November 23, 2015 Staples High School

WESTPORT BOARD OF EDUCATION

*AGENDA

(Agenda Subject to Modification in Accordance with Law)

PUBLIC SESSION/PLEDGE OF ALLEGIANCE:
7:00 p.m., Staples High School, Cafeteria B (Room 301)

ELECTION OF OFFICERS OF THE BOARD OF EDUCATION Dr. Landon

ANNOUNCEMENTS FROM BOARD AND ADMINISTRATION

PUBLIC QUESTIONS/COMMENTS ON NON-AGENDA ITEMS (15 MINUTES)

INFORMATION

Monitors on School Buses - WITHDRAWN
Request for Text Amendment – WITHDRAWN
Automatic External Defibrillators (AEDs)
Westport Education Association Contract: 7/1/16-6/30/19

MINUTES: November 9, 2015

DISCUSSION/ACTION:

1. Proposed Course Additions: 2016-17 School Year	(Encl.)	Dr. Landon Mr. D'Amico
2. Course Sequencing and Offerings in STEM, 6-12	(Encl.)	Mr. D'Amico Mr. Scheetz
3. K-5 STEM and Science Coaches; Creation of Mini-Maker Spaces in the Schools; and, Elementary School World Language Program	(Encl.)	Ms. Droller Ms. Carrignan Ms. Zachery
4. Funding for CES Gymnatorium and Cafeteria Air Conditioning	(Encl.)	Dr. Landon
5. Seat Belts on School Buses	(Encl.)	Dr. Landon
6. Acceptance of Gifts	(Encl.)	Dr. Landon

DISCUSSION:

1. Capital Projects in Rank Order of Priority	(Encl.)	Dr. Landon Mr. Longo

UPDATE:

Health and Medical Insurance Revenues and Expenses; Projected Year-End Balance in Health Reserve Account

ADJOURNMENT

*A 2/3 vote is required to go to executive session, to add a topic to the agenda of a regular meeting, or to start a new topic after 10:30 p.m.
The meeting can also be viewed on cable TV on channel 78; AT&T channel 99 and by video stream @www.westport.k12.ct.us

PUBLIC PARTICIPATION WELCOME USING THE FOLLOWING GUIDELINES:

- Comment on non-agenda topics will occur during the first 15 minutes *except* when staff or guest presentations are scheduled.
- Board will not engage in dialogue on non-agenda items.
- Public may speak as agenda topics come up for discussion or information.
- Speakers on non-agenda items are limited to 2 minutes each, except by prior arrangement with chair.
- Speakers on agenda items are limited to 3 minutes each, except by prior arrangement with chair.
- Speakers must give name and use microphone.
- Responses to questions may be deferred if answers not immediately available.
- Public comment is normally not invited for topics listed for action after having been publicly discussed at one or more meetings.

WESTPORT PUBLIC SCHOOLS

ELLIOTT LANDON
Superintendent of Schools

110 MYRTLE AVENUE
WESTPORT, CONNECTICUT 06880
TELEPHONE: (203) 341-1025
FAX: (203) 341-1029

To: Members of the Board of Education

From: Elliott Landon

Subject: Election of Officers

Date: November 23, 2015

Each year at this time the Board of Education elects its officers to serve through the post-Election Day period of the following year. The positions for which elections are required are chairperson, vice-chairperson, and secretary. Our meeting of November 23 will begin with the election of officers. It has been our practice to have the Superintendent of Schools preside only for the election of the chairperson. The newly elected chairperson then presides for the election of a vice-chairperson and a secretary for the Board.

A nomination does not require a second, although one may be made.

The vote for officers must be in public, by open ballot, and recorded in the Minutes of the meeting.

If there is more than one nomination, votes are taken in the order in which the nominations have been received. As soon as one candidate receives a majority vote, the election is over and that candidate is declared elected. The votes for the other candidates are not called for.

Our first item of business to be conducted on November 23 will be the election of officers.

Elliott

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WESTPORT PUBLIC SCHOOLS

ELLIOTT LANDON
Superintendent of Schools

110 MYRTLE AVENUE
WESTPORT, CONNECTICUT 06880
TELEPHONE: (203) 341-1010
FAX: (203) 341-1029

To: Members of the Board of Education

From: Elliott Landon

Subject: WEA/Board of Education Contract: July 1, 2016 - June 30, 2019

Date: November 23, 2016

Appended to this memorandum may be found a copy of the above-referenced contract, recently negotiated. With the signatures of the Chair of the Board of Education and the co-presidents of the Westport Education Association, the contract will be submitted to the Town Clerk for filing, to be followed by presentation to the Representative Town Meeting, as required by Law.

The major terms and conditions of the new contract are outlined below:

1. Length of Contract:	July 1, 2016 - June 30, 2019
2. Annual Total Wage Increase:	3.46%: (7/1/16 - 6/30/17) 3.46%: (7/1/17 - 6/30/18) 3.29%: (7/1/18 - 6/30/19)
3. Health and Medical Insurance: Employee Contributions	19% (7/1/16 - 6/30/17) 20% (7/1/17 - 6/30/18) 21% (7/1/18 - 6/30/19)

Elliott

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Superintendent of Schools

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WESTPORT, CONNECTICUT 06880
TELEPHONE: (203) 341-1010
FAX: (203) 341-1029

To: Members of the Board of Education

From: Elliott Landon

Subject: Proposed Course Additions: 2016-17 School Year

Date: November 23, 2015

At the Board of Education meeting of November 9, James D'Amico and members of our instructional staff presented to the Board our collective request for Board authorization to offer a number of new and exciting courses at Staples High School beginning with the start of the 2015-16 school year.

Compelling presentations in support were made by the following:

1. A.P. Music Theory	Thomas A. Scavone, K-12 Music Supervisor Luke Rosenberg, Teacher
2. Mandarin Chinese 5 A.P. Chinese Language & Culture	Maria Zachery, K-12 World Language Supervisor Chris Fray, Lili Yang – Teachers
3. Gothic and Horror Literature Sports Literature and Research	Julie Heller, Department Chair, English, 6-12 Cody Thomas, Brendan Giolitto, Brian Solomon – Teachers
4. Earth Science 3-D Design and Engineering Creative Technological Solutions Materials and Design Science	AJ Scheetz, Department Chair, Science, 6-12 Humphrey Wong, Scott Lee, David Rollinson - Teachers

The total cost of these offerings shall be $154,890, consisting of $128,000 for additional staff; $10,890 for textbooks; and, $16,000 for materials.

ADMINISTRATIVE RECOMMENDATION

Be It Resolved, That upon the recommendation of the Superintendent of Schools, the Board of Education authorizes the offering of the following courses at Staples High School for the 2015-16 school year: A.P. Music Theory; Mandarin Chinese 5, A.P. Chinese Language and Culture; Gothic and Horror Literature; Sports Literature and Research; Earth Science; 3-D Design and Engineering; Creative Technological Solutions; and Materials and Design Science.

Elliott

James J. D'Amico
Director of Secondary Education

TO: Elliott Landon
FROM: James D'Amico
SUBJECT: New Course Proposal Costs
DATE: November 23, 2015

Please find below the anticipated cost associated with proposals for new courses at Staples High School for the 2016-17 school year. Final actual cost will be determined by student enrollment numbers.

DEPT	COURSE TITLE	STAFF	TEXTBOOKS	MATERIALS	COMMENTS
EN	Gothic and Horror Literature	0.0	$0.00	$0.00	Texts for English courses will be covered by current allotments of funds for SHS and T&LC
EN	Sports Literature and Research	0.0	$0.00	$0.00	
MU	AP Music Theory	0.0	$0.00	$0.00	Use of existing materials, texts, online resources
WL	Mandarin Chinese 5	0.4	$2,156.00	$0.00	New textbook, no new materials required.
WL	AP Chinese Language and Culture	0.2	$1,534.20	$0.00	New textbook, no new materials required.
SC	Earth Science	0.25	$0.00	$0.00	Free online textbook. Lab costs covered in current allotments of funds at SHS
SC	3-D Design and Engineering	0.25	$7,200.00	$16,000.00	Materials will be shared by Engineering courses, housed in a common facility or carted to instructional space if necessary. Texts/online resources may be shared by multiple courses.
SC	Creative Technological Solutions	0.25			
SC	Materials and Design Science	0.25			
		1.6	**$10,890.20**	**$16,000.00**	

James J. D'Amico
Director of Secondary Education

TO: Elliott Landon
FROM: James D'Amico
SUBJECT: New Course Proposals
DATE: November 9, 2015

Please find attached the proposals for new courses at Staples High School for the 2016-17 school year. The courses being proposed are:

- Music
  - AP Music Theory
- World Languages
  - Mandarin Chinese 5
  - AP Chinese Language and Culture
- English
  - Gothic and Horror Literature
  - Sports Literature and Research
- Science
  - Earth Science
- STEAM
  - Creative Technological Solutions to Real-World Problems
  - 3-D Design and Engineering
  - Materials and Design Science

These course proposals represent exciting opportunities for Staples High School students, whether it be the change to continue learning a language, engaging students with relevant and exciting options within their required coursework, or offering courses of study in STEAM fields. As was pointed out recently by the NEASC visiting team, the variety and quality of our high school curriculum is a source of pride for the school, and we are looking forward to these courses becoming a part of our program of studies.

Maria Zachery, Thomas Scavone, Julie Heller, and A.J. Scheetz, the chairs of the World Languages, Music, English and Science departments, respectively, will be in attendance along with several Staples High School teachers to present the courses to the Board, and field questions about these proposals.

Music

- AP Music Theory

ADVANCED PLACEMENT MUSIC THEORY
COURSE PROPOSAL 2016-17

Staples High School
Westport, Connecticut

Course Title: A.P. Music Theory — Credit: 1

Course proposed by:

Thomas A. Scavone, K-12 Music Supervisor
Luke Rosenberg, Instructor

Course Description

The Advanced Placement Music Theory course offers a clear and thorough introduction to the resources and practices of Western Music from the 17th century to the present day. Students will employ a variety of techniques to clarify underlying voice leading, harmonic structure, and formal procedures. The Advanced Placement Music Theory students will develop the ability to recognize, understand, and describe the basic materials and processes of music that are heard or presented in a score. The student will develop aural, sight-singing, written, compositional, and analytical exercises. The AP Music Theory student will solve compositional problems and become proficient in part-writing. Students will receive ear-training and skills for aural identification and dictation notation. The AP Music Theory exam is a three-hour, standardized exam scheduled for May. Music Composition will be the focus for the remainder of the year.

Prerequisite

Band, Orchestra, Chorus or demonstrated knowledge of fundamental Music Theory concepts

Content Specific Enduring Understandings (by Artistic Processes)

Creating

- The creative ideas, concepts, and feelings that influence musicians' work emerge from a variety of sources.
- Musicians' creative choices are influenced by their expertise, context, and expressive intent.
- Musicians evaluate and refine their work through openness to new ideas, persistence, and the application of appropriate criteria. Musicians' presentation of creative work is the culmination of a process of creation and communication.

Performing

- Performers' interest in and knowledge of musical work(s), understanding of their own technical skill, and the context for a performance influence the selection of repertoire.
- Analyzing creators' context and how they manipulate elements of music provides insight into their intent and informs performance.
- Performers make interpretive decisions based on their understanding of context and expressive intent.
- To express their musical ideas, musicians analyze, evaluate, and refine their performance over time through openness to new ideas, persistence, and the application of appropriate criteria.
- Musicians judge performance based on criteria that vary across time, place, and cultures.
- The context and how a work is presented influence the audience response.

Responding

- Individuals' selection of musical works is influenced by their interests, experiences, understandings, and purposes.
- Response to music is informed by analyzing context (social, cultural, and historical) and how creators and performers manipulate the elements of music.
- Through their use of elements and structures of music, creators and performers provide clues to their expressive intent.
- The personal evaluation of musical works and performances is informed by analysis, interpretation, and established criteria.

Connecting (embedded into processes)

- Musicians connect their personal interests, experiences, ideas, and knowledge to creating, performing, and responding.
- Understanding connections to varied contexts and daily life enhances musicians' creating, performing, and responding.

Content Specific Essential Questions (by Artistic Processes)

Creating

- How do musicians generate creative ideas?
- How do musicians make creative decisions?
- How do musicians improve the quality of their creative work?
- When is creative work ready to share?

Performing

- How do performers select repertoire?
- How does understanding the structure and context of musical works inform performance?
- How do performers interpret musical works?
- How do musicians improve the quality of their performance? When is a performance judged ready to present?
- How do context and the manner in which musical work is presented influence audience response?

Responding

- How do individuals choose music to experience?
- How does understanding the structure and context of music inform a response?
- How do we discern musical creators' and performers' expressive intent?
- How do we judge the quality of musical work(s) and performance(s)?
- How do musicians make meaningful connections to creating, performing, and responding?

Connecting (embedded into processes)

- How do musicians make meaningful connections to creating, performing, and responding? How do the other arts, other disciplines, contexts and daily life inform creating, performing, and responding to music?

CT Music Content Standards to be addressed

1. Singing, alone and with others, a varied repertoire of music.

2. Performing on instruments, alone and with others, a varied repertoire of music.
3. Improvising melodies, variations, and accompaniments.
4. Composing and arranging music within specified guidelines.
5. Reading and notating music.
6. Listening to, analyzing, and describing music.
7. Evaluating music and music performances.
8. Understanding relationships between music, the other arts, and disciplines outside the arts.
9. Understanding music in relation to history and culture.

Proposed Resources

- Kostka, Stefan, and Dorothy Payne. *Tonal Harmony with an Introduction to Twentieth-Century Music.* 5th ed. New York: McGraw-Hill, 2004
- Kostka, Stefan, and Dorothy Payne. *Workbook for Tonal Harmony*
- Various Software including Alfred Music Theory, MacGamut and Finale
- Web-based resources include Noteflight and Musictheory.net

For further information, see College Board Course Description:

http://media.collegeboard.com/digitalServices/pdf/ap/ap-music-theory-course-description.pdf

ADVANCED PLACEMENT MUSIC THEORY
COURSE PROPOSAL 2016-17

Expectations for Student Learning (Outcomes)

QUARTER ONE OVERVIEW

TOPICS	WRITTEN SKILLS	EAR-TRAINING SKILLS	SIGHT-SINGING SKILLS	SUPPLEMENTARY SKILLS
• Musical Notation and Clef Identification • Major & Minor Scales • Key Signatures • Intervals Identification • Triads and Inversions • 7th Chords and Inversions • Figured Bass Symbols • Diatonic Triads • Roman Numerals • Simple and Compound Meters • Musical Form and Texture	• Workbook materials • Hand-outs • Assigned exercises	• Rhythmic Dictation • Melodic Dictation – Steps • Small Skips • Interval Identification Melodic & Harmonic • Triads • 7th Chords • Musical Form and Texture	• Melodies from *Music for Sight Singing* • Step-wise Melodies • Melodies with small Intervallic Skips • Major and Minor Melodies • Treble and Bass Clef	• Keyboard Note ID • Keyboard use on: - Scales - Intervals - Triads - 7th Chords - Inversions - Basic Melodies • Alfred Music Theory Software • Ear-Training Software

COMPOSITION ASSIGNMENTS

Assignments will be selected from the following examples to apply the skills developed during the quarter. Length of compositions, weight of grades will be determined.

- Rhythmic Composition – One Part
- Rhythmic Composition – Two Parts
- Melodic Composition - Treble & Bass Clef

ASSESSMENTS

- Weekly Evaluations – Written, Dictation and/or Sight-Singing

ADVANCED PLACEMENT MUSIC THEORY
COURSE PROPOSAL 2016-17

QUARTER TWO OVERVIEW

TOPICS	WRITTEN SKILLS	EAR-TRAINING SKILLS	SIGHT-SINGING SKILLS	SUPPLEMENTARY SKILLS
• Counterpoint – 1st Species • Counterpoint – 2nd Species • Four-part Part Writing • Harmonic Progressions • Triads in the 1st & 2nd Inversions • Cadences • Phrases • Musical Form and Texture	• Workbook materials • Composition using 1st & 2nd Species • Harmonization	• Continuation of Above • Melodic Dictation - Longer - More Complex Rhythms • Interval Identification Melodic & Harmonic • Triads • 7th Chords • Musical Form and Texture • Transcription of Jazz Head	• Continuation of Above	• Keyboard on basic progressions • Software from above • Previous AP Exams

COMPOSITION ASSIGNMENTS

Assignments will be selected <u>from</u> the following examples to apply the skills developed during the quarter. Length of compositions, weight of grades will be determined.

- Counterpoint Composition – 1st and 2nd Species
- Harmonic Composition

ASSESSMENTS

- Weekly Evaluations – Written, Dictation and/or Sight-Singing
- Mid-term Exam using prior AP Theory Exam

ADVANCED PLACEMENT MUSIC THEORY
COURSE PROPOSAL 2016-17

QUARTER THREE OVERVIEW

TOPICS	WRITTEN SKILLS	EAR-TRAINING SKILLS	SIGHT-SINGING SKILLS	SUPPLEMENTARY SKILLS
• Non-Chord Tones • Seventh Chords • Musical Form and Texture	• Workbook materials • Original Composition using Non-Chord Tones and Seventh Chords	• Continuation of Above • Melodic Dictation - Longer - Larger Leaps • Harmonic Dictation - More Complex Progressions • Musical Form and Texture • Transcription of a more advanced Jazz Head	• Continuation of Above • Melodies with progressively larger Intervallic Skips • Simple Harmonic Progressions	• Keyboard on Progressions including Non-Chord Tones and Seventh Chords • Software from above • Previous AP Exams

COMPOSITION ASSIGNMENTS
- Original Composition using non-chord tones and Seventh Chords

ASSESSMENTS
- Weekly Evaluations – Written, Dictation and/or Sight-Singing
- Prior AP Theory Exam

QUARTER FOUR OVERVIEW

TOPICS	WRITTEN SKILLS	EAR-TRAINING SKILLS	SIGHT-SINGING SKILLS	SUPPLEMENTARY SKILLS
• Secondary Dominant Chords • Secondary Leading Tone Chords • Modulation • Musical Form and Texture	• Workbook materials • Original Composition using secondary dominant or leading tone chords. • Short examples of modulation techniques – Pivot point, common chord, etc. • Review for AP Exam	• Continuation of Above • Identification of Secondary Dominant or Secondary Leading Tone Chords • Harmonic Dictation - Soprano/Bass Lines - Basic Progressions - Error Detection • Identification of Modulation occurrences • Review for AP Exam	• Continuation of Above • Review for AP Exam	• Keyboard on Progressions including Secondary Function Chords • Software from above • Previous AP Exams

COMPOSITION ASSIGNMENTS
- Original Composition using secondary dominant or leading tone chords.

ASSESSMENTS
- Weekly Evaluations – Written, Dictation and/or Sight-Singing
- Prior AP Theory Exam

There will be an intensive review for the AP Exam during Quarter Four. Following the exam, we will focus on original compositions to be performed at a June composition recital.

Sample Quarter One Weekly Expectations

ADVANCED PLACEMENT MUSIC THEORY
COURSE PROPOSAL 2016-17

WEEK ONE **ELEMENTS OF PITCH**
(The Keyboard and Octave Registers; Notation on the Staff; The Major Scale; The Major Key Signatures; Minor Scales; Minor Key Signatures; Scale Degree Names; Intervals; Perfect, Major and Minor Intervals; Augmented and Diminished Intervals; Inversion of Intervals; Consonant and Dissonant Intervals)

WEEK TWO **ELEMENTS OF RHYTHM**
(Rhythm; Durational Symbols; Beat and Tempo; Meter; Division of the Beat; Simple Time Signatures; Compound Time Signatures; Time Signatures Summarized; More on Durational symbols)

WEEK THREE **INTRODUCTION TO TRIADS AND SEVENTH CHORDS**
(Triads; Seventh Chords; Inversion of Chords; Inversion Symbols and Figured Bass; Lead Sheet Symbols; Recognizing Chords in Various Textures)

WEEK FOUR **DIATONIC CHORDS IN MAJOR AND MINOR KEYS**
(The Minor Scale; Diatonic Triads in Major; Diatonic Triads in Minor; Diatonic Seventh Chords in Major; Diatonic Seventh Chords in Minor)

WEEK FIVE **PRINCIPLES OF VOICE LEARNING**
(The Melodic Line; Notating Chords; Voicing a Single Triad; Parallel Motion)

WEEK SIX **ROOT POSITION PART WRITING**
(Root Position Part Writing with Repeated Roots; Four-Part Textures; Three-Part Textures; Root Positioning Part Writing with Roots a 4th (5th) Apart; Four-Part Textures; Three-Part Textures; Root Positioning Part Writing with Roots a 3rd (6th) Apart; Fur-Part Textures; Three-Part Textures; Root Positioning Part Writing with Roots a 2nd (7th) Apart; Four-Part Textures; Three-Part Textures; Instrumental Ranges and Transpositions)

WEEK SEVEN **HARMONIC PROGRESSION**
(Sequences and the Circle of Fifths; The I and V Chords; The II Chord; The VI Chord; The III Chord; The VII Chord; The IV Chord; Common Exceptions; Differences in the Minor Mode; Progressions Involving Seventh Chords; Harmonizing a Simple Melody)

WEEK EIGHT **TRIADS IN FIRST INVERSION**
(Bass Arpeggiation; Substituted First Inversion Triads; Parallel Sixth Chords; Part Writing First Inversion Triads; Four-Part Textures; Three-Part Textures; Soprano-Bass Counterpoint)

WEEK NINE **TRIADS IN SECOND INVERSION**
(Bass Arpeggiation and the Melodic Bass; The Cadential Six-Four; The Passing Six-Four; The Pedal Six-Four; Part Writing for Second Inversion Triads)

World Languages

- Mandarin Chinese 5
- AP Chinese Language and Culture

Staples High School New Course Proposal

Course Title: ***Mandarin Chinese 5***

Credit:
_____ .25 Quarter
____ .50 Semester
__X_ 1 Year

Credit Area(s): World Language

Course proposed by:
If the course has been suggested by an individual teacher, a student, or some other agent, it should have been reviewed and accepted by the department(s) before being presented to Collaborative Team.

_____ Administration	__X__ Board of Education	______ Students
_____ K-12 Curr. Review	__X__ Department	______ Other

Prerequisite: Chinese 4A or 4H

Rationale:

1. How does this course contribute to the department goals and objectives?

   The Mandarin Chinese 5 course constitutes the natural progression of Chinese curriculum at Staples High School. Students who have completed Mandarin Chinese 4 will continue to learn language skills, to understand and make comparisons between cultures, and to use the language in communities outside of the traditional school environment.

2. What is the need this course addresses?

   This course will be one of the terminal Chinese courses in the grade 6-12 curriculum sequence. This course provides students an opportunity to further their Chinese language and culture studies. Students will develop linguistic skills by engaging in various activities, including pair-sharing, group discussion, student presentations, peer critiques, video projects, cultural projects, web searches, skits, debates, and writing compositions.

3. How does this course support the recommendation of the latest K-12 review?
   N/A

4. How does this course support Staples' mission statement?

To inspire learning and encourage global thinking, the course is designed with the use of authentic materials such as news periodicals, video clips, advertisements, web-pages, and phone apps. Students will learn to communicate effectively, respectfully and responsibly in a collaborative in-class and online environment to foster integrity. Current social, economic, and political issues in China and their impact on the world will be discussed and debated to engage students interest and nurture empathy.

5. How does this course support the goals of the Westport 2025 initiative?

   Mandarin Chinese 5 is designed to help students develop 21st century skills of communicating using various media for specific purposes, to work collaboratively and share original ideas. This course will address the Critical Thinking domain by providing students with the opportunity to research and analyze current social, political, and economic events in China in relation to the world. The course will also address the Creative Thinking domain by providing students with the opportunity to ask new and original questions that lead to deeper explorations of these current issues. Lastly, this course will address the Global Thinking domain by synthesizing knowledge from various disciplines to generate ideas to attempt to solve real-world problems such as U.S.-China relations, pollution, economic development, one-child policy and the aging society.

<u>Staples Expectations for Student Learning Alignment:</u>

1. Academic Expectations
   - Students will demonstrate Chinese proficiency in the three communicative modes: interpretive, interpersonal, and presentational.
   - Students will use language within the context of the 5Cs based on the ACTFL Standards: Communication, Cultures, Connections, Comparisons, Communities
   - Students will learn to think critically and creatively in a variety of contexts and situations

2. Civic Expectations
   - Students will demonstrate honesty and integrity
   - Students will develop a rationale for making informed judgements and decisions
   - Students will consider their actions and solutions within the context of the global environment.

3. Social Expectations
   - Students will work collaboratively towards common goals.

<u>Course Catalogue Description:</u>
Prerequisite: Successful completion of Chinese 4H or 4A, recommendation from teacher

Mandarin Chinese 5 is a full-year course that provides opportunities to further develop students' proficiencies across the three communicative modes: interpersonal, interpretive, and presentation; and the five goal areas: communication, cultures, connections, comparisons, and communities. Students will explore both contemporary and historical Chinese culture. Students will enhance their ability to write, speak, comprehend real-life situations and respond.

Course Content

Course content engages students in an exploration of both contemporary and historical Chinese culture. Course content includes 4 major units of studies: family and friends, weather and travel, summer vacation and entertainment, cuisine and volunteer work. Within each unit, some of the essential questions include - how does a non-traditional nuclear family impact one's life? How does the rise of living standards in China impact the travel industry around the Pacific region? How are birthdays celebrated similarly or differently in China and the U.S.? How do we appropriately respond to internship/volunteer opportunities in China's work force?

Expectations for Student Learning (Outcomes)

Skills:

- Students will be able to read, write, listen and speak the Chinese language in various contexts in critical and creative manner
- Students will be able to make comparison between Chinese and American culture
- Students will be able to connect their Chinese studies with other school disciplines
- Students will be able to use their Chinese language skills in communities and situations outside of the school setting

Knowledge:

(What students need to know)

- Students will demonstrate knowledge of Chinese vocabulary, grammar, and syntax
- Students will be gain knowledge of contemporary and historical China
- Students will learn about social, economic, political differences and similarities between China and the U. S.

Assessment:

Students will be evaluated based on:

1. Vocabulary quizzes
2. Situational Dialogues
3. Video Projects
4. Weekly Speaking Assessment
5. Weekly Writing (handwriting and typing) compositions
6. Midterm and Final Exams

Equipment/Materials/Texts:
Easy Steps to Chinese 5 Textbook ($31.95) and Workbook ($21.95)

Brief History of the Chinese Program in Westport:

1. Introduction of the Chinese Program in Westport 2004-2005
2. Petition for Chinese Honors to the Collaborative Team 2006-2007
3. Mandarin Chinese at the Middle School level 2010-2011
4. Growth of the Chinese Program at the High School level 2014-2015
    a. The growth of the Mandarin Chinese program in Westport and the range of learners whom the program attracted necessitated the designation of a two-track system at the high school level, the A level and the Honors level
    b. Currently, in the 2015 - 2016 school year, there are nearly 200 students studying Mandarin Chinese in levels 1A through 4 Honors
5. Anticipating AP and Level 5 Chinese at Staples High School 2016-2017

COURSE OUTLINE - Mandarin 5

Course Description:

- develop students' proficiencies across the three communicative modes: interpersonal, interpretive, and presentation
- five goal areas: communication, culture, connections, comparisons, and communities.
- Course content includes 4 major units of studies: family and friends, weather and travel, summer vacation and entertainment, cuisine and volunteer.
- Essential questions include
    - How does a non-traditional nuclear family impact one's life?
    - How does the rise of living standard in China impact the travel industry around the Pacific region?
    - How are birthdays celebrated similarly or differently in China and the U.S.?
    - How to appropriately respond to internship/volunteer opportunities in China's work force?

Course Rationale:

- natural progression of Chinese curriculum at Staples High School, for primarily Junior students who have completed Mandarin Chinese 4A or 4 Honors

How does this course support the goals of the Westport 2025 initiative?

