

Wise Guys & Gals – Informal STEM Activities Focusing on Engineering Design

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Development

➤ Addressing a need for informal STEM activities

Activity Development Design Parameters:

Pedagogical Strategy

- Blended learning – digital delivery combined with hands-on
- Informed Engineering Design Process – provides scaffolding for each activity
- Interconnected STEM areas – combine engineering with science or technology

Implementation Approach

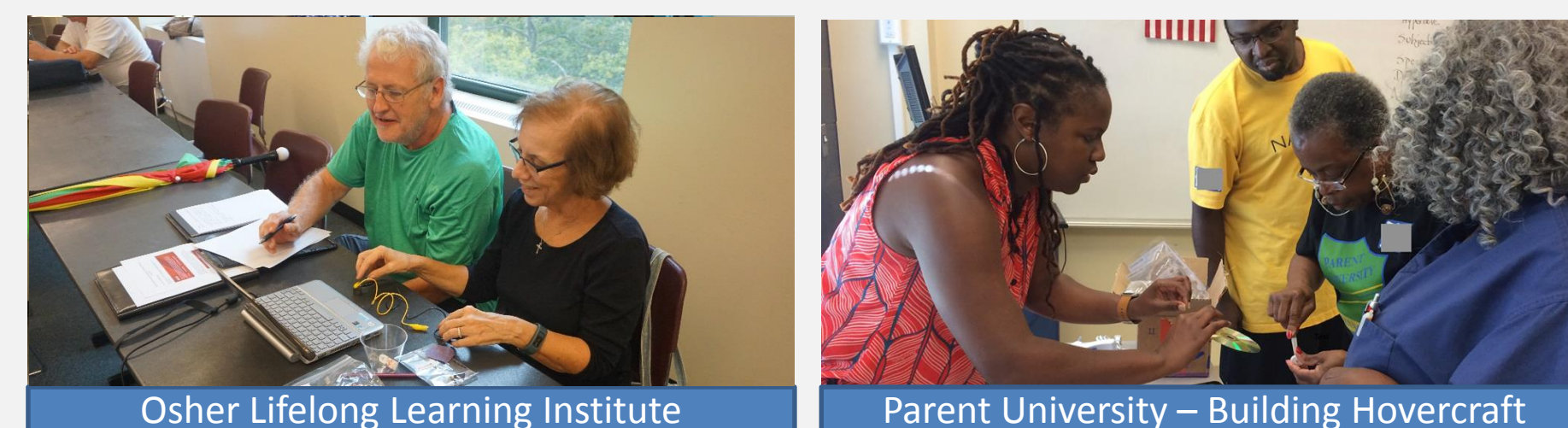
- No STEM background required for facilitators or learners
- Scalable – inexpensive, accessible materials
- Flexible 75-minute activities can be shortened or expanded
- Embedded STEM/Engineering career videos

Collaborative Development, Testing, Evaluation and Optimization:

