Bal Bharati PUBLIC SCHOOL
Sector-21, Noida, G.B. Nagar

Best Practices and Innovation in Education

"Ensure inclusive and equitable quality education and promote lifelong learning opportunities for all"

– SDG4 UNESCO

Education is not just about delivering content, conducting examinations, and distributing degrees. It must transcend beyond it and **allow the students to transform their own lives and act as a vehicle for transforming the lives of others.** Sustainable and inclusive learning is essential for an individual's future life in an everchanging world and also for the growth of the Nation.

The NEP 2020, takes into consideration the global concern of inclusive and equitable quality education which promotes lifelong learning for all as enshrined in the Sustainable Development Goals (SDGs4). It focuses on building the best of Human Capital through our education system which is capable of rising to the global standards, skillful and resilient enough to cope with the challenges of the new and emerging world. **The NEP 2020 envisions to build a New India through a vibrant and robust education system that is holistic, flexible, ethical, dynamic, rooted to the grounds, and sustainable.**

We don't need any advanced tools or rubrics to judge sustainable and inclusive learning, it is evident when students feel confident about the knowledge, skills, values, and attitude that they have acquired. If students can apply the knowledge they have built in the classroom to their surroundings, their learning is sustainable.

Sustainable learning is learning that lasts. At BBPS Noida, we constantly try to achieve this through well-structured and responsive teaching for all learners. We adopt the Pedagogies which are reflective, collaborative, and based on action research which is important for sustainable learning.

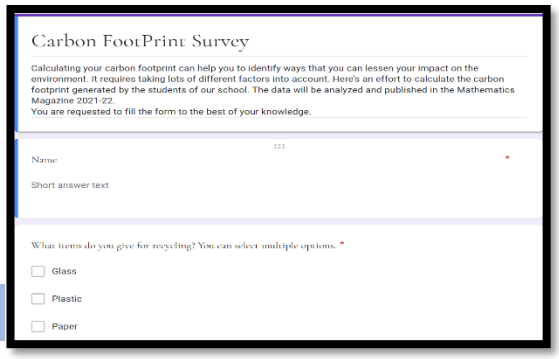
1. Reflective and Inquiry-Based Learning

In the 21st century, education is not about rote learning. **It should inspire creativity, encourage critical thinking and collaboration among students.** It should also encourage a problem-solving attitude. The projects that are based on Action Research for students involves action, evaluation, and reflection which is important for achieving the above goals.

One such project has been undertaken by a group of class XI, students at BBPS Noida, to understand the carbon footprints they are leaving on the earth. Through this project, we tried to **calculate the carbon footprints of students of our school** and analysed the data to understand our impact on the environment.

Step 1: Collection of Data

We created a google form to collect demographic details and personal choices of the students which leave an impact on the carbon footprints of the earth. Various questions based on food preferences, usage of water, yearly purchases, usage of vehicle, Garbage production were asked through the form.



Outlook of the Google Form used for Carbon Footprint Survey.

Step 2: Organize the data and allot numerical value to each response.

Each response given by the students was organized in an excel sheet and numerical weightage was allotted to it using different criterions.

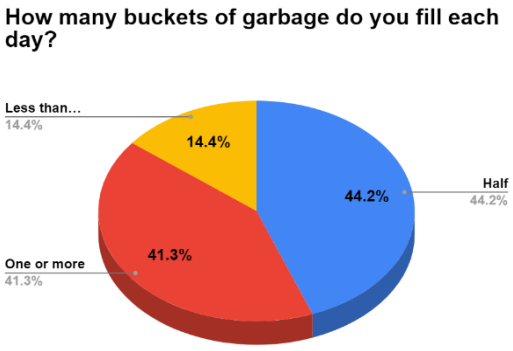
Identify the amount of waste that you recycle. If you do recycle then start with 24 points and subtract 4 points for each type of item you recycle.

