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Innovative Science Pedagogy With Special Emphasis On Learning By Doing, Zero Working Models And Innovative Classroom Teaching Methodologies

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Abstract: ***Various education commissions formed after the independence of India have accepted the importance of co-curricular activities, science and technology education, vocational curriculum in the education process. Kothari Education Commission has said that India's future is being built in its classrooms. NEP 2020 also recognizes the importance of science and technical education, innovative education, vocational education and student centric education. Today's students are the future of tomorrow, that is why it becomes necessary to include technology, creativity, scientific expression and innovation in the teaching process. In this sequence, I teach science with modern technology, innovation and creativity. Innovation in education is not only used in classroom teaching but students are also made to participate in science fairs and conferences, District as well as State level science festival too.***

keywords: science with innovation, zero investment working models, learning by doing, activity based teaching, students participation.

I. INTRODUCTION

In present times, science has become an essential part of our life. It becomes necessary to use some special types of teaching methods to teach logical and factual subjects like science to the rural environment. Therefore, innovative teaching methods were used to teach science to students, in which models made with zero investment were used. Through this type of experiment, interest in science subjects was awakened among the students of rural environment. Models are often used by teachers to help explain difficult concepts or demonstrate how different components interact with each other (Aseeva, 2021; Schwarz & Gwekwerere, 2007).

Earlier students had found science to be a difficult subject because traditional rote methods were used for science teaching. This type of experiment gave opportunity to develop a new expression of science. By developing a new approach towards science, the students have got the opportunity to excel in various aspects of science. The present study aims to develop scientific attitude among the students, to make science teaching feasible and to discover new possibilities for the future.

II. PREVIOUS STATE OF KNOWLEDGE

Only when arrangements are made according to the student's interest, the student takes interest in the subjects and tries to learn accordingly. Therefore, it is the responsibility of every teacher to find out the interest of the students and make them spend as much time as possible in activities according to their interest. It is observed that students are interested in learning by doing, models, charts and activity based innovative teaching in science subjects.

Learning by doing" is a pedagogical method based on the idea that you can learn something better and faster if you practice it. It is acknowledged that improvement can be stimulated with the help of involvements and collective association inside the student's willingness domain (Montessori, 1912). The philosophies mainly centered with

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child development, formulated by Dewey (Dewey, 1938). By the use of learning by doing methods student understand the concept in depth and their misconceptions and misunderstandings were got cleared on time. (Ayub and Khan, 2020).

Modeling is the essence of thinking and working scientifically (Harrison & Treagust, 2000). Models and modeling play a central role regarding the nature of science, its conduct, and the accreditation and dissemination of its outcomes, while also forming a bridge between science and technology (Franco & Colinvaux, 2000). Models are often used by teachers to help explain difficult concepts or demonstrate how different components interact with each other (Aseeva, 2021; Schwarz & Gwekwerere, 2007). Science lessons are a means of exploring and thinking according to experimental criteria, logical thinking, and inquiry, while modeling is the essence of thinking and working scientifically. Models are essential to science learning, much like they are essential to learning in any field (Gilbert, 2011). The National Science Education Standards (NSES) emphasize the use of models in science (Demircali & selvi, 2022).

To know the importance of making science models and teaching, all the work done on this subject till now was studied in depth. Based on this, the needs of the students in our school were first understood and then zero investment models were prepared accordingly.

The students of G.U.P. School Vijaypur were used as sample site to know the knowledge of the students in science and to find new possibilities for the future. Initially, an attempt was made to understand the interest and knowledge of science among the students. Initially, students were taught science through rote traditional methods. Due to this, students had to face great difficulty in understanding a difficult subject like science. Because the students come from extremely rural areas especially from Khattas where they are away from the main stream of life where electricity and water is generally not present, where they do not have any facilities for learning at home. In view of this serious difficulty of the students, it was decided to use some innovative teaching methods.

OBJECTIVES OF THE STUDY

- ✓ Find out the role of learning by doing in building the student self learner.
- ✓ To develop scientific expression and attitude among students.
- ✓ To prepare zero investment based models by using the resources available around the school. Which makes it easier for students to understand science topics.
- ✓ To discover the strategies which support effective implementation of the innovative teaching learning method for the students.
- ✓ To create self-confidence among students so that they do not consider themselves inferior to other students.
- ✓ To encouraging students to learn through learning by doing methods.