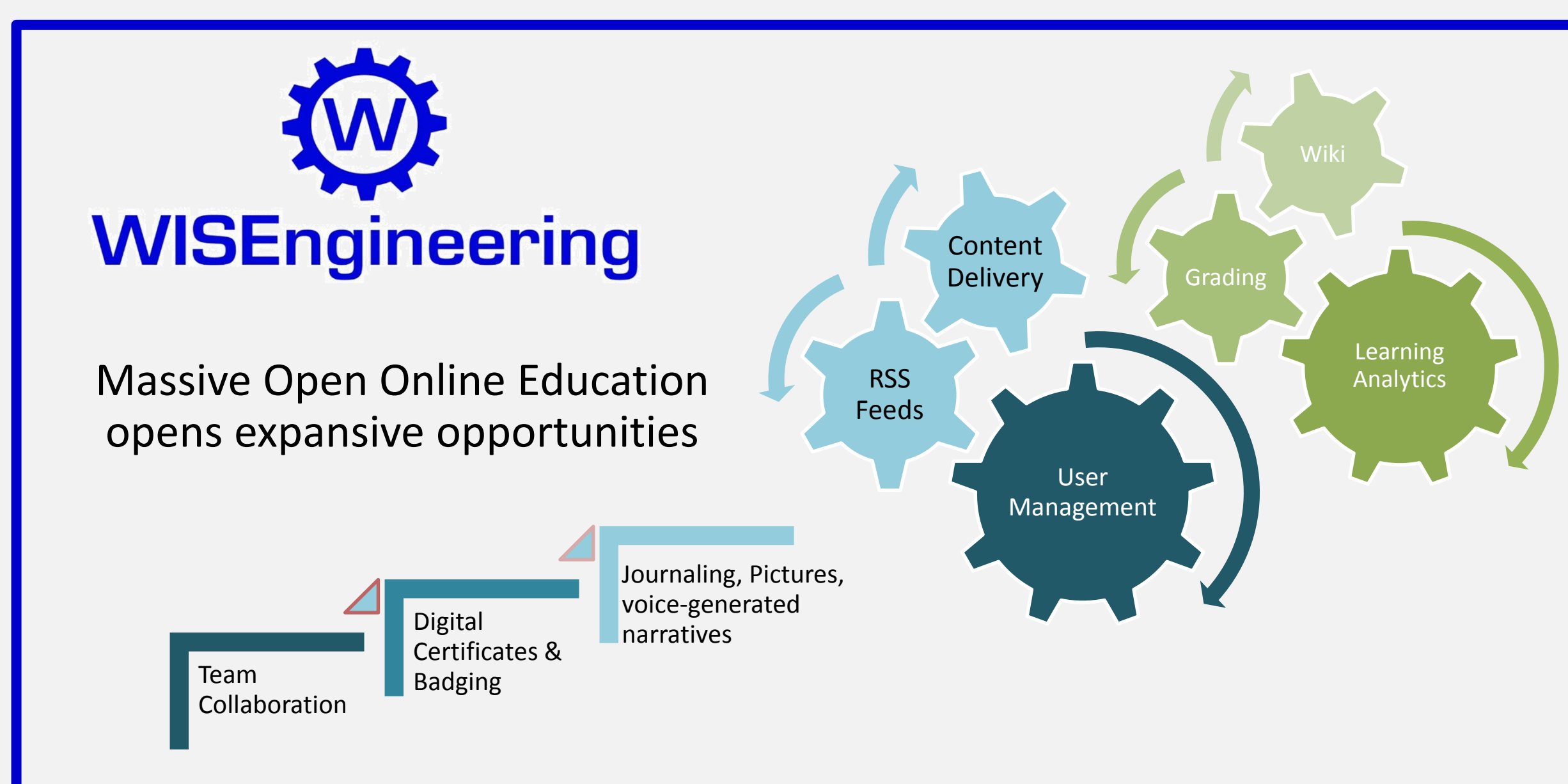
Boys & Girls Club Partnership

- 16 Clubs, 15 unique activities over 5 Years– active partnership with B&GC Leadership
- Facilitator feedback– after EACH activity used to optimize activity design
- Learner responses evaluated– for STEM understanding and use of engineering design as a problem solving strategy and critical thinking skill

➤ Broadening our reach with partners serving diverse audiences



➤ WISEngineering seamlessly delivers content, self quizzes, multi-media links, social media features, facilitator portal and more



