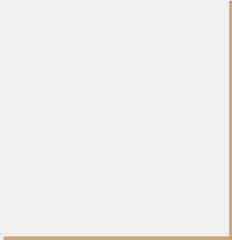


Synergy and STEM

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Inquiry Question

- How does the combination of Science, Technology, Engineering and Math (STEM) increase the leadership and collaboration amongst students?



Why Early STEM Education?

- Most K-12 curriculums do not incorporate STEM until Grade 3. This means that most of the students brain has developed yet they have not encountered significant instruction in STEM.
- Children are born with a natural curiosity and inclination to make messes and and explore the world. This shapes the child's future interests and passions.
- STEM education boosts literacy development by providing opportunities for children to expand their vocabulary and practice using language to describe their ideas.

How does STEM benefit elementary students?

- Intentional focus on enabling children to think critically, solve problems, anticipate cause and effect, and reason.
- Activities are designed to foster creativity, collaboration and persistence.
- Early experiences STEM lays the foundation for lifelong thinking skills and approaches to learning, both of which are required when participating in STEM.
- STEM prompts a growth mindset and confidence when encountering new information or changes.

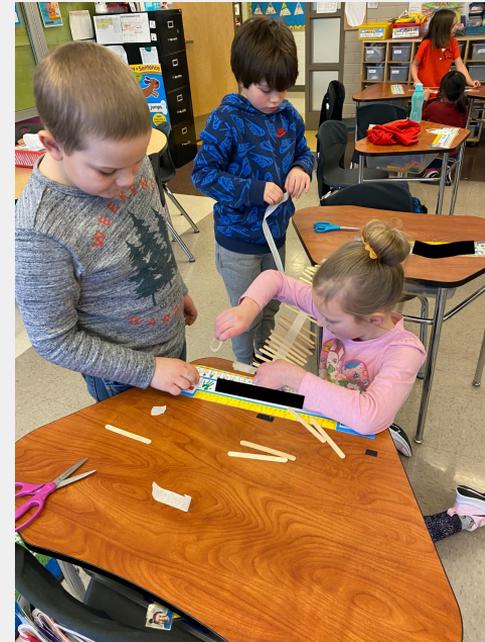
Key Findings in STEM

- To become strong STEM thinker, children need more play. Play is the brain's wired-in process for learning.
- Children test theories about how the world works and developing the brain plasticity for lifelong learning.
- Hands-on learning is more effective at helping children make sense of difficult information.
- Students are successful in developing a growth mindset when participating in STEM.



Collaborative Learning and STEM

- STEM learning and collaborative learning go hand-in-hand
- Students gain various skills through collaborative learning activities
 - **Teamwork**→Working together helps promote understanding.
 - **Collaboration**→Each team members learns to blend their strengths and weaknesses to reach the end goal.
 - **Group Management**→All team members contribute to the learning, they pull their own weight.
 - **Problem Solving**→Two heads are better than one! Collaboration helps students learn to overcome problems and build resiliency.
 - **Communication**→Helps children practice communication skills in group settings.



The Leader in Me and The 7 Habits–W.A.Day School

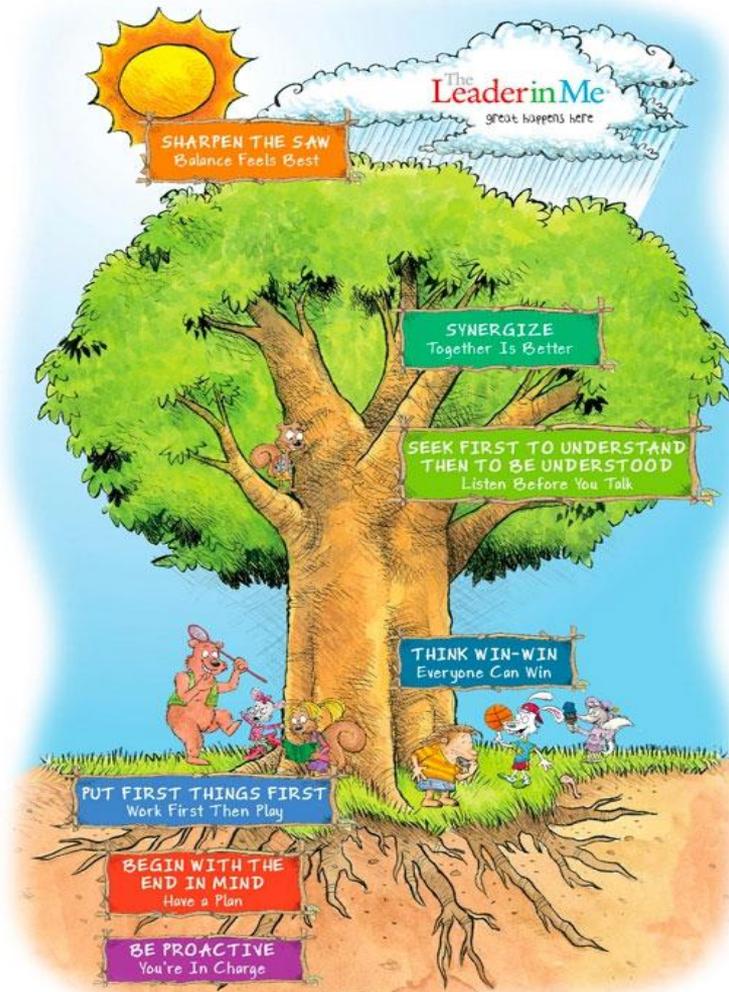
The Leader in Me Program has truly been an eye-opening experience. I personally believe that all schools should try to implement this program. I am eager to take the knowledge and skills that I have gained with me to my future classrooms.



