Solutions Snapshot session

3D Printing Project-Based Learning Ideas to Spark Student Engagement

A Little Bit About Me...

- My name is Bill White

- Applied Engineering and Technology teacher at Avonworth Middle/High School in Pittsburgh, PA.
  - 18 years of teaching experience
  - Grades 7-12

- Matterhackers Education Ambassador

- Member of 3D Pittsburgh

My classroom

- My classes are ALL HANDS-ON

- Traditional schedule
  - 40-45 minute class period
  - 6 unique classes

- 3D printing a part of each of my classes in some capacity
  - 6 3D printers (2 - Lulzbot Taz 6's, Lulzbot Taz Pro S, Raise3D Pro2, Pulse XE, Monoprice Voxel)
  - Projects range from simple keychains to automotive parts
  - Students go through the entire design process

- CIM (Computer-Integrated Manufacturing)
  - Weighted class
  - Small, hands-on class
  - Additive manufacturing already fully utilized
  - Design custom parts to solve problems

My Plan for this Snapshot session

- Focus on your questions and/or concerns
    - Cover a little content and then cover questions in chat
- Share information and resources
    - Email me at bwhite@avonworth.k12.pa.us with any questions

Tech Ed 7

- Currently a 6 week rotation, 40 minute class
    - Minimal exposure to 3d Printing/Design
    - Offered as an accelerated option or for all virtual students
- Next year, this will be an 80 minute long class
    - Use what I currently do in 8th grade
        - Intro to 3d Printing/Design
        - Keychain projects
   - Simple class design project (phone stand or something similar)

Tech Ed 8

- Currently a 6 week rotation, 40 minute class
  - Roughly 2-3 weeks spent on 3d Printing/Design
  - Will be teaching what is listed under Tech Ed 7 next year
- For 2022-23, here are my plans:
  - More focus on DfAM
  - Teach measurement (get into dial calipers)
  - Simple custom, functional design project or some type of design challenge
    - Custom designed bracket to hold something in their room at home
    - Phone case
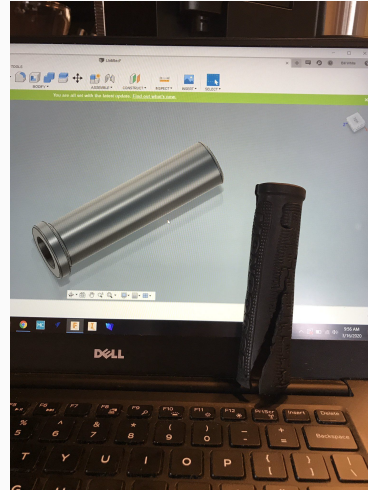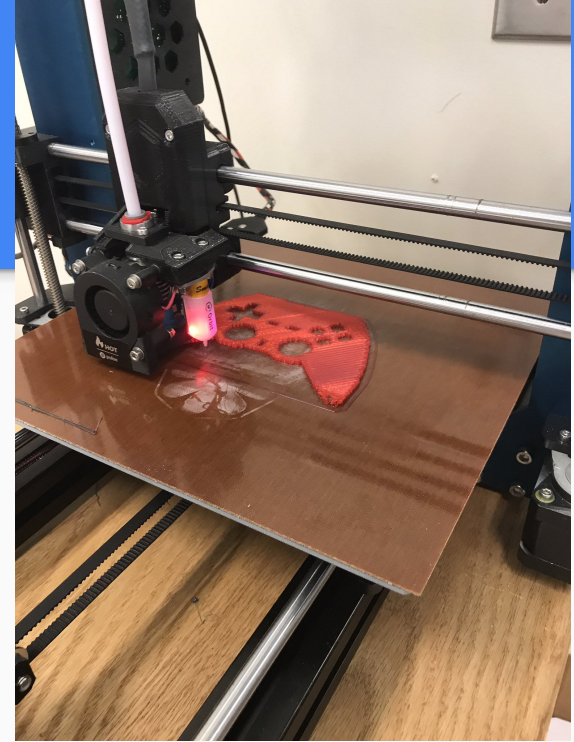
Manufacturing Technology

- Full Year, 40 minute class
    - Varies, but I have 4 weeks set aside for AM
    - Students learn how to slice and run the printers
    - Designed to help naturally integrate 3d printing into other content areas
- Current Projects
    - Keychain project (refresher and now we get into slicing)
    - Holiday related projects (ornaments, decorations, gifts, etc.)
    - Design challenge (iteration, testing, presentation and judging)
    - Custom insert for LED sign project (holds LED and battery)
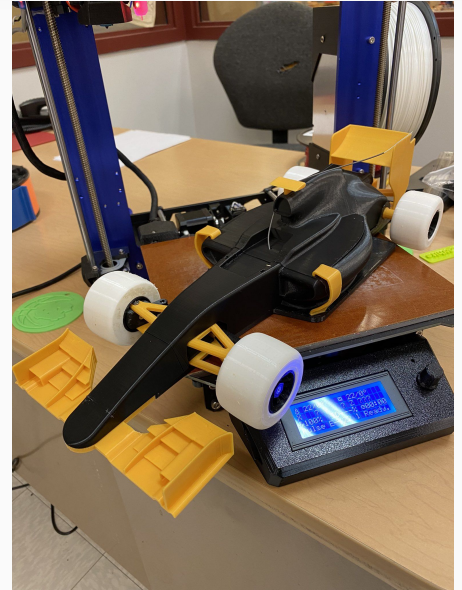   - Independent design projects (student driven)
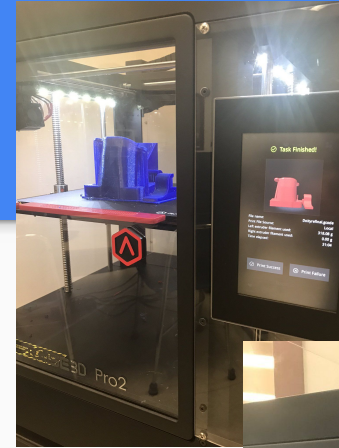
Intro to Engineering Design

