Engineering Design for the Texas Four-by-Four

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Presentation Overview

- What is engineering? Form or function?
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Overview
- Texas Pilot and Early Results
- Pilot Phase Two and Beyond

Presentation Overview

- **What is engineering? Form or function?**
- Engineer Your World Overview
- Texas Pilot and Early Results
- Pilot Phase Two and Beyond

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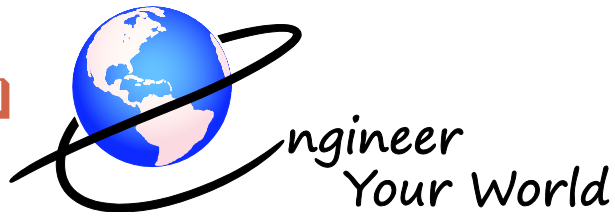
- 

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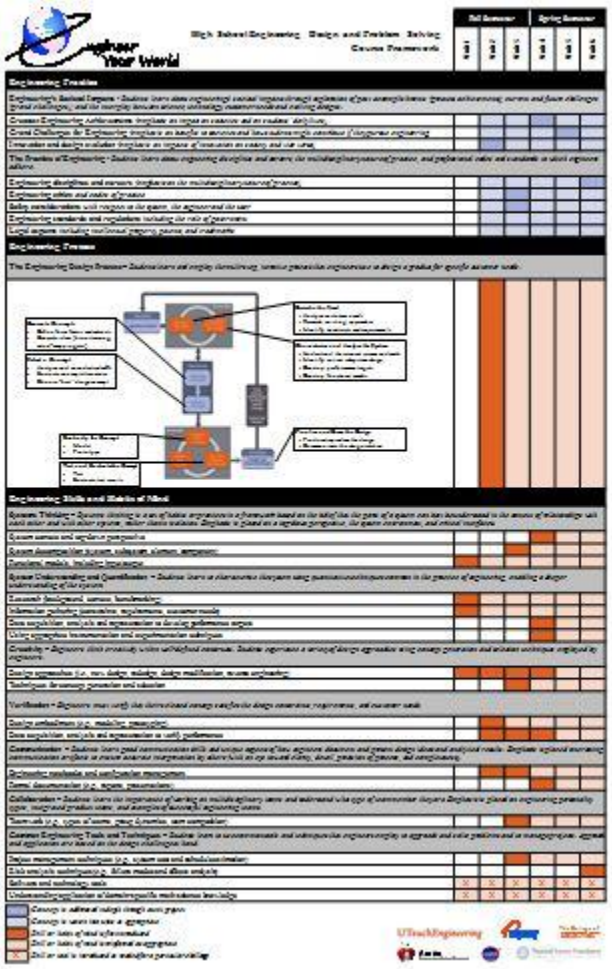
Features

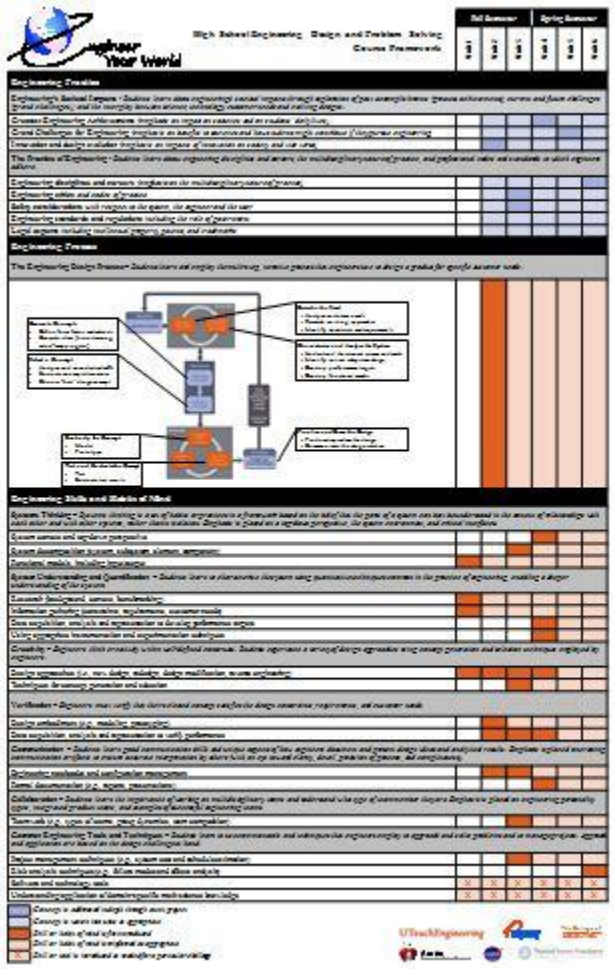
- Engages students in authentic engineering practices
- Project-based environment
  - 80% hands-on activity
  - 20% documenting and reflecting on work, preparing presentations and reports, participating in direct instruction
- Student learning scaffolded over six design challenges
  - Standardized engineering design process
  - Requires purposeful application of engineering principles and relevant science and math concepts
- Aligned with Texas state standards and emerging Next Generation Science Standards