- Communication - using various media for specific purposes, to work collaboratively and share original ideas.
- Critical Thinking - analyze current social, political, and economic events in China in relation to the world
- Creative Thinking - and original questions that lead to deeper explorations of these current issues.
- Global Thinking - synthesize knowledge from various disciplines to generate ideas to attempt to solve real-world problems.

Highlighted Essential Skills

- Students will be able to read, write, listen and speak the Chinese language in various contexts in critical and creative manner
- Students will be able to make comparisons between Chinese and American culture
- Students will be able to connect their Chinese studies with other school disciplines
- Students will be able to use their Chinese language skills in communities and situations outside of the school setting

Assessment:
Vocabulary quizzes, Situational Dialogues, Video Projects, Weekly Speaking Assessment, Weekly Writing (handwriting and typing) compositions, Midterm and Final Exams.

Sample Unit:

Essential Questions: *Easy Steps to Chinese 5:* *Unit 2: Climate; Transportation; Shopping*	-What are the unique challenges rapid industrialization poses to China's climate? -What is the tourism terminology that's specific to air, train & bus travel in China? -How have the changes in China's economy impacted the shopping habits of China's rising middle class?
Content: *Easy Steps to Chinese 5:* *Unit 2: Climate; Transportation; Shopping*	-Students will learn vocabulary associated with pollution & increasing climate change -Students will learn vocabulary associated with both domestic and international travel -Students will learn vocabulary associated with discount shopping and forms of payment
Skills: *Easy Steps to Chinese 5:* *Unit 2: Climate; Transportation; Shopping*	-Students will be able to discuss the obstacles faced by the Chinese government in maintaining economic growth while reversing the rise of pollution -Students will be able to book their own train and plane tickets on-line -Students will be able to find discounts and pay credit card purchases on-line
Activities: *Easy Steps to Chinese 5:* *Unit 2: Climate; Transportation; Shopping*	-Students will view a portion of the banned documentary on pollution in China, "Under the Dome" and discuss it. -Students will develop domestic and international air/train travel itineraries -Students will simulate both on-line and in-person conflict resolution in dialogue format when returning an item for a refund
Assessments:	-Formal Debate on Pollution: Chinese Government vs. Environmentalists -"Round-trip: New York to Beijing with a Side Trip to Shanghai" -On-line Shopping: Scavenger Hunt to Find the Greatest Bargains on the Internet

Staples High School New Course Proposal

Course Title: ***AP Chinese Language and Culture***

Credit:
_____ .25 Quarter
____ .50 Semester
__X_ 1 Year

Credit Area(s): World Language

Course proposed by:
If the course has been suggested by an individual teacher, a student, or some other agent, it should have been reviewed and accepted by the department(s) before being presented to Collaborative Team.

_____ Administration	__X__ Board of Education	______ Students
_____ K-12 Curr. Review	__X__ Department	______ Other

Prerequisite: Chinese 4H

Rationale:

1. How does this course contribute to the department goals and objectives?

   The Advanced Placement Chinese Language and Culture course constitutes the natural progression of Chinese curriculum at Staples High School for the Honors level student population. Students who excel in learning Chinese language at the honor levels, could then learn to use their linguistic skills beyond communicating everyday needs - understand cultures, make connections with other school disciplines, make comparisons, and use the language in communities outside of the traditional school environment. AP Chinese is equivalent to a second-year (and/or the fourth semester) college Chinese course.

2. What is the need this course addresses?

   AP Chinese Language and Culture is a full-year course that covers the equivalent of a second-year (and/or fourth-semester) college Chinese course. The AP Chinese course is designed to provide students with varied opportunities to further develop their proficiencies in Chinese language and culture by following the Standards for Foreign Language Learning in the 21st Century. Students will develop linguistic skills by engaging in multiple activities, including pair-sharing, group discussion, student presentations, peer critiques, video projects, cultural projects, web searches, skits, debates, writing compositions.

3. How does this course support the recommendation of the latest K-12 review?
   N/A

4. How does this course support Staples' mission statement?

   To inspire learning and encourage global thinking, the course is designed with the use of authentic materials such as news periodicals, video clips, advertisements, web-pages, and phone apps. Students will learn to communicate effectively, respectfully and responsibly in a collaborative in-class and online environment to foster integrity. Current social, economic, and political issues in China and their impact on the world will be discussed and debated to engage student interest and nurture empathy.

5. How does this course support the goals of the Westport 2025 initiative?

   Chinese AP is designed to help students develop 21st century skills of communicating using various media for specific purposes, to work collaboratively and share original ideas. This course will address the Critical Thinking domain by providing students with the opportunity to research and analyze current social, political, and economic events in China in relation to the world. The course will also address the Creative Thinking domain by providing students with the opportunity to ask new and original questions that lead to deeper explorations of these current issues. Lastly, this course will address the Global Thinking domain synthesizing knowledge from various disciplines to generate ideas to attempt to solve real-world problems such as U.S. China relations, pollution, economic development, one-child policy and the aging society.

Staples Expectations for Student Learning Alignment:

1. Academic Expectations
   - Students will demonstrate Chinese proficiency in the three communicative modes: interpretive, interpersonal, and presentational.
   - Students will use language with in the context of the 5Cs based on the ACTFL Standards: Communication, Cultures, Connections, Comparisons, Communities
   - Students will learn to think critically and creatively in a variety of contexts and situations

2. Civic Expectations
   - Students will demonstrate honesty and integrity
   - Students will develop a rationale for making informed judgements and decisions

- Students will consider their actions and solutions within the context of the global environment.

3. Social Expectations
   - Students will work collaboratively toward common goals.

Course Catalogue Description:
Prerequisite: Successful completion of Chinese 4H and/or recommendation from teacher

AP Chinese is a full-year course that provides opportunities to further develop students' proficiencies across the three communicative modes: interpersonal, interpretive, and presentation; and the five goal areas: communication, culture, connections, comparisons, and communities. Students will explore both contemporary and historical Chinese culture. Instructional materials including e-mails, social media, films and news periodicals will be used to engage learning. Throughout the course, assessments are frequent, varied and explicitly linked to content and skills. Students will grow their ability to write and speak, comprehend real-life situations and respond.

Course Content
Course content engages students in an exploration of both contemporary and historical Chinese culture. Course content reflects intellectual interest shared by the students and the teacher- cultural celebrations, beliefs and attitudes, interests and career, teen life/self and global community, famous people, social issues and current events, art and music appreciation, literature and poetry, geography/climate, etc.

Expectations for Student Learning (Outcomes)
The information below is derived from the College Board description of the course.

Skills:

- In addition to expressing everyday function, students will be able to read, write, listen and speak the Chinese language in various contexts in a critical and creative manner
- Students will be able to make comparisons between Chinese and American culture
- Students will be able to connect their Chinese studies with other school disciplines
- Students will be able to use their Chinese language skills in communities and situations outside of the school setting

Knowledge:
(What students need to know)
- Students will demonstrate knowledge of Chinese vocabulary, grammar, and syntax
- Students will be gain knowledge of contemporary and historical China
- Students will learn about social, economic, political differences and similarities between China and the U. S.

Assessment:

Students will be evaluated based on:

1. Practice Advanced Placement Exams
2. Vocabulary quizzes
3. Situational Dialogues
4. Video Projects
5. Unit Portfolio
6. Weekly speaking assessments
7. Weekly writing (handwritten and typed) compositions
8. AP Practice Exams

Equipment/Materials/Texts:

Chinese Link with access to digital supplemental material ($103.47)
Integrated Chinese with access to digital supplemental material ($49.95)
Authentic reading materials

Brief History of the Chinese Program in Westport:

1. Introduction of the Chinese Program in Westport 2004-2005
2. Petition for Chinese Honors to the Collaborative Team 2006-2007
3. Mandarin Chinese at the Middle School level 2010-2011
4. Growth of the Chinese Program at the High School level 2014-2015
    a. The growth of the Mandarin Chinese program in Westport and the range of learners whom the program attracted necessitated the designation of a two-track system at the high school level, the A level and the Honors level
    b. Currently, in the 2015 - 2016 school year, there are nearly 200 students studying Mandarin Chinese in levels 1A through 4 Honors
5. Anticipating AP and Level 5 Chinese at Staples High School 2016-2017

COURSE OUTLINE- AP Chinese Language & Culture

Course Description:

- develop students' proficiencies across the three communicative modes: interpersonal, interpretive, and presentation
- five goal areas: communication, culture, connections, comparisons, and communities.
- students will grow their ability to read, write, listen and speak Chinese; comprehend and respond to real-life situations
- students will explore both contemporary and historical Chinese culture
- Course content reflects intellectual interest shared by the students and the teacher:
    - cultural celebrations, beliefs and attitudes
    - interests and career, famous people
    - teen life/self and global community
    - social issues and current events
    - art and music appreciation
    - literature and poetry
    - geography/climate/political divisions

Course Rationale:

- natural progression of Chinese curriculum at Staples High School, primarily for students who have completed Mandarin Chinese 4 Honors

How does this course support the goals of the Westport 2025 initiative?

- Communicate- using various media for specific purposes, to work collaboratively and share original ideas.
- Critical Thinking - analyze current social, political, and economic events in China in relation to the world
- Creative Thinking - ask original questions that lead to deeper explorations of these current issues.
- Global Thinking - synthesize knowledge from various disciplines to generate ideas to attempt to solve a real-world problems such as U.S. China relations, pollution, economic development, one-child policy and the aging society.

Highlighted Essential Skills

- Students will be able to read, write, listen and speak the Chinese language in various contexts to discuss, to explain, to persuade, and to debate.
- Students will be able to make comparisons between Chinese and American culture
- Students will be able to connect their Chinese studies with other school disciplines
- Students will be able to use their Chinese language skills in communities and situations outside of the school setting

Assessment: vocabulary quizzes, situational dialogues, video projects, weekly speaking assessment, weekly writing (handwriting and typing) compositions, AP practice exams

Belief and Attitude Unit Outline:

Unit Goal:	The focus of this thematic unit is to study common beliefs, traditional values, and attitudes within the Chinese culture, such as social etiquette, patterns of interaction, or the role of family. Students compare and contrast the form, meaning, and importance of certain perspectives, products, and practices in different cultures.

Content:	• Chinese view of "Fu" (good fortune), "Lu" (successful career), and "Shou" (longevity)
	• Individualism versus group
	• Birthday celebration
	• The concept of "Li" (politeness and respect)
	• Chinese people's patterns of interaction
	• Gestures and body language
	• Chinese concept of "tian," "di," and "ren"
	  ○ Family values
	  ○ Cultural taboos

Skills:	• Discuss and compare beliefs and attitudes within the Chinese culture and their own in relation to home, school, community, and nation. • Discuss and identify historical and philosophical backgrounds that have influenced Chinese people's patterns of interaction. • Identify and compare cultural characteristics such as formalities, levels of politeness, and information and formal language and gestures used by Chinese people. • Explain how beliefs, perspectives, and attitudes affect a country's position on global issues. • Interact in a variety of cultural contexts with sensitivity and respect.
Activities:	• Selected readings on Chinese philosophy and/or common beliefs • Vocabulary drawn from literary materials • Sentence writing with new vocabulary • Watch videos of students of their same age in China. (Students note how they greet each other—how close they stand, use of their hands, and other gestures. Students practice using these patterns of behavior in role-play.) • Paired or group discussion
Assessments:	• Vocabulary tests • Essays, handwritten • Class participation through debates • Class discussions on selected readings • Oral reports
ACTFL Standards	Communication • 1.1 Interpersonal communication • 1.2 Interpretive communication • 1.3 Presentational communication Cultures • 2.1 Practices of cultures • 2.2 Products of cultures Comparisons • 4.2 Culture comparisons

Adopted from College Board AP Chinese Language and Culture Syllabus 4

English

- Gothic and Horror Literature
- Sports Literature and Research

COURSE OUTLINE FORMAT

Staples High School

Course Title: ***Gothic and Horror Literature***

Credit: _____ .25 Quarter

__X__ .50 Semester

_____ 1 Year

Credit Area(s): English

Prerequisites/Eligibility:

- Open to juniors and seniors as Specific Area semester elective

Course Development:

Course proposed by
______ Administration _____ Board of Education ____ Students
______ K12 Curriculum Review ___X___ Department ____ Other

I. Rationale:

This course will allow students access to analysis of author's purpose. Gothic literature, as well as the horror genre in general, utilizes a wide set of specific techniques to create a sense of fear. This deliberate purpose of the author is easily identifiable to students looking for major themes and techniques, as well as their own responses to text. Students will be able to synthesize different texts through genre conventions that have shifted over time. They will have opportunities to emulate these genre standards in their own creative writing, as well as to utilize multi-genre and media methods to convey a story with a specific purpose. Horror, urban legends, and camp-fire folklore are innately human phenomena, which allow students to interact with interpretations from different cultures and eras. This supports the Global Thinking lens of 2025, as well as the Westport 2025 initiative and the Common Core State Standards. Exposing students to leading authors in the Gothic and horror genres will allow them to approach these skills through an engaging, entertaining, and highly relatable vessel.

II. Westport 2025:

How does the course provide opportunities for students to develop specific capacities on the Westport 2025 lens ?

Students will be able to fully develop global thinking as they look at the horror genre across time periods and cultures. They will develop critical and creative thinking skills as they analyze technique and genre, as well as engage in creative expression and emulation of these techniques. In addition, students will be able to apply current technology to aid in the reading and creating of non-linear, multi-genre texts. Students will have access to the creation of video, photo, and audio content to enhance storytelling, thus strengthening their abilities as 21st century readers who must be able to navigate a wide variety of texts.

III. Course Catalogue Description

This course will introduce students to the Gothic literature genre, as well as a variety of horror-themed texts. Students will learn about the history of the genre, from the 19th century Gothic literature that gave rise to the iconic monsters of Western culture, through the contemporary phenomena of urban legend and internet "fakelore". Students will develop an appreciation for the unique ability of Gothic and horror writers to generate feelings of terror and dread. Students will have opportunities to analyze the social, political and cultural significance of this genre. The course will include both fiction (possible texts include *Carrie* by Stephen King and a collection of short stories by H.P. Lovecraft and Edgar Allan Poe) and non-fiction (possible texts include excerpts from *Danse Macabre* by Stephen King and essays by Joyce Carol Oates). Finally, students will understand and apply techniques of the genre in creating their own original urban-legend, multi-genre piece.

IV. Course Content (Themes, Topics)

Why do we fear the unknown? Why do we enjoy being frightened? What specifically scares us, and why? How do authors achieve this fear in their readers? These are some of the questions students will tackle as they develop an understanding and appreciation of 19th century Gothic literature and more contemporary manifestations of the horror genre. The course will use a variety of texts that are culturally relevant to a diverse student body to study the evolution of the genre and to examine the conventions of Gothic literature and contemporary horror. We will examine the popularity of horror and our interaction with it. Students will also be asked to use technology to create original work in an examination of urban legends and camp-fire folklore. Students will develop a vocabulary of the literary and aesthetic elements and be introduced to various forms.

V. Educational experiences in this course will assure that students will:

- Think critically about a variety of contexts, strategies, and themes.
- Be reflective learners, readers, and writers.
- Read critically.
- Write creatively, analytically, and effectively.
- Communicate effectively in a variety of contexts, such as writing and group discussion.
- Use technology as a tool for researching and creating new texts to share their learning.
- Demonstrate an understanding of the human experience through a study of folklore, tradition, and artistic expression.
- Demonstrate an awareness and critical understanding of aesthetics, especially as they apply to storytelling.
- Write imaginatively using both multimedia and writing, while learning effective 21st century literacy skills

- Identify and analyze a variety of authors' purposes and strategies for conveying argumentative and artistic messages.

VI. Student Assessment

Students will be assessed through class discussions, presentations of ideas, application of research, analytical writing, and multi-genre projects that allow students to explore and create their own Gothic-influenced folklore.

VII. Materials/Texts:

The anticipated texts for this course may include the following:

- *Tales of Mystery and Imagination*; Edgar Allan Poe
- "The Monkey's Paw"; W.W. Jacobs
- *H.P. Lovecraft: Great Tales of Horror*
- *Danse Macabre*; Stephen King
- *I Am Legend*; Richard Matheson
- "The Lottery"; Shirley Jackson
- "A Rose for Emily"; William Faulkner
- "The Yellow Wallpaper"; Charlotte Perkins Gilman
- *Carrie*; Stephen King
- Clive Barker
- "Candle Cove"

VIII. Required Resources and Budget:

While the genre lends itself to short fiction that can be found in the public domain on the internet, we would be required to buy a few texts and anthologies. The Poe anthology listed above is $6.99 per book, the Lovecraft anthology listed above costs $7.18 per book, and *Carrie* is $7.99 per book. Accounting for 30 copies of all of those texts, the budget comes out to $664.80 (not including tax or shipping costs).

Proposed Units of Study

Q1: 10 weeks

Unit 1 - Foundations of Gothic Literature

- Essential Questions: What is the style, form, and content of Gothic literature? What makes something Gothic literature? What were the original conventions of the genre?
- Core Texts: "Fall of the House of Usher," "Telltale Heart"
- Assessment: Find your own 19th century short horror/Gothic story, and analyze how this fits Gothic or how the conventions of Gothic fit it
- Supplemental Texts: "Monkey's Paw," other Poe stories

Unit 2 - Techniques of Terror

- Essential Questions: Why do people like to be scared? How do authors create fear? What's so terrifying about the unknown? What's the role of imagination in horror?
- Core Text: "At the Mountains of Madness," "Rats in the Walls," or "Shadow Over Innsmouth"
- Assessment: Close reading of a Lovecraft story of the student's choice
- Supplemental Texts: Lovecraft essay on horror, *Danse Macabre* excerpts, http://www.academia.edu/1850790/The_Importance_of_Horror, The Others/Turning of the Screw

Unit 3 - Horror in Culture and Society

- Essential Questions: What is/was the role of horror in society? Why are/were people interested in horror in certain time periods? What is the relationship between horror and feeling? How do we scare? What's the difference between realistic horror and fantasy horror (mythos, finding the horror in ourselves and our daily lives)?
- Core Text: *I Am Legend*
- Assessment: Synthesize a text from the time periods studied in previous units with a text from the mid-20th century to make an argument about how horror has changed or stayed the same
- Supplemental Texts: *Twilight Zone*, "Nightmare at 20,000 Feet" (Richard Matheson), "The Lottery," "Monsters Are Due on Mulberry Street," "It's a Good Life," "Treehouse of Horror," "Yellow Wallpaper," "A Rose for Emily"

Unit 4 - Modern Gothic, Folklore, and Urban Legends: Analyzing the Phenomenon

- Essential Questions: How has technology changed the way we tell horror stories and folklore? What techniques have arisen to adapt older story formats for a more modern audience? How are the things that frighten us today different and similar to the things that have frightened us in the past?
- Core Text: *Carrie*
- Assessment: Fakelore Multi-Genre Project
- Supplemental: "Candle Cove," Clive Barker, other King stories

Staples High School New Course Proposal

Course Title: ***Sports Literature and Research***

Credit: _____ .25 Quarter

__X__ .50 Semester

_____ 1 Year

Credit Area(s): English

Prerequisites/Eligibility:

- Open to juniors and seniors as Specific Area semester elective

Course Development:

Course proposed by
______ Administration _____ Board of Education ____ Students
______ K12 Curriculum Review ___X___ Department ____ Other

I. Rationale:

This course provides an opportunity for students to use sports and sports literature as a lens to explore society and culture at the local, national, and global level. Students will discuss and critically think about social issues that arise in the sporting world, such as race, gender, and segregation, in order to synthesize ideas as to how sports reflect and affect various cultures. Students will research important sporting events and athletes that have had a drastic social impact and will go beyond the idea of sports as entertainment in order to analyze how they have influenced culture and why they are an integral aspect of society. Using sports related topics, students will develop writing skills that require them to defend an argument, explain and analyze through research, and report on events as a journalist. A combination of short and long fiction and informational texts will be used to develop reading skills and act as a basis for discussion. This course will be aligned to the common core state standards for reading, writing, language, and research.

II. Westport 2025:

How does the course provide opportunities for students to develop specific capacities on the Westport 2025 lens ?

Students will be able to more fully develop 21st century skills in the areas of critical thinking, creative thinking, and global thinking as they discuss global sports issues. Students will acquire skills to develop multiple perspectives on important social and cultural issues using both historical and current sporting events. The texts to which this course lends itself (fiction, informational, and both print and web journalism) provides students the opportunity to strengthen their ability as 21st century readers who must be able to navigate a wide variety of media.

III. Course Catalogue Description

This course will use sports as a lens to explore, discuss, research, evaluate, and reflect upon the athletic world as an integral aspect of society and culture. Students will be asked to suspend beliefs of sports as solely a form of entertainment, and instead critically think about how and why sports can be used as a way to examine a particular society or culture. The course will begin with an introduction to sports journalism and how this genre has become a fundamental way to critically analyze the impact of sports on society. We will then engage in social and cultural issues (such as race and gender) and how these issues are reflected and represented in sports. There will be a combination of fiction, informational, and journalistic (print, web, and video) texts. Possible texts include *The Fight* by Norman Mailer, *Invictus* by John Carlin, and *ESPN 30 for 30* documentaries. Students will finally evaluate sports across the globe and synthesize discussions and ideas as to how sports ultimately reflect and impact society and culture.

IV. Course Content (Themes, topics)

Students will be exposed to a variety of sports journalism to compare and evaluate how writers use sports as a way to introduce different viewpoints and opinions to important social and cultural issues. They will then report on and express their own thoughts regarding pertinent athletic events. We will research and analyze discrimination in the sporting world and how that reflects our own society. Issues of race, gender, sexuality, etc. will be discussed. Students will then contemplate how sports act as both a divider and unifier within a society. Finally, students will research sports globally and how foreign cultures are affected by and reflected in sports. Students will engage in a variety of research, argumentative, and explanatory writing in order to assess understanding. At the conclusion of the course, students will evaluate athletics as a cultural phenomenon rather than merely entertainment.

V. Educational experiences in this course will assure that students will:

- Think critically in a variety of contexts and situations.
- Be reflective learners.
- Read critically and analytically.
- Write creatively and effectively.
- Communicate effectively.
- Use technology as a tool for researching.
- Demonstrate an understanding of how culture and society are reflected through sports.
- Apply learning to local, national, and global contexts.
- Compare and contrast the cultures of various groups and societies.

VI. Student Assessment

Students will be assessed through class discussions, presentations of ideas and work, application of research, and a final written piece on how and why sports are an integral part of culture and society.

VII. Materials/Texts:

Much of the texts for the class will change semester by semester as new sporting issues arise. Articles on current sporting events and issues will be used, most of which will be found on the Internet (e.g. *Sports Illustrated*, *ESPN*, *NY Times*, etc.).

Possible Texts and Materials include:

- *The Fight* by Norman Mailer
- *Forty Million Dollar Slaves* by William C. Rhoden
- *Invictus: Nelson Mandela and the Game that Made a Nation* by John Carlin
- *ESPN 30 for 30*- Sports documentary series
- Outside the Lines- A sports column by ESPN
- Best American Sports Writing 2013 and 2014- Anthology of Sports articles and stories

VIII. Required Resources and Budget:

ESPN 30 for 30 documentary series- $100
The Fight- $10.36 each
Forty Million Dollar Slaves- $12.86 each
Invictus- $13.17 each

Most of the other materials will be Internet articles or pieces that can be copied from anthologies. A total budget of about $1,000 is expected.

Proposed Units of Study

Q1: 10 weeks
Sports Journalism (4 weeks)
Essential Questions: How does sports journalism enlighten its audience to social issues? How does sports journalism affect the public at the local, national, and global level? How are sports reported on in different cultures?
Core Text: *The Fight* by Norman Mailer
Assessment: Staples Sports Journalism piece

Discrimination in Sports (5 weeks)
Essential Questions: Why is there a large gap between viewership of men's and women's sports? How has Title IX helped to level the playing field for women? What racial inequalities exist in sports and how do they affect athletes of color? How is the sporting world important to creating a less racist society? How do sports reflect our inherently racist and unequal economic society?
Core Text: *Forty Million Dollar Slaves* by William C. Rhoden
Assessment: Research Paper on how a specific event has affected discrimination in sports

Q2: 10 Weeks
Sports as a Divider/Unifier (5 weeks)
Essential Questions: How have sports helped to unify people behind causes and helped communities to heal when dealing with tragedy? Why do sports so easily bring people together? Are professional athletes adequate idols?
Core Text: *Invictus* by John Carlin
Assessment: Argument essay on whether sports unite or divide

Sports in Global Culture (5 weeks)
Essential Questions: How do foreign sports reflect their society's culture? How are sports viewed and received in other parts of the world? How and why do sports bring cultures and societies together?
Core Text: *Why You Should Care About Cricket* by Outside the Lines ESPN
Assessment: How a foreign sport reflects a particular society/culture

Final Project: Overall analysis on how sports affects culture and society

Science

- **Earth Science**

Staples High School New Course Proposal

Course Title: ***Earth Science***

Credit: _____ .25 Quarter
_____ .50 Semester
__✓___ 1 Year

Credit Area(s): *Science*

Course proposed by:
If the course has been suggested by an individual teacher, a student, or some other agent, it should have been reviewed and accepted by the department(s) before being presented to Collaborative Team.

_____ Administration _____ Board of Education _____ Students
_____ K-12 Curr. Review __✓__ Department _____ Other

Prerequisite: *Biology*

Rationale:

1. How does this course contribute to the department goals and objectives?

- This course is being proposed as an A-level course for students who want a more tangible, lab-based, quantitative course to help develop data analysis skills necessary to complete higher level, or more abstract, science courses. This course would focus on developing these skills in a rigorous hands-on, lab based environment, focusing on : understanding the scientific method, problem solving, making connections, understanding the relationship between science concepts and data, math based problem solving skills, and research skills.

2. What is the need this course addresses?

- This course is aimed towards students who want a more tangible, lab-based, quantitative course to help develop data analysis skills necessary to complete higher level, or more abstract, science courses.

- There has been a population of students who complete A-level biology but lack the necessary mathematical skills to succeed in A-level chemistry. This course seeks to develop analytical and critical thinking skills centered around data analysis while providing students the time to acquire the necessary mathematical skills needed for the algebraic processes necessary for A-level chemistry and physics.

3. How does this course support the recommendation of the latest K-12 review?
   - *As the recommendations of the latest K-12 review have likely driven the development of the Westport 2025 initiative, I think the course clearly creates a unique opportunity for students to practice and develop the 21st century skills.*

4. How does this course support Staples' mission statement?
    - *The Staples mission statement focuses on developing students as a "whole person". This course will continue to develop skills from Westport 2025 that foster critical thinking, social responsibility, and academic integrity.*
    - *The Earth Science course will focus on real world problem solving in an effort to prepare students to be successful learners in higher level courses while continuing the Westport 2025 mission of developing students as well rounded learners.*

<u>Staples Expectations for Student Learning Alignment:</u>

1. Academic Expectations
    - Students will think critically in a variety of contexts and situations.
    - Students will be competent problem solvers.
    - Students will use technology as a tool for learning in both accessing and analyzing information.
    - Students will effectively communicate their solutions and understanding using a variety of media.
    - Students will think creatively and will adapt their thinking in response to both critical feedback and changing demands.

2. Civic Expectations
    - Students will demonstrate a sense of ethics both in their words and their actions.
    - Students will consider their actions and solutions within the context of the global environment.

