Career and Technology Connections to Enhance the Teaching & Learning of Mathematics

https://tinyurl.com/PLUS-MATH

Created & Presented By:

Kelly W. Remijan, PhD
Remote Professional Development and Curriculum Specialist
Illinois Mathematics and Science Academy (IMSA) – Center for Teaching & Learning
Email: kremijan@imsa.edu  LinkedIn: https://www.linkedin.com/in/kellyremijan/  Twitter: @Teachers4STEAM

Objective: 5th-12th grade teachers will 1) discover how to incorporate career connections & technology tools into the mathematics curriculum and 2) gain ideas, corresponding activities, and LOTS of resources that will enhance the teaching & learning of math concepts which can also promote CTE programs, pathways, and partnerships.

1) Machinist (Promoting METT- https://www.isbe.net/Pages/Man-Eng-Tech-Trade.aspx)
   a. Plot Points on an x-y coordinate plane
      i.  CNC EXAMPLE = https://docs.google.com/presentation/d/1uEde1F3JxIzdUzmrELiboaMII7t7v664L5PaUMX1vyge0/copy
   b. Utilize a CNC Machine and Write a Computer Program to Make a Design
      i. Partnership between a Math Teacher & a CTE teacher at a high school w/ access to equipment or Partnership Between Math Teacher & a Junior College or Technical School
   c. SUGGESTION = CTE teachers AND math teachers attend CTE events or webinars
      i. Workshops (3D Printers and Animation)
      ii. Construction Career Expo and/or Manufacturing Day
      iii. ASM Materials Camp for Teachers…hosted around the nation*

2) Police Work (Law/Criminal Justice - https://www.isbe.net/Pages/Human-and-Public-Services.aspx)
   a. Crime Scene Investigator
      i. Take Photos of Crime Scene & Evidence (Angles, Perspective, Measurement, Scale)
         • RESOURCES = http://www.forensicsciencesimplified.org/photo/Photography.pdf
         • IDEAS
            o Measure various pieces of evidence or compare length to height
            o Pick up shoe/footprints or tire prints with Adhesive or Dental Casting
            o Create a Crime Scene (Library Room, Stage, or Barbie miniature)
              https://nccsm.instructure.com/courses/1673/pages/option-3-mock-crime-scene?module_item_id=92152
         • OTHER PHOTOGRAPHY TOPICS = Shutter Speed & Aperture Ratios
      ii. Conduct a Crime Scene Sketch (Measurement & Scale Drawings)
         • RESOURCES
            o http://www.forensicsciencesimplified.org/photo/why.html
            o Use https://incompetech.com/graphpaper/ for graph paper
            o Provide alternatives for creating scale drawings such as Google Sketchup
      iii. Determine Bullet Trajectory (Measure Angles Horizontally & Vertically (w/ zero-base protractor)
            • Utilize trajectory rods and a laser to follow the path of a bullet
            • VIDEO = https://www.wired.com/video/watch/technique-tutorial-bullet-trajectory
      iv. SUGGESTION
         • CONNECT CSI to Health Sciences (https://www.isbe.net/Pages/Health-Science-Technology.aspx )
         • TALK to and/or TEAM up with a science teacher from your school/district
         • CONTACT your nearest State Police Forensic Crime Lab for a Guest Speaker
           https://www.isp.state.il.us/Forensics/html/Laboratories.html
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i. Understand Friction, Measure Skid Marks, and Use Formulas to Determine Speed

ii. Use a CBR to reinterpret a crash in the classroom (Systems of Linear Equations)
   - TECH OPTIONS = TI CBR 2 or TI CBR (I purchased my TI CBR via E-bay for $20)

iii. Retrieve Data from an Air Bag Module (Analyze Graphs)
   - RESOURCE = http://www.crashforensics.com/automobiledatarecorders.cfm

iv. Utilize a Drone (Calculate Viewing Area and Landing Pad Area, Understand Inequalities)
   - https://knowbeforeyoufly.org/
   - www.purdue.edu/newsroom/releases/2019/Q1/drones-shown-to-make-traffic-crash-site-assessments-safer,-faster-and-more-accurate.html
   - Take a drone certification class

v. Connect to GPS
   - Many drones have GPS which can be connected to the intersection of 3 or more circles
     - Activity: Geocaching Software - https://digitalcommons.imsa.edu/pfs_tr/25/

vi. IDEAS
   - Discuss how a private accident reconstructionist can also be hired for a court case
   - Contact Kelly Remijan at kremijan@imsa.edu to be connected to an Illinois State Police Crash reconstructionist from your region within Illinois
   - Go to https://actar.org/directory and search within your state to find a local private reconstructionist
   - Expose students to opportunities w/ Autobody/Collision and Auto Repair Technology