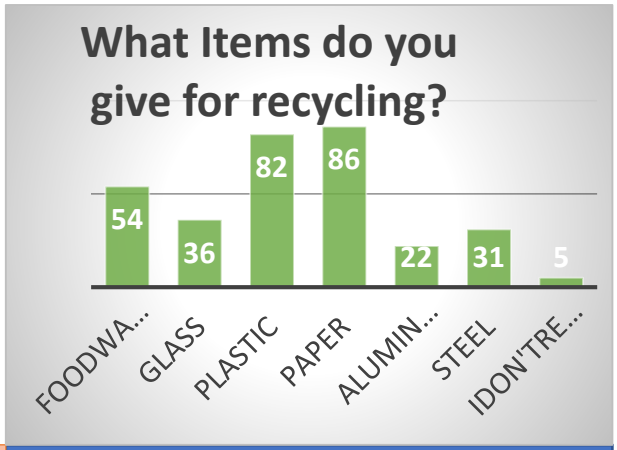
An Example of how Numerical Value was allotted to recycling of waste.

Link of the Excel:

https://docs.google.com/spreadsheets/d/12WE5q33mZlmDbor3NtcfYiA1PfZ5v_n0DI0S3k3Igzk/edit?usp=sharing

Step 3: Analysis of the data: Each category was analyzed individually and presented graphically.





Around 40% of the households produce more than one bucket of waste every day. Reducing the amount of waste produced to less than half will help in reducing our carbon footprints on earth.

Most of the households recycle plastic and paper. Only 50% households recycle food waste by composting. Very few households recycle glass, aluminum and steel. We need to work upon recycling of different materials.

Analysis of the items recycled and Amount of garbage getting produced everyday

Step 4: Presentation

Students presented their findings in the classroom and shared some insights on how these carbon footprints can be reduced by doing some lifestyle changes.

The Goal of sustainable learning should not only be to promote lifelong learning among students but should also make students aware of the current social, economic, and environmental issues. **Through such Action Research Based Projects, we encourage our students to think beyond textbooks and critically analyze the problems and generate out-of-the-box solutions** which are economically and socially feasible.

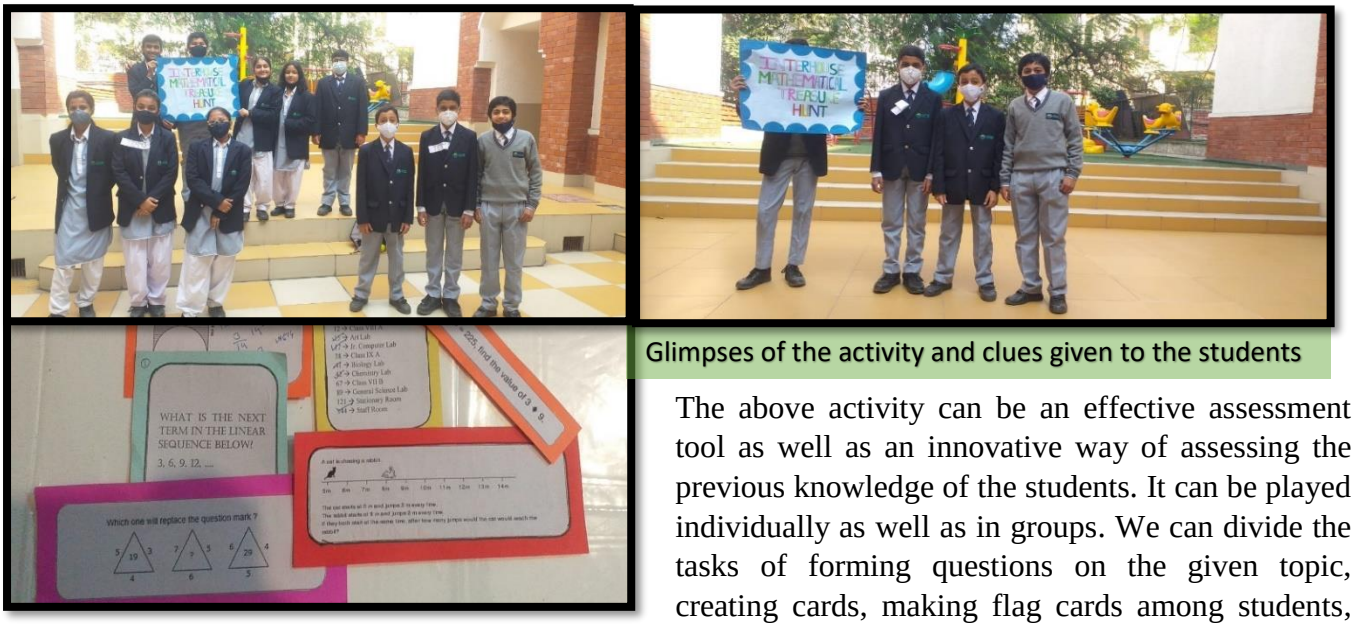
They also help in creating awareness among the society, as they promote family collaborations. Engaging with Parents is equally important for holistic Education. Such projects promote their involvement and lead away to sustainable and inclusive education.

