Welcome to the Math-in-CTE Video Series Webinar

- Thank you for joining us! We are waiting for all attendees to log in.
- This webinar is meant to be heard over your computer’s speakers. Please check your volume. You will be muted.
- If you are not able to hear, close the Audio Broadcast window, then rejoin the Audio Broadcast by clicking this icon on the Participant's panel on the right side of your screen.
- If that fails, ask to join the teleconference by clicking this icon on the Participant's panel on the right side of your screen.
- Please use the Q&A to post questions to the panelists. The last portion of this event has been reserved for Q&A.
Welcome to the Math-in-CTE Video Series Webinar

Our Hosts:

Donna Pearson,
Associate Director, NRCCTE
Co-PI, Math-in-CTE Study

Mary Fudge,
Lead Math-in-CTE Facilitator,
NRCCTE
THE MATH-IN-CTE MODEL

Donna Pearson, Associate Director, NRCCTE
Mary Fudge, Lead Math-in-CTE Facilitator, NRCCTE
What is the Math-in-CTE Model?

- Tested model of CTE-academic integration
- Rigorous, scientifically based research
- Conducted from 2003-2005
- 3,000+ students; 136 teachers
- Multiple CTE content areas
- Technical assistance since 2006
- See studies at: www.nrccte.org
What Makes the Model Work?

Core Principles of Integration

A. Foster and sustain a community of practice
B. Begin with the CTE curricula and not with the academic curricula
C. Understand academic skills as essential to the workplace
D. Maximize the academics in CTE curricula
E. Recognize CTE teachers as teachers of “academics-in-CTE,” NOT as academic teachers
Math-in-CTE Process and Pedagogy

A Process of Extended Professional Development

- Summer PD (5 days) – Curriculum mapping and lesson creation
- Late fall PD (2-3 days) - Lesson creation
- Early Spring PD (2-3 days) – Lesson creation
- CTE teachers partnered with math teachers
- On-going direct and indirect math support

A Pedagogic Framework

The Seven Elements of a math-enhanced CTE lesson
The Math Teacher Partner

• Serves as a coach
• Helps identify the math that already exists in CTE curricula
• Explains math vocabulary
• Explains how to do math processes and procedures correctly
Benefits for Math Teachers

• Math teachers learn about application of math in the CTE classes
• Math teachers learn to use authentic applications in math classroom
• Math teachers learn to effectively explain the relevance of math in the world of work
Curriculum Mapping for Integration

• Genesis of integration

• A “process” of examining the CTE curriculum (CTE teachers and their math partners):
  Where does the math naturally occur?
  Where are the opportunities to enhance math?

• An ongoing process of the Community of Practice (not a one-time only event)
  Teacher teams growing with the model
  Revisiting/revising the maps
## CURRICULUM MAPPING

**CTE PROGRAM:** HEALTH OCCUPATIONS

<table>
<thead>
<tr>
<th>CTE UNIT/TOPIC</th>
<th>CTE CONCEPTS</th>
<th>MATH CONCEPTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Human Structure and Function</td>
<td>Cell, tissue, organ and body systems relationships</td>
<td>Solve linear equations&lt;br&gt;Read and interpret graphs and charts&lt;br&gt;Problem solving involving statistical data&lt;br&gt;Ratio and Proportion</td>
</tr>
<tr>
<td>Health Care and Delivery System</td>
<td>Vital signs; height and weight charts; intake and output; percent of burns; body planes; range of motion</td>
<td>Solving linear equations; reading and interpreting graphs and charts; problem solving involving statistical data; ratio and proportion</td>
</tr>
</tbody>
</table>
The Seven Elements Framework

1. Introduce the CTE lesson
2. Assess students’ math awareness
3. Work through the *embedded* example
4. Work through *related, contextual* examples
5. Work through *traditional math* examples
6. Students demonstrate understanding
7. Formal assessment
Changing the Paradigm in Practice

**Old Models**
- A *box* of curriculum
- Short term “training”
- Little or no support after the “sage on the stage” goes away
- Replicable by individual teachers (assumed)

**New Models**
- Process not an event
- Communities of practice and teacher leadership
- On-going support of teacher development
- Teams of committed teachers working together over time
Math-in-CTE Video Series Webinar

Panelists from Arlington Public Schools (VA):

