



Professional Development Webinars

Infusing Mathematical Modeling Into Your Classroom

Spring 2020

education.ti.com/tiwebinars

Moderator Bio



Mike Houston

T³ National Instructor

Ellwood City, PA

Mike is in his fifteenth year of teaching high school mathematics in Ellwood City, PA. While participating in a TI-Navigator™ Fast-Track in 2007, he learned how technology can effectively cultivate students' wide range of learning styles. During this time, Mike has served as a T³ National Instructor and a contributing author for MathForward™.

Panelists' Bios



Tom Dick

**T³ Senior Math Advisor,
Texas Instruments**

Corvallis, OR

Tom Dick is a Senior Mathematics Advisor for Texas Instruments and is also Professor and former Chair of the Mathematics Department of Oregon State Univ. He has served on the Editorial Panels for the *Journal for Research in Mathematics Education* and the *Mathematics Teacher Educator*. He remains active in the College Board's AP* Calculus Program. In 2008, Tom was inducted by the Oregon Council of Teachers of Mathematics into the Oregon Mathematics Education Hall of Fame.



Gail Burrill

**T³ Senior Math Advisor,
Texas Instruments**

East Lansing, MI

Gail was a secondary teacher Milwaukee, WI for over 28 years. She is currently a Math Specialist in the Program for Math Education at Michigan State Univ. She served as President of NCTM and as Director of the Mathematical Sciences Education Board. She received a Presidential Award for Excellence in Teaching Math and the NCTM Lifetime Achievement Award. Burrill is currently a Senior Math Advisor for Texas Instruments Education Technology.

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Panelist Bio



Curtis Brown

**Market Segment Mgr.,
Texas Instruments, Inc.**

Dallas, TX

Curtis is the Market Segment Manager for the Mathematics education market. He is heading up the development of content-based math programs such as the Math in Motion series. Curtis was an AP* Statistics and Algebra II teacher in Houston and worked as a Statistics content specialist at the National Math and Science Initiative.

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Agenda

- Welcome & introductions
- Introduction to modeling with TI technology
- CO2 levels
- Rating NFL quarterbacks on passing
- Mantids and their prey
- Resources for modelling
- Webinar drawing

Expected Outcomes

- Identify strategies for implementing modeling in your classrooms-
- Experience difference kinds of modeling
- Recognize the role of TI technology in the modeling process
- Understand that modeling goes beyond the regression buttons

Mathematical modeling is

- » a process that uses mathematics to represent, analyze, make predictions, or otherwise provide insights into real world phenomena (GAIMME, 2016)

- » Used to answer questions of
 - 1) Rating to make value comparisons (Which computer is the best to purchase?)
 - 2) Optimization (What driving speed yields the most economical gas consumption?)
 - 3) Prediction (How long will it take to exhaust the world's oil supply?)
 - 4) Simulations (How fast will a disease spread through a population?)

CO₂ levels

- » Carbon dioxide (CO₂) emissions are largely caused by burning fossil fuels like coal, oil and natural gas that keep heat, which would normally disappear into space, trapped on Earth. This results in an increase in the temperature of the earth.
- » Scientists compute daily averages from hourly values at stations around the world. Two independent programs produce a daily CO₂ report at CO₂.Earth using data collected at the Mauna Loa Observatory in Hawaii. The daily averages are based on local time in Hawaii.

CO2 levels Manua Loa

| | Mean monthly CO2 levels (ppm) |
|-----------------|-------------------------------|
| Month/yr | 2018 |
| 1 | 407.88 |
| 2 | 408.61 |
| 3 | 409.35 |
| 4 | 410.8 |
| 5 | 411.48 |
| 6 | 410.8 |
| 7 | 409.05 |
| 8 | 407.07 |
| 9 | 405.48 |
| 10 | 406. |
| 11 | 407.98 |
| 12 | 409.27 |

What do you notice?

What do you wonder?

CO2 levels Mauna Loa

| Month/yr | Mean monthly CO2 levels (ppm) | |
|----------|-------------------------------|--------|
| | 2017 | 2018 |
| 1 | 406.13 | 407.88 |
| 2 | 406.42 | 408.61 |
| 3 | 407.18 | 409.35 |
| 4 | 409 | 410.8 |
| 5 | 409.65 | 411.48 |
| 6 | 408.84 | 410.8 |
| 7 | 407.07 | 409.05 |
| 8 | 405.07 | 407.07 |
| 9 | 403.38 | 405.48 |
| 10 | 403.64 | 406. |
| 11 | 405.14 | 407.98 |
| 12 | 406.82 | 409.27 |

» What do you notice?