Course Framework



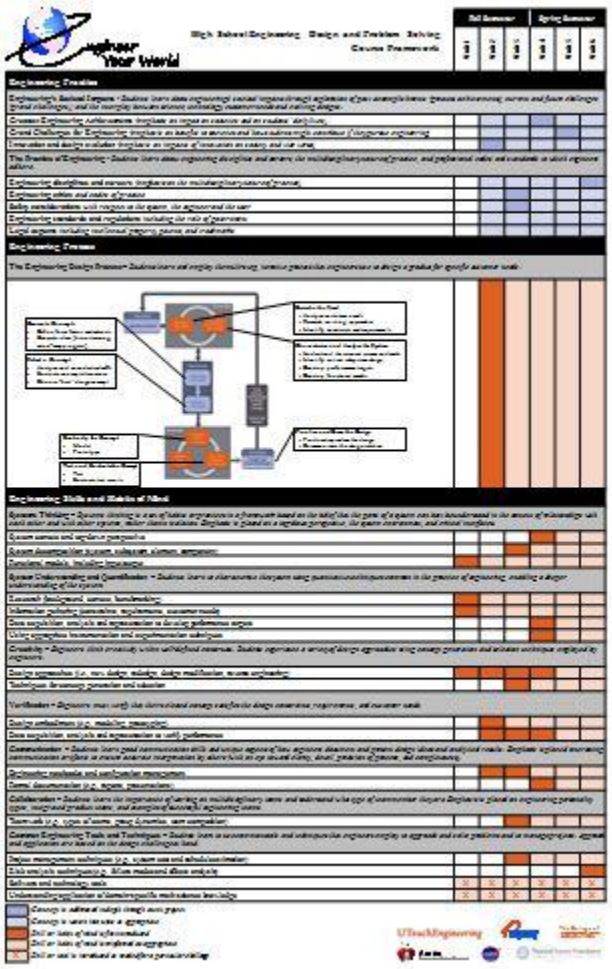
Course Framework

Student Learning Outcomes



Course Framework

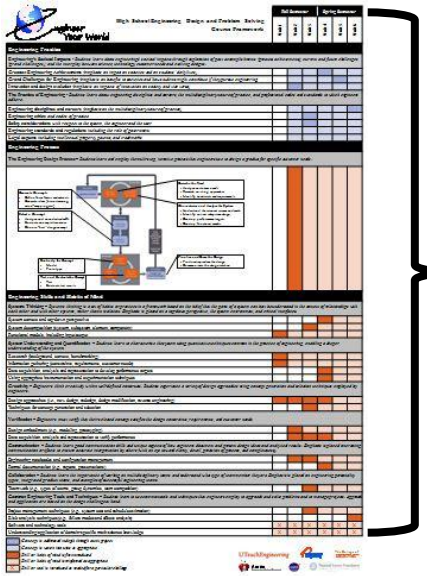
Engineering Design Process



Engineer Your World

Unit 1: What Is Engineering? & Class Norms

Engineers rely on teamwork and communication.



Documentation
Collaboration

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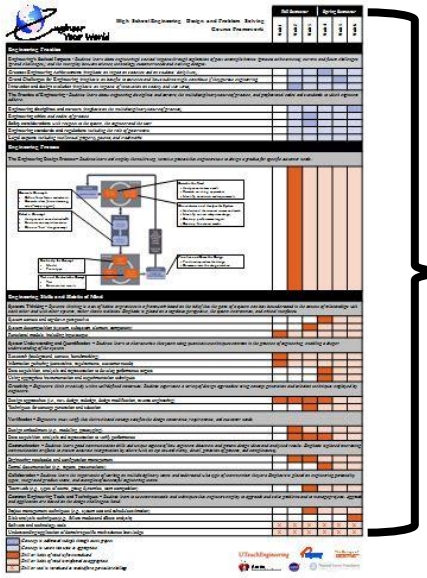
Unit 2: The Evolution of Imagery

Engineers design products to satisfy customer wants and needs.



