

# UPPER SCHOOL DESIGN STUDIO



Robo Fab Design Studio engages students in grades 1-9 in the design process through hands on making experiences. Today's program traces its roots to the Robotics program started 14 years ago. Originally housed in a library closet, the current studio space was purpose built as part of the Arts and Technology building 2007.

This studio is used in multiple ways throughout the day:

- Grades 6 - 9 experience this space and curriculum through regularly scheduled studio classes and through stand alone projects that are part of the content area teachers' curriculum units.
- Grades 1 - 5 generally use this space for experiences in stand alone projects with classroom teachers.
- Afternoon Academy/Summit Summer: Techfusion Afternoon Academies and Summer Camp programs, are open to the community as well as Summit Students.

## Equipment/Tools/Materials:

|                                      |                                      |
|--------------------------------------|--------------------------------------|
| Epilog Zing 40W Laser Cutter         | arduino micro controllers            |
| (4) Makerbot Replicator2 3D printers | variety of arduino shields           |
| Makerbot Replicator Dual 3D printer  | electronic components, breadboards   |
| Makerbot 3D scanner                  | (4) Haco soldering stations          |
| CNC Shark 3 axis milling machine     | dimensional lumber                   |
| table saw                            | carbon fiber sleeves                 |
| (2) bench top Drill Presses          | PVC Pipe                             |
| sliding compound miter saw           | adhesives                            |
| lathe                                | fasteners                            |
| bench top Sander                     | wire feed welder                     |
| hand tools - woodworking             | a variety of hand tools (mechanical) |
| angle grinder                        | ...and much much more                |

## Curriculum

The curriculum that Summit students experience in this space includes teacher set challenges and an emerging curriculum based on student identified challenges and passions. Skills are taught authentically - within the context of the challenges.

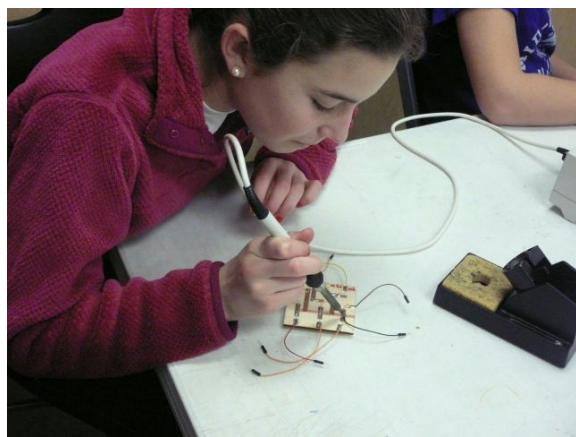
**6th Grade Studio** uses LEGO Mindstorms robotics to explore programming. Students begin by building a simple “Five Minute Bot” then follow up with the Programming Challenge, programming the bot to follow a specific path from point to point. For the next challenge students add a light sensor and create code to turn the bot into a line follower. This exercise introduces the concept of “loop” and a new command “switch”. Students observe a working line follower to determine how these simple commands can allow the bot to follow a complex path.



<photo line kids with line follower>

This foundation prepares students to transition from the LEGO Mindstorms system to the Arduino. WIth the Arduino Students explore electronic components and circuits leading to an Arduino line follower.

**7th Grade Studio** further explores the potential of Arduino microcontrollers. Experiences controlling lights, sounds and motors, building circuits and programming with sensors demonstrate real world applications.



<photo kids building 3x3 LED arrays>

**8th Grade Research and Design Studio** introduces hands on fabrication. Projects introduce design processes involving studio techniques and technologies. There is a high degree of student choice leading to a wide range of projects.

Students work in 2D, creating in Adobe Illustrator and making with the Epilog Zing laser cutter. For 3D work, students design in Sketchup and print using the Makerbot Replicator2 3D printers.

<rocket powered glider on launcher>



**9th Grade STEAM** is an elective course taken for high school credit. This course is an extension of the 8th Grade Research and Design studio. Students work individually or in teams on a variety of self defined projects. In addition to their individual projects, students collaborate on group projects benefiting other Summit programs. Peer review processes engage students in critical analysis and constructive interaction,

providing an external “reality check” on their own work and exposure to the diverse work of others.

<aquaponics build>



Enrichment projects with lower grades for the 14-15 school year have included laser cut pencil boxes with 2nd grade accelerated math students, soundscapes to accompany the 4th grade living biographies, functioning steam boats with all 5th graders, laser engraved acrylic medallions with 5th grade accelerated math students and 3D printed coat hooks with 6th grade accelerated math students. The S15 semester will include a bee dance project with 1st Grade, kites, 3D printed rockets and laser cut race cars with 4th and 5th grades.

<kids building steam boats>