3. Social Expectations
    - Students will work collaboratively towards common goals.

<u>Course Catalogue Description:</u>

Prerequisite: *Biology*

<u>Course Content</u> *and NGSS Alignment*

- Space Systems: The study of the origin of the universe, stars, galaxies, and other orbiting bodies.
    - HS-ESS1-2 & HS-ESS-1-3: Stars & Galaxies
    - HS-ESS1-2: Origin of the Universe
    - HS-ESS-1-1: History of the Solar System
    - HS-ESS-1-4: Orbiting Systems, Formation of Earth & Moon
- Formation of the Earth and its Internal Processes: The study of the formation of planet Earth and its internal mechanisms and how they drive the geologic features that we see today.
    - HS-ESS1-5: Plate tectonics
    - HS-ESS1-6: Early history of the Earth, Earth Formation
    - HSS-ESS2-1 & HS-ESS2-3: Internal Earth Processes, Rock Cycle
    - HSS-ESS2-7: Biogeology
- Earth's Surface Processes: The study of the weathering and erosion processes and their impact on Earth's geological features and bio-geography.
    - HS-ESS2-2 & HS-ESS2-5 & HS-ESS2-3: Weathering & Erosion/Surface Processes

        - Water processes
        - Wind processes
        - Glacial processes
        - Rock Cycle
- Weather & Climate: The study of the energy and movement of earth's atmosphere and the implications on human societies.
    - HS-ESS-2-4 & HS-ESS3-5: Global Climate Change
    - Atmosphere
    - Weather
    - Climate

Expectations for Student Learning (Outcomes)

Skills:

- Students will use mathematical analysis, scientific inquiry, and engineering design, as appropriate, to pose questions, seek answers, and develop solutions to real word problems..
- Students will access, generate, process, and transfer information, using appropriate technologies.
- Students will understand the relationships and common themes that connect mathematics, science, and technology and apply the themes to these and other areas of learning.
- Students will apply the knowledge and thinking skills of mathematics, science, and technology to address real-life problems and make informed decisions.
- Students will understand and apply scientific concepts, principles, and theories pertaining to the physical setting and living environment and recognize the historical development of ideas in science.

Knowledge:

- Students will understand the role of weathering and erosion processes on human societies, such as New Orleans.
- Students will understand Earth's place in the universe.
- Students will understand the role of feedback mechanisms and closed systems in Earth processes.
- Students will understand the interdependent relationship between Earth's processes and biogeography.

Assessment:

- Formative and summative projects, quizzes/tests, labs, and PBL

Equipment/Materials/Texts:

- CK-12 Earth Science Flexbook
- EDC/Lab Aids Earth Science Curriculum
- Exploring Earth TERC Web Resource

Earth Science Complete Topic Outline & Standards

Unit 1: Space Systems

Big Idea: The Earth is a small system that exists within the larger universe that formed billions of years ago. The Earth and other orbiting bodies interact with one another in measurable patterns that scientists use to uncover the mysteries of the universe.

1.1: Origin of the Universe & Galaxies

- *NGSS: HS-ESS1-2*
- Essential Questions:
    - 1. What are the different types of galaxies?
    - 2. What are the characteristics of our galaxy, the Milky Way?
    - 3. Why do scientists believe that the universe is expanding? What evidence do they have for this conclusion?
    - 4. How do scientists describe the formation of the universe according to the Big Bang Theory?
- Subunit Topics:
    - Origin of the Universe & The Big Bang Theory
    - Galaxy definition and galaxy structures
    - Structure and characteristics of the Milky Way

1.2: Stars

- *NGSS: HS-ESS1-3*
- Essential Questions:
    - 1. What is constellation?
    - 2. How are stars classified based on their properties?
    - 3. What is involved in a star's life cycle?
- Subunit Topics:
    - Early observations of stars and their visible characteristics
        - Constellations
    - Distance of stars and their interactions
        - Parallax
    - Characteristics of Stars
        - Composition
        - Mass, size, and temperature
        - H-R Diagrams
    - Star Lifecycles

1.3: The Solar System & Orbiting Bodies

- *NGSS: HS-ESS1-1 & HS-ESS1-4 & HS-ESS1-6*
- Essential Questions:
  - 1. What are the historical views of the solar system?
  - 2. What planets make up our solar system and how do they move around the sin?
  - 3. How did the solar system form?
  - 4. What are the key features of the inner planets?
  - 5. How do the inner planets compare to Earth and to one another?
  - 6. What are the key features of the outer planets?
  - 7. How do the outer planets compare to Earth and to one another?
  - 8. What is the asteroid belt and where is it located?
  - 9. Where do comets come from and what causes their tails?
  - 10. What is the difference between meteors, meteoroids, and meteorites?
- Subunit Topics:
  - Early observations of the solar system
  - Solar system mechanics
    - Aphelion
    - Perihelion
  - Characteristics of the outer planets
  - Characteristics of the inner planets
  - Orbiting bodies
    - Comets
    - Meteors
    - TNOs

1.4 The Sun-Earth-Moon System

- *NGSS: HS-ESS1-4*
- Essential Questions:
  - 1. Why is the Earth spherical and describe evidence for this conclusion.
  - 2. What causes Earth's magnetism?
  - 3. How does Earth rotate on its axis?
  - 4. How does Earth revolve around the sun?
  - 5. How did the moon form?
  - 6. What are the features of the moon?
  - 7. What are the layers of the sun?
  - 8. What are the surface features of the sun?
  - 9. How does the Earth's movement affect seasons and cause day and night?
  - 10. What are solar and lunar eclipses?
  - 11. What are the phases of the moon?
  - 12.How do the movements of the Earth and Moon affect Earth's tides?
- Subunit Topics:
  - Structure and features of the Sun
  - Earth in space
  - Moon's structure and movement

Unit 2: Weather & Climate

Big Idea: The Earth's atmosphere has both a structure and movement that is based on the uneven heating of the Earth's surface by the sun.

2.1: Earth's Atmosphere

- *NGSS: HS-ESS2-1 & HS-ESS2-4*
- Essential Questions:
  - 1. What is the importance of the atmosphere to our planet and its life?
  - 2. What is the role of the atmosphere in the water cycle?
  - 3. What are the major components of the atmosphere and their functions?
  - 4. How does the atmospheric pressure change with altitude?
  - 5. What are the major layers of the atmosphere?
  - 6. Why does weather take place in the troposphere?
  - 7. How does the ozone layer protect Earth's surface from harmful radiation?
  - 8. How does the Sun's energy affect Earth's heat budget?
  - 9. What is the greenhouse effect and why is it important to life on Earth?
  - 10. What are the properties of wind currents within a convection cell?
  - 11. How do global convection cells lead to the global wind belts?
- Subunit Topics:
  - Global wind patterns
  - The atmosphere

2.2: Earth's Climate

- *NGSS:*
- Essential Questions:
  - 1. What is the difference between weather and climate?
  - 2. What is the effect of latitude on climate?
  - 3. How do global convection cells influence the climate?
  - 4. What are other important factors that influence a location's climate?
  - 5. What is the relationship between climate zones and biomes?
  - 6. What are some ways that climate change has been an important part of Earth's history?
  - 7. What factors can cause climate to change and which of these can be exacerbated by human activities?
  - 8. What are the consequences of rising greenhouse gas levels in the atmosphere?
  - 9. What are the different types of air pollutants?
  - 10. What conditions lead some cities to become more polluted than others?
- Subunit Topics:
    - Regional climates
    - Human impact on the atmosphere

2.3: Weather

- *NGSS:*
- Essential Questions:
  - 1. What is the relationship between air temperature and humidity?

- 2. What are the different cloud types and what do they indicate?
- 3. How do the different types of precipitation form?
- 4. What are the characteristics of air masses?
- 5. What happens when air masses meet?
- 6. What are some instruments that meteorologists use to collect weather data?
- 7. What are the roles of satellites and computers in modern weather forecasting?

- Subunit Topics:
  - Air masses and weather
  - Air pressure
  - Clouds
  - Fronts
    - warm fronts
    - cold fronts
  - Precipitation

2.4: Storms

- *NGSS:*
- Essential Questions:
  - 1. How do atmospheric circulation patterns cause storms?
  - 2. What are the weather patterns that lead to tornados?
  - 3. What are the causes of a hurricane?
- Subunit Topics:
  - Hurricanes & cyclones
  - Blizzards
  - Tornados

Unit 3: Earth's Surface Processes

3.1 Weathering

- *<u>NGSS</u>: HS-ESS2-1 & HS-ESS2-2*
- Essential Questions:
    - 1. What are mechanical and chemical weathering?
    - 2. What are the agents of weathering?
    - 3. How does soil form from existing rock?
- Subunit Topics:
    - Mapping the Earth

3.2: Water Processes

- *<u>NGSS</u>: HS-ESS2-1 & HS-ESS2-5*
- Essential Questions:
    - 1. How do surface streams produce erosion?
    - 2. What are some landforms that are produced as groundwater flows?
    - 3. What are the types of deposits left behind by streams?
    - 4. What are some features formed by alpine glaciers?
    - 5. What are the processes by which glaciers change the underlying ground?
    - 6. What are the landforms created as glaciers advance and recede?
- Subunit Topics:
    - Streams & Rivers
    - River Valleys & Floods
    - Stream Erosion & Deposition
    - Glaciers

3.3: Mass Movement

- *<u>NGSS</u>: HS-ESS2-1*
- Essential Questions:
    - 1. What are some ways particles are carried by the wind?
    - 2. How does wind erosion change wind surfaces?
    - 3. How do sand dunes form?
    - 4. What are the types of deposits formed by windborne silts and clay?
    - 5. What are the ways that material can move downhill by gravity?
    - 6. What are factors that increase the likelihood of landslides?
    - 7. What are the different types of gravity driven movement of rock and soil?
- Subunit Topics:
    - Mass Movement
    - Wind Erosion
    - Glaciers

3.4: Introduction to Oceanography

- *<u>NGSS</u>: HS-ESS2-1*
- Essential Questions:
    - 1. How do the action of waves produce different shoreline features?
    - 2. How do areas of quiet water produce areas of sand and sediment?
    - 3. What are some of the structures humans build to defend against wave erosions?
- Subunit Topics:

- Shoreline Features

Unit 4: Earth's Internal Processes

4.1: Rocks & Minerals

- *<u>NGSS</u>: HS-ESS2-1 & HS-ESS2-2*
- Essential Questions:
  - 1. What are the characteristics that all minerals must share?
  - 2. How are minerals classified into distinct groups?
  - 3. How are color, luster, and streak used to identify minerals?
  - 4. How do we measure the hardness of the mineral?
  - 5. What characteristics are unique to cleavage and fracture?
  - 6.How do minerals form from melted rock and solutions?
  - 7. What are rocks and what are they made of?
  - 8. How do we classify and describe rocks?
  - 9. How do each of the three main rock types form?
  - 10. What is the rock cycle?
  - 11. How do igneous rocks form?
  - 12. What are some properties of common igneous rocks?
  - 13. How do sedimentary rocks form?
  - 14. What are some properties of common sedimentary rocks?
  - 15. How do metamorphic rocks form?
  - 16. What are some properties of common metamorphic rocks?
- Subunit Topics:
  - Composition and Structure of Minerals
  - Identification of Minerals
  - Rock Formation
  - Igneous Rocks
  - Metamorphic Rocks
  - Mineral Groups
  - Sedimentary Rocks

4.2: Plate Tectonics

- *<u>NGSS</u>: HS-ESS2-3 & HS-ESS5-1*
- Essential Questions:
  - 1. What are the different layers of the Earth?
  - 2. How do geologists study the Earth's interior?
  - 3. What is the theory of continental drift?
  - 4. What evidence did Wegener use to support his idea of continental drift?
  - 5. What is an Earth plate and how do scientists define the edges?
  - 6. What are the mechanisms that move Earth's plates?
  - 7. What are the three types of plate boundaries?
  - 8. How do plate tectonics lead to changes in Earth's surface features?
- Subunit Topics:
  - Layers of the Earth
  - Causes of Plate Movement
  - Plate Movement & Continental Growth

- Types of Plate Boundaries

4.3: Geologic Features

- *NGSS: HS-ESS2-1*
- Essential Questions:
  - 1. What are the different types of stresses in the Earth's crust?
  - 2. What are the different types of folds, fractures, and faults?
  - 3. How do mountains form?
  - 4. How can we identify the an earthquake's focus and epicenter?
  - 5. What are the different types of seismic waves?
  - 6. What are the different type of earthquake magnitude scales?
  - 7. What are some features that make structures earthquake safe?
  - 8. How are the locations of volcanoes located to plate tectonics?
  - 9. How can intraplate volcanoes form?
  - 10. What are the different types of volcanic eruptions?
  - 11. What are the different types of lava, and the rocks that they form?
  - 12. What are the basic shapes of volcanoes?
  - 13. What are some landforms created by lava and magma?
  - 14.
- Subunit Topics:
  - Earthquakes
  - Volcanoes
  - Magma and Erupted Materials
  - Volcanic Landforms

STEAM

- Creative Technological Solutions to Real-World Problems
- 3-D Design and Engineering
- Materials and Design Science

Staples High School New Course Proposal

Course Title: *CreAtive Technological Solutions (CATS) to Real-World Problems*

Credit: _____ .25 Quarter
_X_ .50 Semester
____ 1 Year

Credit Area(s): *Science, STEAM*

Course proposed by:
If the course has been suggested by an individual teacher, a student, or some other agent, it should have been reviewed and accepted by the department(s) before being presented to Collaborative Team.

_____ Administration	____ Board of Education	______ Students
_____ K-12 Curr. Review	_X_ Department	_____ Other

Prerequisite: *Algebra 1, Successful completion of 8th grade*

Rationale:

1. How does this course contribute to the department goals and objectives?
   One of the main goals of our science department is to teach students to be creative problem solvers and to think analytically. The new Creative Technological Solutions (CATS) course is designed to focus on those skills by being organized around several "Big Ideas." These are: Creativity is at the heart at finding effective technical solutions to many of society's problems; Innovation and creativity are not born in a vacuum, however, and depend on what has gone before; Initial designs may be sufficient to solve a problem, but are rarely optimal and can be improved based on analysis built on strong content knowledge about science and mathematics; Engineering designs that solve problems must work within constraints, yet the best designs are often also the most elegant; Finally, the best designs creatively build upon new ideas but often incorporate elements from multiple existing solutions;
2. What is the need this course addresses?
   This course provides an avenue for students coming out of the Middle School Engineering program to pursue their interest in STEAM-related fields, but who have not yet taken Physics. Many students have taken the introductory Engineering courses in Middle School, but desire more specific skills and experience relating to engineering design, solving problems in

groups, programming microcontrollers to recognize sensor input and create outputs that control other devices, and robotics. However, they do not have the necessary background for the more advanced course in Engineering.

3. How does this course support the recommendation of the latest K-12 review?
   N/A
4. How does this course support Staples' mission statement?
   The mission statement focuses on themes of learning, integrity, and empathy, all of which are important for the CATS course. The course will emphasize the continuity that can only exist between engineering teams when they hand off their work with integrity and clarity so that others can continue the work and learn from both successes and failures. Furthermore, social responsibility and empathy is at the heart of engineering; problems need to be solved within constraints which always include the impact on real people. No engineering project can be performed responsibly in isolation of the environment and without regard to sustainability.

5. How does this course support the goals of the Westport 2025 initative?
   The CreAtive Technical Solutions course is well aligned with all four of the major domains of the lens; Critical Thinking is used when students need to use real materials to solve problems while obeying realistic constraints; Communication is touched upon when we ask students to collaborate on solutions to our engineering design problems; Creative Thinking is required because ALL design builds upon experience and imagination to reach a future goal; Finally, we encourage Global Thinking when we ask students to consider the possible impact of their solutions on real customers and on the world.,

Staples Expectations for Student Learning Alignment:

1. Academic Expectations
   - Students will think critically in solving problems and evaluating how to improve their solutions.
   - Students will become more competent problem solvers.
   - Students will use technology as a tool for learning in both accessing and analyzing information.
   - Students will effectively communicate their solutions and understanding using a variety of media.
   - Students will adapt their thinking in response to both critical feedback and changing demands from others, especially in consideration of ever more global constraints that include the real world.

2. Civic Expectations

- Students will become more aware of being part of a learning community by consciously passing on their experiences to the future students taking the course.
- Students will demonstrate a sense of ethics both in their words and their actions.
- Students will consider their actions and solutions within the context of the global environment.

3. Social Expectations
   - Students will work collaboratively towards common goals.
   - Students will learn how to brainstorm according to rules that value contributions from each team member
   - Students will learn how to make effective decisions in groups

Course Catalogue Description:

Prerequisite: *Successful completion of 8th grade and Algebra 1.*

The CreAting Technological Solutions (CATS) course is designed to help students develop skills in designing creative technological solutions to real-world problems. The key sections of this framework include: creating designed artifacts and prototypes, connecting design to everyday life and global issues, finding creative technological solutions to problems having various levels of definition, analyzing solutions for their impact and effectiveness, and communicating thoughts and collaborating with peers and the larger design community.

Course Content

Students will learn fundamental techniques in Engineering design and problem-solving and learn new science and math, as required, in engineering applications. They will engage in challenges that reinforce the use of the engineering "design cycle," which emphasizes asking questions, developing prototypes, testing solutions, and using the results to improve upon the design. Students will learn that creativity and collaboration lie at the heart of design and that the more one learns about basic physics and engineering skills as well as previous solutions, the more innovative one may become in creating technological solutions to real world problems. In addition to several shorter projects, there will be a multi-semester project in which students of one semester advance the project and pass useful information on to the following semester's class so that they may effectively continue the project. Some projects will build upon previously encountered Middle-school projects but with more rigorous requirements.

Expectations for Student Learning (Outcomes)

Skills (What students will be able to do):

- Use science and mathematics to produce solutions that will work most effectively at solving problems.
- Creatively solve design problems individually and in groups
- Analyze design solutions for form and function while meeting constraints.
- Analyze the costs and benefits of designed solutions.
- Explore and analyze multiple design solutions.

- Collaborate with others in expressing ideas and selecting which ideas to pursue.
- Collaboratively solve a problem using engineering design principles.
- Build and test prototypes to gain insight and knowledge into how well their solution may work.
- Communicate insight and knowledge gained from using design principles to solve real-world problems.
- Describe how design might be influenced by economic, social, and cultural contexts.
- Develop correct 3-D drawings.
- Evaluate orthographic, isometric, and 3D drawings for correctness.
- Express the ideas of a design verbally and with images.
- Explain how a particular design solves a specific problem.
- Learn to effectively document and communicate the progress achieved on a project with a future team or class of students.

Knowledge: (what students will know)

- Creating design solutions to problems requires research, generating ideas, deciding which ideas to use, creating prototypes, testing prototypes, communicating results, and learning from the results.

- Creating engineering solutions employs an iterative and often exploratory process to translate ideas into tangible form.

- Creating engineering solutions requires understanding of physical science concepts and mathematics in order to optimally uuse a variety of software and physical tools to implement designs.

Assessment:

Students are required to construct several design solutions to short-term problems, as well as work toward the completion of a longer term project. They will employ various laboratory simulations to test the qualities of some of their designs. They will be evaluated using a combination of homework, quizzes, project presentations, project reports and exams. Groups will be evaluated using a rubric that looks at how well each project successfully completes the desired performance specifications within the given constraints. The long-term project will be partially evaluated on the effectiveness with which teams communicate with an unknown future team so that their work may be continued efficiently. Individuals will be held responsible for contributing to the overall success of each project, using a group work evaluation tool such as Crowd Grader as well as by work on individual reports and test questions.

Equipment/Materials/Texts:

SOLIDWORKS academic suite (district site license) and Sketchup, computers/devices that meet the software specifications, 3D-printers and software, ShopBot Desktop, assorted hand-tools, additional text or notes TBD.

PROJECTS FOR PROPOSED CreAtive Technological Solutions (CATS) Course

List of Longer, Multiple Semester Projects

Project	*Engineering Type*	*Sizzle Factor 3 max)*	*Difficulty 3 max*
Near Space Balloon	Aeronautical	3	3
Electron microscopes	Electrical	3	3
Magnetic Resonance Imaging	Electrical	3	3
Particle Accelerator, Cyclotron	Electrical	2	3
Windmill generator	Energy	2	3
Earthquake proofing (Active control)	Mechanical	3	3
Balancing a Pencil (Segway, Spoon for ET)	Mechanical	2	3
Making Liquid Nitrogen	Mechanical	2	3
Automatic Lens/Mirror Polishing	Optical	2	3
Flying Drones/Robots	Robotics	3	3
Underwater robots	Robotics	3	3
Solar Powered Vehicles	Systems	3	3
Space Station	Systems	3	3
Musical Instruments (electronic and acoustic)	Acoustic	2	2
FAA Ground school	Aeronautical	1	2
Environmental Engineering (include input from DEP or other local agencies)	Chemical	1	2
Automatic Titration	Chemical	1	2
Science Museum Kiosks	Electrical	2	2
Home Energy Auditing	Energy	1	2
Prosthetics	Mechanical	2	2
Building Steam Turbine/Engine	Mechanical	2	2
Galilean telescope	Optical	2	2
Microscopes	Optical	2	2
Scientific Instrumentation	Systems	2	2

List of shorter projects from 8th grade to be expanded upon with greater depth:

Marble Maze
3D Drawing with Sketchup
Electronics/Snap Circuits
Design/Build a House, Household wiring, double switch, elegance or beauty
Arduino projects
Kites, Airplane on elastic band

Staples High School New Course Proposal

Course Title: ***3-D Design and Engineering***

Credit: _____ .25 Quarter
__X__ .50 Semester
____ 1 Year

Credit Area(s): *Science, STEAM*

Course proposed by:
If the course has been suggested by an individual teacher, a student, or some other agent, it should have been reviewed and accepted by the department(s) before being presented to Collaborative Team.

_____ Administration	__X__ Board of Education	______ Students
_____ K-12 Curr. Review	__X__ Department	______ Other

Prerequisite: *Geometry*

Rationale:

1. How does this course contribute to the department goals and objectives?
   One of the main goals of our the science department is to teach students to be creative problem solvers and to think analytically. The new Thinking in 3-D course is designed to focus on those skills by being organized around "Big Ideas." These are that: Thinking in 3-D enhance design, Some designs are sufficient, but not optimal, The best designs are elegant, 3-D designs that solve problems must work within constraints, The best designs often incorporate elements from multiple existing solutions
2. What is the need this course addresses?
   This course provides another avenue for students to pursue their interest in STEM-related fields. Many students have taken the introductory Engineering course, but desire more specific skills relating to engineering, design and robotics.
3. How does this course support the recommendation of the latest K-12 review?
   N/A
4. How does this course support Staples' mission statement?
   The mission statement focuses on three main themes, all of which are important for the Thinking in 3-D course. For example, students need to use empathy when trying to solve a design problem that is not just a theoretical issue, but something that other people will use and value.Additionally, community is important in this course because no design is done in

isolation. Students must tap into the large, vibrant and collaborative online 3-D design community in order to take advantage of work done by others.

5. How does this course support the goals of the Westport 2025 initiative?
   Thinking in 3-D course is designed to make 3-D design skills accessible to a wider range of students. It is not just about drawing images on a screen, rather it is a course designed to expose students to a range of principles about 3-D problem solving. As such, it is well aligned with all four of the major domains of the lens; Global Thinking in the sense that one performance task asks students to design solutions that could have significant global impact, Critical Thinking in the sense that students will have to use 3-D design principles to solve problems, Communication in the sense that tasks will ask students to communicate with others to collaborate on solutions to design problems and finally and perhaps most significantly, Creative Thinking in the sense that ALL design is essentially a creative endeavour in which a person engages.

Staples Expectations for Student Learning Alignment:

1. Academic Expectations
   - Students will think critically in a variety of contexts and situations.
   - Students will be competent problem solvers.
   - Students will use technology as a tool for learning in both accessing and analyzing information.
   - Students will effectively communicate their solutions and understanding using a variety of media.
   - Students will think creatively and will adapt their thinking in response to both critical feedback and changing demands.

2. Civic Expectations
   - Students will demonstrate a sense of ethics both in their words and their actions.
   - Students will consider their actions and solutions within the context of the global environment.

3. Social Expectations
   - Students will work collaboratively towards common goals.

Course Catalogue Description:
Prerequisite: *Successful completion of Geometry.*

The Thinking in 3-D course is designed to give students the skills they will need to obtain a SOLIDWORKS academic certification as well as to develop skills in design concepts and sustainable deign. The key sections of this framework include; focus on creating design artifacts, connecting design to everyday life, abstracting problems to find solutions, analyzing both problems and solutions, communicating your thoughts and collaborating with peers and the larger design community

Course Content

Students will learn fundamental techniques in 3-D design. They will engage in design challenges that reinforce the use of fundamental techniques. They will learn to simulate thermal and statics forces to understand the function of 3-D designs. They will learn industry focused skills which will lead to industry recognized certification. Above all, students will learn that creativity is at the heart of 3-D design.

Expectations for Student Learning (Outcomes)
The information below is derived from the College Board description of the course.

Skills:

Analyze the considerations involved in optimal design solutions.
Analyze design solutions for form and function.
Analyze how design affects communication, interaction, and cognition.
Analyze the beneficial and harmful effects of design solutions.

Appropriately connect problems and potential design solutions.

Collaborate when processing formulating design solutions to gain insight and knowledge.
Collaborate to solve a problem using design principles.
Collaborate in the creation of design artifacts.

Communicate insight and knowledge gained from using design principles to solve problems.

Connect design within economic, social, and cultural contexts.

Develop an abstraction.
Develop designs to be fabricated and tested.
Develop a correct 3-D drawings.

Employ appropriate mathematical and logical concepts in drawings.

Evaluate a drawing for correctness.

Express the ideas of a design verbally.
Explain how a design solves a problem.

Create design artifacts.
Creatively solve design problems.
Simulation the physical behavior of designs.
Test designs to gain insight and knowledge.
Exploration and the discovery multiple design solutions.

Knowledge:
(What students need to know)
A creative process in the development of a design solution can include but is not limited to employing non-traditional, non-prescribed techniques; the use of novel combinations of design ideas, tools and techniques; and the exploration of personal curiosities.

Creating designs employs an iterative and often exploratory process to translate ideas into tangible form.

Creating designs requires understanding and using software tools and services.

Computing tools and techniques used to create designs in this class use SOLIDWORKS, but the fundamental ideas of 3-D design transcend a specific software suit.

Assessment:

Students are required to generate several design solutions. They will also employ thermal and statics simulation to test the qualities of their designs. The final exam will be the certified SOLIDWORKS associate academic exam.

Equipment/Materials/Texts:

SOLIDWORKS academic suit (district site licence), computers that meet the software specifications, copies of the certified SOLIDWORKS associate exam and 3-D printers (4 dedicated machines). Summer professional development is required for each teacher so they can conduct the course in accordance with SOLIDWORKS certification guidelines.

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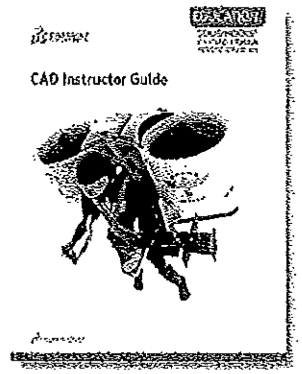
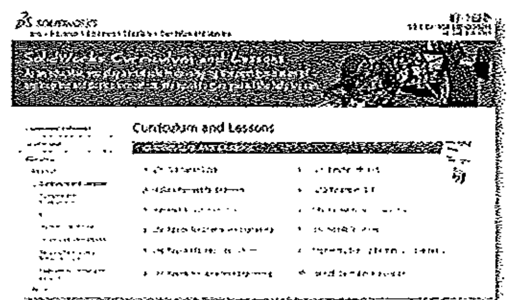


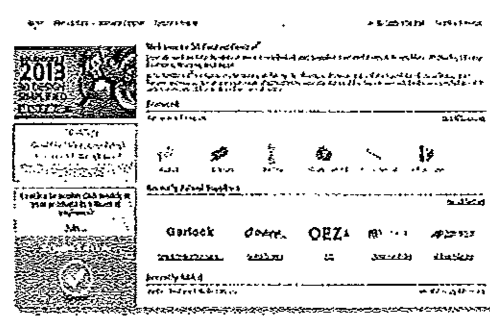
SolidWorks Curriculum Location Instructions
A step by step guide on where and how to find SolidWorks Curriculum.
Access: www.solidworks.com/EDU_Curriculum_Location_Instructions

SolidWorks Instructor Guides
A collection of tutorials and projects that utilize SolidWorks design and analysis tools. Includes the documents, PowerPoint presentations, movie files in reproducible format.
Access: www.solidworks.com/curriculum
(Login account required on SolidWorks Customer Portal.)



