



Materials testing is a fundamental part of Materials Science and Engineering, in understanding the limits of materials through determining their physical and mechanical properties. The information collected during laboratory experimentations are useful to engineers and researchers in helping to determine the appropriate materials for various applications.

For Stage 6 Engineering Studies, this experiment covers the following syllabus points: P/H1.2, P/H2.1 and P/H3.1

There are many tests that can be performed on materials to determine their properties. The tests can be either destructive or non-destructive. Destructive tests are often conducted to determine a specific

image source: Bruker.com

What you need:

- 3D printed Bending Test jig found at: <https://www.thingiverse.com/thing:4609818>
- A sample 110 - 130 mm long and no wider than 25mm or thicker than 10mm and you should also be able to bend it fairly easy with your hands. You can use a variety of materials, from plastic, thin sheets of metal, woodble to bend it

Results:

Material	Elastic Modulus	Flexural Stress and Strain	Bending Moment	Fracture Surface
Example: PLA Cross-section area: XXX				<i>Rough surface</i> <i>No change in cross-section area</i> <i>Brittle fracture</i>

Discussion:

Question time

Question 1:

What was interesting about each material? How do they compare to each other?

(Hints: deflection length, elastic modulus, brittle / ductile behaviour)

Question 2:

Why do some materials have a higher elastic modulus? How does this impact their applications?

(Hints: stiffness, load bearing beams, buildings, planes)

Question 3:

Will the mechanical property of the sample change if the cross-section was different? If yes, how so?

(Hint: solid rectangular beam, hollow rectangular beam, I-beam)

Question 4:

What are the sources of errors in this experiment? What are the limitations of this testing method?

(Hint:

