

# TEACHER'S GUIDE I: WHAT DO WE DO WITH EGG SHELLS?

In the article 'Why add eggs to midday meals?', Amol Anandrao Kate and Rakesh Tewary tell us that every Grade I-VIII student in Azim Premji School (APS), Sirohi, Rajasthan, is offered the choice to have: "...one egg a day, six days a week. In many states, each child receives 2-3 eggs per week under the PM-POSHAN scheme". This would leave these schools with a lot of egg shells to manage! What do we do with them?

**(A) Preparatory-stage EVS:** Chapter 12 ('Taking Charge of Waste') of the Grade III environmental studies (EVS) textbook (NCERT, 2024-2025) introduces children to recycling as one way to manage food waste including egg shells: "Materials such as dried leaves or branches, fruit peels, vegetable waste, or egg shells....rot easily and mix with the soil....[they] can be added to soil where it gets converted into compost food for plants and for tiny animals that live in the soil".<sup>1</sup>

Invite your students to find out what is done with the egg shells in school, at home, and in their community.

- In school: Divide the students into two groups. One group can find out how many eggs are served per day in the midday meal. Ask them to use this number to calculate the number of egg shells that will need to be managed every week. The other group could talk to the person/people who prepare the midday meal to find out what happens to the egg shells: How are they collected, stored (for example, are they stored in a separate bin?), and disposed? Bring the two groups together to observe how egg shells are stored in school. If possible, also see where they are disposed. Encourage students to record their observations and questions.
- At home and in the wider community: Invite your students to talk to family members, friends, and neighbours who eat eggs to find out what they do with the egg shells. Do any of them compost kitchen and farm waste? Do any of them add egg shells to the compost? What do they do with this compost? Where it is possible, encourage them to observe the compost pit and note down what they see. For example, what is the colour of the compost? What does it smell like? Are egg shells thrown in whole or crushed? Can they spot any insects or worms?

Discuss students' observations and questions from this exercise in class. Ask if they observed any differences in how egg shells are managed in school, at their homes, and in their community. Can they think of reasons for these differences? Invite them to think about the possible impacts of throwing egg shells as waste versus composting them. Share that when egg shells are disposed as waste, they accumulate in landfills taking a long time to breakdown. This can encourage pathogen growth, release foul odours, attract rodents, and contaminate soil and water.<sup>2, 3</sup> Egg shells can be composted with vegetable waste or mixed with manure and applied to soil as fertiliser for vegetables, crops, and other garden plants.<sup>4, 5</sup> You could also use this opportunity to think about and discuss some actions you could take together to manage egg shells

in school. Students could also create a poster on the benefits of composting egg shells and share it in school and their neighbourhood to create awareness.

**(B) Middle-stage science:**

Chapter 12 ('Forests: Our Lifeline') of the Grade VII science textbook (NCERT, 2024–2025) introduces students to concepts around composting, decomposers, and humus formation through an activity: "Activity 12.3: Dig a small pit. Put



vegetable waste and leaves in it. Cover them with soil. Add some water. After three days, remove the upper layer of the soil. Does the pit feel warm inside?"<sup>6</sup> In Chapter 1 ('Crop Production and Management') in the Grade VIII science textbook (NCERT, 2024–2025), students read that: "Manure is an organic substance obtained from the decomposition of plant or animal wastes. **Farmers dump plant and animal waste in pits at open places and allow it to decompose.** The decomposition is caused by some microorganisms. The decomposed matter is used as organic manure".<sup>7</sup>

- Invite your students to predict what could happen to egg shells when (i) left untreated and (ii) added to a compost pit. Encourage them to design an activity to verify their predictions. Write it down on the board.
- Through discussion, help them set up the activity. For example, you could divide students into 3 groups. Invite each group to set up a pit. Pit 1 could have only whole egg shells. Pit 2 could have whole eggs shells, vegetable waste, and dried leaves. Pit 3 could have crushed egg shells, vegetable waste, and dried leaves. The vegetable waste can come from the school kitchen. Cover all three pits with soil and sprinkle water.
- Ask students to remove the upper layer of soil after a week and observe the compost. Encourage them to record their observations (for example, soil colour, texture and appearance, smell, egg shells' appearance, and any living creatures). Let them repeat this once a week for three months. Interested students could do this for 12 months. Encourage them to also note down any change in temperature of the pits. Ask them to think about why and how to do this? To help students record their observations systematically, teachers could use the format of Table 2 in the activity sheet: 'Looking for Humus-II' in the article titled 'Getting to the Soul of Soil'.<sup>8</sup>
- Discuss their observations. For example, did they observe any differences in the egg shells in the three pits? How did it compare with their predictions? Did they observe any difference in temperatures between the three pits? Can they think of plausible explanations for their observations?