SolidWorks Student Guides
A collection of tutorials and projects that is available from within the SolidWorks Education Edition.
Access: SolidWorks Resources > Student Curriculum

SolidWorks Sustainability
Tutorials and PowerPoint presentation that introduce students to sustainable design and life cycle assessment (LCA).
Access: www.solidworks.com/customerportal
(Login account required on SolidWorks Customer Portal.)



Teacher Blog
A collection of lessons developed by teachers for teachers that use SolidWorks to reinforce concepts in science, technology, engineering and math concepts.
Access: http://blogs.solidworks.com/teacher

COMMUNITY RESOURCES

My.SolidWorks.com
My.SolidWorks lets customers connect, discover, and share everything SolidWorks in one place, with a single login, common search, and personalized views.
Access: http://my.solidworks.com

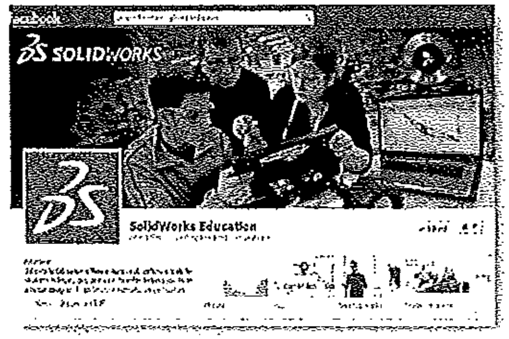
3D Content Central
A library of part, assembly, drawing, blocks and macro files.
Access: www.3DContentCentral.com

SolidWorks User Group Network
An independent community of local and regional SolidWorks users throughout the world.
Access: www.swugn.org

SolidWorks User Network
A comprehensive resource forum on specific product areas.
Access: http://forum.SolidWorks.com/

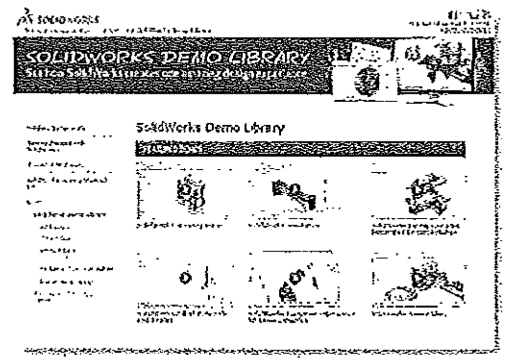
SolidWorks Education on Facebook

SolidWorks Education is on facebook, for students and teachers. Learn tips and tricks from your peers, find tutorials, and enter contests.
Access: www.facebook.com/solidworkseducation
Share your designs on facebook using SolidWorks Social
Access: SolidWorks Social is available as an add-in within the Education and Student Edition.



SolidWorks Sponsored Design Contests

SolidWorks supports thousands of students in design competitions in after school programs including FSAE/Formula Student teams, Robotics competitions, and Technology competitions.
Access: www.solidworks.com/SponsoredDesignContests



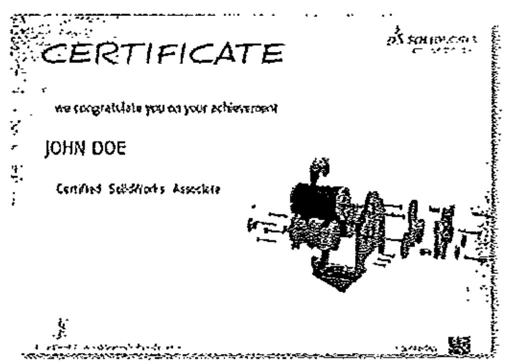
Video

YouTube playlists for SolidWorks Tutorials, Certified SolidWorks Associate Exam (CSWA) and Formula SAE/Formula Student.
Access: www.youtube.com/solidworks

Demo Library

See how SolidWorks creates one amazing design experience by accessing the different and numerous demos available.
Access: www.solidworks.com/demolibrary

CERTIFICATION



Certified SolidWorks Associate (CSWA) Program

The CSWA Program is an engineering design skills based program that leads students to achieve certification through the Certified SolidWorks Associate Exam (CSWA) Exam. Used by industry as a recommended competency for job placement and used by academia for assessment and articulation agreements. Exam Preparation Guide is available through SDC Publications. In order to participate in the CSWA Program, schools must be a CSWA Provider.
Access: CSWA Provider Application www.solidworks.com/CSWAProvider
Sample CSWA exam: www.SolidWorks.com/CSWA

Additional exams: Certified SolidWorks Professional (CSWP), Certified SolidWorks Simulation Associate (CSWSA-FEA), and Certified Sustainable Design Associate (CSDA).

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Dassault Systèmes SolidWorks Corp.
175 Wyman Street
Waltham, MA 02451 USA
Phone: 1 800 693 9000
Outside the US: +1 781 810 5011
Email: solidworks.education@3ds.com

www.solidworks.com/education

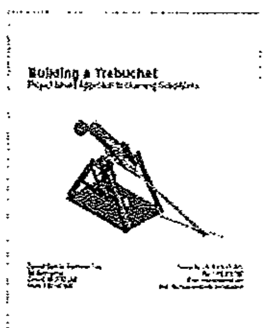
SOLIDWORKS CURRICULUM AND LESSONS

As an educator, you play a vital role in developing the next generation of engineering and design innovators. We want to give you all the help we can.

CAD Tutorial for Science and Engineering

Windmill Project
The Windmill Project guides students through the parts, assemblies and drawings to build a windmill. Students will be introduced to sheet metal as a function in SolidWorks. Students use SolidWorks SimulationXpress to analyze structure and material and SolidWorks SustainabilityXpress to understand and visualize the environmental impacts of the design and, if necessary, improve the design.

Trebuchet Design Project
The Trebuchet Design Project 200-page guide steps students through the parts, assemblies and drawings to build a trebuchet. Students use SolidWorks SimulationXpress to analyze structure, material and thickness, and explore algebra, geometry, weight and gravity with mathematics and physics competency-based exercises. An optional hands-on construction with models is provided by Gears Educational Systems, LLC.



DOWNLOAD PREVIEW DOCUMENTS

Mountain Board Design Project
The Mountain Board Design Project is a competency-based learning activity that takes your students through an interactive design project. Complete with goals and assessment, this 500-page document leads students through varied experiences with practical applications, including the iterative process, implementing design ideas, engineering a product, analysis for improving performance, and visualization for marketing a product

WATCH PREVIEW VIDEOS

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Windmill Project   Trebuchet Design Project

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Staples High School New Course Proposal

Course Title: *Materials and Design (MAD) Science*

Credit: _____ .25 Quarter
__X__ .50 Semester
____ 1 Year

Credit Area(s): *Science, STEAM*

Course proposed by:
If the course has been suggested by an individual teacher, a student, or some other agent, it should have been reviewed and accepted by the department(s) before being presented to Collaborative Team.

______ Administration	_____ Board of Education	______ Students
______ K-12 Curr. Review	__X__ Department	______ Other

Prerequisite: *enrollment in 10th*

Rationale:

1. How does this course contribute to the department goals and objectives?
   A critical school and department goal is to engage students in real-world problem solving. The purpose of Materials and Design Science is to expose students to some of the challenges imposed upon the designer by the limitations and constraints of materials. Students will experimentally explore the properties of materials such as metals, composites and plastics in order to understand current uses, but also envision and imagine new applications based upon their own original designs. They will study historic designs that changed the world and consider today's need for lighter more efficient machines. A "Creative Thinking" process will be encouraged as students are free to experiment. Students can "Imagine what might be by looking at what is".

2. What is the need this course addresses?
   In Science and Math education, students are exposed to the benefits of technology early in their experience. Often there is little understanding of the physical world being represented by the data: its properties and limitations. The processing of data often has preeminence while the physical model becomes an abstraction. Students need to bridge the gap between theory and application.

3. How does this course support the recommendation of the latest K-12 review?
   N/A
4. How does this course support Staples' mission statement?
   The desire to produce successful and innovative designs should inspire new learning. Destructive testing of models will highlight the value of integrity as they experience the consequences of the quality of their work. An appreciation for the hard work of others (empathy) will follow the study of other's design successes and failures.

5. How does this course support the goals of the Westport 2025 initiative?
   Material and Design (MAD) Science will be well aligned with all four of the major domains of the lens; Global Thinking in the sense that students work to design solutions that address global issues, Critical Thinking in the sense that students will use new knowledge of materials and design to solve authentic real world problems, Communication as students plan and collaborate with others to solve design problems. Creative Thinking will be central to the course as this is a design course where students draw from their own creativity as they explore original applications of materials that are new to them.

<u>Staples Expectations for Student Learning Alignment:</u>

1. Academic Expectations
   - Students will think critically in a variety of contexts and situations.
   - Students will become competent problem solvers.
   - Students will use technology such as the Instron device and force analyzing software as tools for learning in both accessing and analyzing information.
   - Students will effectively communicate their solutions and understanding using a variety of media.
   - Students will think creatively and will adapt their thinking in response to both critical feedback and changing demands.

2. Civic Expectations
   - Students will demonstrate a sense of ethics both in their words and their actions.
   - Students will consider their actions and solutions within the context of the greater good.

3. Social Expectations
   - Students will work collaboratively towards common goals.

<u>Course Catalogue Description:</u>

Prerequisite: *Successful completion of 9th grade.**

Material Science is a multi-disciplinary subject that addresses the physical properties of materials and their applications in engineering and manufacturing. *MAD* Science will be a project based introduction to this subject with an emphasis on solving small scale real world problems through knowledge of materials and original design. *MAD* Science will develop in students, a working knowledge of the capabilities of modern and traditional materials as well as the ability to competently and safely work with examples. There will be a process of moving from observation, to imagination, to creation. Students will understand engineering decisions made in the products around them and will recognize and appreciate practical design philosophy and the ever necessary compromises. The key sections of this framework include; learning the nature of materials, understanding the reasoning behind their applications, imagining new solutions to solve real world problems, experimentation and data collection, communication and collaboration with peers, creation of prototypes and testing.

Course Content

Largely an experimental course with much of the knowledge gathered empirically, students will learn the fundamental properties of natural and man made materials including metals and alloys, composites, resins, plastics, ceramics, bio-materials, carbon fiber and graphene. They will gain knowledge of material strengths and limitations as well as their failure modes. They will build prototypes and test the limits in order to gain a real world sense of the behavior of stressed systems. Students will conceive and build with the ability to wisely choose materials that get the job done.

Expectations for Student Learning (Outcomes)

Skills:

- Recognize the modern and traditional materials.
- Understand rational behind historical choices.
- Choose an appropriate material for a specific application.
- Analyze the pros and cons of different materials used in a design.
- Make valid design decisions with a knowledge of the limitations imposed by materials.
- Explore new solutions made possible with new materials.
- Collaborate when processing formulating design solutions to gain insight and knowledge.
- Collaborate to solve a problem using design principles.
- Collaborate in the design process.
- Communicate insight and knowledge gained from using design principles to solve problems.
- Connect design within economic and historical contexts.

- Develop a concept.
- Develop designs to be fabricated and tested.
- Develop a sense of what is and isn't possible or practical.
- Employ basic and appropriate mathematical and logical concepts in designs.
- Evaluate the practicality and failure mode of a design.
- Express the ideas of a design verbally and visually.
- Communicate how a design solves a problem.
- Create a prototype.
- Creatively solve design problems.
- Test physical behavior of designs to gain insight and knowledge.
- Compare multiple design solutions with peers and historical solutions.

Knowledge: (What students need to know)

Students will be able to recognize various materials such as aluminum, steel alloys, polymers, resins, thermoplastics, composites, bio-materials, exotic materials, and have a familiarity with their physical characteristics.

Students will have an overview of historical uses of materials.

Students will learn to recognize problems and apply new knowledge of materials to imagine and design possible solutions.

Students will develop a practical sense for new designs.

The use of basic hand and power tools as well as test equipment will be developed.

Assessment:

Students are required to generate several design solutions throughout the course. They will also employ practical tests and simulations to test the qualities of their designs. The final exam will test general knowledge of materials and their applications with a lab practicum where students use imagination and learned knowledge to solve a physical problem.

Equipment/Materials/Texts:

Samples of materials: Steel alloys, Aluminum alloys, Titanium, Concrete, Carbon Fiber, Wood, Fiberglass, Plastics, Ceramics, Aerogel, Graphene. Instron test fixture, Logger Pro software, Vernier lab sensors, laptops, Hand tools, light power tools, textbooks TBD

MAD Science Project List **10/21/15**

1) **" Breaking Things"**
This project will employ an inquiry approach to discovering the properties of select materials through *destructive* testing. Students will be given samples of materials such as Mild Steel, Aluminum, Carbon Fiber Composite, Wood, Concrete, Plastics, and Ceramics.

Students will, with guidance, create a means to test the limits of Tensile, Compressive, Shear and Flexural strengths as well as the Hardness, Thermal and Electrical Conductivities, Thermal Expansion and Contraction. They will quantify and record their findings and write a report on the suitability of the materials for various applications.

2) **"Fixing Things"**
Students will explore the various methods of "Fixing" materials together. They will experiment with various methods including: glues and bonding agents including epoxies, UV cured bonds, soldering, riveting, metal and plastic fasteners. Appropriateness of welding **TBD.**

Students will affix like and unlike materials and conduct destructive testing to gain a practical knowledge of the strengths and limitations of the various fastening methods.

3) **"Creating Things"**
Students in teams will choose a (small scale) existing design in use today and choose new materials to improve the performance i.e. more economy, reliability, improved function, weight reduction, safety. Students will test the limitations of their project and report on the Failure Mode and Effects Analysis (FMEA). FMEA will continue with future projects. Projects **TBD.**

4) **"It Works"**
Students will design and build a first project involving something in which they have a genuine interest. Essential to the project will be an innovative use of materials and thoughtful design.

5) Additional Projects TBD

6) "Final Project" TBD by students.

James J. D'Amico
Director of Secondary Education

TO: Elliott Landon
FROM: James D'Amico
SUBJECT: Course Sequencing and Offerings in STEM, Grades 6-12
DATE: November 23, 2015

As we introduce new courses at the high school focused on the discipline of Engineering, it is important to review the vision of STEM education as it applies to the Westport Public Schools. The STEM movement in schools has its origins in the national concern that American students are falling behind in Science, Technology, Engineering and Mathematics education, primarily based on American students' lagging scores on international Math and Science tests. Just as we are shifting toward standards based instruction and grading in part because averaging doesn't make sense for students, our district's performance makes clear that our programs cannot be lumped in with the average for the country. However, being a reflective and dynamic school system, we recognized several years ago that our offerings in engineering, design, and computer programming were in need of development as part of our comprehensive approach to educating students for the world of college and work that they will enter after graduating from our schools.

The process began with the introduction of Design and Engineering courses at the middle school level, and were implemented as once-per-week courses in grades 6 and 7 and twice-per-week in grade 8. These courses are designed with a foundation of inquiry-based instruction, and aim to help students think about problems and how to solve them, teach students foundational skills they need to solve engineering problems, and ask students to apply knowledge that spans disciplines. Foundational skills might include teaching students how to identify and create parallel vs. series circuits, and cross-disciplinary knowledge might include scientific disciplines such as aerodynamics and avionics in the grade 8 flight unit, but also skills learned in math, art, and humanities classes.

With the proposal of Creative Technological Solutions to Real World Problems, Materials and Design Science, 3-D Design and Engineering to our course offerings, we are seeking to bridge the gap between eighth grade and the Applied Engineering and Physics course currently offered at the high school. In the coming months and years, we will also begin the process of understanding and refocusing our curriculum to meet the goals of the Next Generation Science Standards, which place greater emphasis on engineering among other changes, and may require additional courses or rewriting of existing ones. The question has been raised about how these courses fit into a philosophy of STEAM vs. STEM.

STEM vs. STEAM

According to the American Society for Engineering Education, the characteristics of a high-quality STEM program are:

- a motivating, engaging, and authentic context
- a focus on the integration and application of meaningful math and science content
- an inquiry-based (and student-centered) teaching approach
- the utilization of an engineering design process to solve challenging problems
- a focus on collaboration and communication
- an environment that fosters critical and creative thinking, innovation, perseverance, and risk-taking

Certainly, these are not only characteristics of our Middle and High School offerings in Design and Engineering, but also represent the goals of all of our curriculum since the adoption of our Westport 2025 capacities.

The attached article represents much of the current thinking on STEM vs. STEAM, and makes the point that at this time, we do not want to dilute the importance of the arts or of STEM subjects. It also reiterates a point we have discussed in the past, which is that STEM, and STEAM for that matter, is not a course in and of itself. It is a program--the sum of its parts with common objectives.

A point not made in the article, but one critical to considering any curriculum initiative, is our ability to ensure that students have access to the highest quality teachers. Were we to attempt at this time to create a STEAM class or truly integrated art and engineering course, it would require additional time and multiple teachers in a single class to achieve. Our current approach, where students (and teachers) learn how to apply technology to problem solving in various disciplines with the guidance of a push-in technology teacher, where the aims outlined above are embedded into all curriculum areas, and where students have explicit opportunities to engage in engineering content on a weekly basis throughout their middle school education, provide a comprehensive and integrative approach to educating the whole child, while maintaining the integrity of the disciplines that shape their thinking.

A commitment to these types of opportunities is also driving our thinking on future augmentations to our program, including developing a schedule that would allow students access to makerspaces and provide the ability to pursue passion projects or other types of enrichment. We are also examining and revising the Music Technology curriculum with an eye on enhancing students' skills for creativity, production, and presentation. As part of our work in identifying and aligning to standards, we are ensuring a commitment to the arts as part of our curriculum by refocusing the Drama/Presentation Skills class around the National Core Arts Standards in Theatre, which include skills focused on design challenges in artistic presentation, integration with global issues.

Design and Engineering lessons do involve the visual arts, literacy, math, science and social studies. Knowledge from these subjects are integrated as needed to solve engineering challenges. We shape the experience for students across disciplines by exploring opportunities where art authentically fits into the curriculum, as an applied subject area, like math and science. In fact, the Next Generation Science Standards highlight the importance of different types of literacy skills that students must develop in order to be successful, making alignment and integration of skills across subject areas a priority. Applied knowledge from multiple disciplines leads to deeper learning.

A few examples of authentic application of art:

- creative brainstorming/planning to generate creative and innovative thinking,

- the communications phase of the engineering process, and
- design and aesthetics

The arts are a learning tool, and may be a means of increasing motivation and accessibility to STEM for a wider range of learners. We believe that all students need a well-rounded, high-quality education that enables them to make informed decision to impact their world and the way they live, and a STEM program is one - but not the only - part of this education.

At the high school level, we are able to take advantage of our ability to offer students dozens of choices across subject areas to provide this level of education, including arts offerings that support a rigorous STEM program. In the attached documentation, you can see that with the addition of Creative Technological Solutions to Real World Problems, Materials and Design Science, and 3-D Design and Engineering, we now have a complete sequence of courses that fall under the label of Engineering, but are more appropriately categorized as Problem Solving courses. These courses are based on a solid foundation of inquiry, creative thinking, authenticity, and math and science content. They are also courses that invite students to apply their learning to multiple contexts outside of the classroom.

As we move toward a graduation requirement structure that fosters broader categories and open thinking about required courses, Staples High School is in the favorable situation of having multiple offerings across every department that support STEAM thinking. As we crystallize our thinking, you will see changes such as cross-listing of courses, student portfolios that emphasize students' holistic growth as learners, and that illustrate how the combinations of our offerings from STEM subjects, the arts, technology, media and the humanities offer students an almost unlimited number of paths to prepare themselves for a world in which creativity and the use of technology to solve problems are requisite skills.

Our district has taken a wise approach over the last several years to acknowledge the changing nature of the world of college and career that our students will enter, including an approach to STEM thinking that spans every subject area, recognizes the need for more explicit engineering experiences for all students, preserves our community's commitment to the arts, and capitalizes on the expertise of our teachers.

Course Sequencing in STEM, Grades 6-12

Westport Public Schools
November 23, 2015

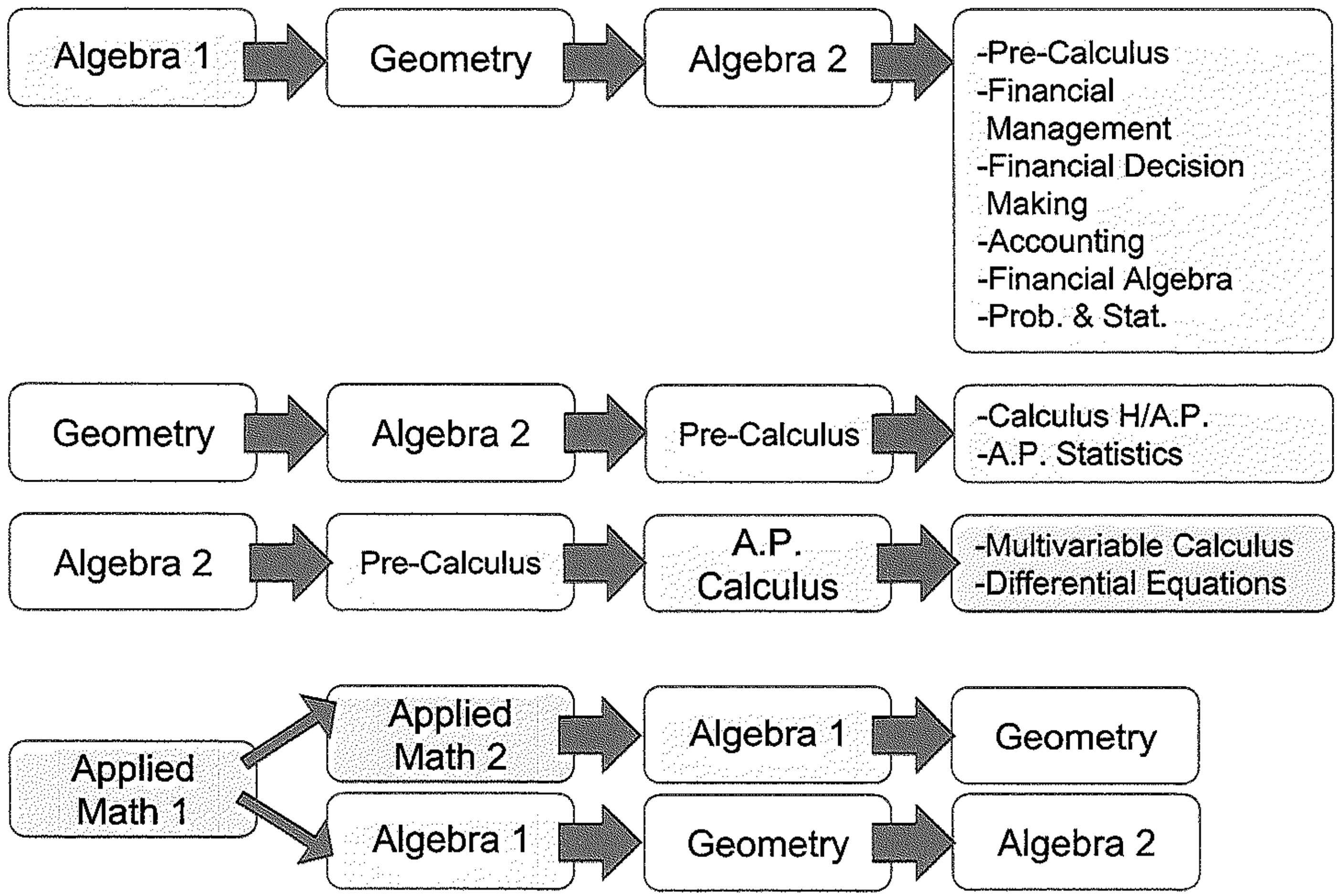
Middle School Science, Technology, Engineering, Mathematics- Grades 6 & 7

Math	Math	Math	Math	Math	Math
Science	Science	Science	Science	Science	Science
Art	Art	Design & Engineering	Music	Music	Instrumental Music
PE	PE	Drama	PE	Health	
ELA	ELA	ELA	ELA	ELA	ELA
Social Studies	Social Studies	Social Studies	Social Studies	Social Studies	Social Studies
World Language	World Language	World Language	World Language	World Language	

Middle School Science, Technology, Engineering, Mathematics- Grade 8

Math	Math	Math	Math	Math	Math
Science	Science	Science	Science	Science	Science
Art	Art	Design & Engineering	Music	Music	Instrumental Music
PE	PE	Design & Engineering	PE	Health	
ELA	ELA	ELA	ELA	ELA	ELA
Social Studies	Social Studies	Social Studies	Social Studies	Social Studies	Social Studies
World Language	World Language	World Language	World Language	World Language	

Mathematics, Grades 9-12



Science, Technology, Engineering Sequencing, Grades 9-12

-Biology
-Solar System
-Meteorology

→

-Earth Science
-Chemistry
-Aerospace
-A.P. Biology
-Scientific Research
-Horticulture
-Medical Terminology
-Anatomy & Physiology
-Animal Behavior

→

-Physics
-Biotechnology
-A.P. Biology
-A.P. Chemistry
-A.P. Environmental Science
-Scientific Research
-Stars, Galaxies & Universe
-Marine Biology
-Physical Oceanography
-Zoology

→

-A.P Physics
-A.P. Biology
-A.P. Chemistry
-A.P. Environmental Science
-Scientific Research
-Environmental Problem Solving

-Creative Technological Solutions
-3-D Design & Engineering
-Intro Programming
-Intro Web Programming

→

-Materials and Design Science
-Building Web Applications
-A.P. Computer Science Principles

→

-Engineering and Applied Physics

STEM vs. STEAM

Core Philosophy: Design Thinking and Inquiry across the curriculum

Opportunities

- Focus on problem solving in real world contexts
- Increased collaborative and parallel instruction

Challenges

- Rigor and demands of subject area standards
- Teacher expertise
- Expense of co-taught classes

STEM Thinking

- Motivating, engaging, and authentic context
- Focus on the integration and application of meaningful math and science content
- Inquiry-based, student-centered teaching approach
- Utilization of an engineering design process to solve challenging problems
- Focus on collaboration and communication
- Environment that fosters critical and creative thinking, innovation, perseverance, and risk-taking

In our schools, this type of thinking is not limited to STEM subjects!

