

### Extension activities

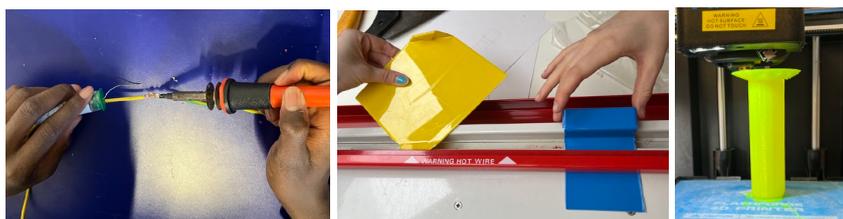
# Design and build a smart lamp

## Extension activity 1: Booster courses on relevant tools

Before students start to build their lamps, they can be offered short practical courses to boost their skills in the use of relevant tools. The choice of courses depends on available materials and tools, students' prior skills, curricular goals, and the time available for the project. The courses might be organized in parallel, so that students can choose which skills they want to enhance based on the needs of their lamp designs. Examples of relevant courses are

- soldering and the use of shrink tubes
- forming plastic using a strip heater
- three-dimensional (3D) printing

Depending on the choice of courses and their organization, this activity takes 2–4 hours.



Soldering, plastic forming and 3D printing

*Image courtesy of the authors*

## Safety notes

It is important to introduce students to safety measures related to their chosen tools. For example, the use of a fume extractor is important during soldering due to the dissipation of toxic gasses.

## Materials

- Soldering and the use of shrink tubes: soldering iron with stand, fume extractor, soldering tin, wire stripper (for removing wire insulation), wire cutter or scissors, a selection of thin electric wires (with PVC coating), shrink tubes, hot-air gun
- Forming plastic: strip heater, acrylic sheets
- 3D design and printing: 3D printer, filament, computer with access to a 3D-design tool, e.g. the free online tools Tinkercad ([www.tinkercad.com](http://www.tinkercad.com)) or BlocksCAD ([www.blockscad3d.com](http://www.blockscad3d.com))



Materials and tools used in the booster courses

*Image courtesy of the authors*

## Procedure

1. Organize materials and tools needed for each course at a separate location.
2. Appoint one teacher or skilled student to guide students at each location.
3. Give a short introduction to the tool, including safety notes.
4. Let students experiment with the tool under guidance. Choose some simple tasks that will walk students through the most important aspects of the tool usage. The 3D printing of a name tag is an example.

## Extension activity 2: Exhibition with gallery walk

Organizing an exhibition at the end of the project, where students can demonstrate their work for teachers and fellow students, is a nice way to wrap up the project. During the exhibition, teachers of different subjects involved in the project have the possibility to assess aspects of students' work related to the curricular goals of their respective subjects. The activity takes 2–4 hours, depending on the number of lamps the teachers have to evaluate.

## Materials

- Appropriate space with enough tables for exhibiting the lamps

## Procedure

1. Organize the space for a gallery walk with tables to exhibit the lamps.
2. Ask students to prepare short oral presentations on their smart lamps.
3. Divide students into two groups. While one group presents their projects, the other takes part in the gallery walk. Alternatively, the students can present their smart lamps to other students in the school or even to parents or members of the community.
4. Teachers participate in the gallery walk and evaluate students work.