How does the 7 Habits integrate STEM?

Students need to be proactive and responsible during the activities.

As a group, students need to begin the end goal in mind, plan and set a goal to reach together.



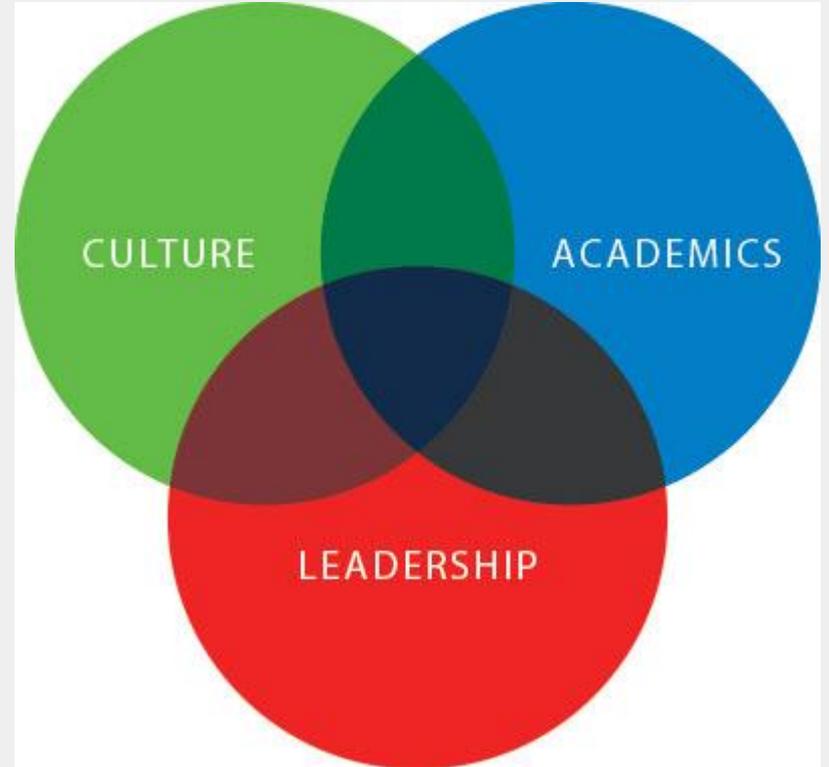
Students learn to listen to others and their ideas for the success of their group.

STEM activities cater to multiple habits aside from synergizing.

Students learn that together we succeed and everyone can be successful, even other groups.

Rationale

I chose to complete my project on this topic because STEM activities have become a popular and effective way to improve collaboration and cross-curricular learning. At my practicum placement, W.A. Day Elementary, the staff and students are all invested in creating a leader in each student. Through the use of the 7 Habits of Happy Kids, students are encouraged daily to become a responsible, cooperative individuals. Every Friday, the entire school has a period of time set aside for Synergy. We use this time to have students from different grade 2 classes to work together, under the guidance of different teachers, completing different activities with each teacher. My responsibility in each rotation is to provide each group with the opportunity to highlight their creative and cooperative skills and knowledge through STEM activities. Students learn to recognize that each team member brings their own strengths to the STEM challenge at hand.



Timeline for Research Observations

- Timeline: January 31, 2022 - April 8, 2022
- # of grade 2 students: 60
- 4 groups comprised of students from all three classes. The groups were named after the characters of seven oaks.
 - Jumper Rabbit
 - Goob Bear
 - Sophie Squirrel
 - Pokey Porcupine
- Each teacher was responsible for providing an activity for their group at the time to complete. Two of the teachers focused on games, the other on yoga and myself on STEM activities.
- Groups were rotated so that students had 2 synergy sessions with each teacher.