2. Gamification of Mathematics

"Games and gamification both can lead to high levels of learner engagement and motivation"- Karl Kapp

The Gamification of learning is a different learning approach that focuses on introducing game elements in the learning environment. The goal of this pedagogy is to maximize enjoyment and engagement by capturing the interests of the learner and promoting Life-Long Learning. **This pedagogy holds great importance in the subjects like Mathematics which instills fear among students due to their abstractness.** Gamification helps in involving those students in the class who are otherwise inactive and avoid taking any lead. We can also include students in designing their games on a particular topic. Gamification can be used for learning as well as assessment of the given concept. **One of the examples of Gamification in Mathematics is the Mathematical Treasure Hunt.** After completing one topic, we can assess the learning of the students with the help of this game.

We conducted Treasure Hunt as a group activity in which each team was given a series of clues in the form of Mathematical questions. The answer to each question represented a venue where the next question is hidden. Students solved the questions to reach the venue and find the next clue. It was an enriching activity as students solved the mathematical questions and enjoyed the process in the form of a game.



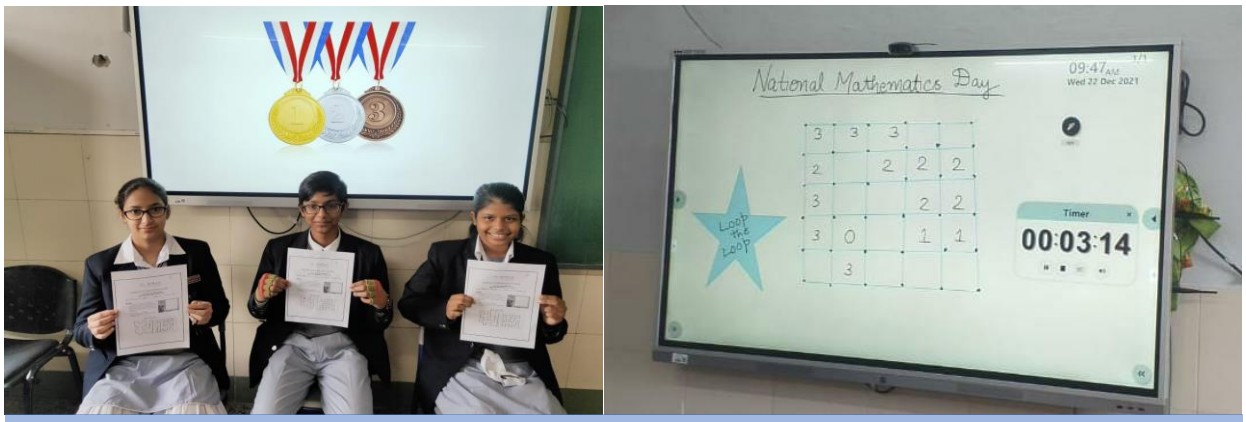
Glimpses of the activity and clues given to the students

The above activity can be an effective assessment tool as well as an innovative way of assessing the previous knowledge of the students. It can be played individually as well as in groups. We can divide the tasks of forming questions on the given topic, creating cards, making flag cards among students, and involving them in the entire process. Such pedagogies help in involving all the students and lead to inclusive learning. It is also helpful in removing the fear of subjects from students and encouraging them for sustainable lifelong learning.

3. Short innovative breaks

Classroom teaching can sometimes become mundane and repetitive. It has been well observed that creative ideas are born in a relaxed and fun environment. To break away from routine and to introduce some fun elements in daily teaching-learning practices, small refreshing breaks can be introduced. **Students can be given puzzles-based activities which enhance not only critical and logical thinking but are also a fun way to break away from regular teaching practices.**

As and when we get the chance, we play various logical thinking-based games in our classroom like Sudoku, Loop the Loop, Magic Squares. Etc.

