



# MADE HERE — Activity Handbook

Blue Apple India · Every classroom activity, by module and age band

## How to use this

**The rule that governs everything here: never talk for more than ten minutes without the students doing something.** A session that is 70% activity and 30% explanation is remembered. A session that is 70% explanation is not, however good the slides are.

Each activity below gives you five things: what you need, how long it takes, how to run it, the trap to avoid, and the one sentence the student should be able to say afterwards. If they can say that sentence, the activity worked.

**Kit is deliberately cheap.** Almost everything is paper, string, a stopwatch and things the school already owns. Nothing on this list needs a budget approval.

## Module 01 · What an industry is — the value chain

### 1.1 Trace the object (*Std 1–5, 15 min*)

**You need:** any manufactured object in the room. **Run it:** hold up a water bottle. Ask what it is made of. Then where that came from. Then who moved it. Keep going backwards until the class runs out — usually five or six steps in. **The trap:** accepting "a factory" as an answer. Push for *which* factory, making *which* part. **They should be able to say:** "One thing is made by many people in many places."

### 1.2 The pencil chain (*Std 6–10, 25 min*)

**You need:** a pencil, five sheets of A3, marker pens. **Run it:** five groups, one per stage — wood, graphite, paint, ferrule and rubber, assembly. Each group draws its stage and writes down what it needs from the group before it. Then join the sheets on the floor into one chain and walk it. **Then break it:** tell one group the mine has flooded. Ask the groups downstream what happens. **The trap:** letting it stay a drawing exercise. The break is the lesson. **They should be able to say:** "If one link stops, everything after it stops."

### 1.3 Landed cost (*Std 11–12, 40 min*)

**You need:** phones or a computer lab. **Run it:** pick a product the class uses. In groups, estimate: material cost, conversion cost, freight, duty, distributor margin, retail margin. Compare estimates and argue about the gaps. **The trap:** precision. The point is the shape of the cost stack, not the accuracy. **They should be able to say:** "The factory gate price is a small part of what I pay."

## Module 02 · How a factory runs — operations excellence

### 2.1 The paper hat line (*Std 1–5, 20 min*)

**You need:** newspaper, one sheet per hat. **Run it:** five children in a line, one fold each, two minutes. Count the hats. Look for the biggest pile of half-made hats — that child is the bottleneck. Move a step off them and run it again. **The trap:**

letting them work as five individuals. They must pass work along. **They should be able to say:** "The line goes as fast as the slowest person."

## 2.2 The five-station line, measured (*Std 6–10, 45 min — the flagship activity*)

**You need:** A4 paper, stopwatches (phones), a tally sheet. **Run it:** 1. Five stations, one task each: fold, fold, fold, mark, stack. One observer per station with a watch. 2. Run three minutes. Record output and the queue in front of each station. 3. Time each station's cycle. Plot the five bars on the board. 4. The tallest bar is the constraint. Move one task off it, or add a person to it. 5. Re-run three minutes. Compare. **The trap:** the class will want to make everyone work faster. Let them try it once — output will not move — then let them discover that rebalancing does. **They should be able to say:** "Speeding up a non-bottleneck just makes a bigger pile."

## 2.3 Takt against demand (*Std 11–12, 30 min*)

**You need:** the results from 2.2, or invented demand numbers. **Run it:** give them a customer demand — 600 pieces in a 480-minute shift. Compute takt (48 seconds). Compare to their measured cycle times. Decide how many people and stations are needed to hit takt. **The trap:** confusing cycle time with takt. Make them write both definitions down. **They should be able to say:** "Takt comes from the customer. Cycle time comes from us."

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# Module 03 • 5S and the eight wastes

## 3.1 Find the crayon (*Std 1–5, 10 min*)

**You need:** two boxes — one jumbled with fifty items, one with the same items in labelled trays. **Run it:** time a child finding a named item in the messy box. Then a different child in the tidy one. Write both times on the board. **The trap:** framing it as "be tidy". Frame it as "how long did we waste". **They should be able to say:** "Tidy is not about looking nice. It is about not waiting."