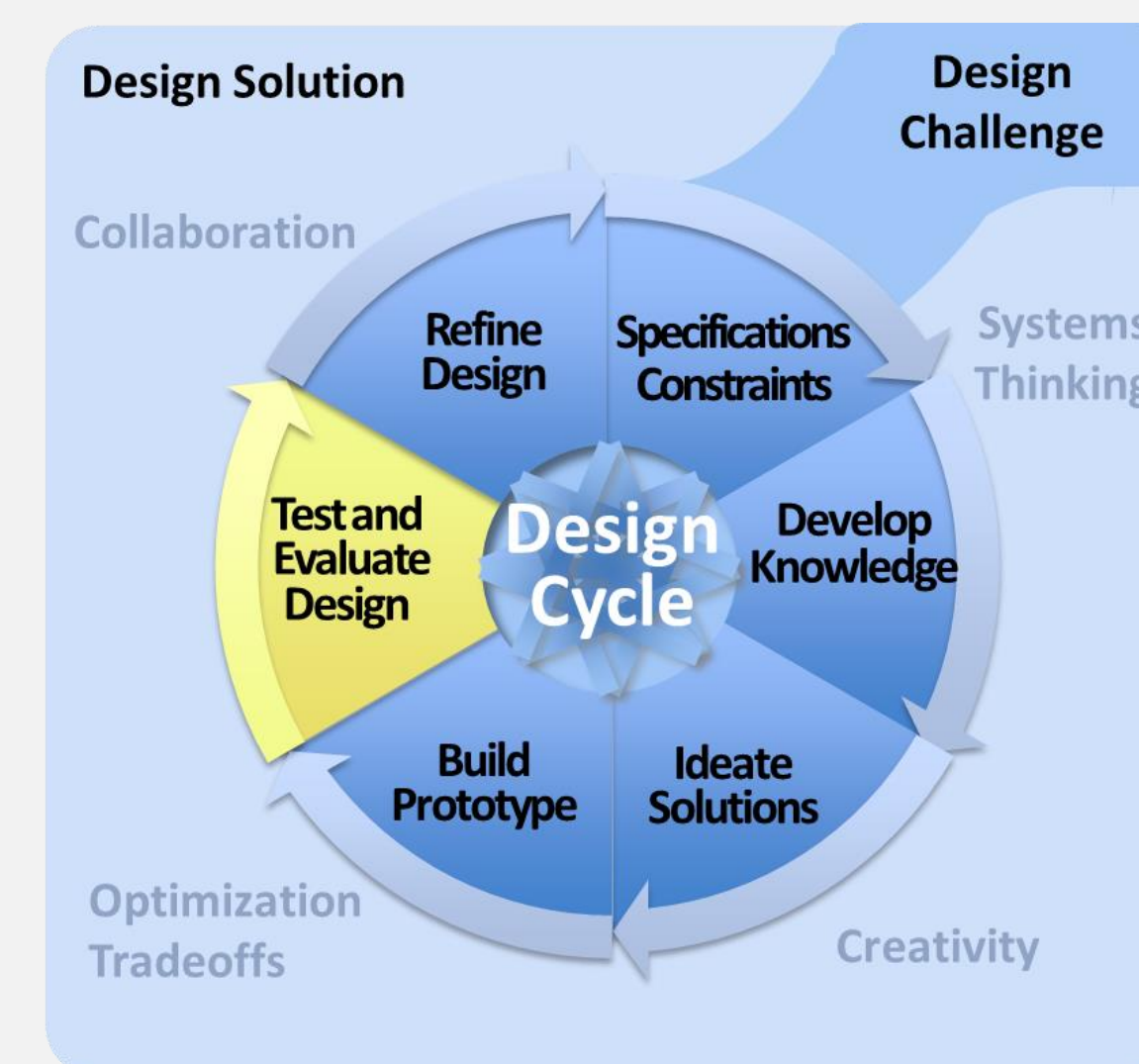
The Outcome



Wise Guys & Gals (WGG) uses the WISEngineering online learning environment to support the blended learning activities.

➤ Informed Engineering Design Activities ➤ Example:

- 22 activities to choose from
- Runs on tablets, phones, computers
- Follows Engineering Design Process
- Learners “make” something in each activity



Use knowledge about permanent and electromagnets (science) to design, build, test and refine (engineering) an audio speaker

Become an Audio Engineer in **“Design for Sound”**

The Challenge: Build a speaker with just a few materials

Test & Evaluate

Speaker Rating	1	2	3
Sound Quality	Cannot clearly identify musical and non-musical sounds	Can clearly identify musical or non-musical sounds	Can clearly identify musical and non-musical sounds
Sound Volume	Can barely hear sound when placing ear next to speaker	Can hear sound when placing ear next to speaker	Can hear sound without placing ear next to speaker
Speaker Cost	Cost \$7.00 or more	Cost \$5.00-\$6.99	Cost less than \$5.00

➤ Example: Use knowledge about compression force (science) to design, build, test and refine (engineering) a strong foundation

Become a Civil Engineer in **“Need Some Support”**

The Challenge: Build a strong, stable foundation from index cards

Test & Evaluate

Foundation Rating	1	2	3	4
Weight	Supports 0-1 book	Supports 2-4 books	Supports 5-9 books	Supports 10 books or more
Time	Collapses immediately	Supports 5 books less than 15 seconds	Supports 5 books 15-59 seconds	Supports 10 books for 60 seconds or more
Foundation Height	0-2 inches	2-4 inches	5 inches or more	
Bonus	Uses all the materials provided	Uses half of the materials	Uses less than half of the materials	