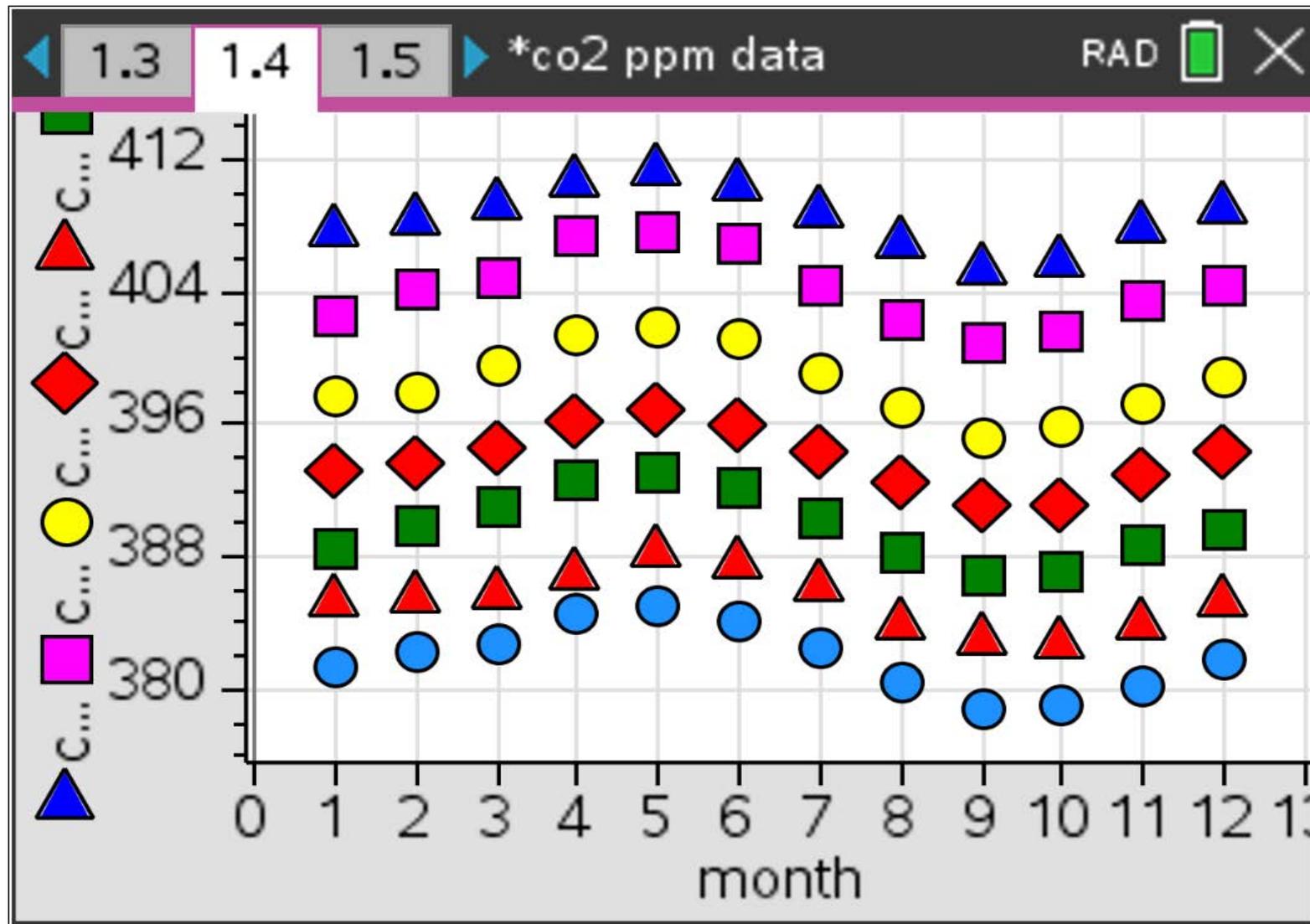
» What do you wonder?

