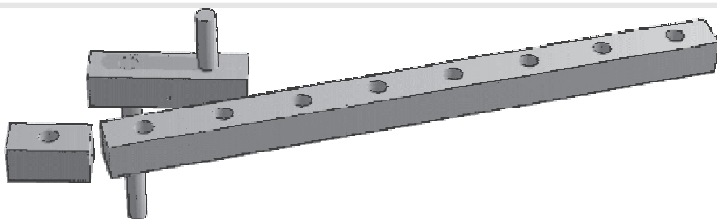
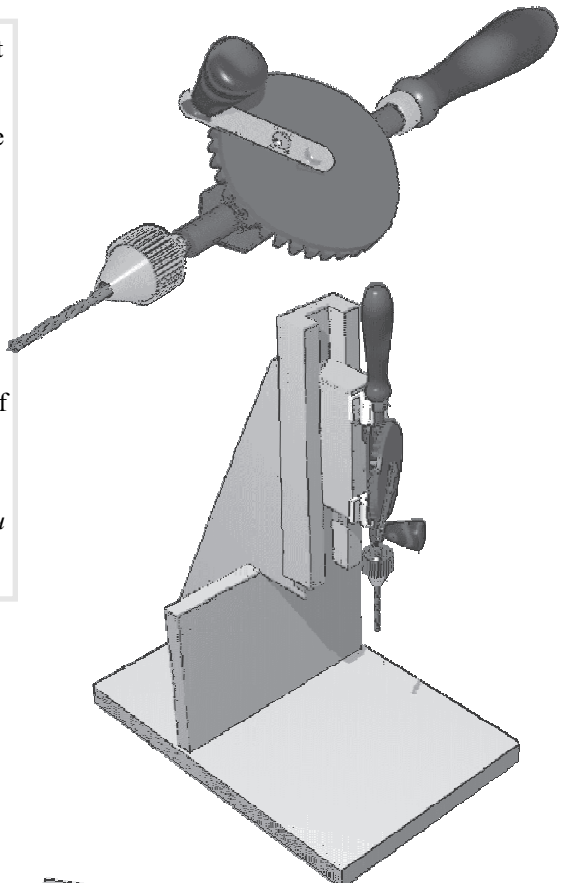


If you need a hole through a piece of wood, then it has to be drilled. For that you will probably use a **hand drill** like the one shown here. There are several patterns of hand drill, some with enclosed gears, some shaped like a pistol. The pistol-grip type we wouldn't recommend. The kind shown on the right at least fits into a simple drill stand. The hand drill is not an easy tool for young children to use accurately.

The **drill bit** is the fluted, interchangeable cutter that fits into the **chuck** of the hand drill. The bit is selected to produce a hole of the required diameter. The regular bit sizes usually recommended for primary school technology are 5mm dia. and 5.5mm dia. Assuming 5mm drill the first gives a push (*tight*) fit and the second a clearance (*loose*) fit. In reality the dowel is often a little oversize and it can be a struggle to fit the dowel into the 5mm hole. If the hole is near the end of the wood there is a risk of the wood splitting. We recommend using a slightly larger drill size as the 'default/push fit' drill. The next size up is 5.1mm, the next is 13/64 inch, the next 5.2mm. *The problem with this approach is that it is very difficult to find a supplier. If you have difficulty finding one then contact us, Rude Mechanicals.*

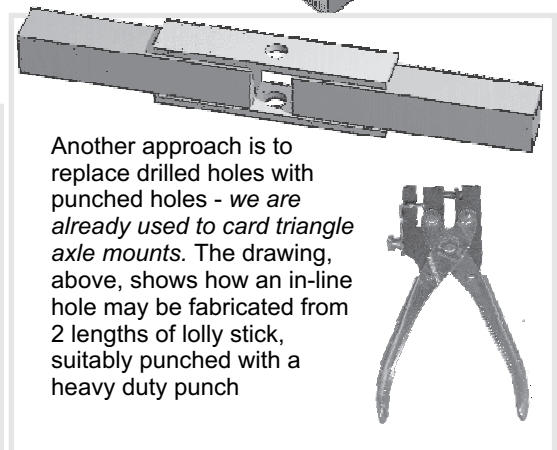
Very often it is important that the hole is drilled perpendicular to the surface of the wood. This is tricky with the hand drill alone. It needs to be held in a drill stand, or you need to devise a system for holding the drill either horizontal or vertical - whichever is relevant.

There are few options at present, the wooden (or more properly, MDF) drill stand on the right is readily available from many suppliers, but the design leaves much to be desired. It doesn't work well, it isn't cheap and it takes up far too much storage space. Having said that it's better than nothing. *We have used 12 volt electric drills, complete with stands, and these proved very successful. However, there are extra safety considerations and they are expensive. We found that using them almost every day with 5mm drill bits soon wore them out.*



Drilling isn't too difficult once the basic skills are acquired. However, it can be very slow. With 30 children all deciding they need to drill four holes each, you can imagine the possible hold-up. A strategy to avoid this is to encourage the use of 'portable' holes. If lengths of 10mm square wood are pre-drilled at approximately 2cm intervals they become a very useful resource. Single holes can be cut from the lengths and glued in position or, as in the illustration, longer lengths can be used. Here a 2-hole piece forms the basis of a wooden crank. This is not as unrealistic as it might first appear. Drilling through structural members will seriously reduce the structure's strength, and it's very difficult to move a hole that's been drilled in the wrong place. Not so with a portable hole!

Basic electric drills are very cheap if bought from DIY stores. Maybe the school could invest in one (with a stand) so that teachers or classroom assistants could produce 'holes-on-a-stick' when required.



Another approach is to replace drilled holes with punched holes - we are already used to card triangle axle mounts. The drawing, above, shows how an in-line hole may be fabricated from 2 lengths of lolly stick, suitably punched with a heavy duty punch

It is good practice to make a small 'dent' in the material to be drilled at the exact point you wish the centre of the hole to be. The tool for this is the centre punch. Place the point in the correct position and tap with small hammer. If you need to drill through a piece of dowel (not 5mm!) then file a flat first (as shown) - then centrepunch - then drill.

A workpiece that is to be drilled needs to be held firmly. Drill stands often come with a simple clamping device attached to the baseboard. Otherwise a small table vice is ideal for holding awkward or small pieces.

Remember though, that there should be a second piece of wood (scrap) under or behind the workpiece. The drill bit shouldn't be allowed to break out of the back of the hole. This will cause splitting. The bit should cut straight into the supporting wood. This applies to all drilling of wood.

A G-cramp or two, together with a block of wood, can substitute for a vice in most circumstances. It just calls for ingenuity!

Drilling into the end of a 10mm square piece of wood is particularly difficult. There's no sensible way that you can use the drill stand. If the workpiece is held in a vice so that the drill is horizontal, then the person drilling can tell if the drill is being held in line and a second person can watch from the side to ensure the drill is level by lining it up against horizontal background features.