III. METHODOLOGY

Various methodologies were adopted to make children interested in science and to make teaching learning process of science simple, interesting, innovative and creative.

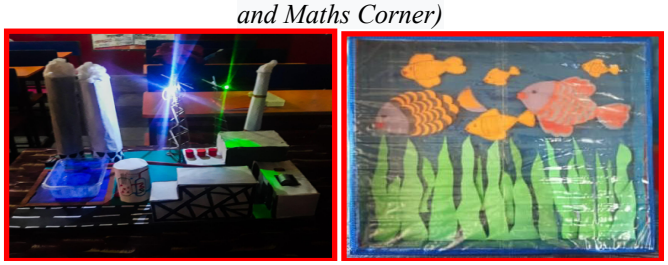
ZERO INVESTMENT WORKING MODEL

Many scientific models were shown to the students and children took more interest in studies with the help of models. To know the importance of science models in teaching of science, students were encouraged to make models on KABAD SAI JUGAAD.

First of all, the unused corners of the school with waste materials etc. were cleaned. The corner wall was painted in attractive colors, posters and beautiful charts. A platform for Science Corners was created by repairing old unused tables. After this, a list of those difficult topics of science was made on which models were to be prepared. Then the work of making models was started with the help of resources available nearby. “Kabhad se Jugaad” technique was used from scrap and students also started taking interest in making models. After that zero investment based working model was made on science topic so that the teaching learning process of science quite interesting, simple, stable, creative and innovative.

In this way a beautiful learning corner of science was created from an unused and waste corner.

Photograpgh 1: working and Non working models (Science and Maths Corner)



Photograph: 2 & 3: Working Model (hydroelectric power plant to generate electricity) and water ecosystem Fish Aquarium (artificial)

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Photograpgh 4 & 5: parts of flower 3D Model, Vikram Land on Moon surface working Model

LEARNING BY DOING METHODS

The process of teaching of science through learning by doing methods was quite interesting and innovative for the students. Students were taught the difficult principles of science with learning by doing methods. They showed a lot of interest in science by this method and participated in the study with enthusiasm. Teaching of quite complex topic of science like chemical effect of electric current, acid and base, natural indicators, physical and chemical changes becomes so easy to understand for the students through learning by doing methods. For this methods we used the local resources like turmeric powder, Detergent powder, china rose, lemon, old newspaper, wood etc. When children learned science through learning by doing activities, it made teaching science simple and interesting

Photograpgh 6 & 7: learning by doing, using local resources. (Acid, Base and Natural Indicaters)

Photograpgh 8 & 9: learning by doing, common electric circuit

HERBARIUM COLLECTION

Students are made to collect herbarium in the school campus and from the locall area. Students also learn about the structure of plants, their scientific names and families and their uses in an interesting way. Student got information about different trees and plants in an interesting way and learning of science becomes easier and faster by this method.

Photograph 10 & 11: Herbarium Collection by the students from school campus

KITCHEN GARDEN WITH MEDICINAL PLANT

We do gardening work with the students in school and also provide knowledge on medicinal plant like tulsi, lemon grass, aswagandha, amla etc. Kitchen garden also developed at school, to develop scientific approach in little learners and young minds flash cards were also created by me at school.

Photograpgh 12 & 13: kitchen Garden and Flower Garden made by us

SCIENCE GROUP OF STUDENTS

A science Group of students were also created in which creative and innovative knowledge of science were shared with the students as well as teaching of science also provided to students via online platform during holidays.

Photograpgh 14 &15: Science group of G. U. P. S. VIJAYPUR

USE OF LOCAL RESOURCES TO MAKE PROJECTS FOR INSPIRED AWARD

Students are taught to use local resources to connect with their community. Students create their own projects using these local resources. In this way children learned to make herbal incense sticks, wooden pens, ayurvedic soap, solar charged umbrella and mosquito repellent etc. The children also sent their projects to Inspire Award where they received Inspire Award Fellowship. These types of teaching methods also serve the objective of the National Education Policy 2020 where skill development is integrated with the curriculum.

Photograpgh 16 & 17: Use Of Local Resources to Make Projects for Inspired Award

ORGANIZATION OF SCIENCE EXHIBITIONS

Science exhibitions were also organized in the school from time to time, in which children participate actively. Recently

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the first Space Day was celebrated with great pomp and show in the school.

Photograpgh 18 & 19: science exhibition organised by our little scientists

BY USING FLASH CARD

By the use of self made flash cards on different topic of science made teaching learning process of science interesting, feasible, stable, innovative and effective.

