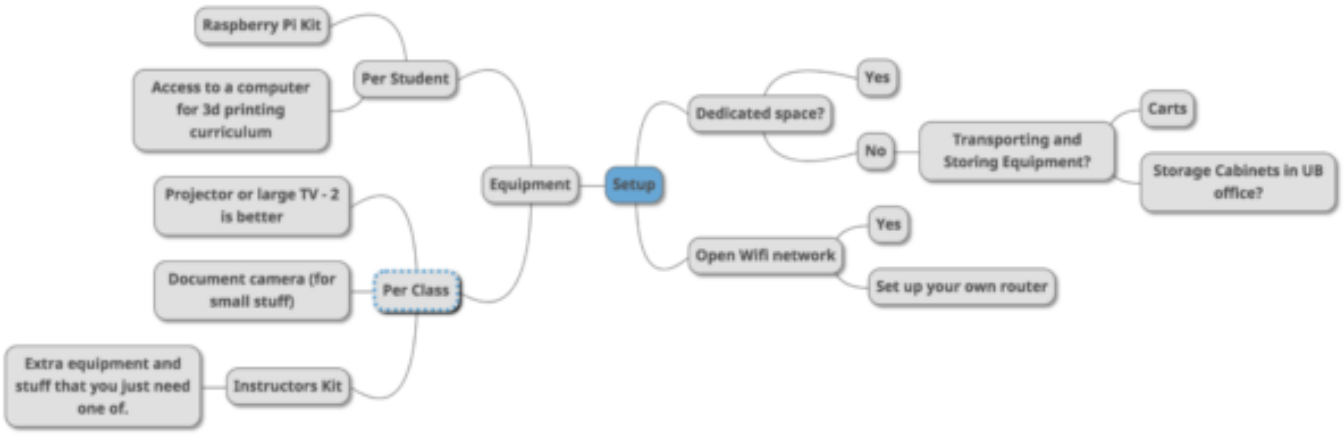
Curriculum

Lesson Sequence

Here is a guide to how you may choose to unpack your program in the first summer of working with T3 Alliance. The same sequence could be used during an academic year, however, it may be more difficult to have students involved in community projects on a tight schedule. If you are seeing this post as part of the community forum, please feel free to contribute with your suggestions. Links will be added to this post for the various lessons referenced.

Setup: It would be ideal if you have a dedicated area where you can have your T3 Alliance program. For many programs, this simply isn't a possibility. Here is a sample flowchart of some of the questions you should consider.



Order of lessons:

1. Overview of your Program:

There will be times when you meet, expectations for students in the program, and a vision that you will share with them for

how this program will open opportunities. A general T3 Alliance presentation will be available that you can share.

2. Lesson on Growth and Fixed Mindset:

This lesson works well in three parts: In the first part teach them about growth and fixed mindsets and then set the culture that this classroom is a safe learning environment where we use phrases that praise effort. In the second part, we practice growth mindset with an icebreaker that causes students to reflect on how they think about hard situations. In the third part we build brush bots and let students compete.

3. Build the raspberry Pi Kits:

Building the boxes can be done without much instruction given that the culture of growth mindset has been set. Students figure out how to assemble the boxes in about 40 minutes. Check that screws have been tightened.

4. Computers, Raspberry Pi and the internet of things:

This lesson is a presentation that is meant to open students eyes to the power of the Raspberry Pi. We focus on the basics of a computer, input, and output, and share examples of cool projects that are done in a number of industries. Biomedical, home security, seismology, environmental science… A discussion about the Internet of things (IoT) and how computer programs function will be valuable here.

5. Scratch and basic programming:

This lesson teaches about some basic programming constructs using one of the simplest programming languages. Many students will have been exposed to it, so if it’s not for your crew, skip it. There are enough advanced options that a student can make a very complicated program. I think of it like legos – it’s a good space to play around and get familiar with the basic programming concepts.