4) Surveyor (Promoting METT - https://www.isbe.net/Pages/Man-Eng-Tech-Trade.aspx)

a. Use a Clinometer and Apply the Concept of an Isosceles Triangle or Trigonometry
   - Use a Smart Phone App to find tree height & help NASA - https://bit.ly/3ocOLV0
   - Finding tree height connects to Cell Tower Surveys
     http://www.georgialandsurveying.com/commercial-surveys/telecommunications-cell-tower-surveys/
     https://millmanland.com/telecommunication-cell-tower-surveys/

b. Utilize a Total Station and Conduct an Impervious Land Survey
   - RESOURCE: https://digitalcommons.imsa.edu/pfs_tr/24

c. SUGGESTION: Shadow a STEM professional or take a non-math class at a junior college
   i. Examples: Surveying, Materials and Methods, Construction Estimating, CAD, Drafting
   ii. Other Ideas: Aviation Meteorology, Precision Machining Intro

d. RECOMMENDATION: Look for & attend STEM workshops outside of “Mathematics”
   - Ex: Botanical Garden - Tree Circumference, Volume, Carbon Storage, etc.
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5) Electrician (Promoting METT - https://www.isbe.net/Pages/Man-Eng-Tech-Trade.aspx )
a. Math Concepts
i. Read Blueprints to Determine # of Lights/Switches/Outlets Needed in Building a House
ii. Calculate Area, Determine Lumens Needed for a Room
   • https://www.alconlighting.com/blog/residential-led-lighting/how-do-i-determine-how-many-led-lumens-i-need-for-a-space/
iii. Utilize a Multimeter, Measure Voltage, Graph Data
   • Additional File located at https://digitalcommons.imsa.edu/pfs_tr/5/
iv. Calculate Area to Determine Number of Solar Panels
   • https://www.youtube.com/watch?v=cEWxkZYroZk
   • https://www.wholesalesolar.com/blog/solar-panel-size-guide/
b. SUGGESTION = Collaborate with organizations or professionals to design meaningful projects
   • IBEW Labor Union, City Planner, Engineer, Architect, Builder, and/or Habitat for Humanity

6) Aviation (Promoting METT - https://www.isbe.net/Pages/Man-Eng-Tech-Trade.aspx )
a. Aviation Mechanic
i. Pose Sheet Metal Problems (Fractions, Scale, Angles)
ii. Demonstrate Propellers (Distance vs Time, Diameter, Collecting & Graphing Data)
   • I purchased a kit and made a propeller car for $19 from https://tinyurl.com/tqlpgyo
   • Utilize FREE Tracker Software - https://physlets.org/tracker/
b. Air Traffic Controller or Pilot or …
i. Visualize Air Traffic Control Tower Airspace (Cylinders)
   • https://science.howstuffworks.com/transport/flight/modern/air-traffic-control.html
   • www.youtube.com/watch?v=r6jimmM98Ig&list=PLBJ4Geffl0T5iYy5O8u2WVaX50Zo3qbgYe
ii. Utilize https://skyvector.com/ for Navigation Charts (Circles & Compass Rose)
iv. Use Google Earth or www.airnav.com/ for Airports/Runways (Headings & Parallel Lines)
v. Connect Flight Profile to Graphing (Increasing, Constant, and Decreasing Functions)
   • https://science.howstuffworks.com/transport/flight/modern/air-traffic-control.html#pt2
vi. Apply the idea of Satellites/GPS (Intersecting Circles)
   c. GPS Tech Activity - https://digitalcommons.imsa.edu/pfs_tr/25

c. SUGGESTION = Utilize aviation organizations for educator resources, guest speakers, etc.
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   a) To learn about math concepts and technology involved in various careers
   b) To establish career to classroom connections and to enhance mathematics curriculum and improve workforce development

2. Southwestern Illinois College
   - Machining - Mark Bosworth, Jerry Bonifield, & David Berry
   - Aviation – Keith Mueller & Matt Harter

3. Illinois State Police
   - Crash Reconstruction – Sgt Brad Brachear & Trooper Ray Sutton
   - Crime Science Investigation – Investigator Josh Easton

4. IBEW 309
   - Electrical Work - Dave Kokotovich

5. Parkland College
   - Surveying - Kory Allred
     o Collaborative project with the Illinois Dept. of Innovation & Technology headed by Mary Reynolds and assisted by Allison Wheeler

Thank you for attending!

I would greatly appreciate your feedback by completing a 2-minute survey. 😊
www.tinyurl.com/IMSAsurvey21

For more resources, check out: www.IMSA.edu/Educator

Sincerely,
Kelly Remijan
kremijan@imsa.edu