Science, Technology, Engineering and Mathematics

STEM

EL-7: Academic Program

Every Student Future Ready:

- *Prepared for College*
- *Prepared for the Global Workplace*
- *Prepared for Personal Success*

Lake Washington School District

Program Report Organization

- Part I: STEM in the K-12 Academic Program
- Part II: STEM in Career and Technical Education (CTE)

Part I: STEM in the K-12 Academic Program

What is STEM?

OSPI Definition of STEM

- STEM literacy is the ability to identify, apply and integrate concepts from science, technology, engineering, and mathematics to understand complex problems and to innovate to solve them. STEM literacy is achieved when a student is able to apply his or her understanding of how the world works within and across the four interrelated STEM disciplines to improve the social, economic, and environmental conditions of their local and global community.

STEM Teaching and Learning Call for:

- Exploration of STEM and STEM-related professions related to student interest
- Equitable access for all students
- Development of foundational knowledge and skills within and across STEM disciplines
- Public presentation of one's work

What are our current STEM efforts?

STEM: Elementary School

Salmon lesson at Blackwell.

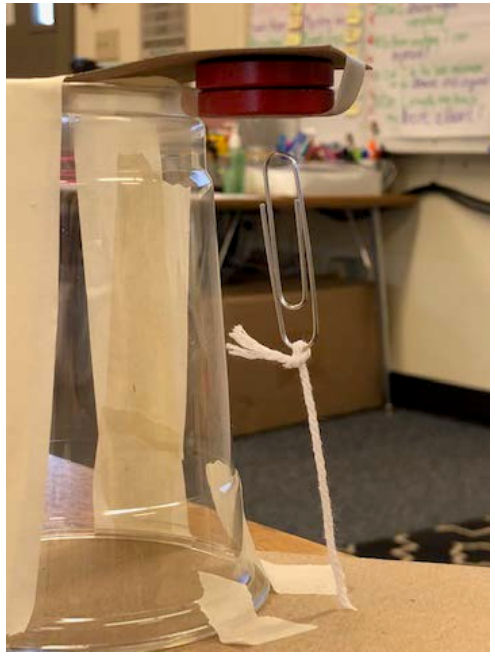
Weekly Time: (Science & Math)	• 10 hours
Core Materials (Science & Math)	• FOSS Science* • enVision MATH
Supporting Resources	• Curriculum Alignment Guides • Proficiency Scales • Common District Summative Assessments • Student Mobile Devices • Technology Skills Continuum (identifies technology skills to integrate across the curriculum)

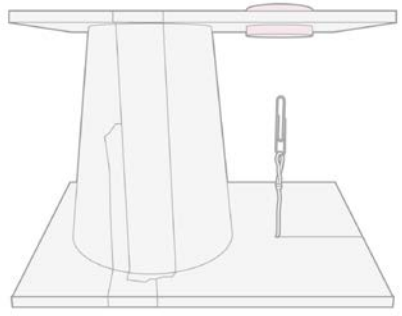
**New program being recommended for adoption in 2019-2020*

K-5 STEM Approach

- New STEM Choice Program at Mead
- Engineering, Technology, and Math are embedded in the recommended science program for adoption in 2019-2020

The mayor has asked us to figure out a scientific explanation for HOW the new floating train works so she can share that information with the citizens of Faraday.





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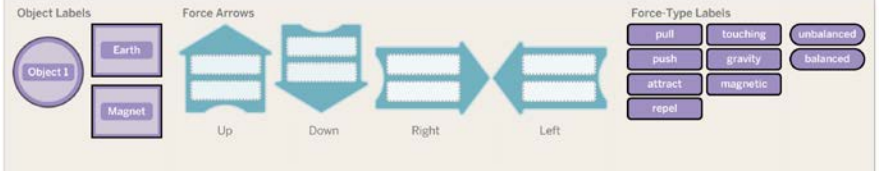


Elementary STEM: Before and After School Programs

Hour of Code at Alcott

Our elementary schools offer before or after school STEM-related clubs and programs

- Science and Math
  - Green Teams, Science & Math Clubs, Math Challenge
- Technology Programs
  - Coding, Scratch Coding, Game Design, , TechVenture
- Engineering Programs
  - Robotics, Electrical Engineering, Lego Engineering

Other K-5 STEM opportunities in our elementary schools

- Hour of Code
- Green Schools Programs
- STEM Family Nights

STEM: Middle School

Science Investigation at Stella Schola

Weekly Time	• 10 hours
Courses	• Integrated Science 6, 7 and 8 • Math 6, 7, and 8, Algebra 1, Geometry • Elective STEM Courses
Core Materials (Science & Math)	• McGraw Hill Integrated iScience Courses 1, 2 and 3 • Glencoe Math Courses 1, 2, 3 • Big Ideas Algebra 1 and Geometry
Supporting Resources	• Curriculum Alignment Guides • Ambitious Science Teaching • Proficiency Scales • Student Mobile Devices • Technology Skills Continuum (identifies technology skills to integrate across the curriculum)

STEM in Middle School Math Curriculum

Students apply math concepts to real-world situations that require STEM skills, such as designing green buildings.

