

PHYSICAL PROTOTYPING

A key component of 'Tinkering' is 'Hands-on' learning using various resources available at your disposal. Thus, students at the ATLs are expected to prototype and use mechanical and electric power tools to translate conceptual ideas into tangible physical prototypes. SAFETY is of UTMOST IMPORTANCE – for every participant in the ATL.

Activities in Physical Prototyping

Physical prototyping typically include, but is not limited to, the following elements:

- Wood working
- Cutting plastics to form structures, bodies, chassis, etc for mounting various electronics
- Using electric power tools like drills, hot glue guns, soldering irons, electric screwdrivers, etc.
- Accurately measuring the workpieces that you are working on to make the desired changes
- Ensuring that individual components are made in a manner that they assemble to make the final prototype.



With SAFETY in mind, a mentor should consider demonstrating the use of the various mechanical and electrical tools available in the ATL. This can be done in a case by case manner, per project, as the need arises. Also, you could hold demonstrations for the students to make them aware of the technical capabilities they have access to, in the ATL. Any physical innovation/prototype made by the students will invariably include tangible physical formulation with common prototyping materials like cardboard, wood, plastics and maybe even metals. Students will have to be able to create components of their prototype and then assemble them.

All mentors are:

1. Expected to be aware and translate the following to their audience:
 - Ensure mentor is familiar with all the tools and equipment available in the ATL before any session.
 - **Tool Training:** For any machine or device, it is imperative that the correct procedure and training is mandatory. Thus, tool training sessions are necessary in the ATL.
 - **Soldering:** A detailed hands-on session – all elements and types, and safe soldering.
 - Observing safe connections and avoid any contact with live wires.
 - Enforce a strict clean-up, dress code and safety policy in the ATL.
 - Lead by example - always wear safety goggles and full covered clothes.
2. Suggested to:
 - Conduct a Q&A session on various tools and their safe use to gauge student knowledge.
 - Share best practices and techniques for efficient use of tools.
 - Work with additional mentors/teachers to observe students while they are practising.
 - Make and display charts with the students, which can be later used in the ATL.



- Encourage elder students to mentor younger ones to impart a sense of ownership and responsibility.

References:

The following is a non-exhaustive and suggestive list of resources on the concept of physical prototyping:

Resource Description	
Woodworking – Basics	Link
Soldering – Wikipedia	Link
Safety in School Makerspaces	Link
Quick Guide – Material Selection	Link
Quick Guide – Adhesives	Link
Quick Guide – Fasteners	Link
The Makerspace Workbench – Tools, Technologies & Techniques for Making	Link
HAND & POWER TOOL SAFETY	Link
Creating a Culture of Safety in Makerspaces	Link

Note:

1. Mentors are recommended to build their content and not plagiarize and then deliver to their audience in the ATLS.
2. Mentors are encouraged to explore resources and share critical observations within communities and with AIM.
3. Please note that these are third party links and AIM or NITI Aayog does not endorse any person(s) or organization(s) mentioned on or related to these links.
4. The opinions and views expressed by the mentors during their interaction are of their own and do not necessarily reflect the views of AIM or NITI Aayog.
5. Mentors are aware that the engagement with the ATLS is treated as a community service and there shall be no financial transactions between any stakeholder and mentor for any official ATL related activity.