Current Middle School Opportunities

Embedded

- Curriculum across subject areas incorporates problem-based learning
- Technology integrated into all subject areas in core/encore
- Subject area standards focused on presentation, use of technology, aesthetics
- Design and Engineering courses require multidisciplinary application

Explicit

- Weekly/Semiweekly Design & Engineering
- Semiweekly Music Technology option
- Semiweekly Art and Music classes for three years
- After school clubs

Future Middle School Opportunities

- Improvements in Music Technology Curriculum
- Refocus of Drama/Presentation to Theatre
  - In line with national arts standards
  - Inclusive of skills around design challenges in artistic presentation, integration with global issues
- Exploration of dedicated Enrichment/Intervention period in Middle School daily schedule
  - Access to Makerspaces
  - Time to work on passion projects/design
  - Opportunity to build integrative experiences
  - Support students to help them engage with demands of dynamic curriculum

High School

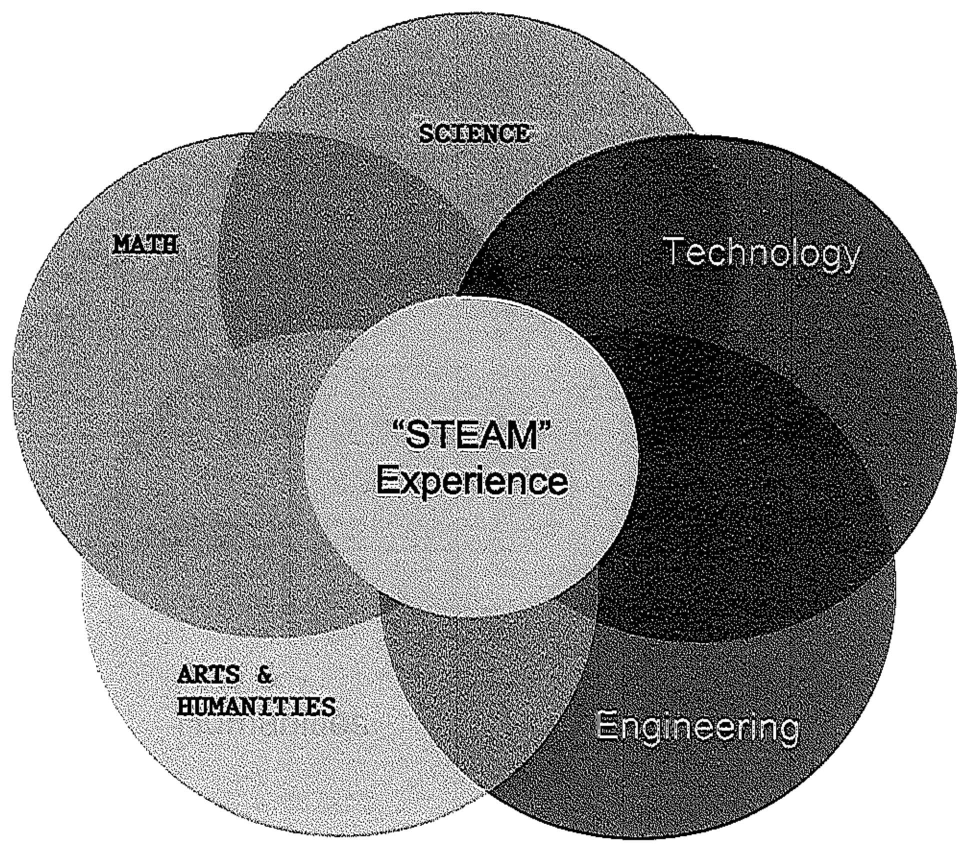
Current Opportunities

- Strength of high school program lies in choices available to students
- Multitude of pathways
- Clearer sequence of explicit offerings from middle to high school

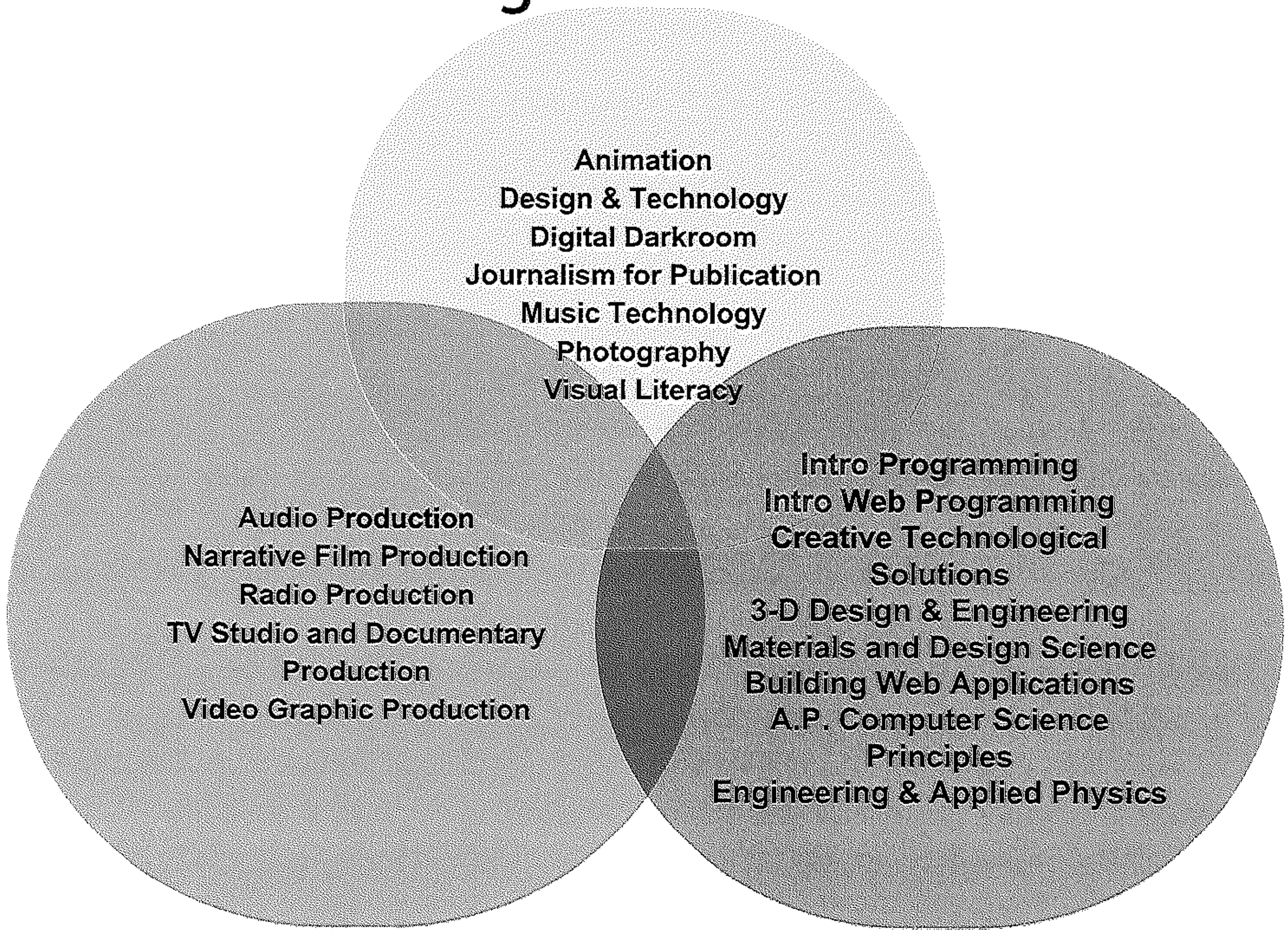
Future Opportunities

- Anticipated Graduation Requirements will increase arts credits
- New graduation categories will illustrate cross-disciplinary pathways
- Capstone will involve portfolio asking students to link STEM, Humanities and other experiences together

Balance, Integration, Choice



Technology, Arts, and Engineering Integrative Offerings



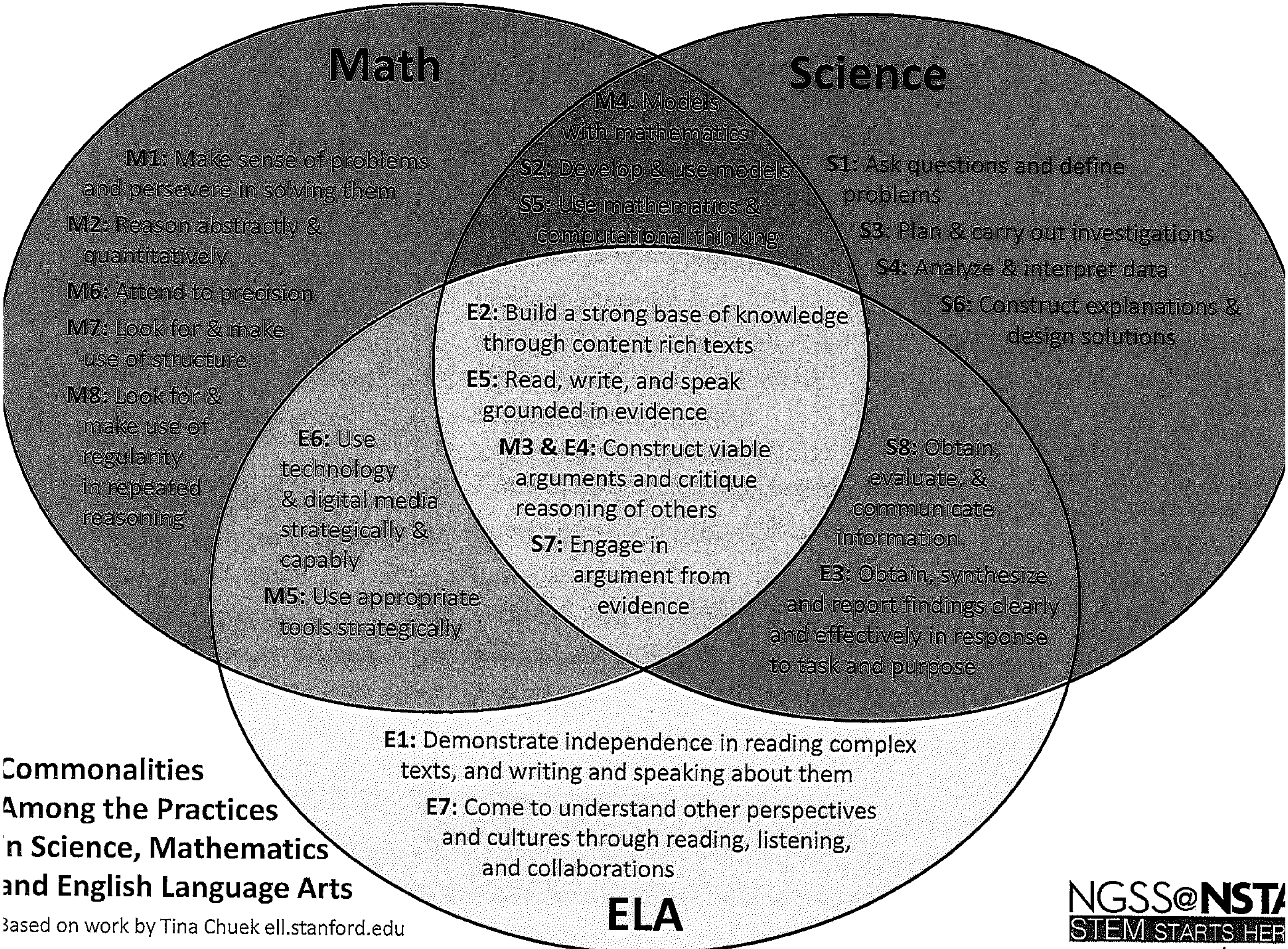
Multiple Paths and Connections

Music Technology
Music Theory
Audio Production
Programming
Web Design

Jewelry
Ceramics
Accounting
Chemistry
3-D Design & Engineering
Materials & Design Science

Design & Technology
TV Studio & Documentary Production
A.P. Statistics
Environmental Problem Solving
Engineering & Applied Physics

Photography
Graphic Design
Environmental Studies
Creative Technological Solutions
AP US Government
Journalism



Commonalities Among the Practices in Science, Mathematics and English Language Arts

Based on work by Tina Chuek ell.stanford.edu

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www.nsta.org/ngss

Practices in Mathematics, Science, and English Language Arts*

Math	Science	English Language Arts
M1. Make sense of problems and persevere in solving them.	**S1.** Asking questions (for science) and defining problems (for engineering).	**E1.** They demonstrate independence.
M2. Reason abstractly and quantitatively.	**S2.** Developing and using models.	**E2.** They build strong content knowledge.
M3. Construct viable arguments and critique the reasoning of others.	**S3.** Planning and carrying out investigations.	**E3.** They respond to the varying demands of audience, task, purpose, and discipline.
M4. Model with mathematics.	**S4.** Analyzing and interpreting data.	**E4.** They comprehend as well as critique.
M5. Use appropriate tools strategically.	**S5.** Using mathematics, information and computer technology, and computational thinking.	**E5.** They value evidence.
M6. Attend to precision.	**S6.** Constructing explanations (for science) and designing solutions (for engineering).	**E6.** They use technology and digital media strategically and capably.
M7. Look for and make use of structure.	**S7.** Engaging in argument from evidence.	**E7.** They come to understanding other perspectives and cultures.
M8. Look for and express regularity in repeated reasoning.	**S8.** Obtaining, evaluating, and communicating information.	

* The Common Core English Language Arts uses the term "student capacities" rather than the term "practices" used in Common Core Mathematics and the Next Generation Science Standards.

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Vince Bertram Become a fan
President and CEO, Project Lead The Way, Inc.

STEM or STEAM? We're Missing the Point

Posted: 03/26/2014 3:01 pm EDT | Updated: 05/26/2014 5:59 am EDT

STEM education is one of the most talked about subjects in our country today -- and for good reason. From our K-12 system and post-secondary institutions to business, industry and government, most everyone is focused on -- or at least has something to say about -- STEM education as a key solution to improve educational performance and solve the persistent workforce development problems that plague our nation.

But what exactly is STEM education? It's much more than science, technology, engineering and math, which are usually taught as discrete subjects with math down one hallway in the school and science down another. Rather, STEM is the applied, integrated approach to those subjects. It is about using math and science to solve real-world challenges and problems. This applied, project-based way of teaching and learning allows students to understand and appreciate the relevancy of their work to the world around them. Arguably, STEM is at the core of everything.

I'm often asked why science, technology, engineering and math are the only words used to create the acronym, and when Project Lead The Way (PLTW), the STEM organization I am proud to lead, will change STEM to STEAM, STREAM or STEMM -- incorporating art, reading or music into the acronym. If that is the debate, we are clearly missing the point. It's not about adding to the acronym, but instead adding to the relevancy of learning. It's about showing students how technical concepts relate to real-world situations and providing them with hands-on projects and problems that help them apply concepts in a new context. It's about nurturing students' curiosity and helping them develop creativity, problem solving and critical thinking skills. STEM isn't simply the subjects in the acronym. It's an engaging and exciting way of teaching and learning.

On a recent flight to a speaking engagement in California, I had a conversation with the person sitting next to me. She asked me what I did, and when I told her, she remarked, "Oh, you're one of those." When I asked what she did, she explained that she was the creative director for an advertising agency, and the world of STEM seems to disregard, even dismiss, the arts. Moments later, she began working on her MacBook Pro, loaded with state-of-the-art software. So my question to her was "Who do you think made that laptop and developed the software for artists and creators like you?" STEM fields are at the core of everything we do. STEM connects to everything, whether it is the arts, music, sports or agriculture.

Look no further than the materials and technology artists use: computers and graphics, paint, a canvas. Computer scientists develop the graphics technology, chemists work to ensure the right chemical composition to create vibrant colors, and engineers design a stronger canvas that absorbs the right amount of paint. Furthermore, the same creativity that inspires beautiful works of art is the same creativity that has led to some of the world's highest-performing, usable and visually appealing inventions. For instance, the Corvette Stingray, the 2014 North American Car of the Year, is an engineering marvel and one of the top-performing automobiles on the market. But, it's also aesthetically appealing. The same could be said for your new light-weight running shoes, your single-serving coffee maker, or the acoustically designed facilities for your community's symphony orchestra. These are all examples of engineering and the arts working together, and they all resulted from the same design process engineers use to build the world's most advanced fighter jets, develop new energy solutions, and create targeted therapies for chronic diseases.

STEM can be found in virtually every discipline and in every product. STEM is not exclusive to the subjects of science, engineering, technology or math. We must continue engaging students in the STEM disciplines and encouraging them to combine technical knowledge and skills with the creativity that leads to innovative ideas -- ideas that give the arts new technologies, music new instruments, farmers new machines, and our businesses a competitive advantage. Unless we continue building the STEM pipeline, each profession suffers.

Through world-class curriculum, high-quality teacher professional development, and a network of business and educational leaders, PLTW is preparing students for the global economy.

Follow Vince Bertram on Twitter: www.twitter.com/vincebertram

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EDUCATION WEEK
TEACHER

Published Online: November 18, 2014

STEM vs. STEAM: Do the Arts Belong?

By Anne Jolly

A tug of war is currently looming between proponents of STEM education (science, technology, engineering, and math) and advocates for STEAM lessons, which add art to the mix. Whichever side you come down on, here are some ideas for you to mull over.

STEM

First, consider the why and what of STEM education. Both private and public sectors report that 21st-century workers require skills that many of today's graduates don't have. Students need more in-depth knowledge of math and science, plus the ability to integrate and apply that knowledge to solve the challenges facing our nation. Children who study STEM also develop a variety of skills that are essential for success: critical thinking and problem solving, creativity and innovation, communication, collaboration, and entrepreneurship, to name a few.

A number of K-12 programs currently fly under the STEM banner. However, a 2014 study published by the American Society for Engineering Education identified several characteristics of quality STEM programs:

1. The context is motivating, engaging, and real-world.
2. Students integrate and apply meaningful and important mathematics and science content.
3. Teaching methods are inquiry-based and student-centered.
4. Students engage in solving engineering challenges using an engineering design process.
5. Teamwork and communications are a major focus. Throughout the program, students have the freedom to think critically, creatively, and innovatively, as well as opportunities to fail and try again in safe environments.

STEM, then, is a specific program designed for a specific purpose—to integrate and apply knowledge of math and science in order to create technologies and solutions for real-world problems, using an engineering design approach. It's no surprise that STEM programs need to maintain an intense focus.

STEAM

Recently, the idea of adding the arts to STEM programs has been gaining momentum. Surprisingly, I've heard push-back from both camps:

1. **From STEM proponents:** STEM lessons naturally involve art (for example, product design), language arts (communication), and social studies and history (setting the context for engineering

challenges). STEM projects do not deliberately exclude the arts or any other subject; rather, these subjects are included incidentally as needed for engineering challenges.
The focus of STEM is developing rigorous math and science skills through engineering. How can you focus on other subjects (such as art) without losing the mission of STEM or watering down its primary purpose?

2. From arts proponents: Engineering and technology can certainly serve the artist and help create art. But if we're talking about how one can use art in engineering… as an artist, it seems we're missing the point and devaluing, or not realizing, art's purpose and importance. We have it backwards.

So how exactly can teachers fit the arts into STEM programs and do justice for both STEM and STEAM? What would an ideal STEAM program look like?

That's what artist and educator-turned-STEAM-enthusiast Ruth Catchen is determined to find out. She currently works with a team of STEM writers and program developers who are using crowdfunding to develop and pilot a STEAM program in Colorado.

According to Ruth, the arts are a great learning tool and can serve as an on-ramp to STEM for underrepresented students. Engaging students' strengths using art activities increases motivation and the probability of STEM success. She views art as a way of offering more diverse learning opportunities and greater access to STEM for all types of learners.

Art also provides diverse opportunities for communication and expression. Ruth believes that in our technically-focused world, we have a responsibility to educate the whole child to become a global citizen in his or her community. She aims to do just that while staying true to the specific purpose of STEM education.

How Do We Solve the STEM vs. STEAM Conundrum?
Let's circle back to the question of how to include the arts in STEM in an authentic way. We could change the scope of STEM so that it focuses equally on learning in all subject areas—but why do that? We already have effective teaching methods for doing that: problem-based learning.

So let's try another question. Can we combine art with just one of the STEM subjects—perhaps science—and ignore meaningful subjects like math and engineering? We certainly could—but that would be just art and science, not STEAM.

What about having students do individual STEAM projects? Again—that's not faithful to basic STEM principles, which always include teamwork. So would that be STEAM or just a good individual project?

I propose we shape STEAM programs by exploring opportunities where art naturally fits in the STEM arena. Art can be treated as an applied subject—just like math and science. Here are a few ideas for giving STEM projects some STEAM:

- **Design.** Art can serve a practical function. Students might apply design and decoration to products that were created during the course of a design challenge. They could use computer graphics to create logos or stylized designs to include in communications or presentations. Through industrial design, students could improve the appearance, design, and usability of a product created during a STEM project.
- **Performing arts, such as drama and speech.** What about technical or persuasive writing? Those arts fit naturally into the "Communications" stage of the engineering design process. They would work well as part of a STEM project. (If you want students to get REALLY ambitious and creative, check out this video of students in Paraguay who made instruments out of discarded materials!)
- **Creative planning.** As students brainstorm solutions for an engineering problem, encourage them to adopt a playful, inventive, artistic approach. Calling on their artistic right brain can help them to generate more creative and innovative thinking.

Just one word of caution, though. Art is often touted as a method of adding creativity to STEM—but keep in mind that engineers are rarely lacking for creativity and ingenuity. Just look at the world around you for proof. The purpose of STEAM should not be so much to teach art but to apply art in real situations. Applied knowledge leads to deeper learning.

All of that is to say: I don't yet have a clear picture of what an ideal STEAM project looks like. In my effort to find some clear examples, I wrote Dr. Howard Gardner to ask him if he had ideas for how to include art in STEM. He responded: "I don't have strong views about whether arts should become a part of STEM or be self-standing. What is important is that every human being deserves to learn about the arts and humanities, just as each person should be cognizant of the sciences."

I don't think anyone could say it better than that. A STEM program is just one part of a child's education, focusing on math and science. But our children need a well-rounded, quality education that enables them to make informed decisions that will impact the world and the way they live.
We need students who are motivated and competent in bringing forth solutions to tomorrow's problems. When push comes to shove, it's not STEM vs. STEAM—it's about making every student a fully-literate 21st-century citizen.

Anne Jolly (@ajollygal) is a Virtual Community Organizer for the CTQ Collaboratory and a member of the CTQ Thought Leaders Circle. Anne taught middle school science for 16 years in the Mobile County Public School System and is a former Alabama State Teacher of the Year. She is a published author and currently writes middle school STEM curriculum. Anne blogs regularly at STEM by Design on MiddleWeb.

Julie Droller
Director of Elementary Education

Telephone: 203-341-1213
Email: jdroller@westport.k12.ct.us

TO: Elliott Landon

FROM: Julie Droller

SUBJECT: Vision for Science Teaching and Learning, K-5:
- STEM, Science Coaches, and Instructional Space
- Makerspaces in the Elementary Schools

DATE: November 23, 2015

With the recent adaption of the Next Generation Science Standards (NGSS) by the Connecticut State Department of Education, we are excited about the opportunities to reimagine science teaching and learning in our elementary schools. With engineering, problem-solving, analytical thinking and communicating at the foreground of the new standards,

The NGSS differ from the previous science standards in several ways:
- From "learning about" to "figuring out"
- Students use 3 "dimensions" of science together to integrate and learn:
    - Science and Engineering Practices
    - Core Disciplinary Ideas
    - Crosscutting Concepts
- Students "practice" science like scientists do, in authentic ways
- Inclusion of Engineering Design in Grades K-12
- Students construct evidence-based explanations of real-world phenomena

This is a dramatic shift in the expectations for student learning, the science instruction, and assessment methods. The NGSS require students to learn by *doing*; to develop and use models, analyze and interpret data, design solutions to real-world problems, engage in argument from evidence, and communicate information. Mathematics, language arts and engineering design are integrated within science. This complex learning requires collaboration so that ideas can be solicited from multiple perspectives, creativity, critical thinking, and perseverance - the outcomes that align with our W2025 mission.

In order to achieve these outcomes, teaching will look significantly different than it does now - in terms of the instructional approach as well as an environment where hands-on, student-centered learning can flourish. This year, we created a science laboratory at CES - a dedicated classroom for students to engage in hand-on, inquiry based learning, facilitated by our .5 Science Coach, Peter Alfano.

Mr. Alfano introduced the lab to all students in grades K-5, but focused his work with 4th and 5th grade teachers and students. Mr. Alfano was able to provide professional development in science content to teachers, while modeling best practices in science instruction. He showed how to make challenging, abstract concepts more concrete for students, how to monitor and assess student understanding, and how to challenge and engage all learners.

To provide the highest quality science instruction for all students and prepare for the implementation of the Next Generation Science Standards, a full time Science Coach and dedicated science lab is essential at each elementary school. NGSS demands an investment in high quality professional development and subject area specialists who can design curriculum that incorporates meaningful STEM learning.

Dedicated science laboratories would allow us to create mini-maker spaces in each school, with ample storage to allow students to engage in an iterative process and continue making over time, in a safe and properly equipped environment. Science Coaches, with content area expertise, would design units that incorporated engineering and making as part of the learning.

Coaches could offer more diverse learning opportunities through differentiated instruction. They could provide engaging, real-world challenges for gifted students to motivate and engage them, as well as build teamwork and communication skills. Not only could the coaches extend the science and engineering content for gifted students, but they could also teach them to use materials and tools in the mini-maker space, and supervise students' exploration and making.

Westport has always been a leader in cutting edge science instruction. In order to prepare our students to be informed citizens who can understand and can design solutions to complex STEM-related issues, and make the shift to the Next Generation Science Standards, Science Coaches and learning environments that foster inquiry and hands-on learning are absolutely essential.

Science Coaches and Instructional Space: A Vision for K-5 STEM Education

A Presentation to the Board of Education
November 23, 2015

2015 - 2016 Pilot: Coleytown Elementary School

Julie Droller, Janna Sirowich, and Peter Alfano

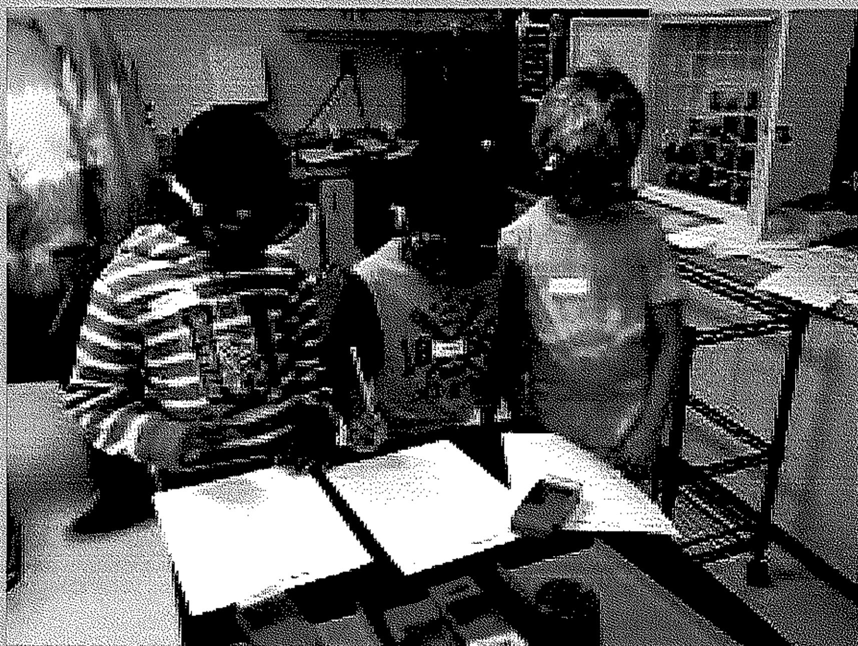
Strengths:

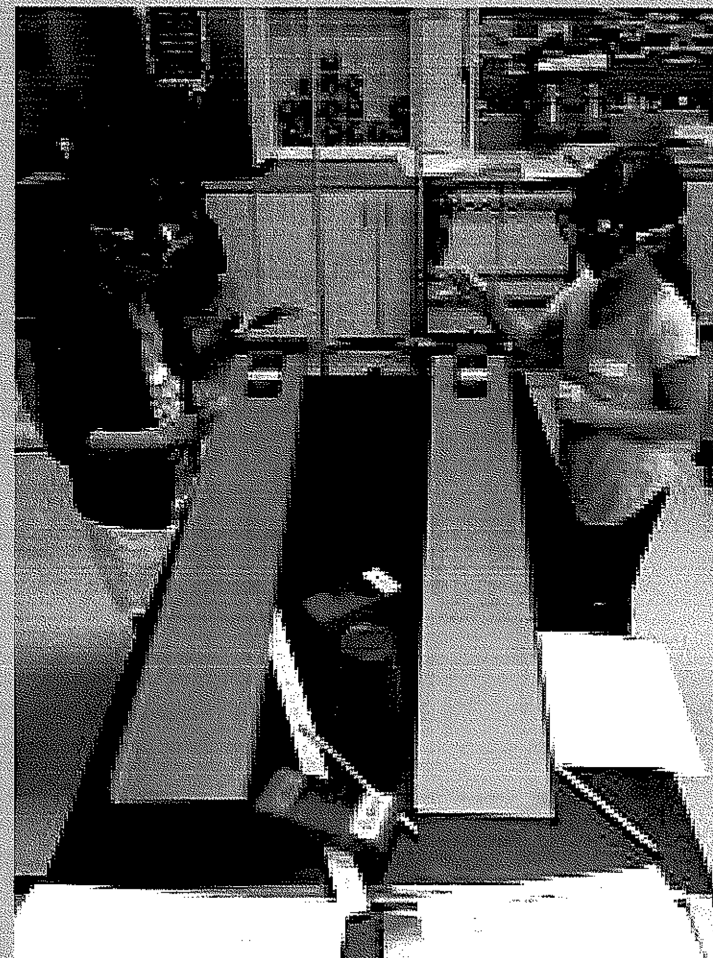
- **Subject area certified**
- **Modeling of best teaching practices**
- **Builds science literacy**
- **In-house resource for materials, equipment, latest teaching strategies and methods, professional development**
- **Exposure to laboratory environment and decorum at an earlier age.**
- **Allows for differentiated instruction**
- **Smooth transition from 5th to 6th grade science**
- **Promotes higher order thinking, problem solving, innovation, collaboration regarding science concepts and inquiry**
- **Can integrate STEM/STEAM opportunities into existing curriculum.**

Scientific Literacy:

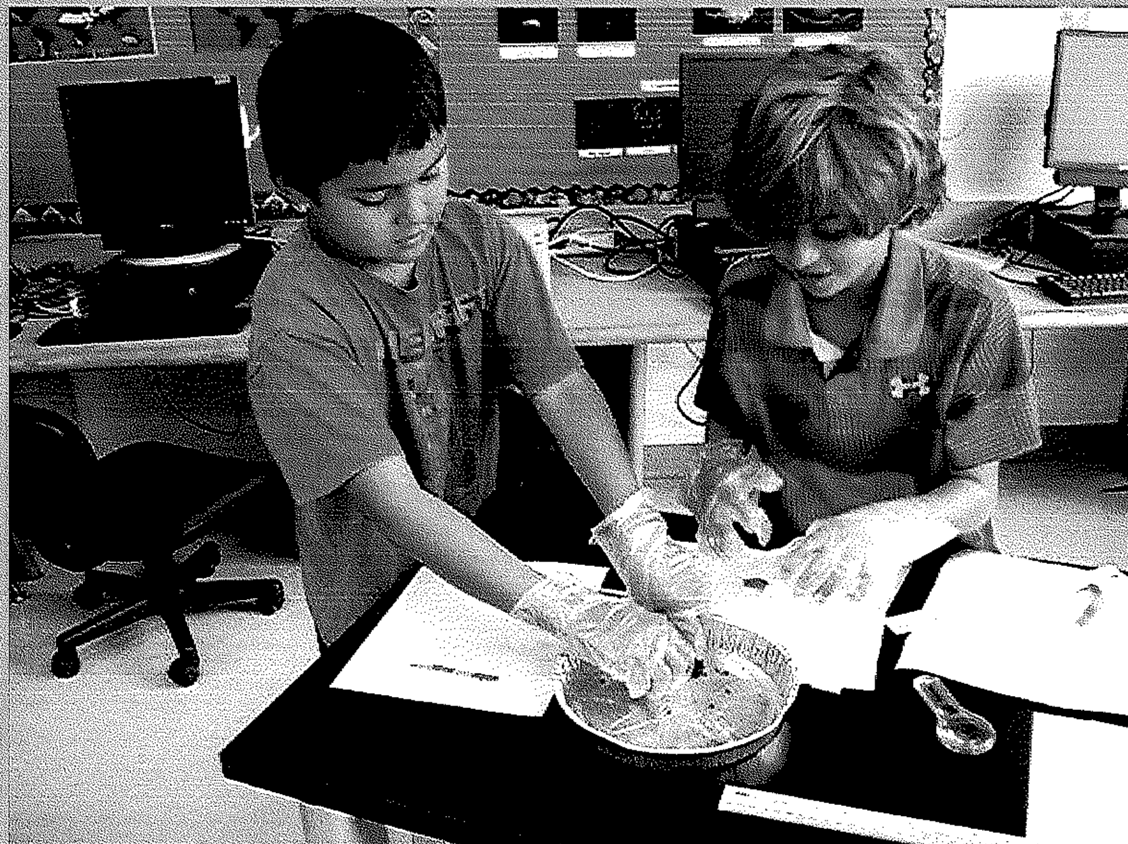
Scientific literacy is the knowledge and understanding of scientific concepts and processes required for personal decision making, participation in civic and cultural affairs, and economic productivity. It also includes specific types of abilities. In the National Science Education Standards, the content standards define scientific literacy.