Middle School STEM Electives

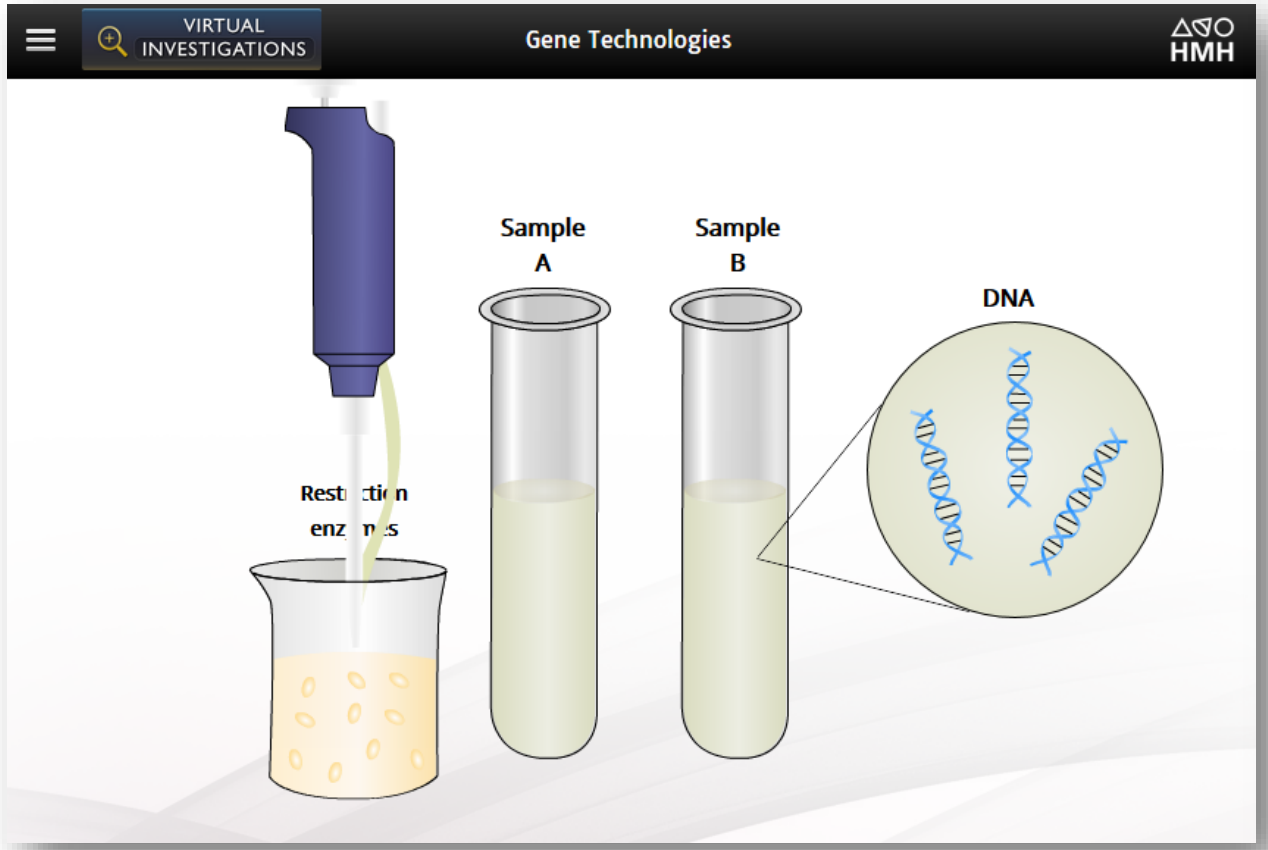
- Computer Literacy
- Technology Foundations
- STEM 1 & 2
- General Technology 1 & 2
- Graphic Arts
- Digital Photography
- Digital Video
- Computer Science for Innovators and Makers1 & 2
- Digital Media
- Design and Modeling 1 & 2
- Robotics 1 & 2
- Video Game Design & Programming
- Survival Science
- Computer Aided Design & Manufacturing