CO2 Levels Mauna Loa

| | Mean monthly CO2 levels (ppm) | | | | |
|----------|-------------------------------|--------|-----|--------|--------|
| Month/yr | 2006 | 2007 | ... | 2017 | 2018 |
| 1 | 381.38 | 382.89 | | 406.13 | 407.88 |
| 2 | 382.19 | 383.9 | | 406.42 | 408.61 |
| 3 | 382.67 | 384.58 | | 407.18 | 409.35 |
| 4 | 384.61 | 386.5 | | 409 | 410.8 |
| 5 | 385.03 | 386.56 | | 409.65 | 411.48 |
| 6 | 384.05 | 386.1 | | 408.84 | 410.8 |
| 7 | 382.46 | 384.5 | | 407.07 | 409.05 |
| 8 | 380.41 | 381.99 | | 405.07 | 407.07 |
| 9 | 378.85 | 380.96 | | 403.38 | 405.48 |
| 10 | 379.13 | 381.12 | | 403.64 | 406. |
| 11 | 380.15 | 382.45 | | 405.14 | 407.98 |
| 12 | 381.82 | 383.95 | | 406.82 | 409.27 |

What might we do to start looking more closely at the data?

CO2 (ppm) for 06,08,10,12,14,16,18



Rating NFL Passing Quarterbacks

Passer ratings after the 2019 football season,

- » Patrick Mahomes - 108.9
- » Jimmy Garoppolo - 102
- » Tom Brady - 97
- » Aaron Rodgers - 95.4

What are these ratings based on and how are they calculated?

The data - 57 top passing quarterbacks

| | TDs | Pass completion | Yds gained | Attempt | Interceptions |
|-------------------------|------------|-----------------|--------------|-------------|---------------|
| Troy Aikman | 165 | 2898 | 32942 | 4715 | 141 |
| Kent Anderson | 197 | 2654 | 32838 | 4475 | 160 |
| *Tom Brady | 512 | 5967 | 70138 | 9318 | 169 |
| *Drew Brees | 519 | 6559 | 74111 | 9744 | 233 |
| *Sam Bradford | 103 | 1855 | 19449 | 2967 | 61 |
| Marc Bulger | 122 | 1969 | 22814 | 3171 | 93 |
| *Derek Carr | 122 | 1716 | 18387 | 2741 | 87 |
| Jay Cutler | 227 | 3048 | 35133 | 4920 | 160 |
| Kurt Cousins | 125 | 1756 | 20119 | 2641 | 65 |
| Dante Culpepper | 149 | 2016 | 24153 | 3199 | 106 |
| R. Cunningham | 207 | 2429 | 29979 | 4289 | 134 |
| *Andy Dalton | 188 | 2443 | 28100 | 3921 | 104 |
| Len Dawson | 239 | 2136 | 28711 | 3741 | 183 |
| Boomer Esiason | 247 | 2969 | 37920 | 5205 | 184 |
| Brett Favre | 508 | 6300 | 71838 | 10169 | 336 |
| *Joe Flacco | 212 | 3499 | 38245 | 5670 | 136 |
| Dan Fouts | 254 | 3297 | 43040 | 5604 | 242 |
| Rich Gannon | 180 | 2533 | 28743 | 4206 | 104 |
| Jeff Garcia | 161 | 2264 | 25537 | 3676 | 83 |
| Otto Graham | 174 | 1464 | 23584 | 2626 | 135 |
| Trent Green | 162 | 2266 | 28475 | 3740 | 114 |
| David Garrard | 89 | 1406 | 16003 | 2281 | 54 |
| Brian Griese | 119 | 1752 | 19440 | 2794 | 99 |
| Matt Hasselbeck | 212 | 3222 | 36638 | 5330 | 104 |
| Sonny Jurgensen | 255 | 2433 | 32224 | 4262 | 189 |
| <u>Colin Kaepernick</u> | 72 | 1011 | 12271 | 1692 | 30 |
| Dave Krieg | 261 | 3105 | 38147 | 5311 | 199 |
| *Andrew Luck | 166 | 1945 | 23029 | 3208 | 81 |
| *Eli Manning | 357 | 4755 | 55371 | 7898 | 237 |