Scientific literacy means that a person can ask, find, or determine answers to questions derived from curiosity about everyday experiences. It means that a person has the ability to describe, explain, and predict natural phenomena. Scientific literacy entails being able to read with understanding articles about science in the popular press and to engage in social conversation about the validity of the conclusions. Scientific literacy implies that a person can identify scientific issues underlying national and local decisions and express positions that are scientifically and technologically informed. A literate citizen should be able to evaluate the quality of scientific information on the basis of its source and the methods used to generate it. Scientific literacy also implies the capacity to pose and evaluate arguments based on evidence and to apply conclusions from such arguments appropriately. (National Science Education Standards, page 22)

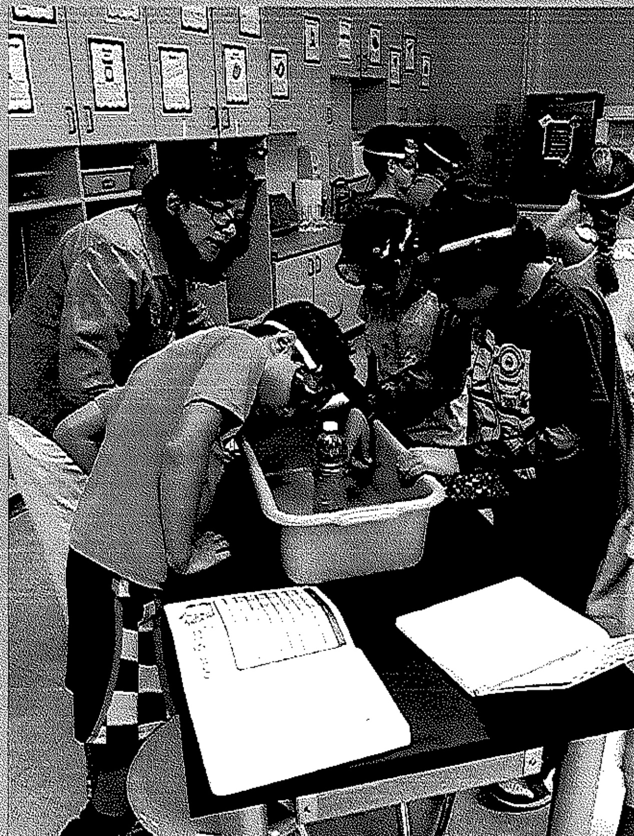


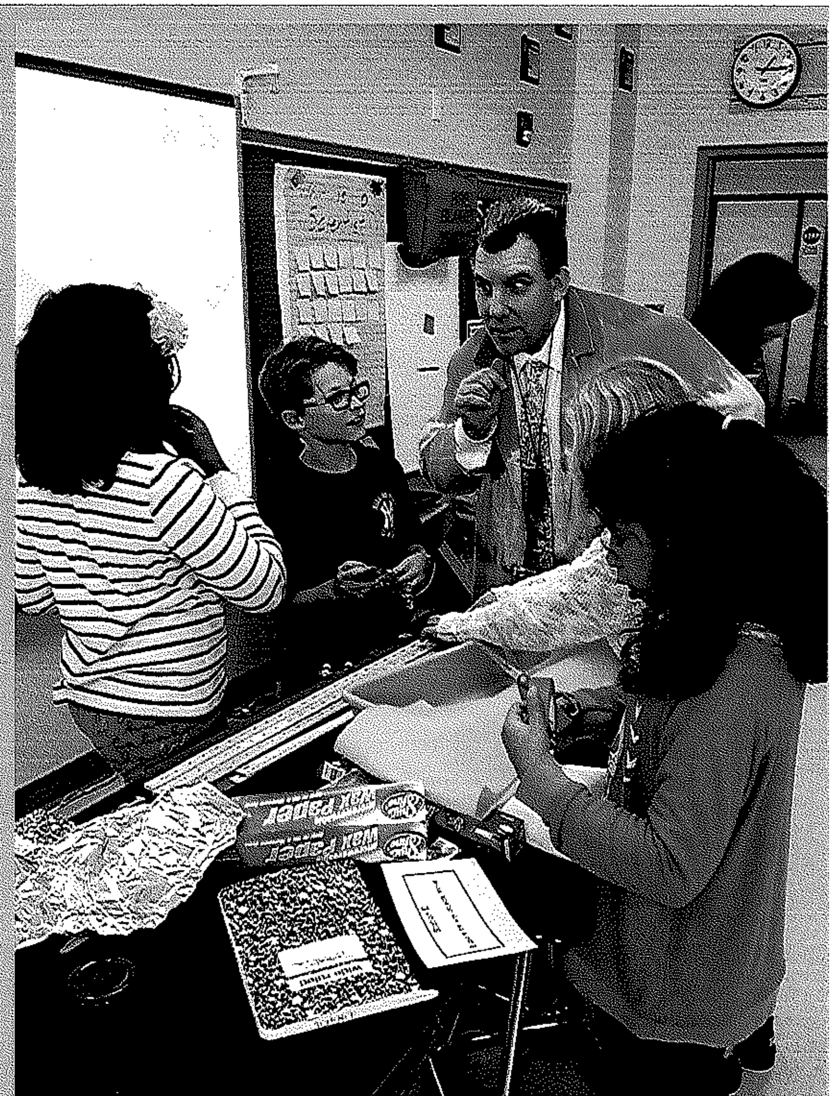


Second Grade Science Lab

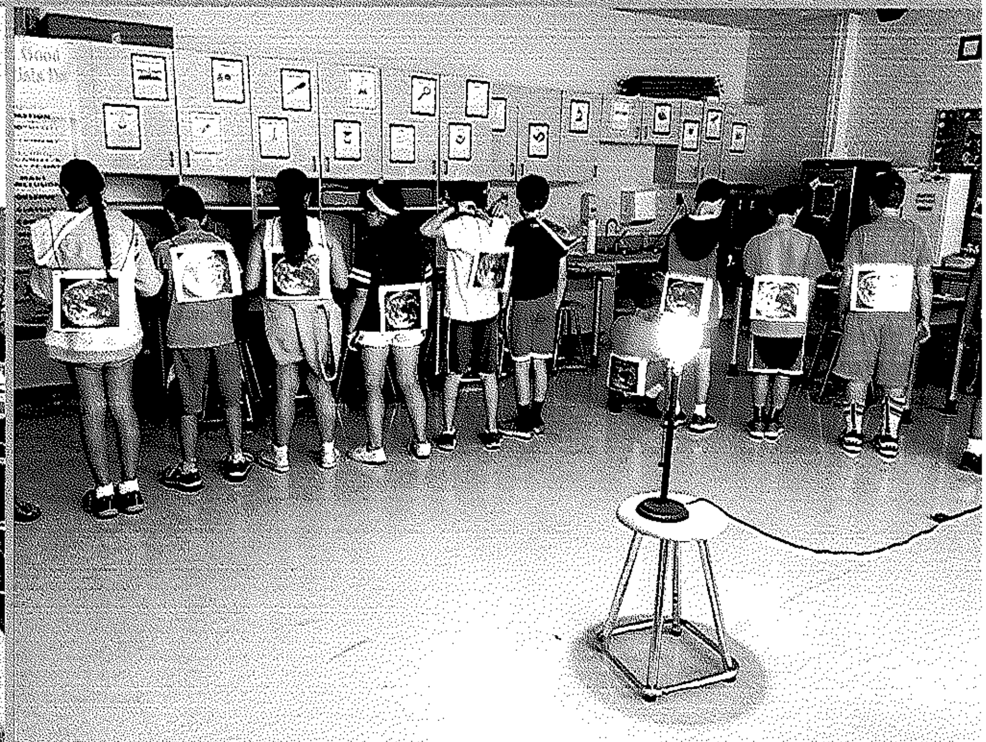


Third grade exploration





Fourth Grade



Fifth Grade-Phases of the Moon

Challenges:

- **Planning time among grade levels with respect to content, lessons, reflection (coaching cycle)**
- **Ability to schedule and work with all grade levels**
- **Ability to work with other elementary schools**
- **Laboratory use schedule**
- **Constraints of laboratory space**
- **Planning of professional development**

Ideas for next year:

- **K-5 integration**
- **Next Generation Science Standards**
- **Professional Development**
- **Differentiation - Maker Space**

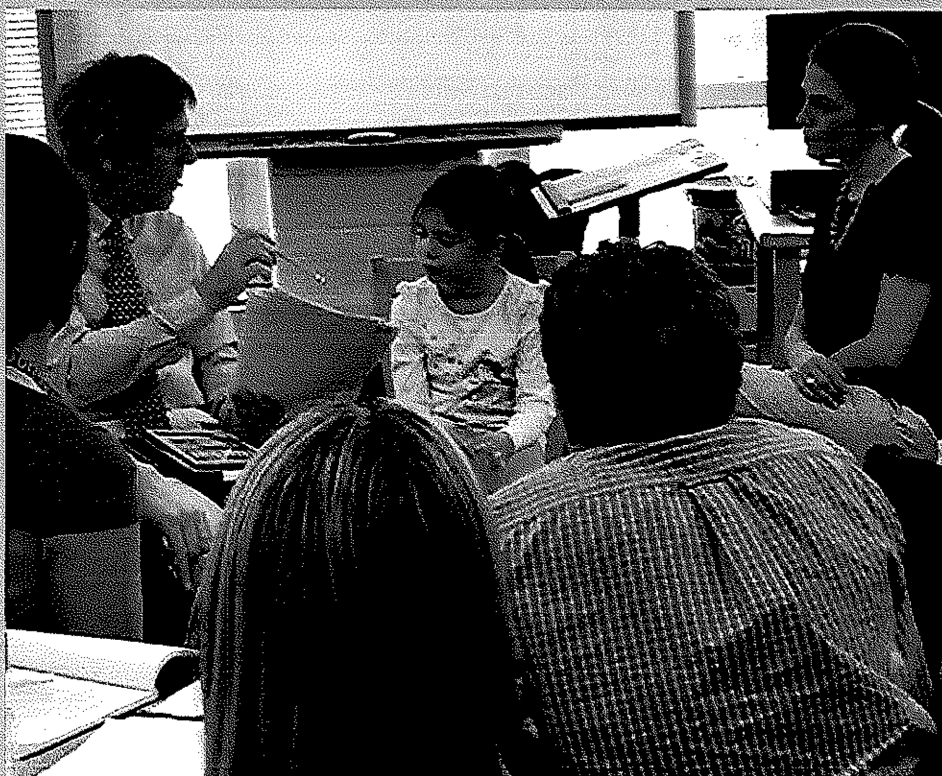
Maker Spaces at the Elementary Schools

Julie Droller and Natalie Carrignan

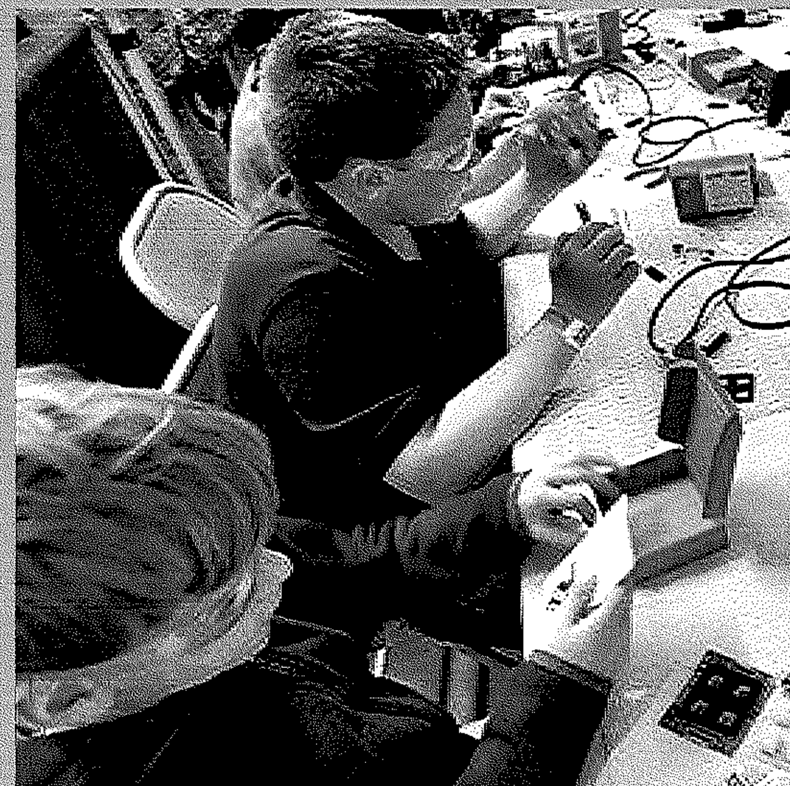
Why Makerspaces?

- **Complement Westport Public Library initiative**
- **Allow more opportunity for younger students time to participate in a maker environment**
- **Complements STEM initiatives**
- **Embed design and iteration into science instruction**

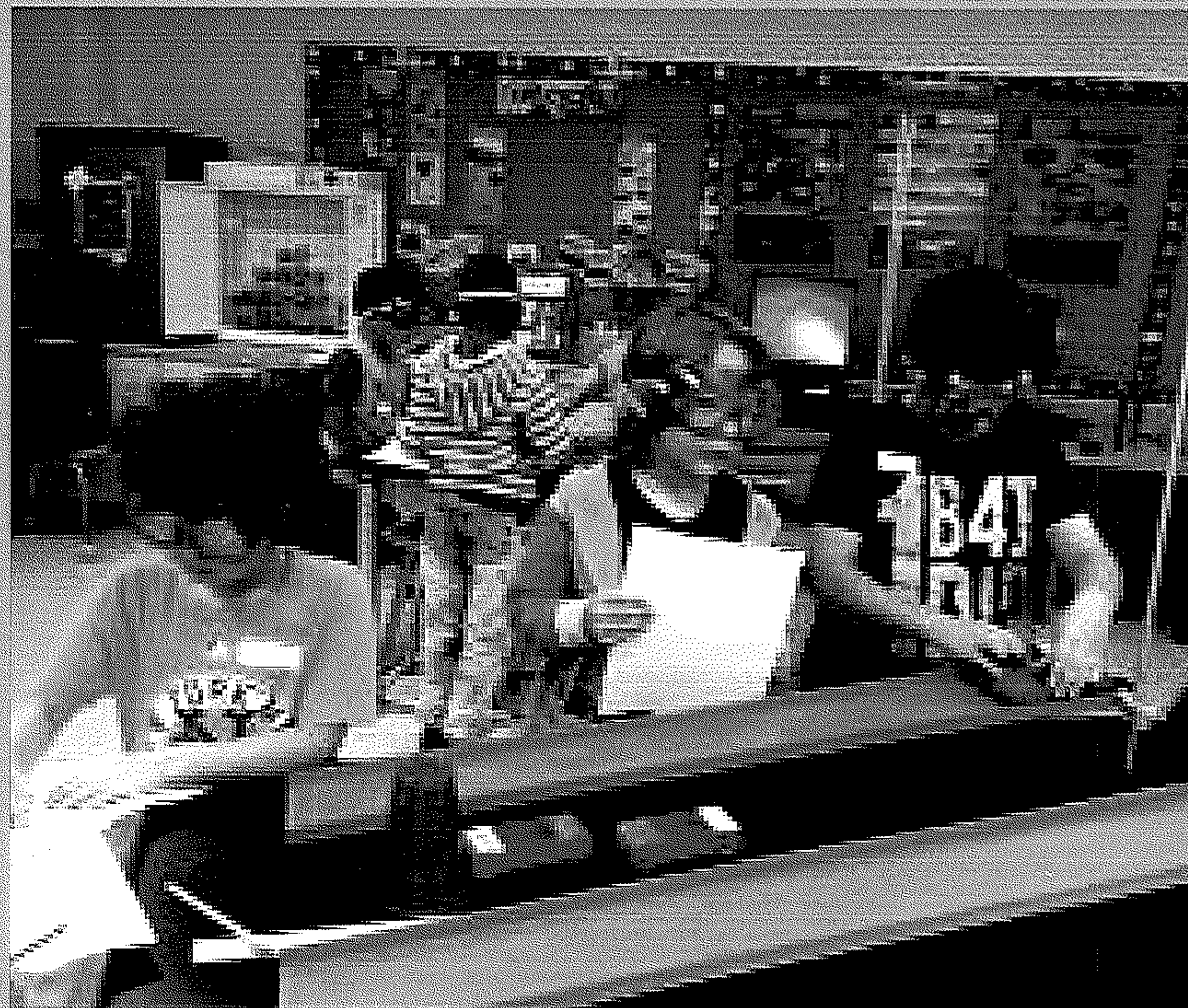
Where do we put them?



Our solution . . .



Makerspaces in our Science Labs

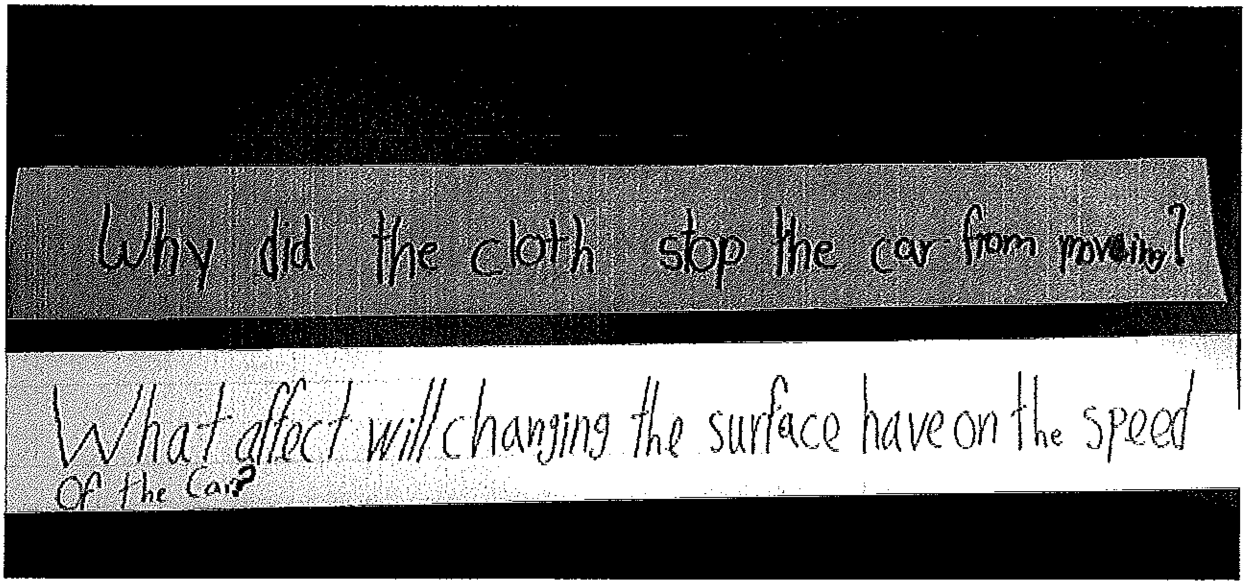


Our Vision for K-5 STEM Education in Westport:

In each elementary school:

- **Full-time Science Coach**
- **Dedicated Science Lab**
- **Makerspaces in each Lab**
- **Curriculum aligned to Next Generation Science Standards**
- **Motivation, engagement, joy!**

Enclosed are student work samples that take you through a 4th grade inquiry on forces and motion from start to finish. The final challenge activity is what students are currently working on. As you can see, it requires authentic problem-solving, perseverance, collaboration, out of the box thinking and application by the students. (Of significance is that some of these samples are from students with special needs.)



Turning "I wonder" questions into investigable questions.

Making hypotheses.

Write your Hypothesis; an educated guess as to what you think will happen.

Write the hypothesis in the form of "If.....then."

- If (variable) then (measurement)

Example: If salt water and fresh water are used with paper towels, then the paper towels will absorb a larger volume of fresh water.

If we [illegible]
car, then [illegible]
will [illegible]

/ite your Hypothesis; an educated guess as to what you think will happen.

/rite the hypothesis in the form of "If.....then."

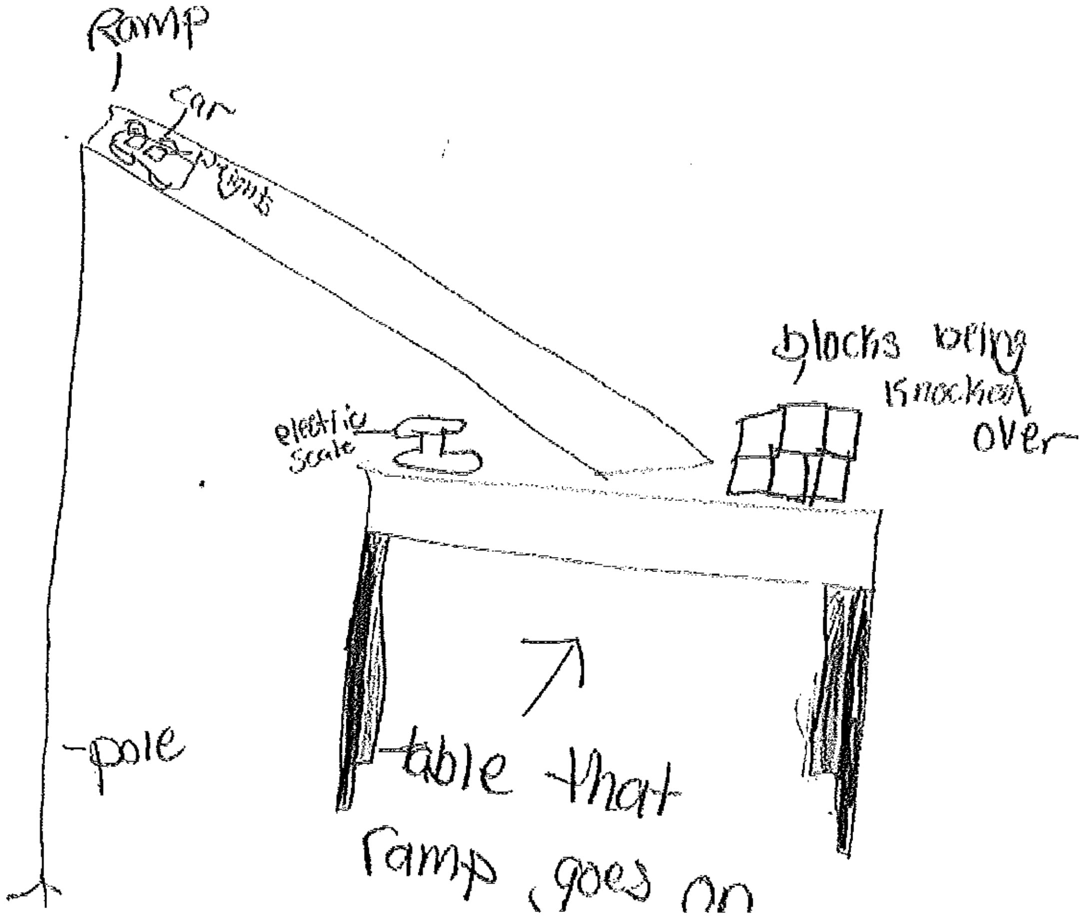
- If (variable) then (measurement)

Example: If salt water and fresh water are used with paper towels, then the paper towels will absorb a larger volume of fresh water.

If the surface is rough and bumpy, then the speed of the car is slower. If the surface is smooth the speed of the car will be faster, because a smooth surface causes less friction which increases the speed, and a bumpy or rough surface makes more friction which decreases the speed.

Designing experimental set-up

5. Draw a picture of what your experiment will look like. Be sure to label the equipment in your drawing.



Group analysis of data and share out

How does the surface effect the distance the car travels?

1. I wonder why the sandpa[per] Went so fast.
2. We notice that ramp went almost the same distance as the wax paper.
3. We notice that the felt did not go very far.
4. We notice that the smooth surfaces are going farther tha[n] the rough surfaces.
5. We think it is weird that the santpaper went so far.

What affect will changing the surface have on the speed of the car?

