

Meeting at the Crossroads



Where CTE Program
Standards Intersect
ELA and Math Standards

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Goal for Today:

Inform and encourage CTE directors to support their instructors to participate in the CTE intersection work.

- Purpose of Work
- Process of Work
- End Results of Work
- Next Steps

Purpose of work:

- **Support** students in multiple pathways to demonstrate their learning and understanding of content area standards
- **Explicitly** identify intersections between the academic classroom/standards and the CTE classroom/standards
- **Foster** a collaborative working relationship between the sending schools and CTE centers

Overall Goal for Project: CTE and Proficiency

- College and Career Readiness and Maine's Learning Results
 - Math
 - ELA
 - Naturally occurring intersections
- CTE/NIS connections to PBE/PBD: how do we prove it?

Process of the Work

- **Who:** 10-CTEs, 5-High Schools, 1-College
 - 7-Auto Tech instructors, 7-Carpentry instructors, 1-CTE director
 - 5-ELA teachers, 5-Math teachers, 1-Curriculum Coordinator, 1-Academic support teacher
 - 4 DOE Specialists, 1-State Board Member, CTE-State Director
- **What:** Two day workshop, May 6th & 7th
- **Why:** Pilot to determine if intersections could be found and demonstrations identified.

English Language Arts

- Not expecting CTE teachers to be English teachers
- Not attempting to align to every ELA standard
 - Not literature (no Shakespeare)
 - Not story writing
 - Not teaching grammar

The ELA Standards we used

- **Reading** in Science and Technical Subjects (RST)
- **Writing** in History, Science and Technical Subjects (WHST)
- **Speaking and Listening** – not content specific
- Charts: ELA on the left/not ELA on the right
 - Reading
 - Writing

We are not simply matching words

- Looking for natural occurrence of literacy standards during work of CTE
 - Reading science and technical texts
 - Activities that support writing: short and sustained research to answer a question or solve a problem
 - Speaking and listening: aligned to audience and purpose

Mathematics

- Not expecting CTE teachers to be Math teachers
- Looking for natural intersections or occurrences
- Demonstration is the key!

The 2 Components of the Mathematics Standards

Content Standards

Mathematical Practices

How the students engage with the Mathematics

Content Standards

There are 6 Conceptual Categories

- Number and Quantity
- Algebra
- Functions
- Geometry
- Statistics and Probability
- Modeling *

8 Mathematical Practices

Habits of Mind of a Productive Mathematical

thinker

MP1 Make sense of problems and persevere in solving them.

MP6 Attend to precision

Reasoning & Explaining

MP2 Reason abstractly and quantitatively

MP3 Construct viable arguments and critique the reasoning of others

Modeling & Using Tools

MP4 Model with Mathematics

MP5 Use appropriate tools strategically

Seeing Structure & Generalizing

MP7 Look for and make use of structure

MP8 Look for and express regularity in repeated reasoning

End Results of Work

- Auto Technology (NATEF)
- Carpentry (NCCER)
- These are exemplars based on instructional situations – allows room for interpretation
- Examples – not prescriptions