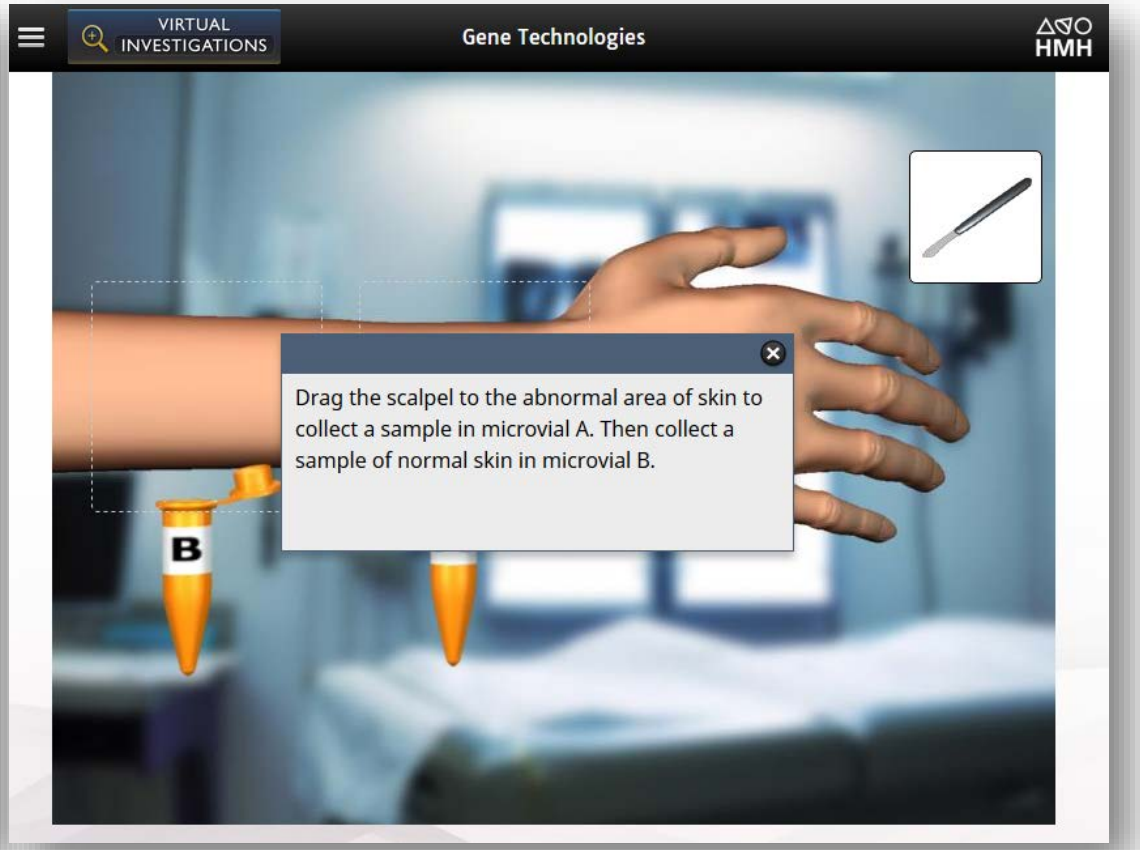
STEM: High School

Biotechnology class at Redmond High School

Courses	• Three years/credits of required coursework in Science • Three years/credits of required coursework in Math • STEM Signature Courses and Programs • CTE STEM Courses • WANIC STEM Courses/Tech Prep • AP courses in STEM offered in grades 10-12
Core Materials (Science and Math)	• Houghton Mifflin Biology (9) • McGraw Hill Chemistry: Matter and Change (10-12) • Pearson Physics (10-12) • Big Ideas Algebra 1, Geometry, Algebra 2 • Cengage Math Analysis, AP Calculus AB & BC (10-12)
Supporting Resources	• Ambitious Science Teaching • Proficiency Scales • Student Mobile Devices • Technology Skills Continuum (identifies technology skills to integrate across the curriculum)

STEM in High School Biology Curriculum





Students have access to real-world laboratory technology and procedures through virtual labs.