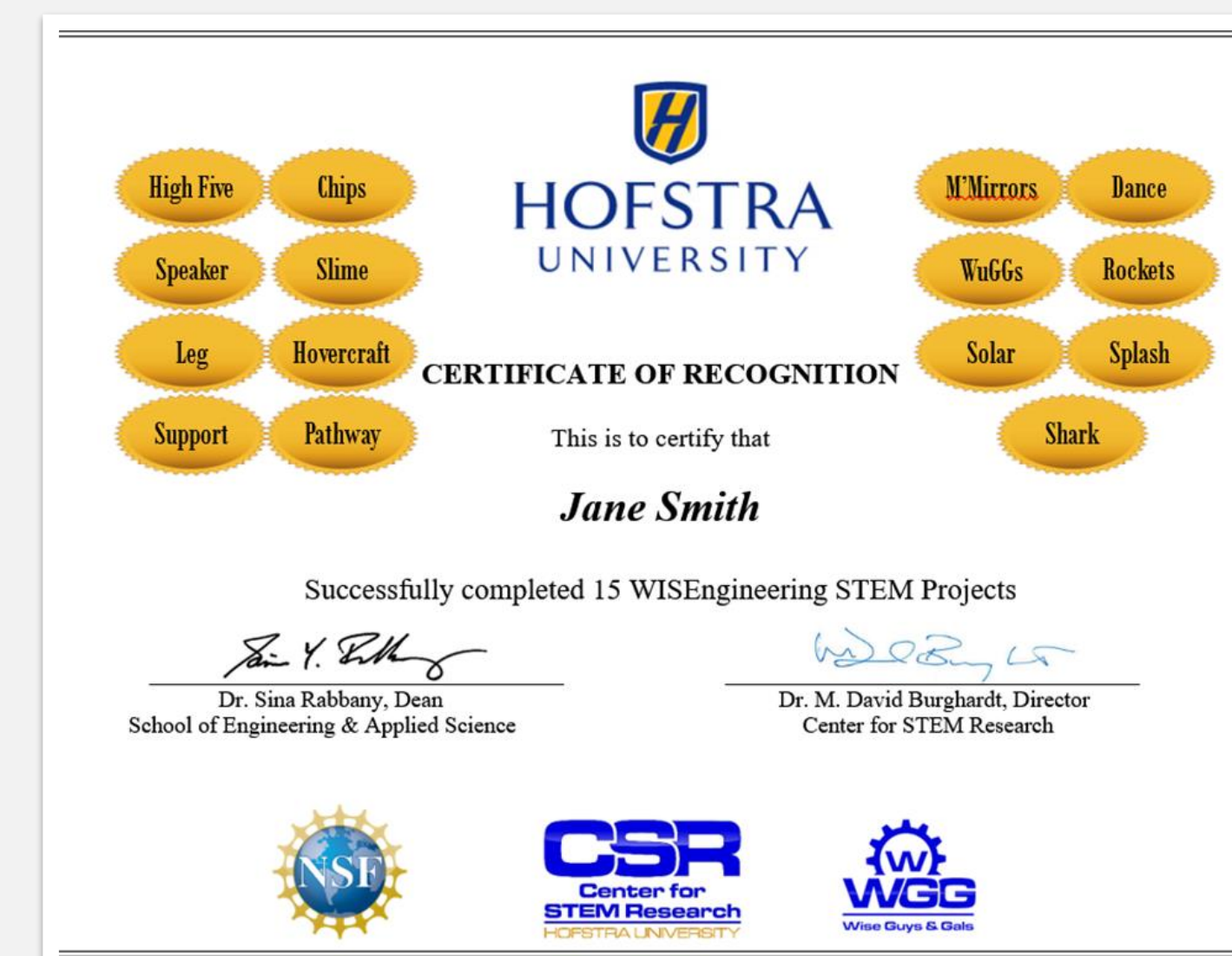
➤ Strong Engagement Ratings (5 point scale)

- 5.0 - Is All Slime Engineered Equally?
- 4.9 - Magical Mirrors, Kaleidoscope Design
- 4.9 - Prosthetic Challenge
- 4.9 - Hover Above it All
- 4.8 - Designing Rockets
- 4.7 - Splash Down! Water Game Design
- 4.6 - Need Some Support

➤ Organizations have successfully leveraged WGG for additional funding, including grants and donations

➤ Evaluation metrics by activity/learner downloadable from Facilitator Portal

➤ Certificates automatically generated to email or print



Available to Your Organization



Access to 22 STEMgineering activities, all facilitation and support materials included
Subscriptions available October, 2018
www.STEMgineeringAcademy.org

➤ Turnkey facilitation with video and written guides, tips, instructions

IS ALL SLIME ENGINEERED EQUALLY? — LEARNING FACILITATOR'S GUIDE

Introduction
This activity will highlight the STEM career of chemical engineering. The WISEngineering portion of the activity includes a video about the branch of engineering. Participating students should watch the video. If time, consider discussing the career option.