ORGANIZATION OF HAAT MARKET AT SCHOOL

Haat Market of local vegetables and fruits was organised by the children at the school on every childerns day, Through this method, students can gain scientific knowledge about fruits and vegetables to be grown by themselves in their local surroundings and also develop the spirit of self-employment.

YOUTUBE CHANNEL

YouTube channel was also created in which knowledge of science were provided through videos to make learning of science easy, effective, innovative, creative, and stable for the students.

Photograpgh 20: YouTube channel with creative science vedio

IV. RESULT AND DISCUSSION

For science teaching, we have made zero investment based models, innovative teaching methods, learning by doing method, using audio visual aids like self made videos and along with this, we have tried to connect the students with their surrounding community. When science was taught to students through these types of methods, the learning outcomes were many times more than before. The knowledge thus acquired is permanent and also provides a platform for the future. Students are given classroom teaching of science with examples and activities. This will ensure that the knowledge and concepts learned by the children become permanent.

By using this type of technique at our school, students got more interested in science and they created many interesting and attractive models through their own efforts. Together with the students, we created working models on the whole journey of Chandrayaan-3 from Earth to the South pole of the Moon and the effect of corona virus on lungs and how to keep our lungs healthy via changing our daily life styles and food models. Both the Models prepared by my students Sanjay Ram and Shabana under my supervision got first place at district level and they got the opportunity to represent Nainital district in the state science festival.

Photograpgh 21 & 22: Journey Of Chandrayaan-3 (Vikram Lander and Rover Pragyan) From Land to South Pole Of Moon and our student Sanjay secured first position in district Science Festival of Nainital and represent Nainital district at state level

Photograph: 23 & 24: Health Food And Safety And Our Lungs Health After Covid- 19: Respiration Perfect and Imperfect Lungs and our student Shabana secured first position in district Science Festival of Nainital and represent Nainital district at state level

Students have prepared science stalls of different working and non working models at cluster level, block level and district level, and we secured first position at all the levels. The biggest benefit of this study was that the difficulties faced by the students in learning science could be identified and suitable teaching methods could be selected for them. All kinds of innovative methods and teaching materials are created by zero investment and own efforts. Thus, we make every possible effort to develop scientific skills and proficiency in the students.

V. CONCLUSION

Such studies will also pave the way for the future to develop scientific expression and attitude among the students.

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This study will be helpful in creating self-confidence among the students from rural environments and giving them a platform of equality. Students felt proud to present their models on such a big stage. Seeing the achievements of the student, other students of the school were also impressed and motivated.

FUTURE PROSPECTIVES

National Education Policy 2020 emphasizes on developing scientific temper and multilingualism among students. In NEP 2020, emphasis has been laid on teaching through experiments and inclusion of techno-friendly teaching methods. Thus, if this study is done on a larger scale, it will also be helpful in achieving the objectives of NEP 2020.

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REFERENCES

[1] Aseeva, O. M. (2021). Modeling as a method of cognition of the surrounding reality. Molodoy Uchenyy [Young Researcher], 6(348), 403-404.
[2] Ayub A. and Khan S. S. (2020). An analysis of learning by doing (Teaching Pedagogy) and its impact on a student's scores at elementary level. New Horizons vol, 14, no. 2 (pp 159-174).
[3] Dewey, J. (1938). How we think. Bastion Houghton Mifflin.
[4] Dermircali S. and Selvi M. (2022). Effects of model based science education on student's academic achievements and scientific process skills. Journal of Turkish science education. Vol, 19, no. 2 (pp 545-558). ISSN: 1304-6020.
[5] Gilbert, S. W. (2011). Models-Based science teaching. NSTA Press.
[6] Franco, C. and Colinvaux, D. (2000). Grasping mental models, On J. K. Gilbert and C. J. Boulter (Ed.), Developing models in science education. (pp 93-118), Kluwer Academic.
[7] Montessori, M. Ed. (1912). The Montessori Method, Scientific Pedagogy as Applied To Child Education. In the Children's Houses" With Additions and Revisions (Mcmxii), Second Edition. New York Frederick A. Stokes Company.
[8] Schwarz, C. and White B. (2003). Developing a model-centered approach to science education.
[9] Schwarz, C. V., & Gwekwerere, Y. N. (2007). Using a guided inquiry and modeling instructional framework (EIMA) to support preservice K-8