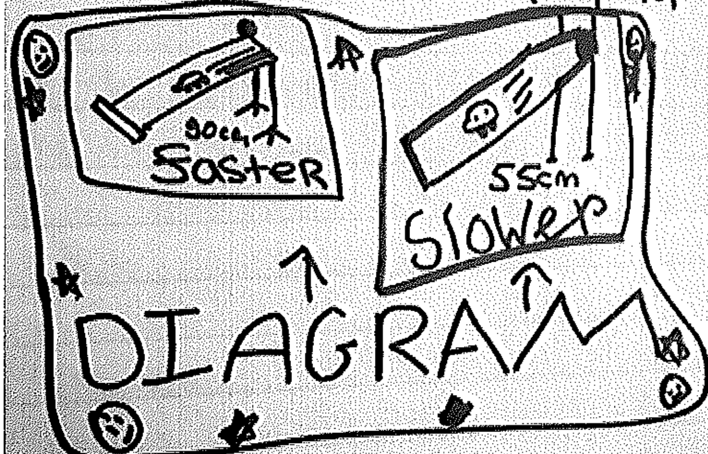
- The rough surfaces slowed down the cars but sometime it's the other way around.
- When there are no surfaces, the car goes fast.
- I noticed that [illegible] sandpaper than wood
- I noticed that the smooter the surface the faster the car.
-

I notice that...
On the surfaces with less friction the car wen farther.

I notice that...
On the surfaces with more friction [redacted] the car didn't go as far as the surface with less friction.

It does not matter on the leath of the car, it matters about the firoe or push you give it.

The higher the Ramp, the Saster the car [redacted] goes (it=car)
The lower the ramp is, slower the car [redacted] will go.



Individual responses

Admit One

What I learned about how and why an object moves the way it does from my experiment or my classmates experiments is....

I learnd that different surfaces can change the distence a car goes for exqple the car went 226 cm on the felt but the car went 353 cm on the tin foil. I would like to investagate ithes cars speed/time on different surfaces in the future.

I think if I repeated this experim

Admit One

I would get the same results. I think force, motion and friction were included in this experiment.

Admit One

What I learned about how and why an object moves the way it does from my experiment or my classmates experiments is....

I learned from my experement that the more weight that you put in a object the faster it goes. The one thing that didn't make sense to me was sometimes more weight slows down the object and That definetly confuses me. I will probably do this at home just to make sure this is still a science experiment with household appliences.

Admit One

Admit One

What I learned about how and why an object moves the way it does from my experiment or my classmates experiments is....

...is that sometimes weighhts do make things go faster on a ramp but sometimes not! for example: 100 got 3.26 meters but 200 got 1.10 meters even though 500 got 3.48 meteers! it makes little sense! well... it could make more sense if there were no obstructions next time

Admit One

Admit One

What I learned about how and why an object moves the way it does from my experiment or my classmates experiments is....

I learned that when different surfaces are placed on a ramp they go different distances for example tin foil went 353 cm and the sandpaper went 527 cm. The more surfaces you put on the less the car will go. The plain ramp goes the farthest. The felt went the least distance out of all five of them.

Admit One

Problem Solving/Application Challenge

Student Activity 3.1

Changing Motion

5

You are to meet the following challenges in any safe way you can. Safe means no one and nothing gets hurt in the process. Here are your challenges:

A. Start a ball rolling on the floor or on a table. Once it's rolling, cause the ball to change speed but not direction.

B. Start a ball rolling on the floor or on a table. Once it's rolling, cause the ball to change direction but not speed.

C. Start a ball rolling on the floor or on a table. Once it's rolling, cause the ball to change both speed and direction. Do this with one action. That means you haven't met the challenge if you change the ball's speed and then start the ball rolling again and this time change its direction.

1. List two ways you changed the speed of the ball without changing its direction.

a. the ball is going to hit the bumpy tin foil at the end of the ramp.

b. We use a tennis ball and put cloth at the end of the ramp.

2. List two ways you changed the direction the ball was moving without changing its speed.

a. rap a ball in tin foil and use a ruler to try to make it change diretion

b.

3. List two ways you changed both the speed and the direction of the ball.

a. use a boncey ball and put some thing at the end of the ramp and it will bounce back slow down and change direction

Student Activity 3.1

Changing Motion

You are to meet the following challenges in any safe way you can. Safe means no one and nothing gets hurt in the process. Here are your challenges:

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C. Start a ball rolling on the floor or on a table. Once it's rolling, cause the ball to change both speed and direction. Do this with one action. That means you haven't met the challenge if you change the ball's speed and then start the ball rolling again and this time change its direction.

1. List two ways you changed the speed of the ball without changing its direction.

a. we could change the speed of the ball by putting tin foil in the middle of the table. we will use the ramp and crunchy tin foil. Lay the ramp flat and then roll it.

b. ________________

O.J

2. List two ways you changed the direction the ball was moving without changing its speed.

a. we could bend the duck tape round on the table. It won't change the speed, it will change the direction.

b. ________________

Beyond the Acronym

STEM education isn't just one thing—it's a range of strategies that help students apply concepts and skills from different disciplines to solve meaningful problems.

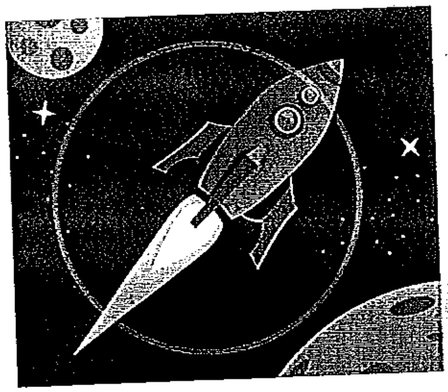
Jo Anne Vasquez

Everywhere you turn, STEM-mania has set in. Most educators are familiar with the acronym, but many have questions: Why is STEM education important? Is it for all students, or just for math- and science-oriented students? Can it improve my teaching? Is this just one more add-on to my already packed curriculum?

Everything Has a Beginning

The concept of STEM—for science, technology, engineering, and mathematics—was introduced in the 1990s by the National Science Foundation. Not long after its introduction, we Americans learned that *The World Is Flat* (Friedman, 2005) and that our students were going to be left behind in the globally competitive marketplace because many other countries were out-STEMming us. Government and private funding began to flow toward all different types of STEM education programs, and today STEM has come to be recognized as a meta-discipline—an integration of formerly separate subjects into a new and coherent field of study.

STEM is not a curriculum (although there are STEM-focused curriculums, such as Engineering Is Elementary and Project Lead the Way). It does not replace state standards, nor is it meant to be a quick fix for our education problems. Rather, STEM education is an approach to learning that removes the traditional barriers separating the four disciplines and integrates them into real-world, rigorous, relevant learning experiences for students (Vasquez, Sneider, & Comer, 2013).



BEATRIZ GASCON J/SHUTTERSTOCK

> Space, you see, is just enormous—just enormous.
> Let's imagine, for purposes of edification and entertainment, that we are about to go on a journey by rocket ship. We won't go terribly far—just to the edge of our own solar system—but we need to get a fix on how big a place space is and what a small part of it we occupy.
> Now the bad news, I'm afraid, is that we won't be home for supper.
>
> —Bill Bryson from *A Short History of Nearly Everything*

From Definition to Practice

Defining STEM is the easy part; implementing STEM education on a large scale is more challenging. Part of the problem is the widespread confusion about what STEM actually looks like in the classroom. (Bybee, 2013).

STEM teaching can take various forms. It doesn't necessarily have to incorporate all four of the STEM disciplines every time, and it's not

> All **STEM learning** has one thing in common—it **gives students opportunities to apply the skills and knowledge** they have learned.

always problem- or project-based. But all STEM learning does have one thing in common—it gives students opportunities to apply the skills and knowledge they have learned or are in the process of learning. Application is at the heart of STEM education. When students ask, "Why do I have to learn this?" a STEM experience provides them with an answer.

Here's one example of a STEM unit (Vasquez, Sneider, & Comer, 2013). A group of 5th grade students are learning about force and motion in science and about data analysis in math. They work in teams to design roller coaster tracks out of cardboard boxes and tubes. As a first step, they use a measuring tape, marbles, masking tape, and several sections of plastic track to learn how a marble moves along the track. They are instructed to measure, in one-second intervals, how the marble accelerates as it rolls down the inclined track. The students plan and conduct the experiment without detailed instructions. Each group compiles its data into a graph, applying the data analysis methods they have studied to choose the appropriate type of graph (for example, bar or line) and what data to use (mean, median, or mode).

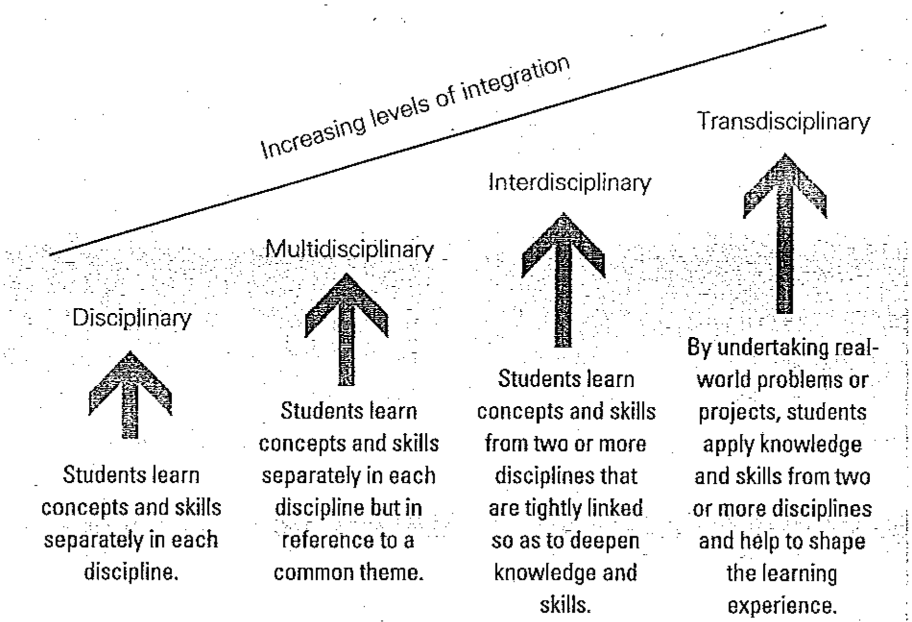
Then the class compiles all the data into one graph that represents the data from all the groups. To do so, they have to debate and decide issues related to the science and math concepts they are learning. For instance, the students see that one group's set of data differs greatly from the others, and on further investigation they learn that the reason is because that group chose a different level of incline for its design. Thus, instead of just being taught the statistical concept of *outliers*, the students gained an authentic understanding of this concept.

During the roller coaster activities, these students are experiencing *transdisciplinary* integration—more commonly referred to as problem-based or project-based learning—which is the most advanced level of STEM teaching and learning. Transdisciplinary integration, grounded in constructivist theory (Fortus, Krajcik, Dershimerb, Marx, & Mamlok-Naamand, 2005), has been shown to improve students' achievement in higher-level cognitive tasks through the application of scientific processes and mathematical problem solving (Satchwell & Loepp, 2002).

Throughout this transdisciplinary experience, the students were applying the new content they had learned in their mathematics (data analysis) and science (force and motion) classes to solve an authentic problem that was of interest to them. They were increasing their communication and collaboration skills as they worked in small groups and then compiled their group results. They were also practicing the engineering design process as they

- defined the problem they needed to solve (to build the roller coaster);
- developed a solution as a group, agreeing on a plan or blueprint; and
- optimized their design (tested whether the roller coaster ramp worked correctly and whether they could collect the data they needed).

FIGURE 1. The Inclined Plane of STEM Integration



Source: From *STEM Lesson Essentials, Grades 3–8: Integrating Science, Technology, Engineering, and Mathematics* (p. 73), by Jo Anne Vasquez, Cary Sneider, and Michael Comer, 2013. New York: Heinemann. Copyright 2013 by authors. Reprinted with permission.

STEM Integration as an Inclined Plane

Transdisciplinary STEM education is the form of integration most often described in the literature because of its relationship to project-based or problem-based learning. It is also the hardest to achieve; it takes careful planning, collaboration, and time to execute within the classroom. But if full transdisciplinary STEM instruction isn't practical (for example, in some middle schools or high schools where subject-area teachers don't have enough common planning opportunities), there are other levels of integration through which teachers can provide STEM experiences for their students.

Think of STEM teaching and learning as an inclined plane that has increasing levels of integration (see fig. 1). At the bottom of this plane sits disciplinary teaching, where students learn the content and skills of the different subjects in separate classes. At the highest point of the inclined plane is transdisciplinary integration. As we move up the plane from disciplinary to transdisciplinary, there are two other approaches to organizing the STEM curriculum—*multidisciplinary* and *interdisciplinary*.

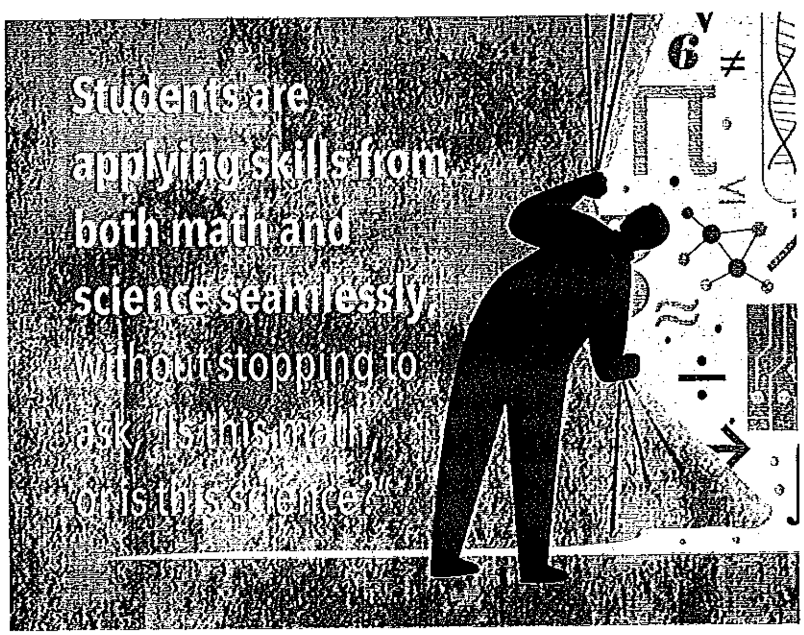
When students ask, "Why do I have to learn this?" a **STEM experience provides** them with **an answer.**

Multidisciplinary Integration

Multidisciplinary, or thematic, integration means teaching concepts and skills in separate courses, but linking the content through a common theme. For example, suppose a group of teachers decide to integrate the theme of "structures" into their classes. The science teacher has students study the properties of rocks and compare building materials, such as limestone or marble. In English class, the students write a paper after interviewing construction companies in their community to learn about the process of building a new structure. In history or social studies, they explore the importance of historical structures like the Parthenon and the U.S. Capitol. And in mathematics, they conduct a cost analysis for the construction of some of these historic buildings, researching what the labor, materials, and so on might have cost when they were built and comparing those total costs to what the construction would cost today.

From Multidisciplinary to Interdisciplinary

As we progress on the STEM inclined plane, we move to an interdisciplinary STEM approach in which teachers actually organize the curriculum around common learning across disciplines. Here, the disciplinary concepts and skills become interconnected and interdependent, and the lines between the disciplines become more blurred.



For example, a group of high school students decide they want to revegetate an area of their community that was destroyed by a wildfire. The students make this suggestion to their science teacher, who meets with the mathematics teachers to plan how both of these disciplines can contribute to the content and skills the students will need. Together, the teachers decide that in science class, students will run transect lines to gather data on the types, amount, and geographical distribution of plants in a surrounding area that was not burned in the fire. In math class, they will analyze the data and provide the plot points for the type and number of new plants that should be introduced into the burned-out area.

By gathering and analyzing the mathematical patterns of plant distribution, the students are able to create a viable plan to restore the ecosystem that was lost. In other words, they worked together to create a mathematical model to solve a scientific problem. The students are applying skills from both math and science seamlessly, without stopping to ask, "Is this math, or is this science?"

Moving Up the Plane

Both multidisciplinary and interdisciplinary STEM instruction are worth doing; compared with traditional instruction, these approaches offer increased relevance and rigor. But we don't need to stop there—it's often a small step from these approaches to transdisciplinary STEM learning.

The middle school students' multidisciplinary study of water conservation, for example, could culminate with a transdisciplinary experience in which students see how much water the school can conserve in one week. They might use mathematics skills to calculate the baseline amount of water per student that the school uses for landscaping and in the cafeteria, science skills to design water catchment areas on their school grounds, and language arts skills to write up their findings. In social studies, they might research what groups would be receptive audiences for their findings, such as the local water agency, school administrators, groundskeepers, and other students. This transdisciplinary STEM experience would be both relevant to the students and beneficial to the community (Curtis, 2002).

To move the high school students' revegetation learning experience from interdisciplinary to transdisciplinary, the students would use the data and information they gathered to actually carry out the revegetation project. In addition to applying their science and mathematics learning, they would develop many other content and skill areas as they planned the steps needed to accomplish the task, wrote to local nurseries to ask them to donate plants, got community members involved, raised the funds needed, and so on.

Creating STEM Experiences

Planning authentic STEM experiences, at whatever level, must start with the outcomes we desire for students. At the heart of STEM teaching are the following questions:

- What should the students know and be able to do? What are the enduring understandings they will gain through these STEM experiences?
- How will I know whether my students have achieved the desired results? What evidence of student understanding will I need?
- What prior knowledge and skills will the students need to perform effectively if they are to achieve the desired results?
- What level of integration will be the most effective to accomplish the learning goals?
- How will lessons be sequenced? What resources and materials will students need to accomplish the learning goals?

Developing integrated STEM experiences is not a linear process. It takes collaboration and preparation. If you haven't taught this way before, it will stretch you as a professional. If you are a middle school or high school teacher, you'll need to think of your content area in the context of other content areas. If you are an elementary school teacher, you'll need to break down those content silos—for instance, showing students the relevance of the persuasive writing they're learning in English lessons by applying it to a science topic they have researched, such as, "Should the buffalo at the bottom of the Grand Canyon be relocated?"

The benefits are worth it, though. Most teachers have experienced the feeling of, "I thought I taught it. I know I taught it. But then I figured out they really didn't get it!" In STEM education, students show you whether they really "got it" as they apply and connect their learning to new situations. This application of the disciplinary concepts and skills is the real power of an integrated approach.

It's OK to go slowly at first. Don't feel that you need to embrace STEMmania too quickly. But when you do, you may wonder, "Why haven't I been teaching this way all along?" EL

STEM Is Everywhere

Pick up a pen and take a close look at it. Do you think this is a piece of technology? If you're like most people, you probably answered no. We tend to think of technology as just things we plug in; in fact, however, technology is anything that is made by humans and used to solve a problem.

The pen certainly solves a lot of problems, and it's very convenient. Let's look at this pen a bit closer. Are there different parts that make up the pen? How many would you get if you took it apart? What happens if you touch the point of the pen to your tongue? Do you think that ink would harm you? (It would not, because this ink was developed and tested by biochemists who made certain the ink was not toxic.)

The physical properties of your pen (hardness, durability, and mass) and the way the parts function together result from the calculations of mathematicians and the design choices of engineers who worked in interdisciplinary teams to develop it. The humble pen in your hand is an excellent example of technology based on science, engineering, and mathematics.

Author's note: Examples used are from Science Foundation Arizona's Helios STEM Pilot Schools funded by Helios Education Foundation.

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Jo Anne Vasquez (jvasquez@helios.org) is vice president of Educational Practices for Helios Education Foundation in Arizona and Florida (www.helios.org). She is the coauthor, with Carey Sneider and Michael Comer, of *STEM Lesson Essentials, Grades 3–8: Integrating Science, Technology, Engineering, and Mathematics* (Heinemann, 2013).

In Step with the New Science Standards

Jeff C. Marshall

Whether your state has adopted the Next Generation Science Standards or will soon revise its own science standards, one thing is clear: Change is underway—in what is learned, in how we teach, and in how we assess. This is more of a revolution than just another iteration of the same old stuff. It's a dramatic shift in the expectations that we have for all students. Let's look at five ways that the new science standards will influence teaching and learning and five recommendations that can help ensure success as you begin your journey.

The Next Generation Science Standards can transform how teaching and learning unfold in the classroom. Here's what they look like—and how you can get started.

What to Expect from the New Standards

① ***The standards provide opportunity.*** Teachers typically vary in their acceptance of standards, with some teachers seeing them as an obstacle that gets in the way of success and others viewing them as a foundation that guides instruction and learning. I suggest that we look at the new standards in a positive light—as an opportunity to challenge learners through authentic, meaningful learning contexts. We can debate whether there are too many standards or take issue with specific ones, but all in all, the new standards afford an opportunity to make learning relevant, challenging, and meaningful for all students. This shift from lesser to greater meaning is inherent in the basic architecture of the standards, which are referred to as *performance expectations.*

To succeed with the standards, schools and districts must shift from a predominant focus on lower-order thinking to one that makes higher-order thinking the norm. Many of the former state standards that were awarded high marks from the Fordham Institute's evaluation of science standards (Gross et al., 2005) placed great value on such skills as *listing*, *recalling*, and *defining*; relevance and meaning were secondary to the learning, if they were present at all.

The Next Generation Science Standards require students to engage in *doing* science by modeling, analyzing, and designing. These actions, by their very nature, encourage relevance, creativity, critical thinking, and meaning. (See fig. 1 on p. 18 for a comparison between the new middle school performance expectations and one state's previous science standards.) This new framework necessitates that we think differently about how teaching and learning transpire.

FIGURE 1. Comparison of NGSS Performance Expectations and Previous State Science Standards for Middle Grades

Discipline	NGSS Performance Expectation	2005 South Carolina Science Standards
Life Science	MS-LS1-5. Construct a scientific explanation based on evidence for how environmental and genetic factors influence the growth of organisms.	7-2.7. Distinguish between inherited traits and those acquired from environmental factors.
Physical Science	MS-PS3-5. Construct, use, and present arguments to support the claim that when the kinetic energy of an object changes, energy is transferred to or from the object.	6-5.1. Explain how energy can be transformed from one form to another in accordance with the Law of Conservation of Energy.
Earth/Space Science	MS-ESS2-6. Develop and use a model to describe how unequal heating and rotation of the Earth cause patterns of atmospheric and oceanic circulation that determine regional climates.	6-4.8. Explain how solar energy affects Earth's atmosphere and surface (land and water).

② *Instruction builds toward mastery of performance expectations.*

Former state and national science standards typically were crafted with a one-to-one ratio between the standard and the objective, almost as though learning were a checklist to complete. For instance, a previous 3rd grade standard began, "Illustrate the life cycles of seed plants and various animals. . . ." This standard could have been achieved in one class period through direct instruction, with time given for the students to draw their illustrations. This only served to perpetuate the feeling that the standards were prescriptive, limiting, and just something to "cover."

Not so with the new performance expectations, which provide objectives that often will take days to master. Students will need to explore, study, and investigate before they can provide evidence-based claims or model complex concepts and phenomena observed in the natural and designed world.

For example, in 4th grade, before students can "use evidence to construct an explanation relating the speed of an object to the energy of that object" (4-PS3-1), they must first explore, investigate, and collect data regarding an object moving at different speeds. They might begin by exploring the energy associated with a car rolling down an inclined surface; as the incline increases, so will the distance traveled because the potential energy increases.

Likewise, high school students must explore and investigate meiosis and mutations before they can "make and defend a claim based on evidence that inheritable genetic variations may result from (1) new genetic combinations through meiosis, (2) viable errors occurring during replication, and/or (3) mutations caused by environmental factors" (HS-LS3-2). Students might brainstorm various ways that information can be passed from one generation to the next. (These could include diaries, newspapers, movies, and e-mails, as well as DNA.) Once students begin to understand the basic process of how genetic infor mation is passed from one generation to the next, they might discuss how possible variations occur. As they identify one of the mechanisms—for example, random, viable error in the passing of the code—the teacher might introduce supporting example: such as how antibiotic-resistant bacteria evolve. Thus, instruction builds toward mastery of the performance expectations instead of conforming to a checklist of material to cover.

③ *Practices are integrated with concepts.*

In the National Science Education Standards, the former guiding document for most state science standards, inquiry was separated from the content standards (National Research Council, 1996). Instruction often sep rated the "doing of science" from the content of science. For example, mar teachers taught the scientific method as a unit separate from the concepts under study.

This was problematic on two level: First, it taught that science is always conducted in a single linear sequence, which is not true; second, contextual, relevant learning experiences were largely absent in this approach.

The Next Generation Science Standards help remedy this with performance expectations that integrate specific practices with core concepts. For example, the high school expectation, "Plan and conduct an investigation to promote evidence that feedback mechanisms maintain homeostasis" (HS-LS1-3) unites practices (plan and conduct an investigation) with core concepts (mechanisms that maintain homeostasis).

④ ***Strategies are aligned to performance expectations.***

Although the new science standards provide the foundation on which teaching and learning will transpire, the curriculum is left up to the state, district, or school. With the change in expectations and the significant increase in rigor and in the need for higher-order thinking skills, it makes sense to rethink which strategies will promote success for all students.

Inquiry-based instruction provides an equitable strategy for achieving mastery. It's been shown to facilitate greater student achievement relative to the learning of both core concepts and scientific practices (Roth, Marshall, Taylor, Wilson, & Hvidsten, 2014). A five-year study that included more than 10,000 students has shown that students of teachers who focus heavily on inquiry-based instruction significantly outperform similar students in classrooms where the teacher uses more traditional forms of instruction (Marshall & Alston, in press). The exciting part is that these findings hold true for male, female, white, Hispanic, and black students at all ability levels.

Inquiry-based instruction has additional strengths. First, it provides opportunities to more easily differentiate instruction. When students are engaged in the design of an investigation or are asked to model their understanding, creativity flourishes. Because learning is not prescriptive, individual students or small groups of students can take more or less challenging approaches in their investigations.

Second, inquiry-based instruction fosters mastery of more advanced, higher-order thinking skills. With that greater emphasis, the need for group interaction becomes paramount to success. As learning becomes more complex, there's a greater need to gather input from multiple perspectives. Moreover, if the questions are challenging enough, students need ideas and assistance from others to complete the task at hand, which could involve carrying out an investigation, analyzing and interpreting data, and communicating findings.

Finally, inquiry-based instruction addresses student (and teacher) apathy. Around 3rd grade, students frequently begin to disengage from learning (Fried, 2001). They often realize that school is a game to master—and that mastering the game is more important than learning. Thus, *learning* becomes different from *school*. By seeking answers to real-world problems, inquiry-based instruction provides a strategy to reengage those who previously failed to see purpose and meaning in school.

By sandwiching change between slices of the familiar, **teachers can enact incremental changes that can dissipate the anxiety** typically associated with change.

⑤ ***Assessments drive change.***

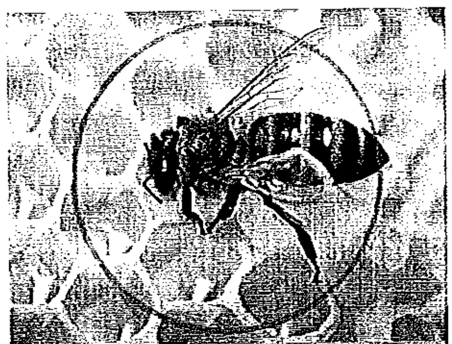
Undoubtedly, high-stakes tests will drive the change. Just as with the Common Core State Standards, the assessments for the Next Generation Science Standards will lag behind implementation. This is beneficial because it gives us time to assemble appropriate professional development opportunities that seek to transform instructional practice, but it's also limiting because we can only approximate the final metrics.

Nevertheless, the new standards provide *assessment boundaries* in many of the performance expectations to help guide the depth of learning. For instance, for the high school life science performance expectation, "Use a model to illustrate the role of cellular division (mitosis) and differentiation in producing and maintaining complex organisms" (HS-LS1-4), the assessment boundary states, "Assessment does not include specific gene control mechanisms or rote memorization of the steps of mitosis." In light of that, an assessment might ask students to create a five- to eight-panel cartoon strip, using 30 words or fewer, to progressively show how a zygote differentiates into a complex organism.