Chemical engineers apply the principles of chemistry, biology, physics, and math to solve problems that involve the production or use of chemicals, fuel, drugs, food, and many other products. They design processes and equipment for large-scale safe and sustainable manufacturing, plan and test methods of manufacturing products and testing apparatus, and supervise production. Occupational Outlook Handbook, Bureau of Labor Statistics. <http://www.bls.gov/oes/2018/may/00-4000-0000-chemical-engineers.htm>

Also see <https://chemie.stanford.edu/admission/undergraduate/what-to-expect-at-stanford>

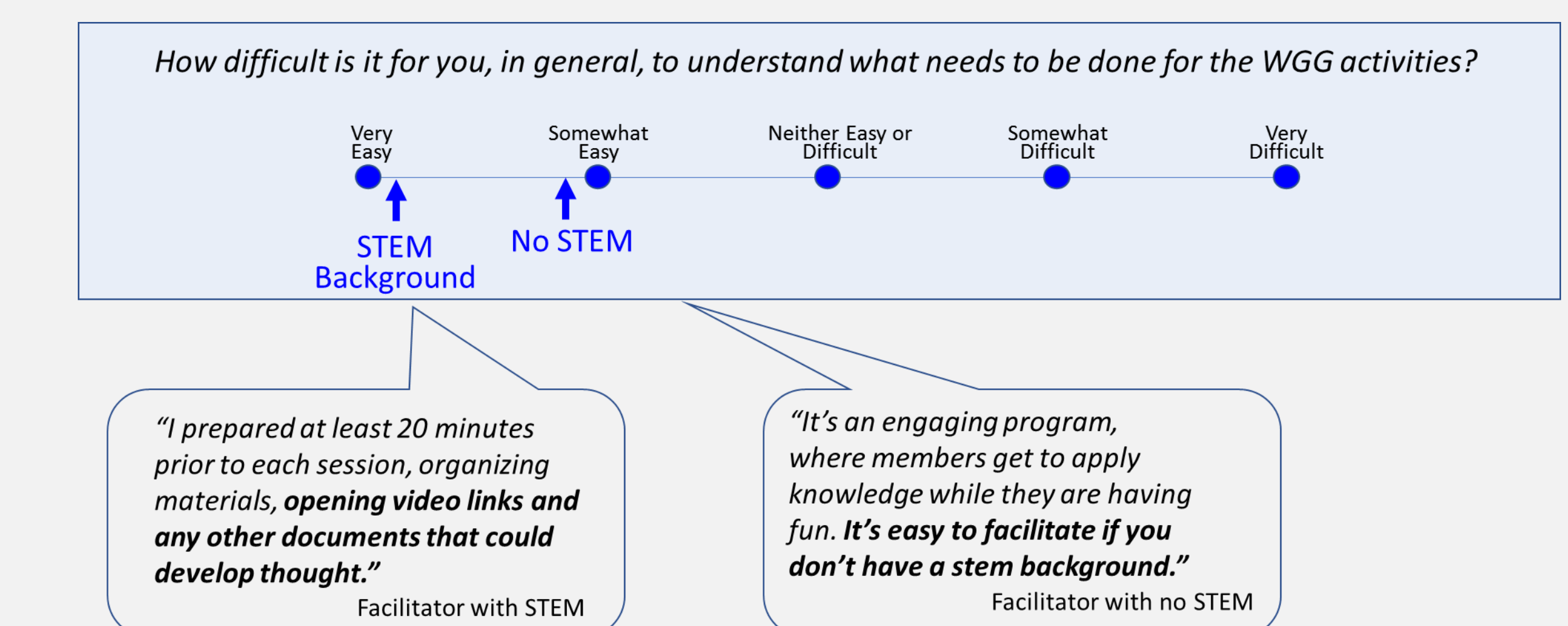
In the role of a chemical engineer, the participants will be doing something somewhat different than in other WGG activities. Instead of designing and building a product, they will be designing a test for a chemical product. They will be looking on the role of quality control expert.

Safety and Precautionary Notes
Bases can be an eye irritant. Participants should be cautioned not to touch their eyes during the experience and to wash hands after handling the slime. Food coloring will stain hands and clothes. Only one drop of food coloring should be used (optional) to minimize staining.

More information on slime chemistry:
Over a mole of ring, ring-like molecules that sometimes get tangled together. That's why glue doesn't flow fast like water. Glue reacts with the glue to loosely tie the long molecules together.
The molecules of the new material, "slime", look more like a poorly woven rug than a piece of spaghetti. The new material feels and acts quite different from what you started out with.



➤ Virtual facilitator training is effective regardless of STEM experience



➤ Contact Information

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