High School STEM Electives

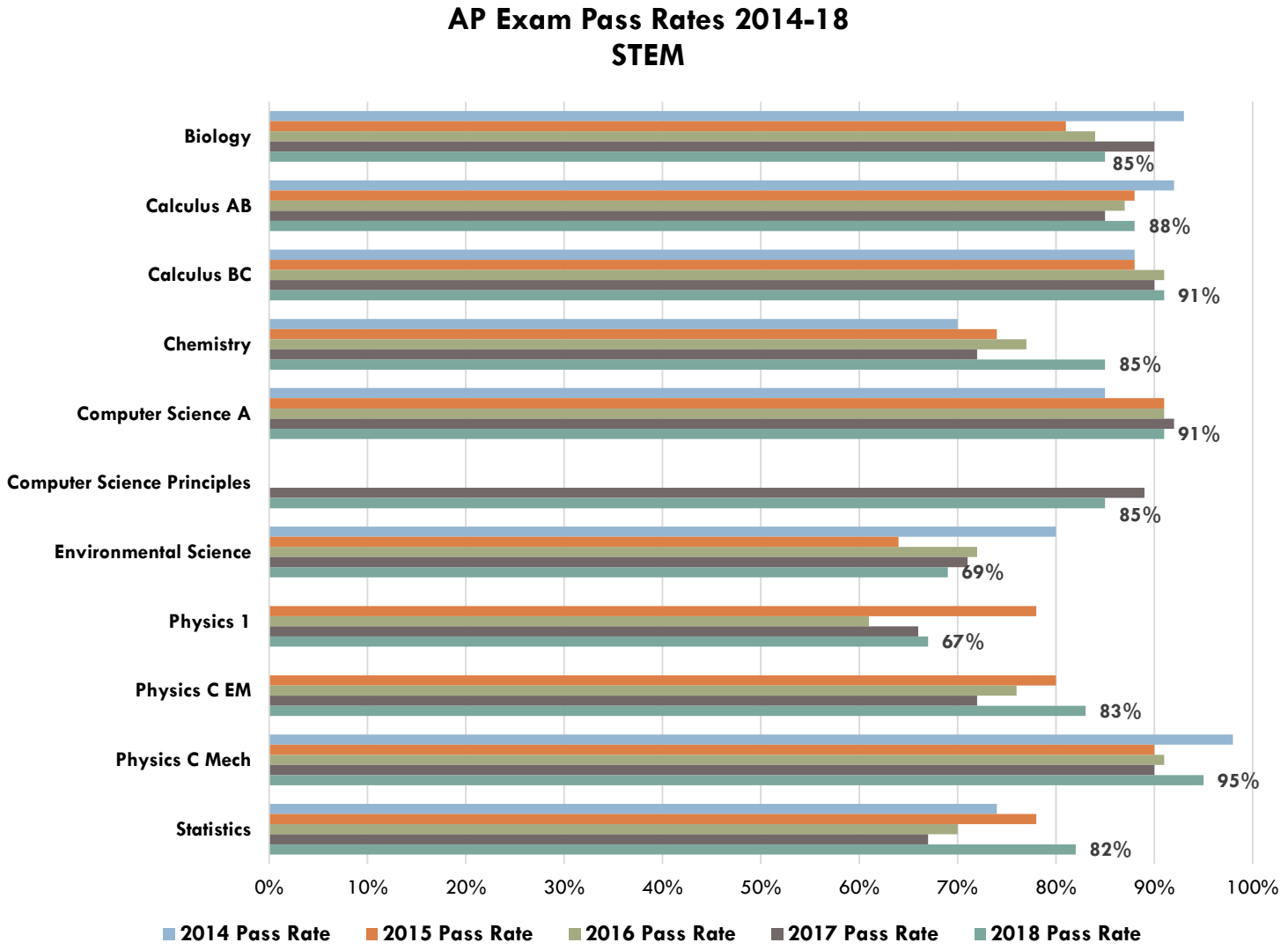
- Forensic Science
- Biotechnology
- Biomedical Engineering
- Materials Science Tech 1 & 2
- Computer Programming
- Microsoft Imagine Academy
- Digital Graphics Production
- Digital Design
- Architectural and Engineering Tools 1, 2 & 3
- Applied Photography 1 & 2
- AP Computer Science
- Applied Materials Technology
- Engineering Design
- Robotics 1 & 2
- Computer Integrated Manufacturing
- WaNIC: Digipen
  - Art and Animation
  - Music Engineering & Sound Design
  - Robotics and Future Technologies
  - Video Game Programming
- WaNIC
  - Health Sciences Careers
  - Medical Careers
  - Fire & EMS

High School STEM Signature Courses and Programs

Eastlake HS	**Sammamish Start-Ups** • Entrepreneurship • Software Engineering/Computer Programming • Engineering Design and Development
Emerson HS	**Green Sustainable Design and Technology**
Juanita HS	**STEM Global Health** • Biotechnology and Social Studies • Anatomy/Physiology and English • STEM Workplace Experience
Lake Washington HS	**Design Your World** • Engineering Design Process
Redmond HS	**Global Health** • Biology and Social Studies
Tesla STEM HS	**Four STEM Signature Programs/Labs** • Environmental Engineering and Sustainable Design • Forensics and Psychology • Biomedical Engineering • Advanced Physics and Global Engineering