The engineering design process
New design
Design evolution
Analyzing/interpreting requirements
Concept generation
Design embodiment
Performance verification
Engineering notebooks

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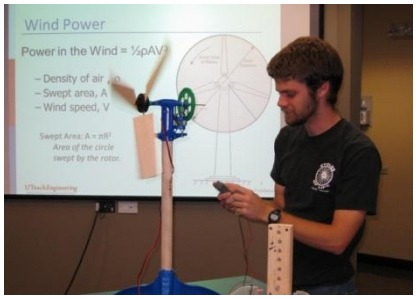
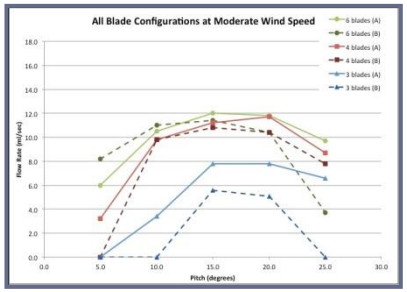
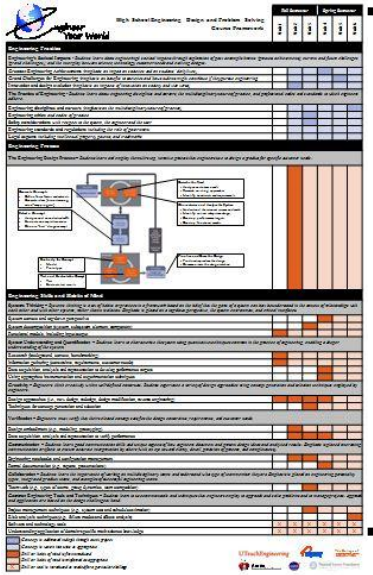
Unit 3: Green Energy for Clean Water

Engineers improve lives.







- Design modification
- Appropriate instrumentation and experimentation
- Data acquisition, analysis and representation
- Engineering standards and regulations

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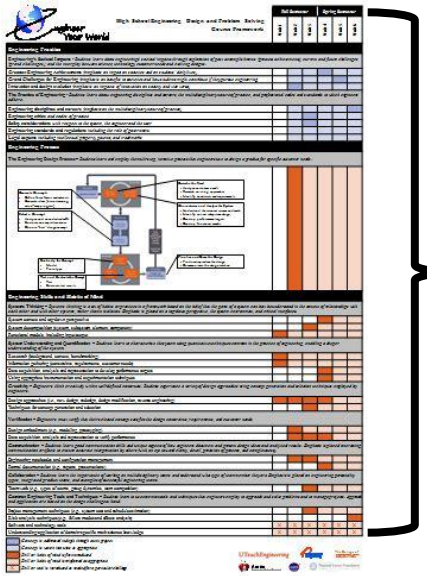
Unit 4: Aerial Imaging

Engineers work in teams to solve complex design challenges.



- Systems thinking
- Design at the subsystem level
- Complex teams
- Project management
- Concept selection
- Risk analysis
- Ethics and safety

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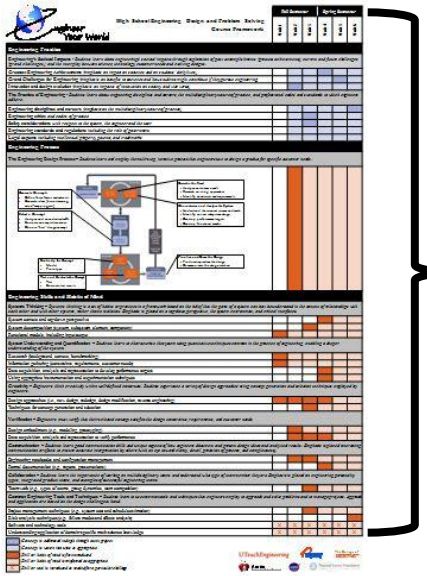
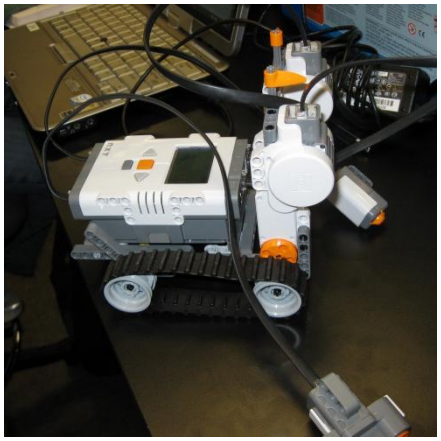
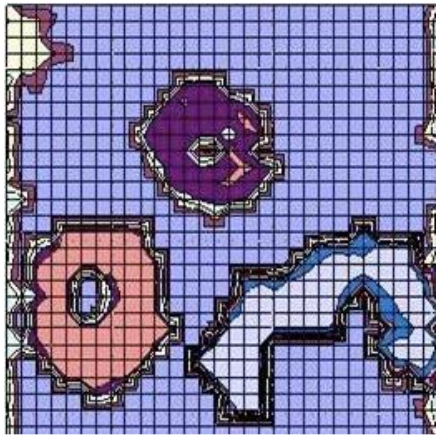
Unit 5: The Search for Lunar Ice

Engineering opens frontiers.