Five Recommendations for Success

① ***Move rocks, not boulders.***
It's best to start small, seeing intended changes through to fruition before tackling more. The Electronic Quality of Inquiry Protocol (EQUIP) rubric provides one example of an instrument that teachers can use to target intentional change (Marshall, Smart, & Horton, 2010). The rubric provides 19 indicators of practices linked to student achievement that teachers can change in the areas of instruction, curriculum, assessment, and discourse in the classroom. Indicators include such items as teacher and student roles, question complexity, communication patterns, the role of assessment, the degree of student reflection, and integration of content and investigation.

The instrument doesn't seek to measure all forms of quality instruction—only those that are inquiry-based. There are four levels of proficiency: *pre-inquiry*, *developing inquiry*, *proficient inquiry*, and *exemplary inquiry*. (The Electronic Quality of Inquiry Protocol rubric is available for download at www.clemson.edu/hehd/departments/education/iim/documents/equip-2009.pdf.)



ANDREY KUZMIN/SHUTTERSTOCK

What it needs is for the air to be made right. If you want a bee to make honey, you do not issue protocols on solar navigation or carbohydrate chemistry, you put him together with other bees...and you do what you can to arrange the general environment around the hive. If the air is right, the science will come in its own season, like pure honey.

–Lewis Thomas from *Lives of a Cell: Notes of a Biology Watcher*

For instance, the *proficient inquiry* expectation for the instructional indicator Order of Instruction states that teachers should provide opportunities for students to explore major concepts (such as forces and motion, inheritance of traits, and chemical reactions) *before* the formal explanation occurs and that students and teachers will be involved in the explanation. To that end, 2nd graders, armed with a magnifying glass, a ruler, and their notebook, might explore the different forms of living matter (plants, insects, birds, and so on) in a field or outdoor classroom and sketch and describe what they found. On returning to class, they could share their findings conjecture why certain things were (weren't present, and begin to explor what other habitats might look like, given different conditions. In this ca students are exploring biodiversity on their own, without first being told about the various habitats and the kinds of living things found in each one.

Although seemingly small, this change takes time and effort. Howev the effect can be enormously benefi to students. As Malcolm Gladwell (2000) points out in *The Tipping Po* small changes can have extraordina effects—when the change is the rigl one.

② ***Offer a peanut butter and jelly sandwich instead of Brussels sprou***
Because people tend to avoid chang and because change can produce anxiety, it's important to introduce gradually. Two approaches will hel scaffolding the change and using th sandwich effect.

Scaffolding change allows for growth while enabling students and teachers to remain within their comfort levels. For instance, breaki an assignment or goal into smaller timed tasks enables students to progress without becoming cogniti overloaded. Instead of giving stude 50 minutes to plan, carry out, and communicate findings concerning a scientific question, you could scaff the experience. Give students eight minutes to develop and present the group's procedure, then three minu to discuss how they'll collect and organize data, and so forth. Note th the emphasis moves away from tell students what to do. Instead, they engage in the work through a serie of guiding scaffolds. Students don't get overwhelmed, and if they do, th only have to wait a minute or two to get teacher support.

By sandwiching change between slices of the familiar, teachers can enact incremental changes while dissipating the anxiety typically associated with change. For example, if students have always completed prescriptive lab experiences in which everything was provided for them, begin with small changes to make the inquiry less prescriptive. If students will be collecting data, give the procedure, but don't include the data table. Instead, let groups wrestle with how to organize the data. Then, as a class, work through how to make sense out of what the students observed or collected.

Students frequently struggle at first and ask what they're supposed to do. This provides a great opportunity to ask them to discuss the kinds of data they'll need to collect and how they'll go about organizing the data. The first time students do this, you can walk through the process with the class as a whole, but over time, groups or individuals should be able to organize data without major teacher support. Thus, you've sandwiched the change (collecting and analyzing data) between the familiar (procedures and questions).

③ ***Muck around, and then make sense.*** In inquiry-based instruction, students need opportunities to explore ideas before the formal explanation occurs. However, this shift in approach takes time, and it should be tackled collaboratively as a school or science department and supported through sustained professional development. We need to acknowledge that most of our preparation as professionals and most of our experiences as students were counter to this new approach. The explain-first paradigm sufficed in a world that sought and valued primarily factual knowledge, but today such knowledge is only a small portion of expected outcomes.

For example, in a life science class in which students are beginning to study the cell, students can view microscope slides or digital images *before* you've told them the names and functions of the organelles. As they draw what they see, formulate questions, and model things that are going on in the cell, they create need-to-know information. Compare this with the more traditional situation in which the teacher tells the students all the parts and functions of the organelles and leaves them to memorize and identify the parts from pictures or slides.

Likewise, in a unit on weather, you could ask students to explore an essential question, such as, How can you predict tomorrow's weather? This sets them on a quest for learning. In contrast, just telling them what's required in terms of instruments and data doesn't give them the opportunity to muck around with books, resources, and equipment to begin solving the question.

The Next Generation Science Standards require students to **engage in doing science by modeling, analyzing, and designing.**

Because this shift in instructional approach takes time to master, teachers and administrative leaders need to carefully prioritize professional development. We already know many essential components of effective professional learning:

- It needs to be sustained over a significant period of time (1–2 years is the target for major instructional transformations).
- It needs to provide modeling and time for practice.
- The administration needs to value it as a priority. This work is not an add-on to everything else; instead, learning is offered *in place of* something else.
- Administrative support needs to be present throughout the professional development.

Sometimes an internal person in the district can facilitate this process without assistance; in other cases, uniting with an external consultant can add credibility and provide guidance in key areas. The time and effort that teachers spend in targeted professional development must become a central focal point because they're essential to achieve this shift.

④ ***Run the marathon instead of the sprint.***
The tendency in our quick-fix society is to seek super-fast solutions—even to problems as complex as learning. But just telling students more facts, having them memorize more information, or assigning more of the same type of problems won't help them excel with the new science standards.

Instead, the goal should be sustained growth over an extended period of time. Teachers should give students data sets to interpret, provide multiple experiences with science content rather than just one, and offer time for students to practice after they have understood the concept—not before. Although our inclination is to make lots of changes all at once, both teachers and students need time to adjust, so it's preferable to scaffold changes, adding one new piece at a time and developing competence before tackling more.

⑤ ***Put the challenges in perspective.***
Challenges often accompany change. However, we can address them by being proactive and intentional.

The first challenge is this: Inquiry-based instruction, which aligns so beautifully with the Next Generation Science Standards performance expectations, isn't the easiest way to instruct. But considering the academic success and personal growth that students experience when they engage in inquiry learning, our goal should be *effectiveness* as opposed to just ease and efficiency.

A second challenge is that classroom management looks different when students are active and engaged (Marshall, 2013). Compliant learners who sit passively in rows will behave differently from active, engaged learners who are exploring and creating. This can be exciting, but it requires forethought in your role as a facilitator of learning.

An excellent way to begin shifting from teacher-as-teller to teacher-as-facilitator entails improving your questioning. Try to move away from fact-based, fill-in-the-blank questioning toward asking more *how* and *why* questions. Consider the way you respond to student comments. Instead of simply affirming the accuracy or inaccuracy of a response, move toward a more conversational style that seeks and values input from everyone in the classroom.

It's a Victory for the Team

The Next Generation Science Standards provide a framework to help teachers and students thrive. And because of their natural alignment with inquiry-based instruction, they offer an equitable approach for achieving mastery.

Effective professional development will be essential to help teachers transition from previous approaches to newer and more relevant forms of instruction and curriculum. However, the success that teachers can experience with all groups of students at all ability levels makes this effort toward transformation worthwhile. EL

Author's Note: The standards quoted in this article are from NGSS Lead States. (2013). *Next Generation Science Standards: For states, by states.* Washington, DC: National Academies Press.

Editor's Note: Coincidentally, two rubrics mentioned in this issue share the same acronym, EQUIP. In Jeff Marshall's article, "In Step with the New Science Standards," the Electronic Quality of Inquiry Protocol (EQUIP) rubric focu on assessing the level of inquiry learn in the classroom. In Jo Ellen Rosemar Mary Koppal's article, "Aligned—Or I the Educators Evaluating the Quality Instructional Products (EQuIP) rubri provides criteria by which to measure alignment and overall quality of materials with respect to the Next Generat Science Standards.

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Jeff C. Marshall (marsha9@clems .edu) is associate professor in scie education at Clemson University a director of the Inquiry in Motion Ins He is the author of *Succeeding wit Inquiry in Science and Math Classr* (ASCD & NSTA, 2013).

ELEMENTRY WORLD LANGUAGE PROGRAM

Julie Droller
Director of Elementary Education

Telephone: 203-341-1213
Email: jdroller@westport.k12.ct.us

TO: ELLIOTT LANDON

FROM: JULIE DROLLER

SUBJECT: ELEMENTARY WORLD LANGUAGE PROGRAM

DATE: NOVEMBER 23, 2015

One of the Board goals, as part of our continuous improvement efforts in curriculum, instruction and assessment, is to enumerate ways in which to strengthen the elementary school world language program. Over the past several years, we have carefully analyzed our FLES program, developed a strategic vision, and determined a three prong approach to continuous improvement.

FLES programs have been associated with specific outcomes that can be attributed to the program design and implementation. Research studies have shown that students do gain expected levels of proficiency in the target language, and gain vocabulary, conversational, and cultural knowledge. Students learn grammar indirectly. FLES programs are expected to improve cross-cultural understanding and prepare students for jobs in the coming decades.

After reviewing our FLES curriculum, instruction, and assessment, we have determined there has been considerable work over the past few years on aligning our curriculum to the American Council on the Teaching of Foreign Languages (ACTFL) standards, as well as the Common Core State Standards (CCSS) for English Language Arts, identifying what students have to know, understand, and be able to demonstrate at the end of each grade.

Changes in the Teacher Evaluation plan have resulted in the creation of student learning outcomes, which have led to reviewing assessment tools and practices, and opportunities for professional development in this area. We have also evaluated our use of best practices for meaningful, engaging instruction with sufficient intensity to motivate students, and determined that this is another area of focus for our professional development efforts.

What is our strategic vision?

- Greater emphasis on oral presentation in the target language; greater emphasis on auditory skills.
- Modifications to instructional strategies, especially focusing on student engagement, self-assessment, and differentiated instruction

- Elementary world language teachers will continually improve their own level of Spanish language proficiency
- Maintain our current instructional time of 90 minutes per week in grades K through 5

3 prong approach to continuous improvement:
- Provide professional development in instructional best practices that focus on student engagement
- Improve teachers' proficiency in Spanish
- Expand and improve use of assessments to monitor student progress and inform instruction

While the structure and outcomes of a FLES program differ from that of an immersion model, we believe that the need for foreign language proficiency is a critical 21st century skill, and like all of our programs, we are always looking critically at our practice and seeking ways of strengthening our program.

WESTPORT PUBLIC SCHOOLS

ELLIOTT LANDON
Superintendent of Schools

110 MYRTLE AVENUE
WESTPORT, CONNECTICUT 06880
TELEPHONE: (203) 341-1010
FAX: (203) 341-1029

To: Members of the Board of Education

From: Elliott Landon

Subject: Funding for Air Conditioning of Coley El Gymnatorium and Cafeteria

Date: November 23, 2015

Pursuant to the decision of the Board at our meeting of November 9, the item of funding for air conditioning for two key areas of the building at Coleytown Elementary School has been placed on the agenda of November 23 for Board consideration.

As noted in previous discussions, this item has appeared on the Board of Education's list of proposed capital expenditures since 2005, a period of 11 years. During that period of time, all our elementary schools have been provided air conditioning for their gymnasiums, auditoriums and cafeterias, thereby leaving Coleytown Elementary School as the only one of our eight schools without air conditioning in these areas.

Should the Board vote to enable the project to get underway so that it may concluded before the warm weather in May and June of 2016, funding for this project will be made through the Board of Education's Capital Expenditure Offset Account and the School Food Service Capital Account, estimated to be in the range of $290,000, thereby negating the need to seek a separate appropriation from the Board of Finance and the Representative Town Meeting.

I recommend that the Board authorize the use of the above-mentioned capital funds for the installation of air conditioning in the Coleytown Elementary School gymnatorium and cafeteria.

ADMINISTRATIVE RECOMMENDATION

Be It Resolved, That upon the recommendation of the Superintendent of Schools, the Board of Education authorizes the Administration to expend no more than $290,000 from the Capital Expenditure Offset Account and the School Food Service Capital Account for the purpose of installing air conditioning in the Coleytown Elementary School gymnatorium and school cafeteria, as soon as may be reasonably possible within the 2015-16 school year.

Elliott

WESTPORT PUBLIC SCHOOLS

ELLIOTT LANDON
Superintendent of Schools

110 MYRTLE AVENUE
WESTPORT, CONNECTICUT 06880
TELEPHONE: (203) 341-1010
FAX: (203) 341-1029

To: Members of the Board of Education

From: Elliott Landon

Subject: Seat Belts on School Buses

Date: November 23, 2015

In light of the recent publicity surrounding the installation of seat belts on school buses; namely, the suggestion by Mark Rosekind, Administrator of the National Highway Traffic Safety Administration (NHTSA) that, "every child on every school bus should have a three-point seat belt" (please see article attached), this is an appropriate time for the Board of Education to decide whether to have 3 three-point seat belts installed on all seats on all school buses utilized to transport Westport children to school.

Three-point seat belts, just like the ones installed on automobiles, are the preferred type of equipment for school buses. In fact, as I have mentioned several times over the past several years when questioned about seat belts, I have stated that I am unequivocally opposed to lap belts for school buses because of the potential for physical damage to students across their torsos resulting from sudden stops and the potential to use the buckle for destructive purposes in one-to-one student interaction.

Currently, we have forty-one (41) school buses in operation under our Dattco contract. Of these buses, 26 can be retrofitted with three-point seat belts.

Of the fifteen (15) school buses remaining, only seven are scheduled for replacement for the upcoming 2016-17 school year. However, that would leave us with eight (8) buses without seat belts. Should the Board of Education decide to install three-point seat belts on the fifteen remaining school buses to ensure that all buses would have seat belts available for student use, there would be an additional cost. We will have an exact cost for the Board of Education in time for our meeting of November 23.

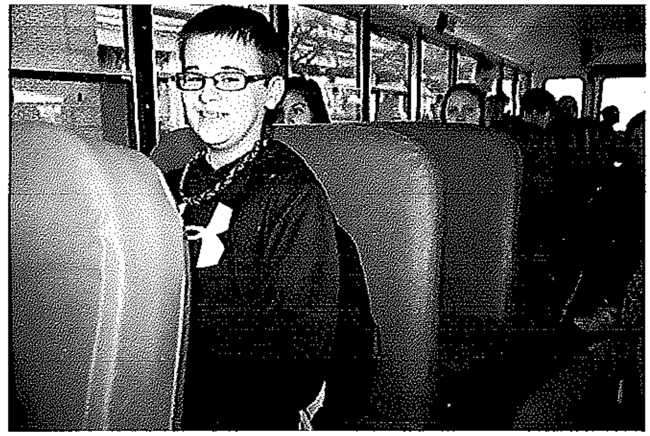
If the Board wishes to pursue this approach, a Resolution can be drafted for Board of Education approval for our meeting of December 7, 2015.

Elliott

NHTSA administrator recommends seat belts on school buses

Posted: Sunday, November 15, 2015 5:20 pm

The National Highway Traffic Safety Administration's new leader Mark Rosekind recently changed directions regarding the agency's recommendations about whether seat belts should be installed on school buses.



CSE 1116 seat belts MAIN.JPG

Floyd T. Binns Middle School sixth-grader Aiden Lusk, 12, boards the bus at his school Thursday afternoon. Culpeper County Public School's general education buses don't have seat belts, but one federal adminsitrator wants to change that.

In statements to the National Association for Pupil Transportation, Rosekind suggested that "every child on every school bus should have a three-point seat belt," securing a combination of a student's lap and shoulder.

"NHTSA has not always spoken with a clear voice on the issue of seat belts on school buses. So let me clear up any ambiguity now. The position of the NHTSA is that seat belts save lives. That is true whether in a passenger car or in a big yellow bus. And saving lives is what we are about," said Rosekind.

Asking himself the rhetorical question, "is this a change in position," to that, Rosekind answered "yes."

"But it is consistent with NHTSA's role as the guardian of safety on America's roads. It is consistent with decades of progress in raising seat belts in the minds from novelty to nuisance to the car doesn't move until I hear that click," shared Rosekind. "Seat belts are icons of safety. And that makes them the single most effective thing we can provide to improve the confidence of parents, policymakers and children. Without seat belts on buses, there is a gaping obvious hole in our safety measures that sparks questions all of us have to answer. School buses should have seat belts. Period. It should be utterly uncontroversial. There is no question that seat belts offer improved safety."

Russell Houck, executive director of student services for Culpeper County Public Schools, said Thursday that, "even if seatbelts were installed at a low cost, ensuring students are properly buckled would also be a challenge with anywhere from 40 to 70 students on a bus.

“Improper buckling can cause injuries in minor mishaps. Having drivers check each child would take considerable time. How would a driver do this on a morning pick-up? It’s not something we could do without backing up traffic even more and causing significantly longer bus rides,” explained Houck. “The most significant threat to students occurs when loading or unloading the bus and impatient drivers who drive around a stopped bus. Slowing down the loading or unloading processes will serve to exacerbate this problem with impatient drivers.”

According to Houck, the school division operates 117 buses, transporting about 5,323 students each day. However, CCPS does have seat belts installed on the certain buses used to transport students with disabilities. Houck added that car seats are also available on the special education buses, if necessary.

Houck said the base cost of a school bus without seat belts runs about $80,000 to $100,000 depending on bus size and other features. According to the “School Transportation News and School Bus Fleet” magazine, the cost to add lap to shoulder belts to newly manufactured buses would cost about $7,000 to $10,000 per bus.

And to retro-fit seat belts on CCPS’s existing buses would run about $20,000 to $23,000 for each bus. Houck explained that the total cost will be a considerable amount estimated at $2.34 million.

“Based on a cost-benefit analysis, having seatbelts on school buses is not advisable,” concluded Houck.

In his recent remarks, Rosekind also mentions that seat belts on school buses isn’t a new issue.

“The data and the arguments have not changed, but my message to you today is that we don’t really need to change the data and arguments. What has to change is all of us,” said Rosekind.

According to the NHTSA’s National Center for Statistics and Analysis, from 2004 to 2013 there were 340,039 fatal motor vehicle traffic crashes and of those, 1,214 or 0.4 percent were school-transportation related.

Del. Ed Scott, R-Madison, said the House Transportation Committee has tackled the issue of seat belts on school buses from time to time.

“Testimony was given, but the issue never moved forward because school buses are already a very safe form of transportation as Mr. Rosekind acknowledges in his remarks,” shared Scott, via email. “It is interesting to me that he says the data has not changed, but he is changing the position of NHTSA. I am willing to be persuaded by data, but skeptical that many states will change their policy based simply on the whim of a Washington administrator.”

Rosekind, who became the NHTSA’s new administrator in January, also promised to launch a series of research projects slated to improve the benefits of seat belts on school buses; NHTSA will continue to talk with safety advocates to determine how NHTSA might overcome the financial barriers in making seat belts universally available and Rosekind will reach out to the governors of each the six states that require seat belts on school buses.

So far, California, Florida, Louisiana, New York, New Jersey and Texas are the only states to require seat belts on school buses.

To clarify, Rosekind added that he's neither announcing any new rules nor prejudging the outcome at this point.

"What I am saying is that NHTSA will use all the tools available in seeking to maximize safety for the nation's school children," said Rosekind. "I won't downplay the challenges of the rulemaking process, including the time involved and the dispassionate cost-benefit requirements imposed upon NHTSA as a safety regulator. But NHTSA will seek every avenue to make sure kids get to and from school safely, every time."

WESTPORT PUBLIC SCHOOLS

ELLIOTT LANDON
Superintendent of Schools

110 MYRTLE AVENUE
WESTPORT, CONNECTICUT 06880
TELEPHONE: (203) 341-1010
FAX: (203) 341-1029

To: Members of the Board of Education

From: Elliott Landon

Subject: Acceptance of Gift

Date: November 23, 2015

We have received a very generous gift of a Steinway and Son Model M Baby Grand Piano, valued at $24,000, for placement at Staples High School. This gift was provided by Fran Tanguay of Westport. The gift includes the sum of $500 to cover the cost of the move of the piano from its present location to Staples.

It is my recommendation that the Board accept this very generous gift with gratitude to Fran Tanguay.

ADMINISTRATIVE RECOMMENDATION

Be It Resolved, That upon the recommendation of the Superintendent of Schools, the Board of Education accepts with great appreciation a gift from Fran Tanguay of Westport of a Steinway and Son Model M Baby Grand Piano, valued at $24,000, for placement at Staples High School.

Elliott

WESTPORT PUBLIC SCHOOLS
FIVE YEAR PROPOSED CAPITAL FORECAST - PRIORITY LISTING
2016-2017 THROUGH 2020-2021

FISCAL YEAR	DESCRIPTION	ESTIMATE	SUB-TOTAL	In Capital (Year)	Priority	Notes
2016-2017						
	Coleytown Elementary School					
	Replace Pitched Asphalt 3-Tab Shingled Roof (1986)	$165,000	$165,000	2011	1	30 Year Roof end of life
	Staples High School					
	Upgrade Boys Gym Locker Room Area (lockers, flooring)	$200,000		2008	2	Damaged lockers, floors & ceiling tiles
	Upgrade Pool General Area and Bleachers (tile, trim, paint, seating)	$500,000		2008	2	Damaged lockers, floors & ceiling tiles
	Upgrade Boys and Girls Pool Locker Room Area (lockers, flooring)	$350,000	$1,050,000	2008	2	Damaged lockers, floors & ceiling tiles
	Coleytown Elementary School					
	Replace Classroom Casework	$200,000	$200,000	2006	3	Casework failing, splitting apart
	Total Fiscal Year 2016-2017		$1,415,000			

FISCAL YEAR	DESCRIPTION	ESTIMATE	SUB-TOTAL	In Capital (Year)	Priority	Notes
2017-2018						
	Staples High School					
	Field House Floor Resurface	$172,312		2005	1	
	Field House Roof Replacement	$610,000	$782,312	2005		Installed on Sept. 18, 1998 Carlisle Roof (Roof A) Moved from 16/17- Do Floor & Roof same time due to FH Closing
	Coleytown Middle,Bedford Middle, Green's Farms School					
	Asphalt Repair and Replacement	$517,000	$517,000	2008	2	Pending Crack and Seal Approval moved from 16/17
	Technology Center (136 Riverside Avenue) Exterior Renovation	$200,000	$200,000		3	Historic District Committee Input required
	Total Fiscal Year 2017-2018		$1,499,312			

FISCAL YEAR	DESCRIPTION	ESTIMATE	SUB-TOTAL	In Capital (Year)	Priority	Notes
2018-2019						
	Staples High School					
	Replace 1998 Roofs (106,000 square feet) Areas C, D, E, F,G, H, I, J,K,L,M,N, P,Q,Z	$1,400,000	$1,400,000	2013	1	End of Life Cycle
	Long Lots Elementary School year					
	Casework Replacement	$670,000	$670,000	2008	2	Casement work failing splitting and falling apart
	Total Fiscal Year 2018-2019		$2,070,000			

FISCAL YEAR	DESCRIPTION	ESTIMATE	SUB-TOTAL	In Capital (Year)	Priority	Notes
2019-2020	**King's Highway Elementary School year** Casework Replacement (lead remediation required)	$600,000	$600,000	2008	1	Pending Space Utilization Report/ Casement work failing
	Total Fiscal Year 2019-2020		$600,000			

FISCAL YEAR	DESCRIPTION	ESTIMATE	SUB-TOTAL	In Capital (Year)	Priority	Notes
2020-2021	Saugatuck Elementary Partial Roof Replacement Sections: 2,8,13,14,16,17,18,19 (Install date March 1995)	$976,700	$976,700	2015	1	End of Life Cycle
	Total Fiscal Year 2020-2021		$976,700			
	FIVE YEAR TOTAL (2016-2017 THROUGH 2020-2021)		$6,561,012			

NOTE:

FISCAL YEAR	DESCRIPTION	ESTIMATE	SUB-TOTAL	In Capital (Year)	Priority	Notes
TBD	**Coleytown Elementary School** Install A/C in Gym and Café	290,000	290,000	Estimated Cost 2015	1	Removed from EPC under review by Facilities per Elio Longo
	Long Lots Elementary School Locker Room to Classroom Conversion (3 closets, 2 showers plus main room to 3 classrooms, 2 common rooms, boys & girls bathroom)	$1,400,000	$1,400,000	2006	2	Pending Space Utilization Report

Medical Health Insurance Fund
FY 15-16 Projections
with Claims Cash Draw Data as of October 31, 2015

	FY16 Projections		
	Mar-15	Sep-15	
Cash receipts			
General Fund Budget from line 210	14,049,493	14,247,493	
Other Fund Contributions	85,000	70,000	
Employee Contributions (Active)	2,672,011	2,607,655	
Flex Spending Accounts	-	-	
Cobra Participants	18,100	18,100	
Retirees under 65	365,701	365,701	
State Teachers Retirement (TRB)	160,000	150,000	
Life Insurance Premiums	25,000	25,000	
Retirees over 65	442,939	442,939	
Other Contributions (FMLA, Retiree Life, etc.)	-	45,000	
Total cash receipts	17,818,244	17,971,888	
Cash disbursements			
Medical	11,914,994	11,394,635	
Prescription	2,112,056	2,106,117	
Dental	1,082,451	1,149,455	
Flex Spending Accounts	-	-	
Contribution to HSA	1,159,000	1,162,000	
Medical Adminsitrative	422,832	420,720	
Network Access Fee	163,981	163,162	
Individual Stop-Loss	772,613	772,613	
Dental Adminsitrative	54,850	54,564	
FSA Administrative	2,931	2,931	
Consulting Fee	45,000	45,000	
ACA Related Fees	89,540	88,792	
PCORI Fee	1,666	4,197	
Retirees over 65	723,435	723,435	
Total cash disbursements	18,545,349	18,087,621	
Change in cash balance	(727,105)	(115,733)	
Beginning cash balance	2,471,243	2,471,243	
Insurance Fund Draw Down (budget)	(500,000)	(500,000)	
Insurance Fund Draw Down (YTD delta)	(227,105)	384,267	
Ending cash balance(deficit)-projection	1,744,138	2,355,510	16.1%
Less: Incurred but not reported claims (carrying FY15)	(952,000)	(952,000)	-6.5%
Net Position(Deficit) end of year-projection	792,138	1,403,510	9.6%

Claims Cash Draw Against Insurance Fund Account

	Medical/Rx	Dental	Flex	Other	Total	Avg. Monthly Claims (Med/Rx/Dental)	Variance	Avg. Monthly Claims-FY 2015 (Med/Rx/Dental)	Variance
Jul 2015	$ 1,069,478	$ 66,973	$ 383	$ 29	$ 1,136,863	$ 1,136,451		$ 1,034,843	
Aug 2015	$ 1,254,174	$ 113,005	$ 8,498	$ -	$ 1,375,677	$ 1,251,815	$ 115,364	$ 1,339,689	$ 304,846
Sept 2015	$ 1,411,824	$ 81,297	$ 5,898		$ 1,499,018	$ 1,332,250	$ 80,435	$ 1,342,380	$ 2,691
Oct 2015	$ 814,214	$ 92,276	$ 4,785		$ 911,274	$ 1,225,810	$ (106,440)	$ 1,193,967	$ (148,413)
	$ 4,549,689	$ 353,551	$ 19,564	$ 29	$ 4,922,832				
YTD/Estimate	33.7%	30.8%	n/a	n/a					
Theoretical YTD Spend Rate	33.3%	33.3%	n/a	n/a					
variance %	0.4%	-2.6%							
variance $	$ 49,888	$ (29,563)							
FY16 Projection (Sep-15):	$ 13,500,752	1,149,455							
YTD Expense:	$ (4,549,689)	$ (353,551)							
Balance available to June 30:	$ 8,951,063	$ 795,904							
Average remaining monthly allowance:	$ 1,118,883 +	$ 99,488 =	$ 1,218,371						