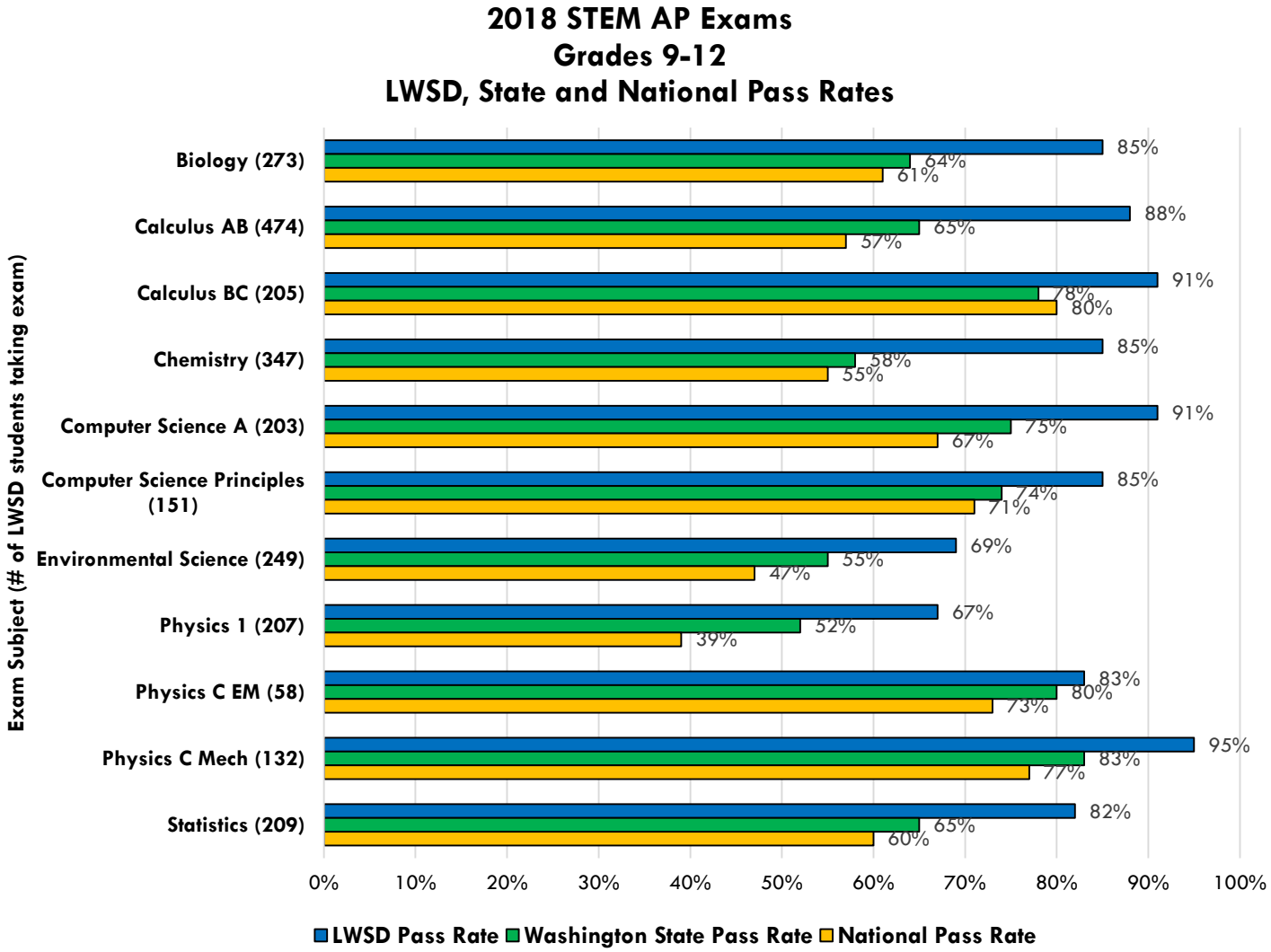
How are students performing in STEM?

Advanced Placement: STEM-Related Courses



NUMBER OF STUDENTS ATTEMPTING EXAM					
	YEAR				
EXAM	**2014**	**2015**	**2016**	**2017**	**2018**
Biology	244	201	251	229	273
Calculus AB	321	426	409	428	474
Calculus BC	112	146	205	206	205
Chemistry	237	346	307	293	347
Computer Science A	62	160	148	218	203
Computer Science Principles				164	151
Environmental Science	226	228	215	305	249
Physics 1	52	83	119	145	207
Physics 2		25	1	35	
Physics C EM	3	51	54	53	58
Physics C Mech	52	115	138	139	132
Statistics	128	157	145	186	209
TOTAL	**1437**	**1938**	**1992**	**2401**	**2508**

Advanced Placement: STEM-Related Courses



How are we using STEM partnerships?