- Automation and control
- Programming basics
- Operations planning
- Greatest engineering achievements

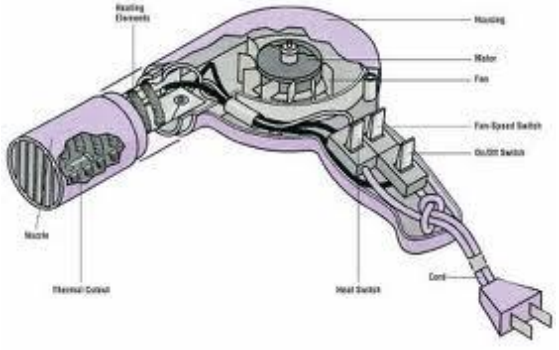


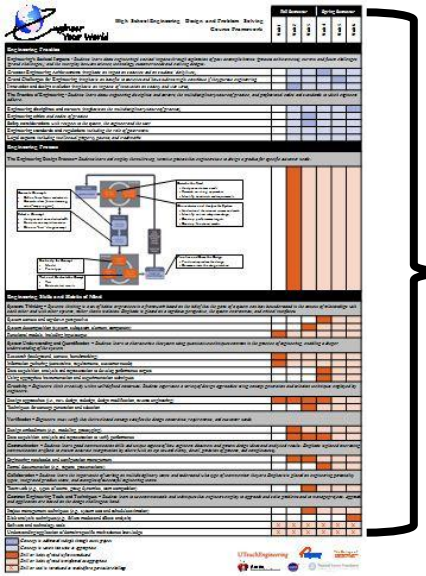


Engineer Your World

Unit 6: Reverse Engineer Your World

Engineering impacts our everyday lives.



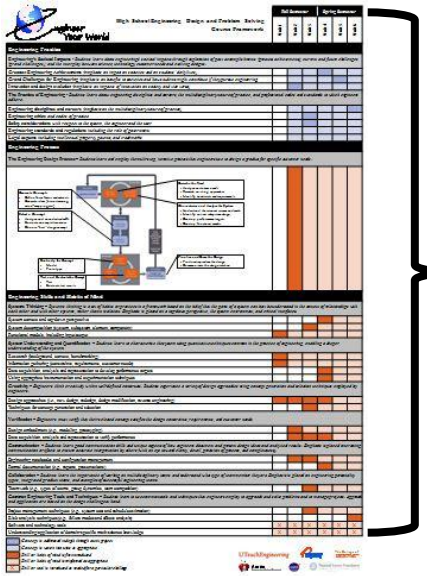


- Reverse engineering and redesign
- Functional modeling
- Gathering/analyzing customer needs
- Information gathering
- Grand challenges for engineering
- Safety and legal aspects

Engineer Your World

Unit 7: Culminating Design Challenge

Engineers in all disciplines solve open-ended design challenges.



- More complex, less structured unit
- Student-directed design process
- Includes all engineering critical aspects
- Focuses on STEM professions
- Emphasizes project management skills

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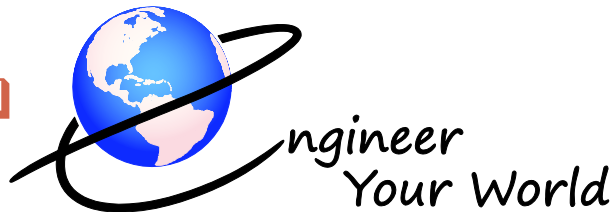
- 