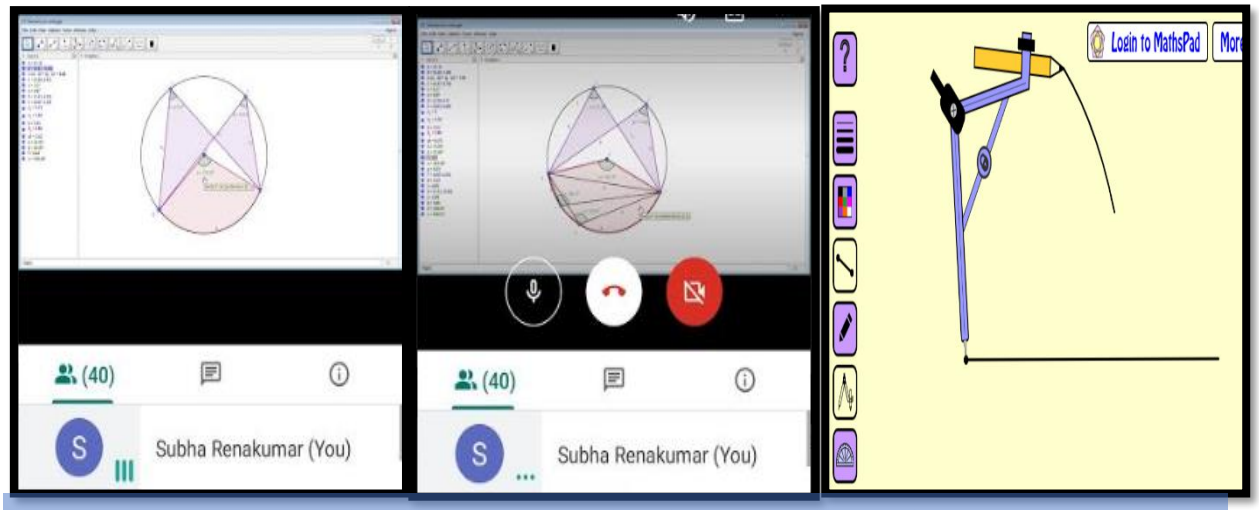


Students enjoying Loop the Loop Puzzle on National Mathematics Day

Such small breaks enhance the creative thinking among the students and maintain a healthy learning environment. Such activities also help in removing the fear of Mathematics and make it more enjoyable. They also help children in developing various mathematical skills like visualization, geometry, the concept of spatial geometry, etc.

4. Hybrid Learning

According to NCF 2005, the core area of concern in Mathematics Teaching in India is a sense of fear and failure regarding mathematics among the majority of students. Our curriculum is disappointing a talented minority as well as a non-participating majority at the same time. Several different technologies are being used in today's mathematics classrooms with varying degrees of success. Recent researches indicate that **the purposeful use of technology in the classroom can indeed enhance students' outcomes.** Technology can greatly aid the process of mathematical exploration, and clever use of such aids can help engage students.



Using Ed-tools to enhance the teaching learning process in classrooms.

We constantly use different Mathematical tools like **GeoGebra, Mathpad, Quizzes, videos from Diksha Portal, etc.** to enhance our teaching-learning process. Such technological interventions help students in the visualization of the concept and remove abstractness to some extent.

5. Subject Integration through Project Work

In the real-world problems are neither completely Mathematical nor completely social, they meet us in an integrated form. **Integration of subjects not only helps students in developing a different perspective for the same situation but also helps in understanding the application of different subjects in a real-life situation.** The integrated projects can also be used for creating awareness among the students on different sustainability issues and help in developing sustainable solutions to the existing problems. Each child is different and has a different perspective. Integration of subjects with different topics helps in understanding the learning ability of different students and creates an inclusive environment.

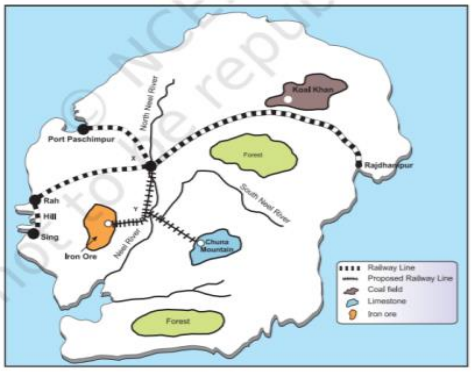
Mathematics

Project:

Imagine you are a part of Board of Directors faced with the problem of choosing a suitable site for an iron and steel plant of Developen Dweep. A team of technical experts has submitted a report with notes and a map. The team considered access to iron ore, coal, water and limestone, as well as the main market, sources of labour and port facilities. The team has suggested two sites, X and Y. The Board of Directors has to take the final decision about where to locate the steel plant.