## 3.2 Shadow board (*Std 1–5 and 6–10, 25 min*)

**You need:** a tray, a marker, the classroom's shared equipment. **Run it:** lay out the items, draw around each one, label it. Photograph the finished tray. Print the photograph and tape it above the tray — that is now the standard. Audit it every Friday for a month. **The trap:** doing it for them. They must draw the outlines. **They should be able to say:** "If a shape is empty, something is missing — and I can see it from here."

## 3.3 The waste walk (*Std 6–10, 45 min*)

**You need:** stopwatches, clipboards, the DOWNTIME list. **Run it:** pick a real school process — the lunch queue, book issue, lab setup, assembly. Follow one person end to end with a stopwatch, writing down every second of waiting and every unnecessary step. Back in class, tag each observation against the eight wastes and total the time. **The trap:** blaming people. Rule stated up front: we are looking at the process, never the person. **They should be able to say:** "Most of the time in any process is not adding value."

## 3.4 Kaizen in one week (*Std 6–10 and 11–12, one week*)

**You need:** the results of 3.3. **Run it:** pick the single biggest waste. Design one change that costs nothing. Run it for a week. Re-measure. Present the before-and-after to the class — and to whoever owns that process. **The trap:** proposing something that needs money or permission. Constrain it to zero-cost. **They should be able to say:** "We changed something and we can prove it worked."

## 3.5 Value stream map (*Std 11–12, 60 min*)

**You need:** brown paper, sticky notes. **Run it:** map a process end to end — every step, its time, and the wait between steps. Total the value-added time and divide by the total elapsed time. The ratio is usually shockingly low. **The trap:** mapping what should happen instead of what does. **They should be able to say:** "Value-added time was under 5% of the total."

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# Module 04 • Quality management

#### 4.1 Good one, bad one (*Std 1–5, 15 min*)

**You need:** a packet of biscuits, two plates. **Run it:** the class sorts good from bad. Then take three that ended up on different plates according to different children and ask why. They will disagree. Write the disagreements on the board — that is a specification being born. **The trap:** letting them agree too quickly. Choose the ambiguous ones deliberately. **They should be able to say:** "Somebody has to decide what good means, in writing."

#### 4.2 Three rulers (*Std 6–10, 30 min — gauge R&R*)

**You need:** one bolt or block, a ruler, a tape and a vernier if the lab has one. **Run it:** three students measure the same object with the same instrument, independently, and write their answers face down. Reveal. They will not match. Repeat with different instruments. Then write a measurement procedure precise enough that everyone gets the same number, and test it. **The trap:** implying somebody was careless. Nobody was — that is the point. **They should be able to say:** "Before you trust a number, you have to prove the measuring is repeatable."

#### 4.3 The cost of one defect (*Std 6–10, 20 min*)

**You need:** the board. **Run it:** a defect costs ₹1 at the machine. Work out together what it costs at inspection, at assembly, and at the customer, multiplying by ten each time. Then ask where they would put the inspector. **The trap:** none — this one always lands. **They should be able to say:** "Find it early or pay a hundred times more."

#### 4.4 Process capability (*Std 11–12, 45 min*)

**You need:** thirty measurements of anything repeatable — paper aeroplane distance, a cut length. **Run it:** plot the histogram. Draw specification limits either side. Compute the spread against the tolerance. Discuss whether the process is capable, and what you would change. **The trap:** jumping to formulas. Draw it first, calculate second. **They should be able to say:** "A process can be on target and still not be capable."

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## Module 05 • TPM — why machines stop

#### 5.1 Listen to the bicycle (*Std 1–5, 10 min*)

**You need:** nothing. **Run it:** ask who has a bicycle and what noise it makes before something goes wrong. Collect five answers on the board. Explain that a factory pays people to listen for exactly that. **They should be able to say:** "Machines warn you before they break."

#### 5.2 Classroom availability (*Std 6–10, one week + 20 min*)

**You need:** a wall chart and a clock. **Run it:** agree what a full period is — say 40 minutes from 9:00. For one week, log actual start, actual finish, and every interruption with its cause. At the end, compute availability as actual teaching minutes over planned minutes. Pareto the causes. **The trap:** this can become a complaint session about the teacher. Set the rule first: process, not people. Have the teacher log their own losses too. **They should be able to say:** "Availability is a number, not an opinion."

