

Image Recognition for Waste Segregation

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Learning Outcomes

After completing this project, students will be able to:

- Explain how AI learns to classify images using data.
- Understand the importance of data quality and variety.
- Recognize how AI can help in solving environmental issues.
- Demonstrate responsible and innovative use of technology.

Introduction

Artificial Intelligence (AI) helps machines recognize patterns and make decisions by learning from data. In this project, students use **Google's Teachable Machine** to train a model that can identify **biodegradable** and **non-biodegradable** waste items.

This activity promotes **environmental awareness** and demonstrates how AI can support sustainable practices in schools and communities.

The Smart Bin Challenge at ABC School

At ABC School, **Mr. Ankit Verma**, a science teacher, noticed that the waste bins in the school canteen were often mixed—banana peels were thrown into the plastic bin, and wrappers into the green one. He decided to turn this into a learning opportunity.

In his AI club class, he asked, “Can we make our school bins smarter using technology?”

The students were curious. “How can a dustbin be smart?” one asked.

Mr. Ankit smiled and said, “Let’s teach a computer to identify waste just like we do.”



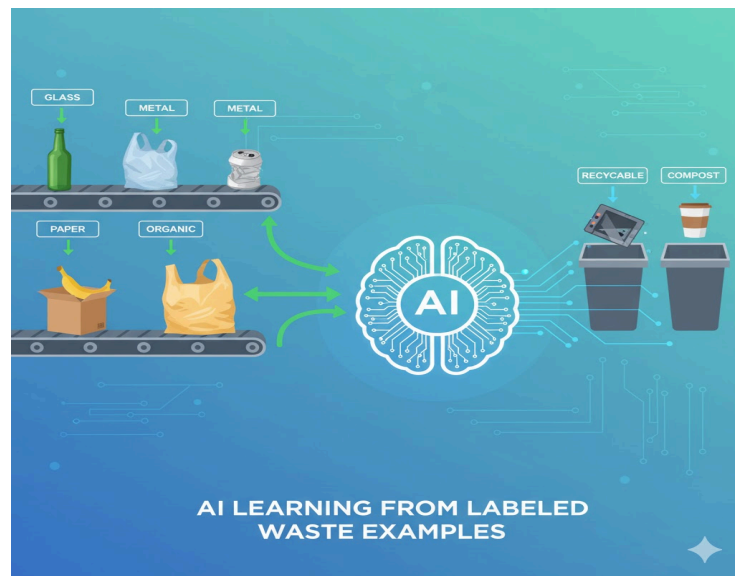
He introduced them to **Teachable Machine**, a free tool that allows anyone to create a simple AI model using pictures. The class was divided into two groups: **Eco Coders** and **Green Guardians**.

One group collected **biodegradable items** such as fruit peels, paper, and leaves. The other group gathered **non-biodegradable items** like bottles, plastic cups, and wrappers.

Concept Simplified

The model works on **image classification**, a branch of AI where the computer learns by looking at examples.

By showing the machine many pictures of different kinds of waste, it begins to notice patterns—like color, shape, and texture—and uses these clues to predict what type of waste it sees next.



Step-by-Step Process

1. Open Teachable Machine

Visit <https://teachablemachine.withgoogle.com>.

Click **Get Started** → **Image Project** → **Standard Image Model**.

2. Add Classes

Rename the first class as *Biodegradable* and the second as *Non-Biodegradable*.

3. Upload Images

- Add 20–25 clear pictures for each class.
- Use photos from different angles and lighting conditions for better learning.

4. Train the Model

Click **Train Model**. The computer now studies your images to find patterns.

Encourage students to notice how the model “learns” as the progress bar moves.

5. Test the Model

Upload a new image (e.g., a chips packet or fruit peel).

Observe whether it classifies correctly. Discuss why errors might occur.

6. Export and Share

Click **Export Model** → **Upload (for cloud use)** or **Download (for offline use)**.

Students can showcase their trained model during exhibitions or eco-awareness campaigns.

7. <https://teachablemachine.withgoogle.com/models/kVyJiMs04/> link to run in browser.

Integration with Curriculum

The project aligns with multiple subjects, making it a rich interdisciplinary learning experience. In **Science**, students explore the process of waste decomposition and study different types of biodegradable and non-biodegradable materials. Through **ICT / Artificial Intelligence (AI)**, they learn how to collect data, identify features, and train simple machine learning models to classify or predict waste categories. In **Social Science**, learners connect the activity with real-world applications by studying clean city initiatives, waste segregation systems, and sustainable waste management practices. Together, these subjects encourage students to apply technology for social good, fostering both environmental awareness and digital competence.

Tools and Resources

Tool	Link	Use
Teachable Machine	https://teachablemachine.withgoogle.com	Train and test the AI model
Google Drive	https://drive.google.com	Store collected images
Canva	https://www.canva.com	Create posters for awareness
Padlet	https://padlet.com	Share reflections and results

By the end of the project, students at ABC School were proud of their “Smart Bin.” Mr. Ankit reminded them that technology is most meaningful when it helps us take better care of our surroundings. The project proved that with curiosity, teamwork, and AI, even a small classroom can make a big difference toward a cleaner, greener planet.

Link to model -

video link - <https://youtu.be/TQT-4gQkoEU>