- Read the report submitted by the team.
- Study the map to find out the distances of the resources from each site.
- Give each resource a 'weight' from 1 to 10, according to its importance. The greater the 'pull' of the factor on the industry the higher the weight from 1 to 10.
- Complete the table on the next page.
- The site with the lowest total should be the most satisfactory site.

Remember each one of you can decide differently



Scale: 1 cm = 100 Km

Class VIII Mathematics Holiday Homework help students in understanding the importance of different resources while setting up an industry. They used Mathematics to identify an ideal location for setting up an industry.

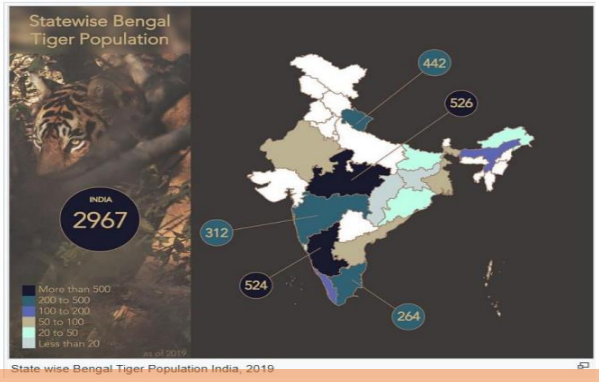
MATHEMATICS

Due to cutting of forests and hunting, several species of wildlife of India are declining rapidly. Many species have already become extinct. In order to protect them many national parks, sanctuaries and biosphere reserves have been set up. The Government has also started Project Tiger and Project Elephant to protect these animals.

Activity 1: Given below is region wise distribution of elephant's population in India. Read the given data and plot the percentage of elephant population region wise on a bar graph.

Region-wise Distribution of Corridors

Region	Number of Corridors	Area (km^2)	Percentage of elephant population
North-East	58	41,000	33%
East	54	23,500	10%
North	8	5,500	4%
South	46	40,000	53%



State wise Bengal Tiger Population India, 2019

Class VI Mathematics Holiday Homework is intended to create awareness among the students for the depleting flora and fauna in our country. We are using Mathematics to plot the number of elephants and tigers left in different states of our country.

Such Integrated Projects can be used as Holiday Homework for the students and can be assessed during Internal Assessment.

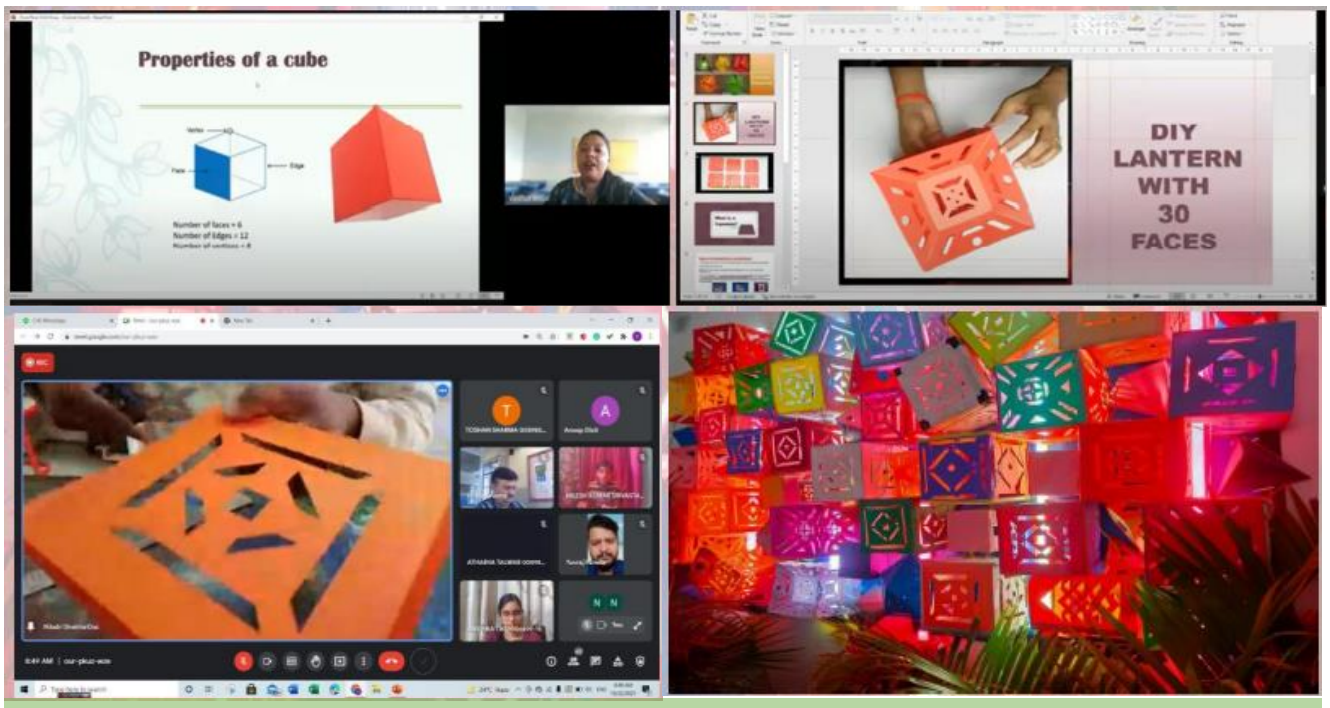
6. Art Integrated Learning

"Mathematics is an art of human understanding"- William Thurston

Art Integrated Learning (AIL) is a teaching-learning model which is based on learning 'through the arts' and 'with the arts': it is a process where art becomes the medium of teaching-learning, a key to understanding concepts within any subject of the curriculum.

Art experiences, lead to a better understanding and construction of knowledge about different concepts. Arts have the flexibility to accommodate age-appropriate opportunities for learners who can explore at their pace. This resonates with the experiential learning approach.

As a part of celebrating clean and green Diwali this year, an activity **'Let's Celebrate a Cubical Deepawali'** was planned for the students of Classes VII and VIII. The Visual Art and Mathematics faculty of the school conducted various sessions demonstrating the making of paper lanterns using innovative techniques and 3D shapes. The above activity was conducted as a part of the skill development program. **The activity not only enhanced the aesthetic skills of the students but also developed a strong understanding of 3D shapes such as a cube, pentagon, hexagon, octagon, etc.**



Glimpses of the activity and Learning outcomes

The educational landscape is changing so fast that it is almost impossible to predict how our classrooms will look like in the future. The Pandemic has also taught us that nothing is to be taken for granted, it showed us the importance of cultivating a growth mindset that is critically open to new ideas and expansion.

The above Best Practices used in the teaching and learning process are an attempt to improve upon the existing methodologies and increase the learning outcomes. It has been observed that even a small change in the routine can help pique the interest of the students and create a more sustainable and inclusive classroom. These activities helped in achieving those goals to some extent **but there still are many challenges that need to be faced, for example, a large number of students in our classrooms, inaccessibility to technology, etc.** As a teaching community, we need to brainstorm more and more such ideas which are in sync with NEP 2020 and fulfill our vision of sustainable and inclusive education for all.

References:

1. The 5 Cs Framework | Embedding environmental concerns in higher educational institutions https://student-learning.in/2021/10/10/the-5-cs-framework-embedding-environmental-concerns-in-higher-educational-institutions/
2. Sustainable learning: inclusive practices for 21st-century classrooms / Lorraine Graham, Jeanette Berman, Anne Bellert.
3. Art Integrated Learning: https://vikaspedia.in/education/teachers-corner/tips-for-teachers/art-integrated-learning
4. Gamification of learning: https://en.wikipedia.org/wiki/Gamification_of_learning
5. Highlights of New Education Policy-2020 https://pib.gov.in/PressReleasePage.aspx?PRID=1654058
6. Sustainable Development https://sdgs.un.org/goals

Vaishali Mittal
TGT Mathematics
BBPS Noida