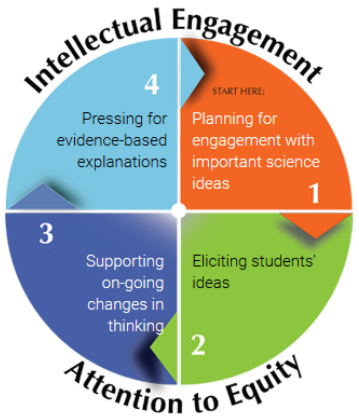
STEM Partnerships

- Washington Alliance for Better Schools
  - STEM Summer Externships for teachers
  - STEM Mini-Externships for counselors, librarians and administrators
  - Elementary STEM Nights

- Effective Practices in Teaching Science:
  - Ambitious Science Teaching (AST) Project: University of Washington
    - 60 elementary teachers, 55 middle school teachers and 32 high school teachers received training
  - Process Oriented Guided Inquiry Learning (POGIL)
    - 32 secondary teachers participated in training

- Institute for Systems Biology
  - All high school science teachers participated in STEM-focused training in August

- Math and Science Fellows with Puget Sound Educational Service District
  - 3 Curriculum Specialists & 2 Professional Learning Specialists



Part II: STEM in Career and Technical Education (CTE)

Career and Technical Education (CTE)

CTE:

- Prepares students to be college and career ready by providing core academic skills, employability skills and technical, job-specific skills
- Offers clear pathways to industry certifications, postsecondary certificates and degrees
- Partners with businesses to prepare students for tomorrow's workforce

How Does CTE Benefit Students?

CTE Courses:

- Align with 16 nationally-recognized Career Clusters
- Incorporate both industry and academic standards
- Provide student leadership through Career and Technical Student Organizations (CTSOs)
- Can provide CTE Dual Credit
  - Ability to earn both high school and community/technical college credit
- Can provide Graduation Requirement Equivalency – "2-for-1"
  - Ability to earn one credit and meet two graduation requirements

16 Nationally-Recognized Career Clusters

Eastlake	Juanita	Lake Washington	Redmond	Tesla STEM
• Introduction to Engineering Design • Material Science 1	• Architectural and Engineering Tools and Techniques 1 & 2 • Applied Material Technology 1 & 2	• Computer Science and Engineering • Computer Integrated Manufacturing • Introduction to Engineering Design • Principles of Engineering • Robotics 1& 2	• Computer Science and Engineering	• Engineering 1, 2 & 3

Lake Washington	Redmond	Tesla STEM
• AP Environmental Science • Urban Gardening	• AP Environmental Science	• AP Environmental Science • Engineering/Sustainable Design

Health Science

Eastlake	Juanita	Lake Washington	Redmond	Tesla STEM
• Anatomy and Physiology • Biotechnology	• Biotechnology • Food Science and Nutrition	• Family Health	• Anatomy and Physiology • Biotechnology • Food Science and Nutrition • Health 1	• Anatomy and Physiology

Lake Washington School District

Eastlake	Juanita	Lake Washington	Redmond	Tesla STEM
• AP Computer Science A • AP Computer Science Principles • Microsoft Imagine Academy	• AP Computer Science A • Computer Science • Computer Science and Engineering • Microsoft Imagine Academy	• AP Computer Science A • AP Computer Science Principles • Computer Science • Microsoft Imagine Academy	• AP Computer Science A • Microsoft Imagine Academy	• AP Computer Science A • AP Computer Science Principles • Computer Programming • Data Structures

Career and Technical Education (CTE)

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CTE Dual Credit

- Through the Pacific Northwest College Credit Consortium, certain CTE courses provide students with the opportunity to earn both high school and college credit for the course, if they complete the course with a grade of “B” or better

CTE Dual Credit Approval Process

- School districts identify potential high school CTE courses for articulation and submit course frameworks to Pacific NW College Credit
- Pacific NW College Credit works with college(s) to assess course outcomes and seeks approval for articulation agreement
- Qualifying courses are designated in course catalogs, and teachers inform students about how to register for CTE Dual Credit
- Students must register and pay a $46 fee (fee covers all CTE Dual Credit Courses) through the Pacific NW College Credit Consortium to be awarded college credit

Pacific NW
COLLEGE CREDIT

Current Situation

- LWSD has approximately 40 CTE courses that offer CTE Dual Credit
- While numerous CTE courses have the opportunity for CTE Dual Credit, course offerings have not historically been intentionally "packaged" to articulate a sequence of courses/pathway that aligns with specific certificate or degree programs at community and technical colleges