Why do egg shells take so long to break down when left untreated? One reason is the shells' chemical composition. Almost 95% of the shell is made of **calcium carbonate**.<sup>5</sup> Grade VIII student read about the function of this hard layer in hens' eggs in Chapter 6 ('Reproduction in Animals') of their science textbook (NCERT, 2024–2025): "Soon after fertilisation, the zygote divides repeatedly and travels down the oviduct. As it travels down, many protective layers are formed around it. **The**

**hard shell that you see in a hen's egg is one such protective layer.** After the hard shell is formed around the developing embryo, the hen finally lays the egg<sup>9</sup>. Studies by agricultural scientists and experiences of gardeners tell us that egg shells in various forms (crushed, composted) can be a good source of calcium and other minerals (such as magnesium, potassium, and phosphorus) for plants.<sup>5,10</sup> In Chapter 1 ('Nutrition in Plants') of the Grade VII science textbook (NCERT, 2024-2025), students are introduced to the role of fertilisers in plant nutrition: "Have you seen farmers spreading manure or fertilisers in the fields, or gardeners using them in lawns or in pots? Do you know why this is done? You learnt that plants absorb **minerals and nutrients** from the soil. So their amounts in the soil keep on declining. Fertilisers and manures contain nutrients such as nitrogen, potassium, phosphorous, etc. These nutrients need to be added from time to time to enrich the soil".<sup>11</sup> In Chapter 4: 'Acids Bases and Salts' of the Grade VII science textbook (NCERT, 2024-2025), students read that: "Excessive use of chemical fertilisers makes the soil acidic. Plants do not grow well when the soil is either too acidic or too basic. When the soil is too acidic, it is treated with **bases like quick lime (calcium oxide) or slaked lime (calcium hydroxide)**. If the soil is basic, organic matter (compost) is added to it. Organic matter releases acids which neutralises the basic nature of the soil".<sup>12</sup>

- Encourage students to talk to their parents (if they are farmers or have a kitchen garden) or to other farmers they know to find out how they enrich their soils. They could ask questions like: *Are their soils acidic or basic and how do they know this? Do they test their soil before deciding what nutrients need to be added? Do they add calcium? Have they used egg shells for their crops? If so, in what form and why? What has been their experience?* Students could also read the labels on fertiliser packets to see if some of them contain calcium. Encourage students to record this information in their notebooks.
- Discuss the information that students have collected. Ask questions to help them connect it with what they learn about acids and bases. For example, you could invite students to use a natural acid-base indicator to compare the acidity or alkalinity of soil samples with that of compost with egg shells. This exercise could help students identify acidic soils and appreciate the difference that the addition of compost with egg shells could make to them. Also, invite them to share ideas on ways to recycle egg shells as fertiliser.

#### Curricular connections:

The activities and discussions presented in this guide align with following recommendations of the National Curriculum Framework (NCF-SE) 2023 in its 'Approach to Learning about and Caring for the Environment': "Students should be encouraged to engage with the content at an intellectual level through active participation in the classroom (e.g., asking questions, engaging in debates) and also at an experiential level by undertaking hands-on community projects (e.g., **participating in environmentally sustainable activities at school, composting, minimising waste and maximising recycling/ upcycling, raising a small plot or bed of medicinal plants... community service in and around the school locality**)".<sup>13</sup>

They can also help teachers meet the following grade-specific learning outcomes:

- Grade IV: "[The learner] suggests ways for hygiene, **reduce, reuse, recycle** and takes care of different living beings (plants, animals, ...), resources (food, water and public property)".
- Grade V: "[The learner] suggests ways for hygiene, health, **managing waste... protecting/saving resources (land... etc.)**".
- Grade VII: "[The learner] applies learning of scientific concepts in day-to-day life, e.g., dealing with acidity; testing and treating soil..."

- (d) Grade VII: “[The learner] makes efforts to protect environment, e.g., following good practices for sanitation at public places; minimising generation of pollutants....”
- (e) Grade VIII: “[The learner] applies learning of scientific concepts in day-to-day life, e.g., ... **segregating biodegradable and non-biodegradable wastes; increasing crop production**”<sup>14</sup>

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