3D Printers for beginners

Choosing a 3D printer

A good resource for comparing 3D printers is Make Magazine's annual 3D Printer review.
http://makezine.com/?s=3d+printer+review

For those new to 3D printing: Look for key words in the review such as: automatic or self-leveling, easy to use and "not for tinkerers" as these models should allow the printers to be transported with quick setup time and no adjusting. Some models in this category:

- Up Plus 2 http://makezine.com/2013/11/08/up-plus-2/
- Lulzbot Mini http://makezine.com/2015/05/01/lulzbot-mini-3d-printer/
- Afinia H480 (similar to Up Plus 2) http://makezine.com/2014/11/22/afinia-h480-3d-printer/

Avoid models which indicate they are "great for hackers" as these will typically require careful adjustments and more knowledge of the software used for printing.

Features to look for:

- Cost – 3D printers range from $500 to more than $3000. More expensive is not necessarily better for most 4-H workshop activities. Keep in mind that less expensive models could potentially require more maintenance and adjustment. A $1300 printer may be a better value than a $500 printer if it can print continuously with little intervention during a two hour workshop.
- Print bed size – more expensive units tend to have larger print beds which means larger parts can be printed.
- Software – some of the easier to use 3D printers have proprietary software which does not allow minor manipulations of the print file. This proprietary software is ideal for workshops where all that is necessary is to hit "print".

As clubs and sites become more proficient at using 3D printers, look for models with more adjustment and fine tuning capabilities. More sophisticated printers would also be appropriate for sites that have tinkerers who are capable of adjusting these machines.

Other good resources for 3D printer recommendations are local Makerspaces or Fab Labs as well as colleagues who are using 3D printers. Often colleagues can not only recommend printers they like but can also indicate which ones are difficult to get to print correctly.

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Tips for successfully using 3D printers in workshops:

- Keep designs small
    - Objects with large footprints tend to warp.
    - Tall objects (relative to the base of the printer) take longer to print.
    - Combine multiple objects into a single print session.
- Budget funds for material – 3D printer filament is about $30/spool
- Computers
    - Most printers require a dedicated computer
    - Have youth work in pairs to reduce the total number of computers needed
    - Make sure computers are compatible with the program you are using. For example, even though Tinkercad runs in a web browser, the program requires a more recent graphics card and won't run on a 10 year old laptop such as a Dell D630.
- Expect periodic printing failures. Even when using a printer with self-alignment features, the filament roll can stick, the part can come off the bed, or the filament just doesn't stick partway through the print.
- Plan on not being able to print everything on the day of the workshop; have a generic similar item for youth to take home on the day of the workshop.
- Let youth know how many designs they may be able to print so they don't rush through their designs trying to print as many objects as possible.
- Review designs for any obvious flaws before printing.
    - For example, a small elephant with trunk extended – or anything with large projections or cantilevered structures - would be difficult to print because the projection needs to be supported by some material. A 2D elephant printed flat would be fine.
- If at a partner site, make sure to check print time and make sure you will be able to wait until print is finished. (Note that printing software should indicate the print time and the amount of material that will be used).