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)
- 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??
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
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
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!