STEM CTE Program and Pathway Articulation Efforts

2018 – 2019 STEM Program and Pathway Efforts

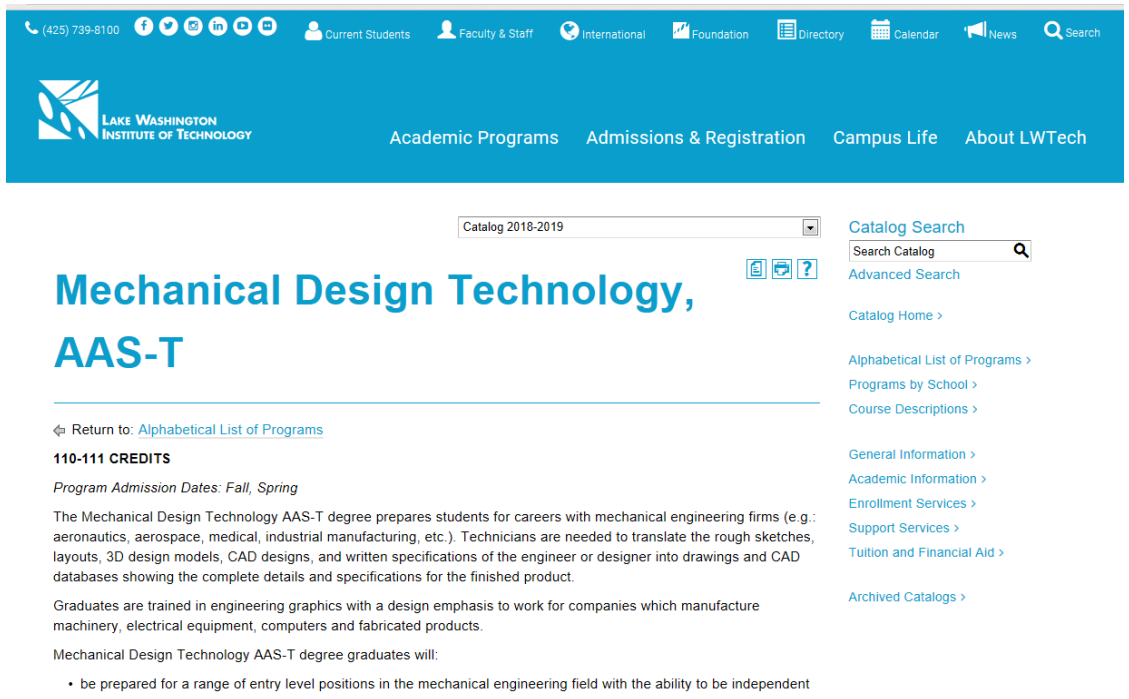
- Assess/internally audit existing CTE Dual Credit offerings and CTE equivalencies
  - Begin to identify opportunities to intentionally expand CTE Dual Credit offerings to "package" a sequence of courses/pathway that aligns with and fulfills aspects of specific certificate or degree programs at community and technical colleges

