

ECI 518, Unit 6 Project: Option 1 – Budget for a 3D Printer Makerspace Cart

This project idea was inspired by the many examples of makerspaces we've seen throughout the course. While some schools have the space and/or budget to dedicate an entire room or portion of a room (like the back of a library) to their makerspace, others may prefer a more mobile approach that makerspace carts offer. The [STEAM trunks](#) site has examples of carts designed with specific purposes in mind, from basic arts and crafts to construction to 3D printing. I chose to explore the 3D printing cart as an option as it allows students to practice multiple skills such as design, coding, construction, production, and materials engineering just to name a few.

For this example, I went with a 4-printer setup to maximize the number of projects that could be operating simultaneously. The project can easily be scaled up or down depending on school requirements or budget constraints. After researching the specific equipment and materials required for this trunk, I then had to determine the lifespan of each piece. The longest-lasting equipment should be the printers, and if well maintained a printer can last up to 10 years. This assumes the printers will be used for four hours per day during a school year of 185 days. Over 10 years, this equates to roughly 7,500 hours of printer use. I used that as my baseline life of the project to capture the total cost of ownership. All replacement parts and extra filament rolls are based on that usage model. After 10 years, the school would need to forecast replacing the printers, the most expensive piece in the trunk.

The one variable that could change based on how many printers a school can afford is the construction of the storage cabinet. The STEAM trunk example uses a simple wooden storage cabinet with drop-down doors to protect the printers in transit (see below). These cabinets can be easily constructed by a school shop for a few hundred dollars. There are more expensive options and companies that build cabinets specifically for this purpose, but I think simple is just as good and much cheaper.



The only manpower costs are associated with training time. I budgeted for 10 hours of training per school year based on multiple classes/teachers per semester. I used the average salary of a technology instructor for an NC middle/high school (\$66K per year) which roughly equated to \$45 per hour. Not surprisingly, this training cost is the single-most expensive item in the budget.

The total cost of ownership over the lifespan of a set of 4 printers (10 years) is approximately \$16,000. This is fairly reasonable at only \$1600 per year, though the first and sixth years pay heavily into capital equipment replacement. Those years cost just over \$4700 and \$3200 respectively.

References:

1. STEAM makerspace trunks - <https://steamatdrew.weebly.com/steam-trunks.html>
2. Creality Ender 5 Pro 3D Printer - <https://www.creality3dofficial.com/products/ender-5-pro-3d-printer>
3. Lifespan of 3D Printers - <https://3dprinterly.com/how-long-does-a-3d-printer-last-creality-ender-3-others/>