Jim Egenrieder, STEM Education Specialist,
Kris Martini, Director of Career, Technical, and Adult Education, APS
Jeffrey Elkner, Information and Communication Technology Teacher
Isaac Zawolo, Math Teacher, HILT (High Intensity Language Training) Institute
J.C. Parry, Aviation Technology, Engineering, and Computer-Aided Drafting Teacher
Joshua Folb, Math Teacher, Arlington Public Schools

Association for Career and Technical Education

National Research Center for Career and Technical Education
Math-in-CTE in Northern Virginia

One-minute history

Strategies for smaller implementations

CTE Teacher Perspectives

Math Teacher Perspectives

Outcomes

goo.gl/4c7pG
Our Math-in-CTE Involvement

American Youth Policy Forum

Explorations in 2007-08 - Jumpstart

Implementation in Summer 2009

Outreach to Date:

- Automotive and IT in 2009-2010
- Engineering, Aviation, Architectural, Electricity in 2010-2011
- FACS, Technology Ed. in 2011-2012
- Business, additional FACS, and Culinary in 2012-2013
CTE in Arlington Public Schools

- 26 square miles
- 21,872 students
- 3 high schools
- 5 middle schools
- 4 altern. programs
- Shared technical center
CTE in Arlington Public Schools (cont.)

- 533 CTE Program Completers
- 279 (52%) Advanced Diplomas
- 217 (41%) Standard Diplomas
Our typical approach to a Math-in-CTE session:

8am - Gather in 223 (Career Center)
   Set up technology, coffee, discussion.
8:30am – Updates, announcements, reintroductions, resources
9:00am - Reintroduce and review the processes
9:20am - Lesson rewrites and refinements as needed
11:00am - Lesson presentations and reflections
11:30am – Continued work with colleagues (and lunch)
1:00pm – Status Reports, Questions and Answers
1:30pm - Continue with lesson re-writes and refinements
3:00pm - Presentations
3:30pm - Adjourn and open lab (until 5pm)
Our Resources

Lessons previously submitted: [LINK]

Teaching Schedule:
Click this link to see the Calendar: [LINK]

Reporting: Use these reports to evaluate each lesson you teach (these are similar to the forms provided on your flash drive):

- [Pre-lesson report](#) (completed by Math teacher)
- [Post-lesson report](#): (completed by CTE teacher)

Preparing a new Math-in-CTE lesson?
Use this [Google Docs template](#).
Calendar of Continuing Professional Development

Session 1. August 22-25 (4 days)

Session 2. October 20 (1 day)

Session 3. November 17 (1 day)

Session 4. January 19 (1 day)

Session 4. March 15 (1 day)

Wrap-up - June 2012 (1 day)
Review of Math-in-CTE Core Principles

1. Develop and sustain a community of practice.
2. Begin with the CTE curriculum, not with the math curriculum.
3. Address the math in CTE as an essential workplace skill.
4. Maximize the math in CTE curricula.
7 Elements of Math Integration in CTE

1. Introduce the CTE lesson.
2. Assess students’ math awareness as it relates to the CTE lesson.
3. Work through the math example embedded in the CTE lesson.
5. Work through traditional math examples.
6. Students demonstrate their understanding.
7. Formal assessment.

and our Lesson Format:  [Google Docs template]
Perspectives of CTE Teachers

Jeff Elkner

Computer Science and Information Technology

J.C. Parry

Aviation Architectural and Engineering Drawing
Outcomes

- Participants
- Graduate credits
- Re-certification points
- Lessons
- Curriculum maps
- Community of practice

<table>
<thead>
<tr>
<th>Year</th>
<th>Participants by Subject</th>
<th>Participants by Academic Level</th>
<th>Lessons Published</th>
</tr>
</thead>
<tbody>
<tr>
<td>2009 - 2010</td>
<td>Business and IT - 4, Automotive Tech. - 4, Math - 9</td>
<td>NOVA - 5, High School - 9, Middle School - 3</td>
<td>IT - 11, AT - 9</td>
</tr>
<tr>
<td>2010 - 2011</td>
<td>Health Sciences - 2, Engineering/Tech Ed - 3, Business and IT - 1, Math - 5</td>
<td>High School - 8, Middle School - 3</td>
<td>Health - 4, Engin. - 8, Bus. - 3</td>
</tr>
<tr>
<td>TOTAL</td>
<td>44 Participants (total) or 14 teams (34 unique)</td>
<td>NOVA - 5, High School - 17 Middle School - 6</td>
<td>48 (to date)</td>
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More information:

Isaac Zawolo - Isaac.Zawolo@apsva.us

JC Parry - JC.Parry@apsva.us

Jeff Elkner - Jeff@Elkner.net

Jim Egenrieder - Jim@STEMeducation.us

Kris Martini - kris.martini@apsva.us

These slides: goo.gl/4c7pG
Math-in-CTE Video Series Webinar

Panelists from Oregon:

Tom Thompson,
Educational Specialist, Industrial and Engineering Systems,
Oregon Department of Education

Kristin Gunson,
CTE Regional Coordinator, Lane Education Service District, Oregon
Math-in-CTE as Catalyst

Tom Thompson – Oregon Dept. of Education
Kristin Gunson – Lane Education Service District
Early Work

- Applied Academic Guidelines
  - Aligned with new diploma requirements
  - Provided a process
    - http://www.ode.state.or.us/search/page/?id=1695
Early Work

- Math-in-CTE workshops
  - Technical assistance from NRCCTE
  - Built regional and local partnerships
  - Established a cadre of trainers
  - Over 15 regional workshops to date
Expansion – Sharing Lessons

http://www.clackamascareers.com/math/

http://www.ctemathlessons.com/
Expansion – Providing Credit

- Salem-Keizer SD
- North Marion HS
- Mt. View HS
- Beaverton SD
- Case studies

Here’s a sample project:

**Project #5: Designing the “Perfect Greenhouse”.

**Introduction:** You have a client that has recently learned that there is a “boatload” of money to be made by growing tomatoes and mushrooms simultaneously… in a greenhouse! The key is to design the perfect greenhouse to be able to meet the requirements necessary to make this happen. He has given you the following list of “rules”. You make your money by designing a facility to meet these rules:
Expansion – Math Teachers

• Research and Development Project
  – Reverse the role of the partners
  – Develop a course that meets state requirements
  – Identify a process
Expansion – Statewide Assessment

http://www.ode.state.or.us/search/page/?=281

<table>
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<tr>
<th>Career and Technical Education (CTE)</th>
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| Health Club |
| Trampoline |
| Walking and Jogging |
| Sunrise Punch |
| Jack and Coke Plants |
| Donuts Galore |
| FedEx Club |
| Portland/Seattle Trip |
|42nd Street |
| Farmer John |
| Sophomore Security |
| Tetra Dice |

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<tr>
<th>Tasks Only</th>
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<tbody>
<tr>
<td>Oasis’ Home</td>
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<tr>
<td>Mr. Gerardo’s Oil Tank</td>
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<tr>
<td>Roof Vents</td>
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<table>
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<tr>
<th>Scored Student Work with Task</th>
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<tbody>
<tr>
<td>Mr. Gerardo’s Oil Tank</td>
</tr>
<tr>
<td>Sample A7</td>
</tr>
<tr>
<td>Sample A8</td>
</tr>
<tr>
<td>Sample A18</td>
</tr>
<tr>
<td>Sample A23</td>
</tr>
<tr>
<td>Roof Vents</td>
</tr>
<tr>
<td>Sample B2</td>
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<tr>
<td>Sample B10</td>
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<tr>
<td>Sample B11</td>
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<td>Composite</td>
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<tr>
<td>Jim Leigh (503) 947-5822</td>
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Assessment and Accountability - Specialist, Mathematics

Oregon Department of Education | March 2012
Instructional Core

STUDENT
Math-in-CTE Lessons
Literacy-in-CTE Lessons
Applied Academic R&D Course

TEACHER
Math-in-CTE PD
Literacy-in-CTE PD
Applied Academic R&D

Student Learning Tasks

CONTENT
Oregon Skill Sets
CCSS
SMARTER Balanced Assessments

Oregon Department of Education | March 2012
Links to CCSS

• Focus on assessment
  – Leverages work done in Math-in-CTE
  – Meets a district and state need
  – Alignment with Smarter Balanced Consortium
  – Community college grant
Thank you
Questions and Answers

• Type your question in the text box at the bottom of your screen

• Click “Send” to All Panelists
Thank you for joining us!

To learn more about Math-in-CTE and watch the videos in this series, please visit us at www.nrccte.org.

Questions about this presentation or want to be notified when the archived webinar is ready? Email us at nrccte@louisville.edu.
The work reported herein was supported under the National Research Center for Career and Technical Education (PR/Award No. VO51A070003) as administered by the Office of Vocational and Adult Education, U.S. Department of Education. However, the contents do not necessarily represent the positions or policies of the Office of Vocational and Adult Education or the U.S. Department of Education and you should not assume endorsement by the Federal Government.