#### 5.3 Take it apart (*Std 6–10, 60 min*)

**You need:** a dead appliance — a fan, a pump, an old printer. Screwdrivers. Safety briefing. **Run it:** photograph every step. Strip it down. Identify which part would fail first and why. Rebuild it from the photographs. **The trap:** anything mains-powered. Cut the plug off before it enters the room. **They should be able to say:** "I know what is inside it and which part wears out."

#### 5.4 SMED on a real changeover (*Std 11–12, 45 min*)

**You need:** any changeover the school actually does — the hall from assembly to exam layout, a lab between practicals. **Run it:** film it. Watch it back and split every task into internal (only possible when stopped) and external (possible while still running). Move everything external out. Re-run and time it. **The trap:** trying to make people move faster instead of resequencing. **They should be able to say:** "Most of a changeover can happen before you stop."

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## Module 06 • Applied AI

### 6.1 Teach the class to be a model (*Std 1–5, 15 min*)

**You need:** twenty objects, ten of one kind. **Run it:** one child leaves. The class agrees a secret rule ("round things"). The child is shown examples labelled yes or no until they can predict the next one. Then show them something ambiguous. **They should be able to say:** "It learned from examples. It did not understand."

### 6.2 Train a defect classifier (*Std 6–10 and 11–12, 45 min*)

**You need:** a laptop with a webcam, internet, a free browser-based image trainer, and thirty of one object — bottle caps, printed sheets — some deliberately damaged. **Run it:** capture thirty good and thirty defective images. Train. Test on new parts. Then break it deliberately: train only on good parts photographed in bright light and defective ones in shade, and watch it learn the lighting instead of the defect. **The trap:** stopping at the demo. The deliberate break is the whole lesson. **They should be able to say:** "The model learns whatever the data actually contains, not what I meant."

### 6.3 Scope it against a payback (*Std 11–12, 30 min*)

**You need:** the board. **Run it:** give them a scenario — 2% of parts defective, 10,000 parts a day, ₹40 per defect, an inspection system costing ₹12 lakh. Compute the payback. Then change the defect rate to 0.2% and recompute. Discuss when AI is not worth it. **They should be able to say:** "A model is only worth building if the maths works."

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## Module 07 • IoT and connected machines

### 7.1 The machine's diary (*Std 1–5, 10 min*)

**Run it:** one child is a machine and must say out loud, every ten seconds, what they are doing. Another child writes each statement down. After two minutes, read the log back and work out what happened without having watched. **They should be able to say:** "You can know what a machine did without standing next to it."

### 7.2 Build a counter (*Std 6–10, 60 min — best in an Atal Tinkering Lab*)

**You need:** a microcontroller board, an IR or ultrasonic sensor, a laptop. **Run it:** wire a sensor across a doorway or a chute. Count objects passing. Log the count with a timestamp. Plot it. Discuss what a plant would do with ten thousand of these. **No lab?** Use a phone stopwatch and a tally sheet, then discuss what changes when a machine does the counting instead of a person. **They should be able to say:** "A sensor turns something physical into a number you can plot."

### 7.3 Design the data architecture (*Std 11–12, 45 min*)

**You need:** brown paper. **Run it:** given a line of six machines, decide what to measure on each, how often, where it is stored, who looks at it and what action it triggers. Then compute how much data a year that is. **The trap:** measuring everything. Push them to justify each sensor by the decision it enables. **They should be able to say:** "Data with no decision attached to it is just cost."

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## Module 08 • Environment and sustainability

### 8.1 Sort the bin (*Std 1–5, 15 min*)

**You need:** the classroom bin, newspaper, gloves, four labelled trays. **Run it:** tip it out on the newspaper. Sort into paper, plastic, food and other. Weigh or estimate each. Discuss which could have been avoided entirely rather than sorted. **The trap:** stopping at sorting. Avoidance beats segregation. **They should be able to say:** "Mixed waste is worth nothing. Sorted waste is worth something."

### 8.2 The school energy audit (*Std 6–10, 2 sessions*)

**You need:** clipboards, the electricity bill, the tariff. **Run it:** 1. Walk the school. Count every light, fan, computer and pump; note the rating in watts and hours used. 2. Compute units per day: watts × hours ÷ 1000. Multiply by the tariff for a rupee figure. 3. Rank the top three consumers, and separately the top three *wastes* — things left on. 4. Cost one fix: rupees saved a year against rupees to implement. Write it up and give it to the principal. **The trap:** producing a number with no action attached. **They should be able to say:** "This room costs ₹ *a year, and we could save* ₹ of it for nothing."

