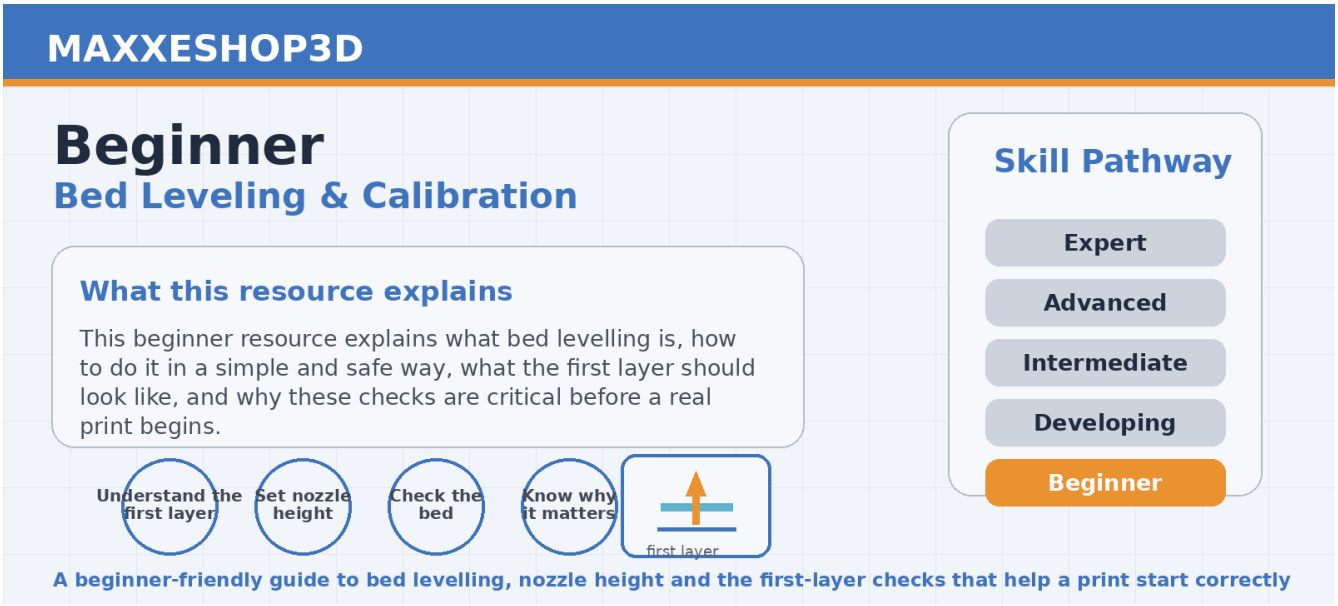


Beginner Level • Bed Leveling & Calibration

A beginner-friendly guide to bed levelling, nozzle height and the first-layer checks that help a print start correctly

This beginner resource explains what bed levelling is, how to do it in a simple and safe way, what the first layer should look like, and why these checks are critical before a real print begins.

Resource overview

Bed levelling and calibration are some of the most important setup tasks in 3D printing because the first layer depends on them. If the nozzle is too close to the bed, too far away, or uneven across the surface, the print may fail before the object has had a real chance to begin.

This document explains bed levelling and first-layer calibration in clear classroom language. It focuses on what to do, what to look for, and why each step helps the printer start in a stable, repeatable and reliable way.