| | | | | | |
|-----------------------|------------|-------------|--------------|-------------|------------|
| Peyton Manning | 539 | 6125 | 71940 | 9380 | 251 |
| Dan Marino | 420 | 4967 | 61361 | 8358 | 252 |
| *Marcus Mariota | 69 | 1005 | 11894 | 1592 | 42 |
| Donovan McNabb | 234 | 3170 | 37276 | 5374 | 117 |
| Steve McNair | 174 | 2733 | 31304 | 4544 | 119 |
| Joe Montana | 273 | 3409 | 40551 | 5391 | 139 |
| Warren Moon | 291 | 3988 | 49325 | 6823 | 233 |
| *Cam Newton | 182 | 2321 | 28469 | 3891 | 107 |
| Carson Palmer | 294 | 3941 | 46247 | 6307 | 187 |
| Chad Pennington | 102 | 1632 | 17823 | 2471 | 64 |
| *Matt Ryan | 290 | 4006 | 46103 | 6131 | 132 |
| * Philip Rivers | 373 | 4481 | 54299 | 6939 | 174 |
| *Aaron Rodgers | 336 | 3520 | 42476 | 5432 | 80 |
| * B. Roethlisberger | 388 | 4552 | 55527 | 7073 | 189 |
| Tony Romo | 248 | 2829 | 34183 | 4335 | 117 |
| *Matt Schaub | 133 | 2098 | 24887 | 3281 | 90 |
| *Alex Smith | 193 | 3082 | 34068 | 4941 | 101 |
| Roger Staubach | 153 | 1685 | 22700 | 2958 | 109 |
| *Matthew Stafford | 235 | 3334 | 38144 | 5341 | 129 |
| Bart Starr | 152 | 1808 | 24718 | 3149 | 138 |
| Ryan Tannehill | 122 | 1796 | 20141 | 2858 | 72 |
| Fran Tarkenton | 342 | 3686 | 47003 | 6467 | 266 |
| Kurt Warner | 208 | 2666 | 32344 | 4070 | 128 |
| *Russell Wilson | 192 | 2065 | 25201 | 3211 | 62 |
| *Jameis Winston | 83 | 1127 | 13947 | 1839 | 57 |
| Steve Young | 232 | 2667 | 33124 | 4149 | 107 |

* Active 2019

INTERCEPTIONS

Mantids and their prey

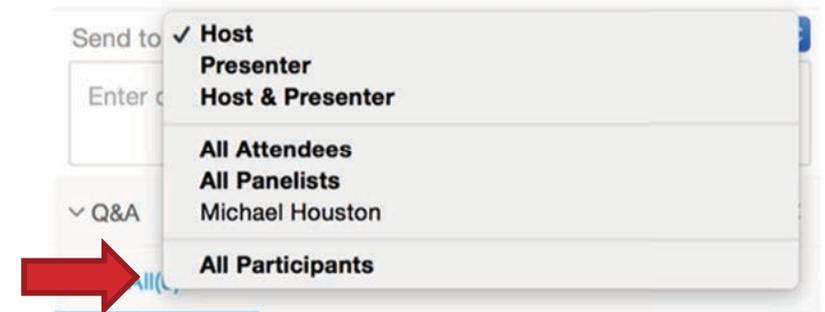
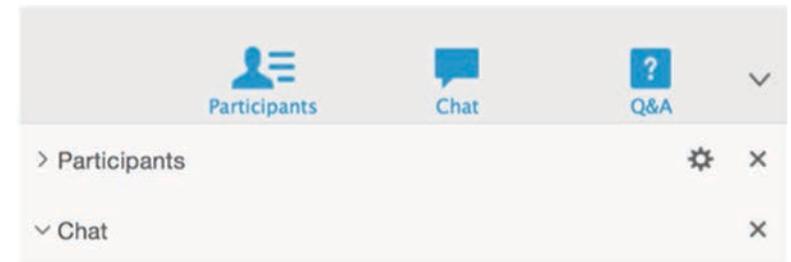
- » There seems to be a relationship between how hungry a praying mantis (a “mantid”) is and the distance at which the praying mantis will strike (jump) at prey
(GAIMME 2016).
- » What do you notice about the data?

| Food in stomach (cg) | Striking distance (mm) |
|----------------------|------------------------|
| 11 | 65 |
| 18 | 52 |
| 23 | 44 |
| 31 | 42 |
| 35 | 34 |
| 40 | 23 |
| 53 | 23 |
| 59 | 8 |
| 66 | 4 |
| 70 | 0 |
| 72 | 0 |
| 75 | 0 |
| 86 | 0 |
| 90 | 0 |

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- We'll use the chat window to send general messages.
- The chat window can be opened by choosing the messaging icon at the bottom of your screen
- When sending chats, please send to “all participants”.
- The Q&A and chat windows are located on the right side of your screen.



Resources for modelling with TI technology

- » Add to Math Nspired and 84 Activity Central
- » 4 categories
 - » Ratings
 - » Optimization
 - » Prediction
 - » Simulations

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Math Nspired Resource Center: Calculus

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presented to
Your Name

1
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