

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

<https://tinyurl.com/PLUS-MATH>

Created & Presented By:

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Objective: 5<sup>th</sup>-12<sup>th</sup> 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/1uEdelF3JXdUzmvEiboAMIT7u7Vf61L5FnUMX1yqge0/copy>
    - ii. **ARTICLE** = Remijan, K.W. (September 2018). "Cultivating the Machining Field by Planting Seeds in the Math Classroom". **The Record**. 24-27. Retrieved from <https://ntma.org/wp-content/uploads/2019/02/Sept18-Record-web-compressed.pdf>
  - 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
    - ii. Utilize an Online Simulator- <https://ncviewer.com/> & Video- [https://youtu.be/Z4V\\_qKuoMMk](https://youtu.be/Z4V_qKuoMMk)
  - 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\*  
<https://www.asminternational.org/en/about/foundation/teachers/teacher-camps>
- 2) Police Work (Law/Criminal Justice - <https://www.isbe.net/Pages/Human-and-Public-Services.aspx>)  
Crime Scene Investigator
  - i. Take Photos of Crime Scene & Evidence (Angles, Perspective, Measurement, Scale)
    - **RESOURCES** = <http://www.forensicsciencesimplified.org/photo/Photography.pdf>
    - **IDEAS**
      - Measure various pieces of evidence or compare length to height
      - Pick up shoe/footprints or tire prints with Adhesive or Dental Casting
      - Create a Crime Scene (Library Room, Stage, or Barbie miniature)  
[https://ncssm.instructure.com/courses/1673/pages/option-3-mock-crime-scene?module\\_item\\_id=92152](https://ncssm.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**
      - <http://www.forensicsciencesimplified.org/photo/why.html>
      - [http://www.evidencemagazine.com/index.php?option=com\\_content&task=view&id=184](http://www.evidencemagazine.com/index.php?option=com_content&task=view&id=184)
      - Use <https://incompetech.com/graphpaper/> for graph paper
      - 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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- 3) Police Work (Law/Criminal Justice - <https://www.isbe.net/Pages/Human-and-Public-Services.aspx>)  
Crash Reconstructionist (Algebra)
- i. Understand Friction, Measure Skid Marks, and Use Formulas to Determine Speed
    - **ARTICLE** = Remijan, K.W. (November 22, 2017). *Building Mathematical Skills and Community Relationships Through Crash Reconstruction*. **ASCD Express**.  
<http://www.ascd.org/ascd-express/vol13/1306-remijan.aspx>
  - 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)
    - **ARTICLE** = Remijan, K.W. (Under Development). When Turtle Met Mickey.
  - 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](http://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: Where am I? <http://www.gps-stem.com/earth/>
      - Activity: Geocaching Software - [https://digitalcommons.imsa.edu/pfs\\_tr/25/](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](mailto: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>
    - Clinometer Handout – [http://www.globe.ee/TeacherGuide/landcover/appendix/land\\_app.pdf](http://www.globe.ee/TeacherGuide/landcover/appendix/land_app.pdf)
    - Finding tree height connects to Cell Tower Surveys  
<http://www.georgialandsurveying.com/commercial-surveys/telecommunications-cell-tower-surveys/>  
<https://bit.ly/35f5DD7>  
<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](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/](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.wholesolar.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
  - c. **ARTICLE** = Remijan, K.W. (2017). *Project-Based Learning and Design-Focused Projects to Motivate Secondary Mathematics Students*. **Interdisciplinary Journal of Problem-Based Learning**. <http://docs.lib.purdue.edu/ijpbl/vol11/iss1/1/>
- 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=rl6jmmM98Ig&list=PLBJ4Geff0T5iYy5Q8u2WVaX50Zo3qbgYe](http://www.youtube.com/watch?v=rl6jmmM98Ig&list=PLBJ4Geff0T5iYy5Q8u2WVaX50Zo3qbgYe)
    - ii. Utilize <https://skyvector.com/> for Navigation Charts (Circles & Compass Rose)
    - iii. Promote opportunities for students to fly = <https://www.eaa.org/eaayouth/free-ye-flights> or <https://www.legacyflightacademy.org/>
    - iv. Use Google Earth or [www.airnav.com/](http://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.htm#pt2>
    - vi. Apply the idea of Satellites/GPS (Intersecting Circles)
      - a. <https://gisgeography.com/trilateration-triangulation-gps/>
      - b. Where Am I Activity? - <http://www.gps-stem.com/earth/>
      - c. GPS Tech Activity - [https://digitalcommons.imsa.edu/pfs\\_tr/25](https://digitalcommons.imsa.edu/pfs_tr/25)
    - vii. Integrate GIS - <https://www.esri.com/en-us/industries/education/schools/geoinquiries-mathematics>
  - c. **SUGGESTION** = Utilize aviation organizations for educator resources, guest speakers, etc.
    - i. Resources = [www.aaa.org/membership/types-of-membership/educator-membership](http://www.aaa.org/membership/types-of-membership/educator-membership), [www.nasa.gov/stem](http://www.nasa.gov/stem), [www.gocivilairpatrol.com/programs/aerospace-education/for-educators](http://www.gocivilairpatrol.com/programs/aerospace-education/for-educators), [www.faa.gov/education/](http://www.faa.gov/education/)
    - ii. Speakers & Other Opportunities = <https://tuskegeeairmenstl.com/contact-us/>, [www.awam.org](http://www.awam.org), [www.wai.org](http://www.wai.org), [www.weather.gov/education](http://www.weather.gov/education), <https://wingsofhope.ngo/>, Scott AFB Public Affairs- [christine.spargur@us.af.mil](mailto:christine.spargur@us.af.mil)

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  - b) To establish career to classroom connections and to enhance mathematics curriculum and improve workforce development
2. Southwestern Illinois College
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  - 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
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  - Surveying - Kory Allred
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Thank you for attending!

I would greatly appreciate your feedback by completing a 2-minute survey. 😊

[www.tinyurl.com/IMSAsurvey21](https://www.tinyurl.com/IMSAsurvey21)

For more resources, check out: [www.IMSA.edu/Educator](http://www.IMSA.edu/Educator)

Sincerely,

Kelly Remijan

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