellectual point of view, science is the most inexhaustible store house of knowledge. It is opening up to new knowledge, explorations and ideas. It makes man aware of the vastness of the unknowable in the universe. Further science is universal in character, which is international in character.

The study of science has several disciplinary values- eg-its pursuit demands persistent efforts, diligence and patience.

Any experiment in science requires keen observation, patience, concentration of mind as well as accurate representation of facts. Scientific pursuits warrant objective observation and impartial judgement.

Engagement in any scientific activity requires intellectual honesty, perseverance, concentration of mind and broad minded attitude.

Pursuing scientific problem-

In pursuing scientific problem, one has to define the problem, plan the process, collect relevant data, formulate necessary hypothesis, repeat the process if necessary, apply to specific cases before generalising. During the process one has to be logical and objective at every step.

Therefore, scientific pursuits demands such qualities as minute observations, scientific attitude of mind, persistence, perseverance, concentration of mind, accuracy of measurement, patience, logical, objective and unprejudiced judgement, search for truth.

Aims of teaching science-

The aims should be formulated in the form of attainable objectives. Objectives should be of practical value and worthwhile, attainable and specific in terms. These objectives should be able to guide us to select and organize learning materials. While framing objectives we must keep into account the age and interest of the learners and also to keep in view the behavioural change we want to about in them.

Keeping in view the objectives, the specific views can be framed which may be attainable in the classroom situation. Thus, the specific objective are those which can be measured in the classroom which depends on the learning skills and interests which can actually be developed through classroom teaching. Since schools prepare future citizens, it is their duty to equip the pupils properly for their future life. The teachers are to inculcate in the students the basic scientific facts and principles and their application in their everyday life. Every science teacher has to realise the aims and objectives and they should make conscious efforts to achieve them through their teaching. Therefore, they should apply modern methods of teaching, use modern teaching aids, evolve creative activities for pupils and try to accomplish the ends as far as practicable.

Methods of Teaching Science

About the general choice to the teaching of science, it can be said that there is no set approach to which the science teacher must follow. Different teachers follow different methods. It is impossible to suggest a particular method or technique. Science teachers differ in their ability and so do pupils they teach. Ultimately learning is essential for the students. Eg- laboratory experiments requires practical method.

Some methods of teaching science

Lecture method-Usual chalk and talk method. It is not considered scientific at all and not suitable for teaching science at school stage. The greatest drawback is that it ignores experimentation.

Historical method-Here the idea is to follow the historic route of original discovery of a scientific phenomenon. Lives of scientists such as Einstien, Newton,s curiosity of the falling of apple etc. The greatest drawback in this process is that it is a very slow process in teaching.

Biographical method-This method is often interesting in teaching science as the lives of the scientists are described in an interesting manner. The students develop their vision and attitude.

Topic Method- F.W.Wesatway says this method is a sort of approach to a subject rather than a method of teaching. Topic selection and finishing is the utmost priority of a teacher. A teacher here is not interested in the interest of the students.

Heuristic method- The term heuristic is derived from the greek word which means to discover. It was designed and develop[ed by Prof. H.E. Armstrong, professor of chemistry at the imperial college of London. In this method each student has to

solve scientific problem experimentally, think for himself how to proceed, observe carefully and note down the essential data, analyse the data and draw conclusions.

Heuristic method is indisputably an excellent approach for training students in a scientific way. This method is superior to other methods but a good preparation is necessary in the part of the teacher.

Project Method-This method came into existence as a result of the former dull, monotonous method of teaching science in which there is no link between the knowledge imparted in schools and activity outside the classrooms.

A project is usually defined as a piece of whole heartedly activity carried to completion in its natural environment. Here the teacher acts as a guide and helps the students with full cooperation.

Planning and carrying out the project involves much more work on the part of the teacher than our traditional methods of teaching science.

Demonstration method- A demonstration as the word implies means to show. It is one of the most useful methods of teaching science. This method provides for a good display of objects, specimens and apparatus to the class. It also provides a means of clarifying experimentally certain parts of the subject as done in the laboratory.

Important points for demonstration

The demonstration should be tried out in advance.

Purpose should be clear from the beginning

Apparatus and equipment should be as simple as possible

Climatic conditions are important as it may affect the apparatus and materials.

Good use of black board should be made

Must be visible to all pupils

Good amount of questioning is important from the students.

Laboratory Methods-In this method maximum pupil activity can be achieved. The students themselves carry out the experiments, therefore first-hand knowledge is achieved. This method develops a sense of curiosity. The advantage of this method is that it gives scope for learning by doing.