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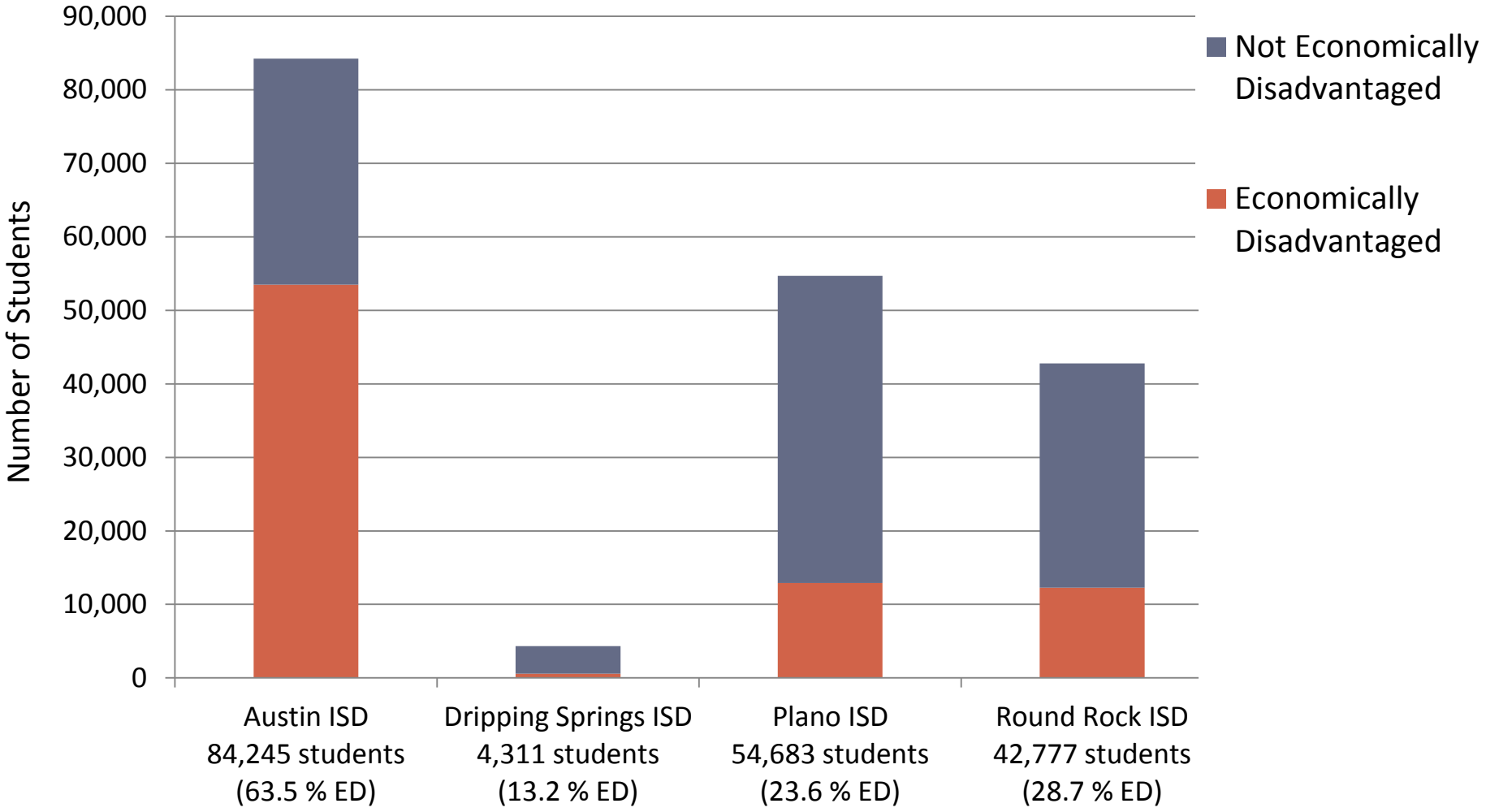
2011-12 Pilot Districts



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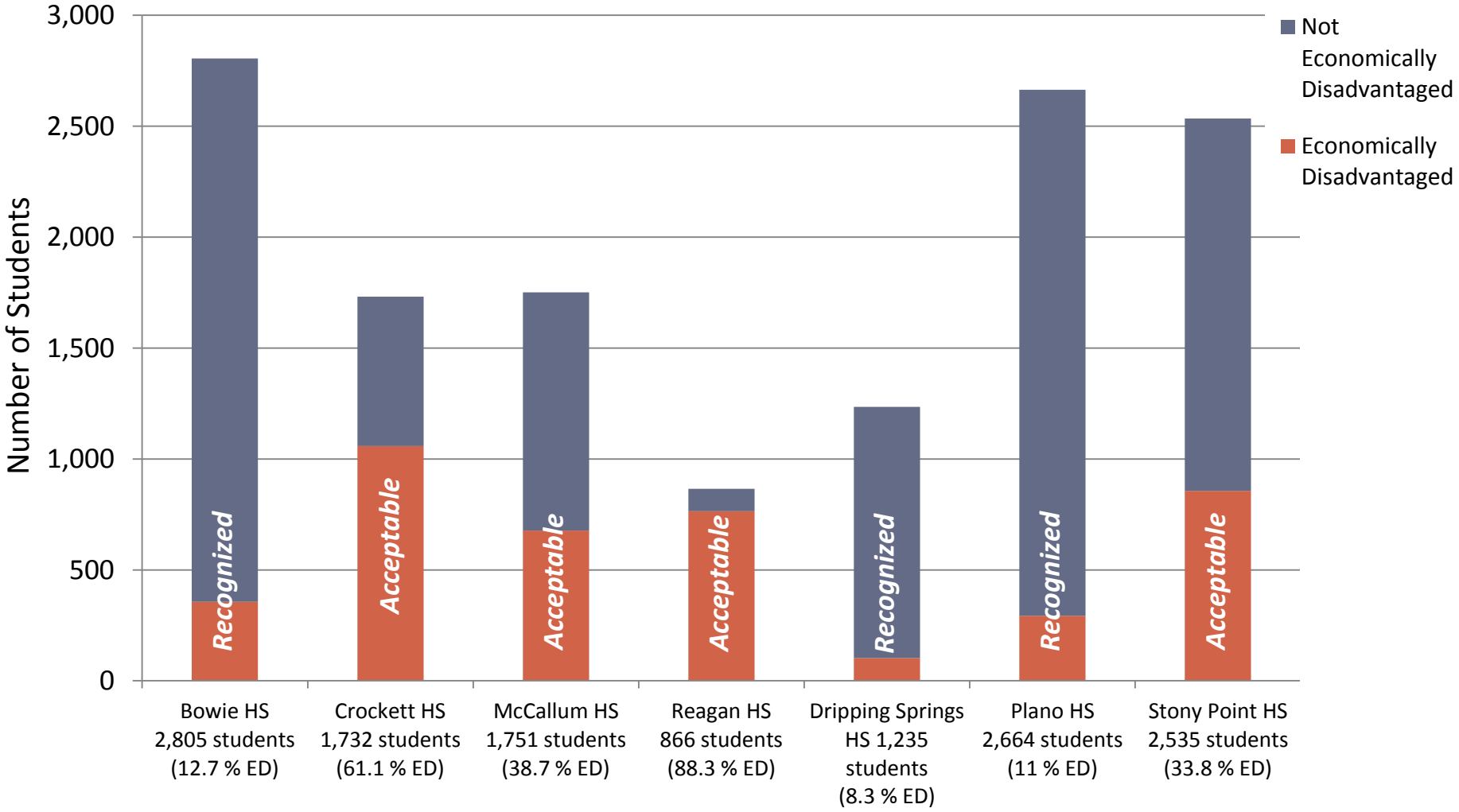
2011-12 Pilot Schools