### 8.3 Water balance (*Std 6–10, 30 min*)

**Run it:** estimate litres in — taps, tanks, deliveries — and litres out. The gap is leakage and evaporation. Find one dripping tap and calculate its annual loss in litres and rupees. **They should be able to say:** "A drip is a measurable amount of money."

### 8.4 Carbon footprint of one product (*Std 11–12, 45 min*)

**Run it:** pick a product. Estimate emissions across Scope 1 (their own fuel), Scope 2 (their electricity) and Scope 3 (everything upstream and downstream). Discover that Scope 3 dominates and discuss why that makes it hard. **They should be able to say:** "Most of a product's footprint is not inside the factory that made it."

## The capstone • Run your classroom like a plant

*Std 6–10 and 11–12 • one term*

| WEEK | WHAT HAPPENS                                                                       |
|------|------------------------------------------------------------------------------------|
| 1    | Agree the measures — availability, performance, quality — and how each is recorded |
| 2–5  | Measure. Nothing else. Wall chart updated daily by a rota                          |
| 6    | Analyse. Pareto the losses. Pick one                                               |
| 7    | Design a countermeasure that costs nothing and needs no permission                 |
| 8–11 | Run it. Keep measuring                                                             |
| 12   | Present before-and-after to the principal. Did it hold?                            |

**The only compulsory part is the measuring.** If they get as far as a countermeasure that holds, they have done at fourteen what a professional improvement engineer does.

## Running a plant visit

**Before:** confirm minimum age with the host's EHS head, in writing. Confirm PPE in children's sizes. Written parental consent for every student. One adult per eight students minimum. Insurance confirmed.

**On the day:** brief the students on the safety rules *before* they get off the bus. Give every student three questions they must ask somebody — one about the process, one about the job, one about what that person studied.

**After:** thirty minutes back in class, immediately. What surprised you? What job would you want? What did you not understand? The debrief is worth more than the visit.

**No visit possible?** Use the filmed 360° tour. It is not as good, but it is far better than nothing, and it removes age, distance and consent as blockers.

## Kit list for one school, one year

| ITEM                                   | ROUGH COST | USED IN            |
|----------------------------------------|------------|--------------------|
| Stopwatches (or use phones)            | —          | 2.2, 3.3, 5.2, 5.4 |
| A4 and newspaper                       | ₹500       | 2.1, 2.2           |
| Steel rule, tape, vernier caliper      | ₹2,500     | 4.2                |
| Shadow-board tray, markers, label tape | ₹1,200     | 3.2                |

| ITEM                                       | ROUGH COST       | USED IN                             |
|--------------------------------------------|------------------|-------------------------------------|
| Dead appliances for stripping              | free             | 5.3                                 |
| Screwdriver and spanner set                | ₹1,500           | 5.3                                 |
| Clamp meter or plug-in energy monitor      | ₹2,500           | 8.2                                 |
| Four segregation trays                     | ₹800             | 8.1                                 |
| Brown paper roll and sticky notes          | ₹700             | 3.5, 7.3                            |
| Microcontroller kit and sensors            | ₹4,000           | 7.2 (skip if the school has an ATL) |
| Printing — charts, standards, certificates | ₹2,000           | throughout                          |
| <b>Total</b>                               | <b>≈ ₹15,700</b> |                                     |

## Training the team who will deliver it

Before any practitioner or teacher runs a session:

- **Watch one, run one.** Nobody delivers alone until they have observed a full session and then co-run one.
- **Practise the ten-minute rule.** Time yourself in rehearsal. If you speak for more than ten minutes without an activity, cut something.
- **Prepare your own story.** Every session ends with fifteen minutes of you: what you do, what you studied, what you earn, what you wish you had known at fifteen. Write it down and keep it to three minutes so there is time for questions.
- **Learn to lose control safely.** These activities get noisy. Agree a stop signal with the teacher before you start.
- **Never answer a question you do not know.** Say so, write it down, and send the answer to the teacher within a week. Doing that once buys more credibility than any credential.
- **Safeguarding brief.** Background verification and POCSO awareness are completed before a first visit, not after.