Assignment method-In this method the whole course content is divided into a number of connected portions or assignments. Each assignment is meant to completed within a specified period.

Constructivist approach in teaching

This is based on constructivist learning theory. Constructivist teaching is based on the belief that learning occurs as learners are actively involved in a process of meaning and knowledge construction as opposed to passively receiving information. Learners are the makers of meaning and knowledge.

Constructivist teaching fosters critical thinking, and creates motivated and independent learners. This theoretical framework holds that learning always builds upon knowledge that a student already knows; this prior knowledge is called a schema.

Constructivists suggest that learning is more effective when a student is actively engaged in the learning process rather than attempting to receive knowledge passively.

A wide variety of methods claim to be based on constructivist learning theory. Most of these methods rely on some form of guided discovery where the teacher avoids most direct instruction and attempts to lead the student through questions and activities to discover, discuss, appreciate, and verbalize the new knowledge.

Characteristics of Constructivist Teaching

One of the primary goals of using constructivist teaching is that students learn how to learn by giving them the training to take initiative for their own learning experiences.

According to Audrey Gray, the characteristics of a constructivist classroom are as follows:

Learners are actively involved

Environment is democratic

Activities are interactive and student-centered

Teacher facilitates a process of learning in which students are encouraged to be responsible and autonomous

Examples of Constructivist activities

Furthermore, in the constructivist classroom, students work primarily in groups and learning and knowledge are interactive and dynamic. There is a great focus and emphasis on social and communication skills, as well as collaboration and exchange of ideas.

This is contrary to the traditional classroom in which students work primarily alone, learning is achieved through repetition, and the subjects are strictly adhered to and are guided by a textbook. Some activities encouraged in constructivist classrooms are:

Experimentation- students individually perform an experiment and then come together as a class to discuss the results.

Research projects: students research a topic and can present their findings to the class.

Field trips- This allows students to put the concepts and ideas discussed in class in a real-world context. Field trips would often be followed by class discussions.

Films- These provide visual context and thus bring another sense into the learning experience.

The Traditional Classroom

Begins with parts of the whole–Emphasizes basic skills

Strict adherence to fixed curriculum

Textbooks and workbooks

Instructor gives/students receive

Instructor assumes directive, authoritative role

Assessment via testing / correct answers

Knowledge is inert

Students work individually

The constructivist Classroom

Begin with the whole – expanding to parts

Pursuit of student questions / interests

Primary Sources / manipulative materials

Learning is interaction – building on what students already know

Instructor interacts / negotiates with students

Assessment via student works, observations, points of view, tests. Process is as important as product

Knowledge is dynamic / change with experiences

Students work in groups (Source : Thirteen Ed Online 2004)

Because existing knowledge schemata are explicitly acknowledged as a starting point for new learning, constructivist approaches tend to validate individual and cultural differences and diversity

Science chapters-

Adolescence and puberty-Class-9

Period of life, when the body undergoes changes, leading to reproductive maturity, is called **adolescence**. Adolescence begins around the age of

11 and lasts upto 18 or 19 years of age. Since this period covers the ‘teens’ (13

to 18 or 19 years of age), adolescents are also called ‘teenagers’. In girls, adolescence may begin a year or two earlier than in boys. Also, the period of adolescence varies from person to person.

Adolescence is also a period of change in a person's way of thinking. Adolescents are more independent than before and are also self-conscious. Intellectual development takes place and they tend to spend considerable time thinking. In fact, it is often the time in one's life when the brain has the greatest capacity for learning. Sometimes, however, an adolescent may feel insecure while trying to adjust to the changes in the body and mind. But as adolescent learners, you should know that there is no reason to feel insecure. These changes are a natural part of growing up.

Thus teachers after teaching the chapter should be able to conceptualize the content matter, pass it on to the students following an appropriate method and bring about learning.

Chapter-Health science

Class-6-9

Does eating hearty breakfast before exam yield better scores

In this experiment, students will learn whether eating a hearty breakfast before an exam will get them better test scores. For this specific experiment, a simple memory test will be used in attempts to keep other factors that affect test scores out.

Research Questions:

Which part of the brain controls memory? Is there a specific part?

Memory is controlled by the brain and is intangible. It is a person's ability to store, retain, and recall information and experiences. It is said that a person's memory significantly gets poorer with age. That is why the elderly tend to not remember things very well.