Activity 1-The Cup Stacking Pyramid

Materials needed:

- Cups
- String (approximately 3 ft long)
- Rubber bands

Plan:

- Split students into groups!
- Begin with 6 cups stacked together upside down
- Students cannot touch cups with their hands
- In groups of 4, have students each take the string
- Together the students will have to manipulate the rubber band by pulling the strings in different directions
- This requires students to communicate, if students finish the challenge quickly, they could try again but this time without talking.
- Students will attempt to put the rubber band over the bottom of the cup as a group.
- They will move the cups and attempt to stack them into a pyramid
- If there are groups who are struggling to build a pyramid, encourage them to simply stack the cups again but in a different area.

Rationale:

- This activity is a great way for students to learn to work with others, strengthening the importance of communication. It is a hands-on activity that promotes habit 6→synergize. Students will practice working together and to complete the challenge. Inviting them to try without talking is an added challenge that challenges students to communicate with their peers non-verbally.



Activity 2-The Spaghetti Tower Challenge

Materials Needed:

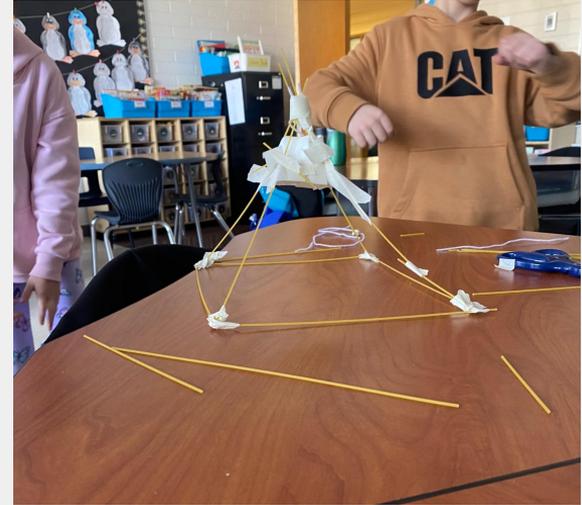
- Spaghetti Noodles (20 sticks)
- String (1 yard, 92 cm)
- Tape (1 yard, 92 cm)
- Marshmallow
- Tape measure to measure tower at the end

Plan:

- Explain the activity: build the tallest tower that can support a marshmallow
- Split the students into groups of 4
- Give each team their supplies
- Set a timer for 18 minutes
- Encourage students to build a structure that will support a marshmallow.
- At the end of the 18 minutes have each group test whether or not their structure supports their marshmallow at the top

Rationale:

- This activity asks students to work together to construct a tall tower strong enough to hold a marshmallow. It is a great team-building activity. It encourages design mindset and support basic engineering skills. The team practices the design process that includes thinking, doing, prototyping, and iteration. Lots of focus on collaboration.



Activity 3–Building Bridges

Materials Needed:

- Popsicle sticks (25 per group)
- Masking tape (3 ft per group)
- Tape measure

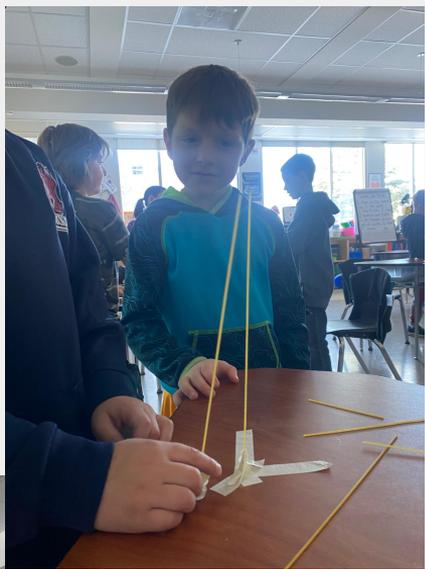
Plan:

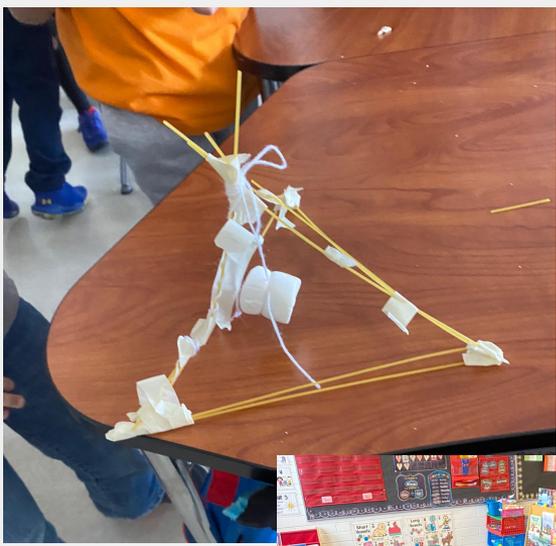
- Introduce the activity and explain instructions
 - Today your goal is to build a bridge from one desk to another.
- Move desks so they are 1 foot apart
- Give each group a bundle of popsicle sticks
- Give each group their tape
- Give students 15-20 minutes to build bridges
- Test bridge strength with weight.