Engineer Your World

Pilot Teachers

Campus (Rating)	# Sections Offered	# Students in 2011-12 Pilot Course	Other Courses Taught	Years Teaching Experience	Engineering Degree or Experience
Bowie HS (R)	1	24	Physics	20	No
Crockett HS (A)	1	9	Physics	15	No
McCallum HS (A)	1	10	CAD	10	No
Reagan HS (A)	1	7	Physics	4	
Dripping Springs HS (R)	1	22	Statistics	10	
Plano HS (R)	4 (2 teachers)	> 120	Physics	5 and 2	
Stony Point HS (A)	2	60	Physics	16	No

Early Results from 2011-12 Pilot

- Teachers struggled to complete the course in their first year (to be expected)
- Need to establish classroom norms early in the course
- Need to modify and strengthen scaffolding

- What do you want to know?

Q&A with a pilot teacher

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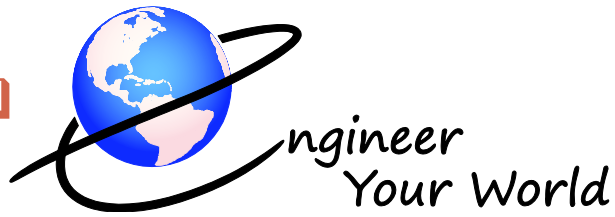
- 

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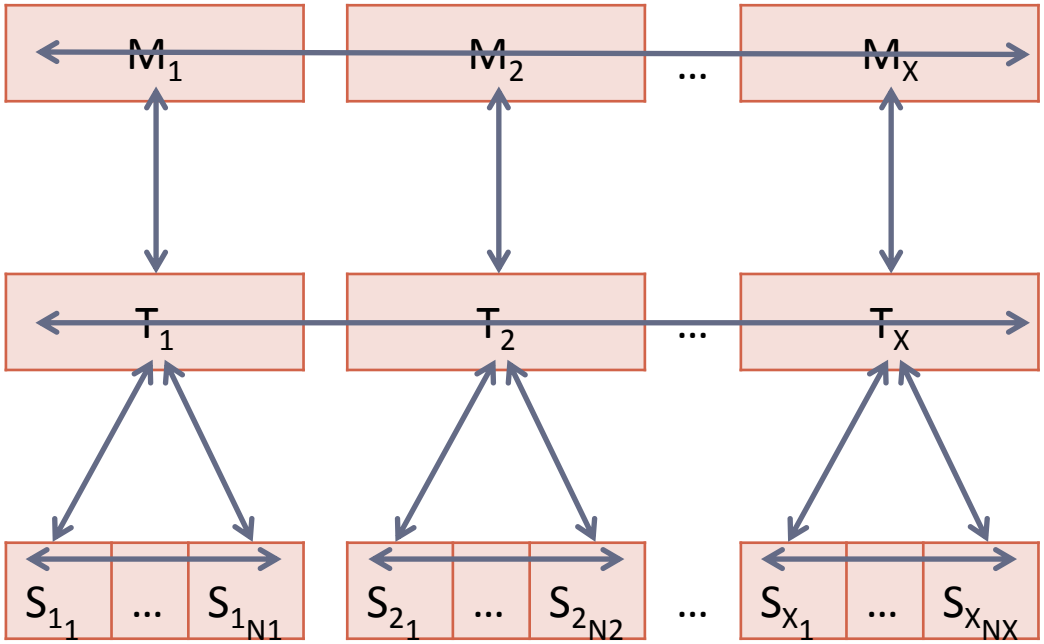
What's New in 2012-2013?