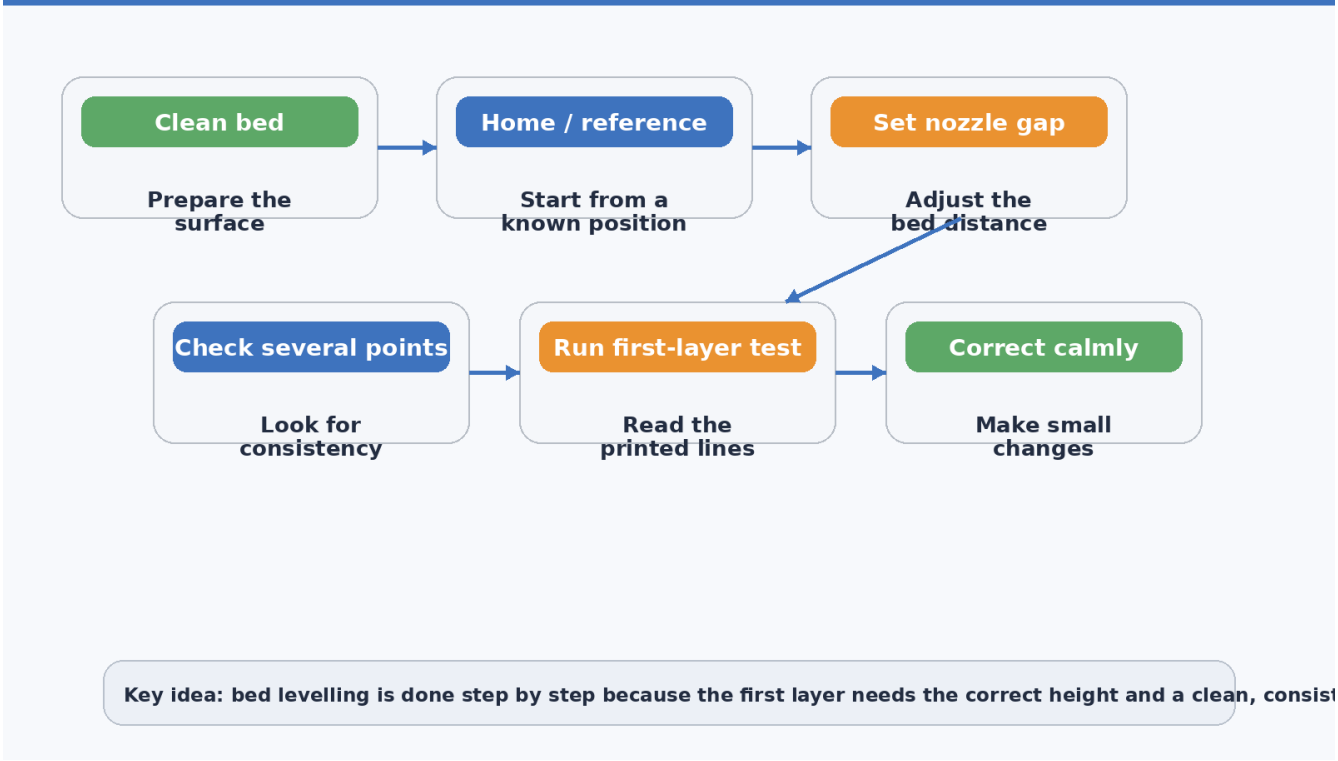
Indicative level	Beginner
Suggested use	First-layer lesson, early printer training or beginner setup guide
Best suited to	Students and new users learning why the first layer matters
Learning focus	Explain the purpose of bed levelling and recognise a good or poor starting layer
Related resource areas	Initial Setup • First Print • Troubleshooting

Bed levelling is about giving the first layer a fair chance

At beginner level, bed levelling should be understood as making sure the nozzle starts at a useful and even distance from the print surface. It is not only about turning knobs or following a ritual. It is about creating the right conditions for the first layer to stick and form properly.

When the bed is not prepared well, a print may not stick, may drag, or may print uneven lines. That is why levelling is one of the first skills a printer user needs to learn.

Diagram 1 • Bed levelling and first-layer setup sequence



This diagram supports the beginner explanation by showing the main bed-levelling and first-layer calibration stages.

Bed-leveling steps and why they matter

Calibration area	What to do	Why it matters
Clean the bed	Remove dust, grease or old residue before levelling or printing.	A dirty surface can weaken adhesion even if the height is correct.
Home the printer	Let the printer move to its known starting position before checking the bed.	The printer needs a reference point before height can be judged.
Check bed-to-nozzle distance	Use a simple method such as paper feel or guided adjustment to set the gap.	This gap affects how the first layer is placed.
Work around the bed	Check more than one point so the surface is not only correct in one small area.	A bed can be uneven across different zones.
Run a first-layer test	Print or inspect the early lines and adjust if needed.	The first layer shows whether levelling is really working.
Repeat calmly	Make small changes rather than rushing large ones.	Careful adjustment improves accuracy and confidence.