- Full Year, 45 minute class
    - Varies, but I have 4 weeks set aside for AM
    - Students learn how to slice and run the printers
- Current Projects
    - Keychain project (refresher and now we get into slicing)
    - Holiday related projects (ornaments, decorations, gifts, etc.)
    - Reverse engineering project
    - Puzzle cube project (old PLTW project)
    - Gadget design project (fidget cube, custom braille project, jar grip)

Computer Integrated Manufacturing (CIM)

- Full Year, 45 minute class
    - Varies, but I have 9 weeks set aside for AM
    - Students learn how to slice and run the printers (after this class, they should be able to do it all)
- Current Projects
    - Holiday related projects (ornaments, decorations, gifts, etc.)
    - Major project (battlebots, OpenRC, drones, etc.)
    - Independent design project (custom parts for a car, custom wall bracket for skateboard, etc.)

3D Printing Project-Based Learning Ideas

- Where should you start?
    - A little research goes a long way (do a quick Google search about 3d printing in your content area)
    - Tap into your local 3d printing community
    - Talk to the teachers that are already using them in your building
- Why 3d Printing
    - It is fun to watch:)
    - Additive manufacturing isn't just for printing trinkets
    - Safe
    - Options are a good thing

Project-Based Learning Ideas in my Classroom

- Keychain projects
    - Early design success is huge
    - Add layers of detail
- Functional design challenge
    - Design something for the woodshop that will enhance lab safety and/or make something more ergonomic
    - Design something to solve a personal a problem at home
- Bridge/truss design
    - Research truss design
    - West Point Bridge Designer
    - Test the designs for efficiency or see who can hold the most weight

Project-Based Learning Ideas in my Classroom

- Battlebots
    - Rapid prototyping allows for more unique ideas to come about
    - Design flexibility
- Design competition
    - Engage students with a friendly competition
    - Bring in outside judges
    - Add a presentation piece

What questions do you have so far??

The fear of the unknown...3d Printing

- I don't have time for 3d printing…
    - I can respect the time thing for sure honestly
- Remember, you do not have to become a 3d printing expert
- The more options students have, the more likely there will be full engagement
- Utilize the resources in your building
    - Find the teacher that already uses 3d printers
    - Make use of that makerspace
- Don't be afraid to ask for help

Cross-curricular projects I have helped out with

- Puff Mobile project (Science)
  - 3d printed student designed wheels
- Chocolate covered pretzel project (FCS)
  - 3d printed packaging inserts
  - 3d printed parts to create a mold for vacuum forming
- Awards as part of a presentation (English)
  - 3d printed student designed awards
- Foreign Languages
  - 3d printed sculptures
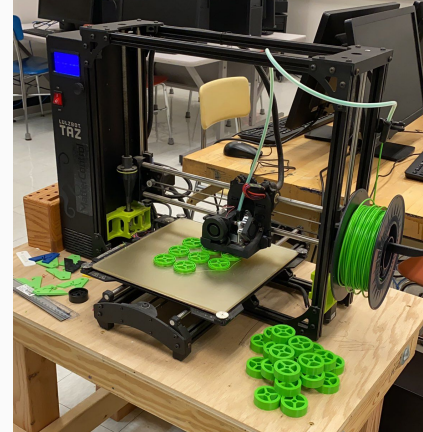
Cross-curricular projects I have helped out with

- Presentation display items (Integrated - Social Studies, English and Art)
    - 3d printed student designed parts to enhance their gallery walk displays
- Robotic Arm
    - 3d printed all the pieces for a robotic arm project
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Where should you start with 3d Printing??

- Talk to someone in your building that already 3d prints
- Do some research
- Email the experts (remember, you don't have to be an expert)
- Try something small yourself first
- Hopefully, invest in a budget friendly, reliable printer!
    - Reliability is key
    - Your support network is also important

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What is holding you back from 3d Printing in your classroom??

Pulse Giveaway!!

Thanks for your time!!

- Any questions?

- Contact info:
  - Bill White - bwhite@avonworth.k12.pa.us
  - Mara Hitner - education@matterhackers.com OR (949) 613-5838 for **educational discounts!**

- Don't be afraid to reach out to me with any questions!

- Have a safe and awesome summer!