Maintenance and Light Repair (MLR) Duties, Skills, and Tasks	English Language Arts Standards	Criteria for Demonstration of Proficiency (possible; to be determined at the local level)
Shop and Personal Safety (required supplemental tasks)		
<p>a. Identify general shop safety rules and procedures.</p> <p>b. Utilize safe procedures for handling of tools and equipment.</p> <p>c. Identify and use proper placement of floor jacks and jack stands.</p> <p>d. Identify and use proper procedures for safe lift operation.</p> <p>e. Utilize proper ventilation procedures for working within the lab/shop area.</p> <p>f. Identify marked safety areas.</p> <p>g. Identify the location and the types of fire extinguishers and other fire safety equipment; demonstrate knowledge of the procedures for using fire extinguishers and other fire safety equipment.</p> <p>h. Identify the location and use of eye wash stations.</p> <p>i. Identify the location of the posted evacuation routes.</p> <p>j. Comply with the required use of safety glasses, ear protection, gloves, and shoes during lab/shop activities.</p> <p>k. Identify and wear appropriate clothing for lab/shop activities.</p> <p>l. Secure hair and jewelry for lab/shop activities.</p> <p>m. Demonstrate awareness of the safety aspects of supplemental restraint systems (SRS), electronic brake control systems, and hybrid vehicle high voltage circuits.</p> <p>n. Demonstrate awareness of the safety aspects of high voltage circuits (such as high intensity discharge (HID) lamps, ignition systems, injection systems, etc.).</p> <p>o. Locate and demonstrate knowledge of material safety data sheets (MSDS).</p>	<p>RST.3.11-12 Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks; analyze the specific results based on explanations in the text.</p> <p>RST.4.11-12 Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 11-12 texts and topics.</p> <p>RST.7.11-12 Integrate and evaluate multiple sources of information presented in diverse formats and media (e.g., quantitative data, video, multimedia) in order to address a question or solve a problem</p> <p>WHST.9.11-12 Draw evidence from informational texts to support analysis, reflection and research.</p> <p>SL.2.11-12 Integrate multiple sources of information presented in diverse formats and media (e.g., visually, quantitatively, orally) in order to make informed decisions and solve problems, evaluating the credibility and accuracy of each source and noting any discrepancies among the data.</p>	<p>Demonstration includes:</p> <p>Understanding of industry/shop safety rules and proper safety procedures, symbols and key terms and the ability to maintain learned safety standards daily throughout the entirety of the course.</p> <p>Applying industry/shop safety rules and proper safety procedures, symbols and key terms and the ability to maintain learned safety standards daily throughout the entirety of the course.</p> <p>Analyze importance of following industry/shop safety rules and proper safety procedures, symbols and key terms and the ability to maintain learned safety standards daily throughout the entirety of the course.</p>

Carpentry Duties, Skills, and Tasks (NCCER)	English Language Arts Standards(CCSS)	Criteria for Demonstration of Proficiency* (possible; to be determined at the local level)
<p>10) Basic Stair Lay out</p> <p>a. Identify the various types of stairs.</p> <p>b. Identify the various parts of stairs.</p> <p>c. Identify the materials used in the construction of stairs.</p> <p>d. Interpret construction drawings of stairs.</p> <p>e. Calculate the total rise, number and size of risers, and number and size of treads required for a stairway.</p> <p>f. Lay out and cut stringers, risers, and treads.</p> <p>g. Build a small stair unit with a temporary handrail.</p>	<p>RST.3.11-12 Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks; analyze the specific results based on explanations in the text.</p> <p>RST.4.11-12 Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to <i>grades 11–12 texts and topics</i>.</p> <p>RST. 7.11-12 Integrate and evaluate multiple sources of information presented in diverse formats and media (e.g., quantitative data, video, multimedia) in order to address a question or solve a problem.</p> <p>RST.9.11-12 Synthesize information from a range of sources (e.g., texts, experiments, simulations) into a coherent understanding of a process, phenomenon, or concept, resolving conflicting information when possible.</p> <p>RST.10.11-12 By the end of grade 12, read and comprehend science/technical texts in the grades 11-CCR text complexity band independently and proficiently.</p> <p>SL.2.11-12 Integrate multiple sources of information presented in diverse formats and media (e.g., visually, quantitatively, orally) in order to make informed decisions and solve problems, evaluating the credibility and accuracy of each source and noting any discrepancies among the data.</p> <p>SL.6.11-12 Adapt speech to a variety of contexts and tasks, demonstrating a command of formal English when indicated or appropriate. (See grades 11–12 Language standards 1 and 3 on page 54 for specific expectations.)</p>	<p>Demonstration includes the following:</p> <p>reading and comprehending diverse media and formats,</p> <ul style="list-style-type: none"> – visually – quantitatively – writing – speaking <p>Examples may include the following:</p> <p>Collaborative Conversation</p> <p>Performance Assessment</p> <p>Module Exam</p> <p>Interview</p>