Clean and prepare the print surface first

Bed levelling begins before the nozzle is checked against the bed. The surface itself needs to be ready. Dust, oils from fingers, leftover glue or fragments from an earlier print can all reduce how well the first layer sticks. This means a printer can appear level and still struggle because the surface is not clean enough for reliable adhesion.

A clean surface matters because the first layer needs both correct height and correct contact. If the bed is contaminated, the material may slide, lift or fail to bond properly even when the nozzle distance seems reasonable.

This step is taken because levelling only helps when the print surface is capable of supporting the first layer. Cleaning removes one of the most common early causes of poor adhesion.

Set the nozzle distance so the first layer can grip

The main idea of bed levelling is to create the right distance between nozzle and bed at the start of the print. If the nozzle is too high, the filament may sit loosely on the surface and fail to grip. If the nozzle is too low, the nozzle may scrape, over-squash the line or make it hard for material to come out smoothly.

A beginner often learns this through a simple feel method, such as using paper as a guide, or by following the printer’s guided adjustment process. The goal is not to memorise a magic number at this stage. The goal is to understand that the gap must be small enough for the filament to press gently onto the bed, but not so small that the nozzle is forced into it.

This step is taken because the first layer depends on line shape. Good first-layer lines are gently flattened and connected. The right starting distance helps create that shape.

Diagram 2 • Beginner bed-calibration workflow

The workflow diagram above shows how bed preparation, nozzle distance and printed evidence work together at beginner level.

Check more than one area of the bed

A printer bed is not always perfectly even across the whole surface, especially on beginner machines or after the printer has been moved. That is why levelling is usually checked in more than one place. If only one corner is checked, the nozzle may still be too close or too far somewhere else.

This matters because a print may use a wider area than a single centre point. A bed that works in one spot but not in another can still produce first-layer problems, lifted corners or uneven extrusion across the print area.

This step is taken because levelling is about consistency, not just one successful measurement. The printer needs a useful height across the area where it will actually begin printing.

Use the first layer as proof

After levelling, the first layer becomes the most valuable check. It shows whether the nozzle is close enough, whether the lines are smooth, whether the material is sticking and whether the height looks similar across the surface. A careful first-layer check teaches the operator far more than levelling by memory alone.

If the first layer looks too round, patchy or loose, the nozzle may be too high. If it looks overly thin, scraped or rough, the nozzle may be too low. These early visual signs help beginners connect the adjustment step to the real printed result.

This step is taken because levelling is only complete when it produces a useful first layer. The printed evidence confirms whether the adjustment has actually solved the problem.

Good levelling reminders	Suggested classroom discussion
• Clean the bed before assuming the height is wrong. • Use the first layer as evidence, not decoration. • Adjust calmly and re-check rather than making large random changes. • Watch how the line shape changes when the gap changes.	• Explain how a nozzle that is too high looks different from one that is too low. • Describe why one good corner does not prove the whole bed is ready. • Discuss how first-layer tests help calibration. • Compare a rushed levelling routine with an evidence-based one.

Vocabulary focus

Bed levelling Setting the relationship between nozzle and bed so the first layer can start well.	**First layer** The first printed layer that all later layers depend on.	**Nozzle gap** The starting distance between the nozzle and the print surface.
Adhesion How well the first layer sticks to the bed.	**Homing** Moving the printer to a known start position.	**First-layer test** A simple print or observation used to check bed height and adhesion.

Why this level matters

This level matters because many failed prints are really first-layer failures, and many first-layer failures begin with poor bed levelling. Learning this early saves time, material and frustration.

It also helps students build visual judgement. They learn to read what the first layer is telling them rather than relying only on guesswork.

Teacher extension prompt

Ask students to describe what happens when the nozzle is too high, too low and correctly set. Strong beginner responses should connect each case to the appearance of the first layer.