- Teacher PD
  - Two-week workshop to enhance participants' engineering content knowledge and pedagogical content knowledge
- Mentorship
  - Developing and testing a mentorship model for scale
- Assessments
  - Developing validated assessment tools for assessing student artifacts
- Portfolio (AP®) Version
  - Piloting portfolio version aligned with current draft AP® standards

Developing Courseware: LMS + Virtual Collaboration Tool



- Mentor/mentor collaboration
- Teacher/mentor collaboration
- Teacher/teacher collaboration
- Teacher-student communication
- Student/student collaboration

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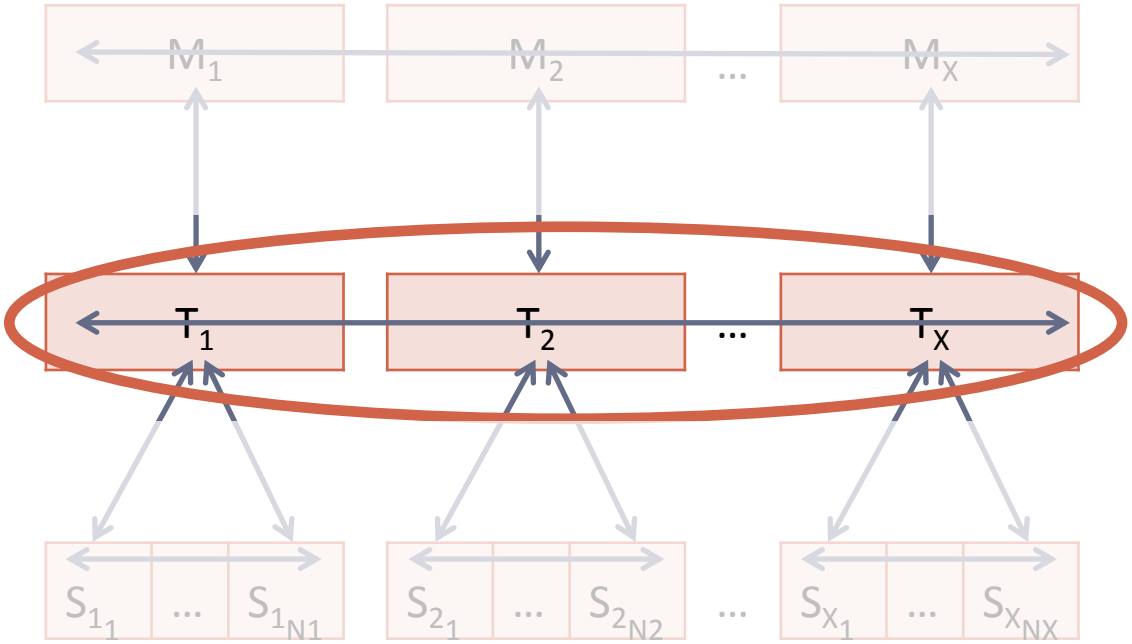

For teachers, access to

- **Course Materials**
  - Lesson plans
  - Background materials
  - Supporting resources
- **Ongoing PD**
  - Refresher videos
  - On-time training
  - Webinars on practice
- **Course Management Tools**
  - Share resources with students
  - Assign, view, assess student work
- **Collaboration Tools**
  - Teacher-to-teacher
  - Teacher-to-mentor