Program Standards	Math Standards	Exemplars
<p>h. Check electrical/electronic systems</p> <ul style="list-style-type: none"> • Demonstrate knowledge of the operation of series, parallel and series-parallel circuits using principles of electricity (Ohm’s Law). • Use wiring diagrams during diagnosis of electrical circuit problems. • Demonstrate the proper use of a digital multi-meter (DMM) during diagnosis of electrical circuit problems, including source voltage, voltage drop, current flow and resistance. • Check electrical circuits with a test light; determine necessary action. • Check electrical circuits using fused jumper wires; determine necessary action. • Demonstrate knowledge of the causes and effects of shorts, grounds, opens, and resistance problems in electrical/electronic circuits. • Measure key-off battery drain (parasitic draw); determine necessary action. • Inspect and test fusible links, circuit breakers, and fuses; determine necessary action. • Inspect and test switches, connectors, relays, and wires of electrical/electronic circuits. • Repair connectors and terminal ends. • Perform solder repair of electrical wiring. • Perform battery state-of-charge test; determine necessary action. • Perform battery capacity test; confirm proper battery capacity for vehicle application; determine necessary action. • Maintain or restore electronic memory functions. • Inspect, clean, fill, and/or replace battery, battery cables, connectors, clamps, and hold-downs. • Perform battery charge. • Start a vehicle using jumper cables or an auxiliary power supply. • Perform starter current draw tests; determine necessary action. • Perform starter circuit voltage drop tests; determine necessary action. 	<p>A-CED.A.1: Create equations and inequalities in one variable and use them to solve problems.</p> <p style="padding-left: 40px;">Mathematical Practice 6 Mathematical Practice 5 Mathematical Practice 4</p> <p>A-CED.A.4: Rearrange formulas to highlight a quantity of interest, using the same reasoning as in solving equations.</p> <p style="padding-left: 40px;">Mathematical Practice 8 Mathematical Practice 4</p> <p>N-Q.A.1: Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; choose and interpret scale and the origin in graphs and data displays.</p> <p>N-Q.A.2: Define appropriate quantities for the purpose of descriptive modeling.</p> <p>N-Q.A.3: Choose a level of accuracy appropriate to limitations on measurement when reporting quantities.</p> <p style="padding-left: 40px;">Mathematical Practice 2 Mathematical Practice 6</p>	<p>Students will demonstrate understanding of Ohm’s Law.</p> <p>Students will be able to interpret information gathered from multimeter and make calculations and predictions based on the readings.</p> <p>Students will choose a measurement scale on the multimeter that is appropriate for the task that is being presented.</p>

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<p>10) Basic Stair Lay out</p> <p>a. Identify the various types of stairs.</p> <p>b. Identify the various parts of stairs.</p> <p>c. Identify the materials used in the construction of stairs.</p> <p>d. Interpret construction drawings of stairs.</p> <p>e. Calculate the total rise, number and size of risers, and number and size of treads required for a stairway.</p> <p>f. Lay out and cut stringers, risers, and treads.</p> <p>g. Build a small stair unit with a temporary handrail.</p>	<p>High School: Geometry-SRT.B.5: Use congruence and similarity criteria for triangles to solve problems and to prove relationships in geometric figures</p> <p>High School: Geometry-SRT.C.8: Use trigonometric ratios and the Pythagorean Theorem to solve right triangles in applied problems.</p> <p>High School: Geometry-GPE.B.6: Find the point on a directed line segment between two given points that partitions the segment into a given ratio</p> <p>High School: Number and Quantity Reason quantitatively and use units to solve problems</p> <p>High School Functions-BF.A.1 Write a function that describes a relationship between two quantities.*</p> <p>High School: Functions-IF.B.6: Calculate and interpret the average rate of change of a function (presented symbolically or as a table) over a specified interval. Estimate the rate of change from a graph.</p> <p>Standards for Mathematical Practice</p> <ol style="list-style-type: none"> 1) Make sense of problems and persevere in solving them. 2) Reason abstractly and quantitatively. 3) Construct viable arguments and critique the reasoning of others. 4) Model with mathematics. 5) Use appropriate tools strategically. 6) Attend to precision. 7) Look for and make use of structure. 8) Look for and express regularity in repeated reasoning. 	<ol style="list-style-type: none"> 1. Make a materials list, with cost per item, quantity, and total. 2. Determine proper slope using building codes 3. Determine spacing of treads and risers, balusters, newel posts and railings, according to building codes 5. Layout to ensure that all parts are perfectly square and plumb, angles and ratios correct