Juanita High School/LW Tech Example

Juanita High School Classes

- Architectural Drawing
- Mechanical Engineering
- Material Science Technology

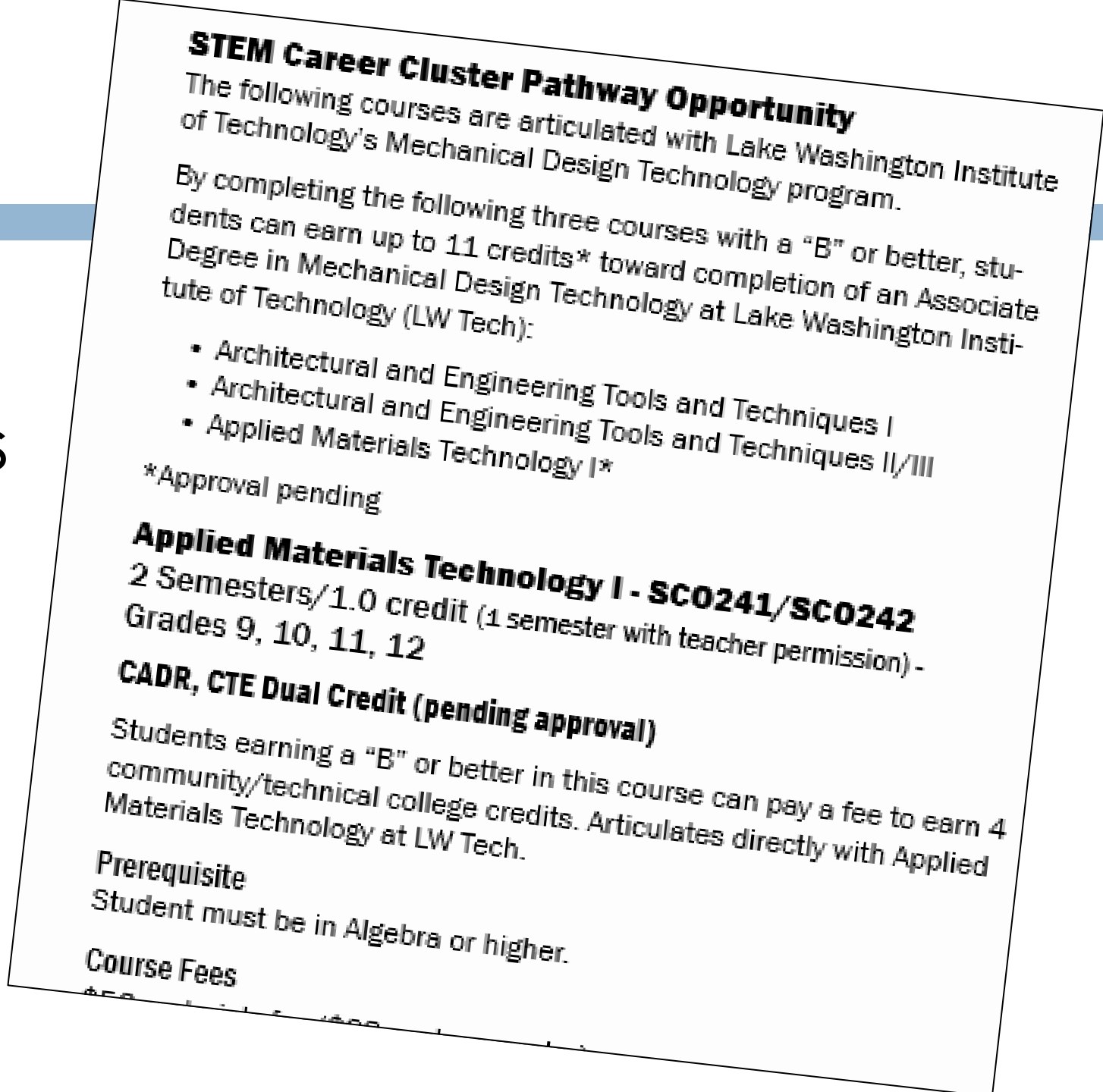
Lake Washington Institute of Technology Degree Program



Juanita High School

2019 – 2020 Course Catalog

- Identifies STEM Career Cluster Pathway Opportunity from JHS to LW Tech



STEM Career Cluster Pathway Opportunity

The following courses are articulated with Lake Washington Institute of Technology's Mechanical Design Technology program.

By completing the following three courses with a "B" or better, students can earn up to 11 credits* toward completion of an Associate Degree in Mechanical Design Technology at Lake Washington Institute of Technology (LW Tech):

- Architectural and Engineering Tools and Techniques I
- Architectural and Engineering Tools and Techniques II/III
- Applied Materials Technology I*

*Approval pending

Applied Materials Technology I - SCO241/SCO242

2 Semesters/1.0 credit (1 semester with teacher permission) - Grades 9, 10, 11, 12

CADR, CTE Dual Credit (pending approval)

Students earning a "B" or better in this course can pay a fee to earn 4 community/technical college credits. Articulates directly with Applied Materials Technology at LW Tech.

Prerequisite

Student must be in Algebra or higher.

Course Fees

STEM CTE Program and Pathway Articulation Efforts

2018 – 2019 STEM Program and Pathway Efforts

- Assess middle to high school STEM pathways to ensure exposure to STEM learning at the middle school level
  - Implement STEM course offerings at Kamiakin Middle School
  - Develop STEM program offerings at Timberline Middle School for 2019-20 implementation

Kamiakin Middle School STEM CTE Courses

- Automation and Robotics 1 & 2
- STEM 1 & 2
  - Design and Modeling
  - Flight Science
  - Computer Programming
  - Digital Media
  - 2D/3D Animation
  - Aerial Drone Science

Timberline CTE STEM Course Offerings

- Design & Modeling
- Green Sustainable Design
- Medical Detectives and Medicine
- Automation and Robotics
- Flight and Space
- App Creators and Game Design

CTE Program and Pathway Articulation Goals

2019 – 2020 CTE Program and Pathway Goals

- Continue to identify opportunities to intentionally expand CTE Dual Credit offerings to "package" a sequence of courses/pathway that aligns with and fulfills aspects specific certificate or degree programs at community and technical colleges
- Identify and communicate STEM Career Cluster Pathway opportunities at all high schools
- Organize 2020-2021 high school courses catalogs to align CTE course offerings with career clusters
- Continue to assess middle to high school STEM pathways to ensure exposure to STEM learning at the middle school level