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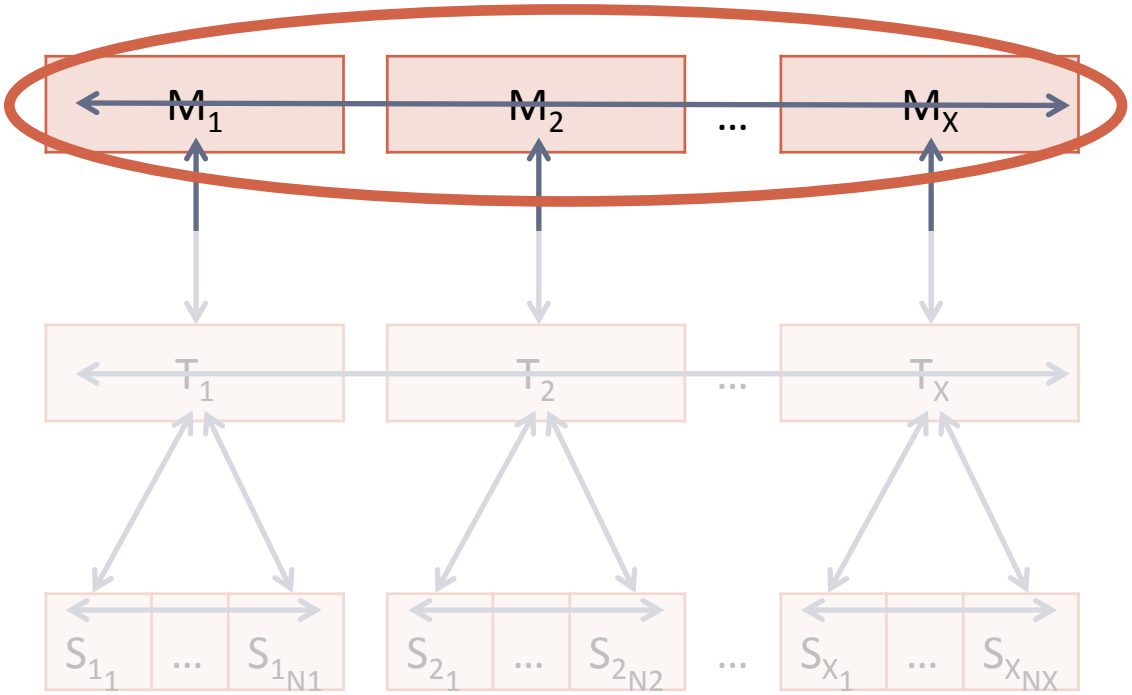

For mentors, access to

- **Course Materials**
  - Lesson plans
  - Background materials
  - Supporting resources
- **Teacher PD Materials**
  - Refresher videos
  - On-time training
- **Collaboration Tools**
  - Mentor-to-mentor
  - Mentor-to-teacher

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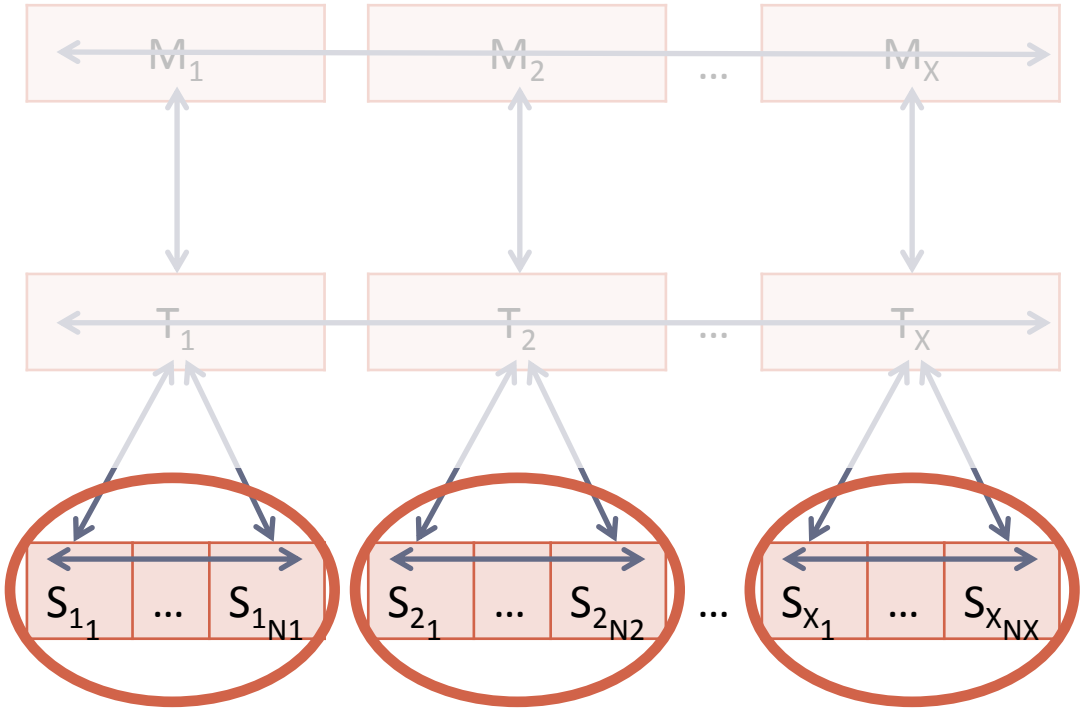

For students, access to

- **Course Materials**
  - Background materials and supporting resources shared by teacher
  - Assignments
- **Virtual Engineering Notebook**
  - Document work for self
  - Submit work to teacher
  - Prepare portfolio for AP or admissions
- **Collaboration Tools**
  - Student-to-student
  - Student-to-teacher

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