Materials:

Number memory test

Overhead projector & transparencies for the memory test

Paper for your test subjects to write on

Test subjects (at least 10, the more you have, the more accurate your results will be)

Pen/pencil for notes

Experimental Procedure:

Separate your test subjects evenly into 2 groups, randomly. One of these groups will have a hearty breakfast in the morning before taking the memory test and the other group will not have breakfast (make sure of this).

Have all your test subjects gather in a classroom to prepare for the test.

Take the transparency off the projector and ask your test subjects to write down all the numbers in order that they can remember

Continue projecting numbers until you reach 10 sets of numbers (or however many you wish.)

Repeat the above at least twice weekly. One thing to remember is to alternate which group has breakfast and which group does not, but keep the members in the groups the same throughout.

Evaluate the performance of the group members. How many did they get correct? Is there a dramatic difference between groups?

Teachers will record the results.

Suggested Chart

Average number of correct answers

Notes

Hearty Breakfast

No Breakfast

Terms/Concepts: Memory; Sensory memory; Short term memory; Long term memory

Chapter- Renewable energy project: Power from water

Class-3-5

Energy can be made, or generated, using solids, gas or liquids as its source of power. So how do you use energy? Energy can be generated to produce light, heat or the movement of objects. In this experiment, we explore how to get power from water, or hydropower, which can be used to pick up household objects.

Hydropower is mechanical energy that is generated by using the motion of water caused by gravity. Hydropower is one of the oldest forms of energy and has been used by humans since 4000 BC! By learning how to make a water wheel with a handful of household materials, we too can harness, or capture, different amounts of water to generate our own power.

Problem: How can hydropower be used to lift an object?

Materials

2-liter plastic soda bottle

Ruler

Marker

Craft knife (have an adult help you use it)

Scissors

2 corks

1 wooden barbecue skewer

Sewing thread (16 inches)

Small objects to lift (small fishing sinker, an eraser)

Sink

Duct Tape

Large Funnel

Paper clips

Procedure

Using your marker and ruler, measure and mark a few dots 6 cm up from the bottom of the bottle. Connect your dots and have an adult help you cut off the bottom using the craft knife.

Measure an 8cm section from the cut part of the bottle. Cut out this section so that you have a cylindrical section of plastic.

Cut four 2 cm-wide strips from the 8cm section with your scissors. Cut these strips in half so you are left with eight curved strips that measure 4 cm by 2 cm.

Draw 8 evenly spaced lines lengthwise on the cork, and make slits along each line with your hobby knife. Making sure that the plastic pieces all curve in the same direction, slide each 4 cm by 2 cm plastic piece into its own slit. *Why do you think it's important that the strips all curve in the same direction?*

Unfold two paperclips and flex one end of each to create a small loop. These paperclips will act as supports for the water wheel's axle.

Water has potential energy due to its position above the ground. The higher above the ground the water is, the more potential energy it has. Can you convert more of this potential energy into mechanical energy? Try making several water wheels and daisy-chaining them together! When water exits one water wheel, it can pass through another, and so on.

Results

The wheel spins and produces enough mechanical energy to elevate small items tied to the end of the thread. You just generated hydropower using the water from your faucet! Gravity pulls water down toward the earth, and the weight of the water exerts **torque** (a rotational force) on the water wheel. This torque provides enough energy to turn the skewer, allowing you to raise items attached to the other cork. Did you notice that more water pressure was needed to lift heavier objects? More energy is needed to lift heavy items than lighter ones, and by increasing the flow of water you generated more power.

Hydropower is used as a source of electricity in India. Using the same concepts from your experiment, water wheels capture the force of powerful rivers,

converting it into electricity and sending it into the electrical grid. Hydropower is an example of renewable energy, energy that can be continually replenished. What other renewable energy projects for kids can you find?

Aids for teaching science

Use of audio visual aids

Collected materials

Designed materials-charts, pictures, diagrams, graphs

Visual implements- projector, micro-projector, motion picture, film strips, slides

Audio implements-records, tape recorders, radio broadcasts, aquarium etc.

Science museum and biological garden

Field trips

Student discussions

Science clubs

Science fairs

Science exhibition photography

dramatization

Conclusion

Therefore we conclude in the words of GalilioGalilei(1564-1642) “ the authority of a thousand is not worth the humble reasoning of a single individual.”

The achievements and benefits of science in schools touches all sectors and all levels of modern society. Science is a subject where ideas can be experimented upon and verified.

References-

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