What we learned

- Content and program teachers need to understand what happens in classrooms and shops during instruction
- Language that instructors and teachers use is very different
- Need expertise to recognize opportunity
- Key component: learning transfer

CTE Intersections Workshop Evaluations				
Top 3 Take-Aways				
Most Valuable	Questions/Concerns	1	2	3
common language with counterparts	that it does not become so cumbersome that it changes my program	that it is doable	working with Academic Teachers	open arms of Dept. of Education
		helping to match up student work for credit	helping to form a working relationship with academics	help in looking at how I teach
collaboration	I felt like our personal curriculums would have a large affect on what ELA standards we would meet	It has to meet 11-12 rigor	It has to have evidence attached	
work groups				
working together w/math/ELA counterparts		developed a road in the right direction	identified the relationship of math and CTE auto	developed a positive working relationship
gained much better understanding of how industry standards line up w/CCR				
continued work with counterparts and members of DOE		students struggling to hit their targets can do it in my class		
contact with colleagues and math content experts	none	connections	intersections	relevant math standards
interacting with the CTE instructors and available mentoring	none			
connecting with professionals from CTE	will they be supplied at the administrative level?	this needs to happen more regularly	significant amount of math happens at CTE; realizing how much we share is impressive	this is a huge step in the direction of standard certification in various environments
collaboration; having people share resources; leaving about new math resources	I hope that others who were not pat of the process will accept the work we did as valid/accurate	academic and CTE teachers CAN work together	we all learned a lot from each other	It's hard work, but valuable
working with the ELA teachers!		where the intersections occur	understanding of the standards	how academics are embedded in CTE programs
the great discussions	consistency among schools with standards	making the connections with the CTE		
connecting with colleagues; opening the lines of communication across the curriculum...we never get to talk	What is the "end game" of all of this? What are the next steps?	How valuable CTE is!	How necessary these conversations are!!	I feel very respected and treated like a professional!
collaborating with others				
So much				
combining ELA, Math & CTE teachers to work together		provides insight on expanding curriculum	open mind to what we as CTE are	already teaching
networking with other CTE professionals	adding clarity to the process	natural intersections	level of rigor not likely to occur	
		getting a chance to talk and discuss with other teacher		
spending time with CTE and having more information to share about how they work with the academic side	I have no concerns	making connections w/other teachers around state	discussing how literacy standards connect away from ELA	Gave me more arguments for my students when they ask me why I have to learn this
		connections w/math	common core connections	meeting great academic teachers
collaborative time		new appreciation for carpentry!		

Pre and Post Confidence Survey Results

<i>Explain CCR Intersections</i>		
	PRE	Post
Totals	45	92
Averages	1.96	4.00
<i>Describe Criteria for Proficiency</i>		
Totals	49	94
Averages	2.13	4.09

Next Steps

Health Occupations	Certified Nursing Assistant, and Medical Assistant (combined)	51.0000
Hospitality	Culinary Arts	12.0503
Education	Early Childhood Education	19.0709
Manufacturing	Welding	48.0508
Information Technology	Computer Installation and Repair Technology/Technician	47.0104
Manufacturing	Machine Tool/Precision Machining	48.0501

Next Steps

- Plant Systems (Horticulture)
 - Pilot early this December
- Law Enforcement
 - Assessment review by Tech Group this year
- Small Engine
 - Item verification review by Tech Group this year

CTE National or State Standards

Where You Can Find Them:

CTE Career Clusters

<http://www.maine.gov/doe/cte/resources/cluster.html>

Mathematics standards

<http://maine.gov/doe/math/standards/ccssm/index.html>

ELA/Literacy standards

<http://www.maine.gov/doe/ela/standards/commoncore/index.html>

Questions?

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