6. Node-Red and programming the GPIO pins:

This lesson introduces Node-Red and how it can be used to control the GPIO pins on the Raspberry Pi. The first part of the lesson is seeing how Node-Red is a programing language that follows the basic concepts identified earlier. The second part is in understanding the GPIO pins and how they function with and without Node-Red. A challenge activity that students build such as push button timer or stop lights will be available soon.

7. Advanced Node-Red and the camera:

This lesson will introduce more advanced features of Node-Red programming along with the installation of the camera.

8. Project – Make a Whoopee Cushion:

This lesson is an opportunity for students to have fun converting their understanding of the technology into something in the real world. A whoopee cushion is a glorified button that can be made out of easily available materials.

9. Control your device from a distance – remoting and networking through a LAN:

This lesson introduces students to the idea that they do not need to be physically connected to a screen to “talk” to their Raspberry Pi.

10. Setting up Node-Red to send to google photos:

This lesson will explore how to set up a flow to send photos to a google photos account using different triggers.

11. The Design Thinking Process:

This Lesson will introduce the design thinking process and delve into the various communication skills that are within it. The process will be introduced in relation to the IoT context that students have been exploring. The format of the

mini-grant and the idea of deliverables will be discussed and modeled in role play scenarios.

12. Basic videography:

We assume for this lesson that students have some access to cameras, either the ones on their cell phones or ones that can be used within your UB program. This lesson will focus on taking still photos and short videos that can be useful as part of a documentation video.

13. Project – Build a selfie station:

For this project to be most impactful for the students, find someone from the community who would have a use for the project. Have them come in and share their problem with the class, and let the students interview them and follow the design thinking process. I would put them in teams of 3 – 4 students, but it can also be done as one class project. Have them submit the grant, build and install it, and then have them be accountable for their work. This project may take several days. To make it really impactful, have the community member present during the installation and provide positive feedback.

14. Sending data to a cloud service and building an analog scale with a servo:

This lesson introduces students to Thingspeak and other cloud services that collect information from a sensor. Exploring the temperature, pressure, and humidity sensor can be a fun way to engage students in some hands on science experiments. Blowing gently across the sensor can change the temperature and the pressure. This is connected with a lesson on the servo motor in order to set it up as scale so that it can become a dial.

15. Air quality sensors:

This can be turned into a project that meets a community need

or it can be taught as a lesson on air quality. A lesson on air quality and the ways that it is measured precedes the assembly of the air quality kit. A series of experiments that test various levels of air quality can be done as a class. Ideally, students can work on this project in groups of 4 -5.

16. Controlling the LED Screen:

This lesson introduces students to a large matrix LED screen that often comes as part of the air quality kit. A group of students can remote into the pi and edit the images and information displayed. The screen can become an important output device used in a variety of community projects.

17. Seismology and the Raspberry Shake:

This lesson introduces seismology, the Raspberry Shake seismogram, and the cloud-based monitoring system that it connects with. After learning about the physics of the seismogram, one will be set up in a classroom or a UB office and some experiments can be done to measure its sensitivity and how seismic waves travel. The data from this shake is sent to a database where seismic events can be monitored in real time.

18. Communication norms and field trip:

This lesson introduces students to communication norms that are expected in your community and helps students see where technology is already being applied or could be applied. Set up a field trip to a location where students can learn about some aspect of your community that’s worth them knowing about. This is an opportunity to teach students that they are good listeners and that they have the capacity to give back.

19. Design Challenge introduction:

This lesson introduces students to the T3 Alliance Design Challenge: This is a commitment that involves your UB program supervising and overseeing their involvement in the project.

In general, a group of students is looking to tackle a problem with their technology skills and a small five hundred dollar materials budget from your program. They need to follow the design thinking process, involve their community, and produce a one minute video describing the project. A panel of judges will evaluate the submissions and T3 Alliance will recognize them in some capacity.

20. Local, regional, or national projects

Ideally, your students are working on a local project that has evolved and has brought on new challenges. Introducing students to the T3 Alliance community forum will open new opportunities for collaboration on projects that either share data or share techniques for addressing issues.