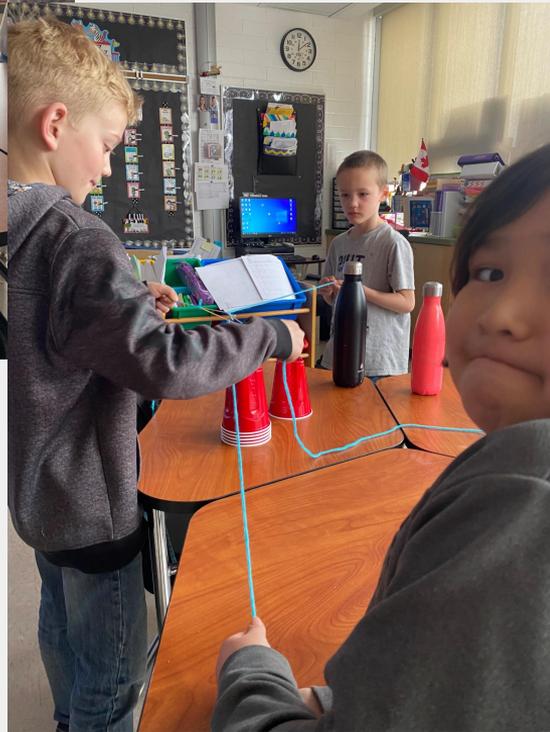
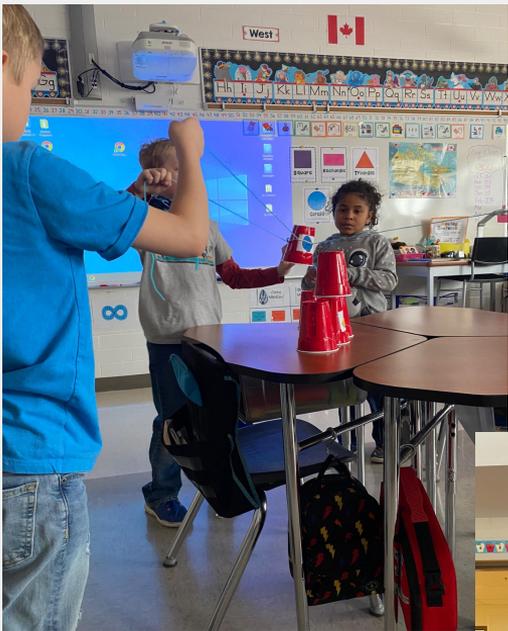
Rationale:

- The goal of this lesson is to have students work together to build a bridge from one desk to another. Students will need to plan with the end in mind, communicate with their group to build a strong aesthetically pleasing bridge. The group practices the design process, coupled with trial and error to create an effective bridge. Students will have to work together to implement a plan before building their bridge.









Student Feedback

Bentley

Ms. Dery's Synergy Feedback

My favourite activity

was building bridges

I liked the activity

because my group was the first one to succeed.

Using a scale of 1-5, answer the following:

The STEM activities that we did were fun?

1 2 3 4 5

The activities helped me work better with others?

1 2 3 4 5

I was a leader in the activity and helped my group?

1 2 3 4 5

Working in groups can help to create better ideas than working alone?

1 2 3 4 5

Newton

Ms. Dery's Synergy Feedback

My favourite activity

was Spaghetti

I liked the activity

because I vsd my imagination

Using a scale of 1-5, answer the following:

The STEM activities that we did were fun?

1 2 3 4 5

The activities helped me work better with others?

1 2 3 4 5

I was a leader in the activity and helped my group?

1 2 3 4 5

Working in groups can help to create better ideas than working alone?

1 2 3 4 5

Anson

Ms. Dery's Synergy Feedback

My favourite activity

was building bridges

I liked the activity

because the groups were very fun and we could be creative.

Using a scale of 1-5, answer the following:

The STEM activities that we did were fun?

1 2 3 4 5

The activities helped me work better with others?

1 2 3 4 5

I was a leader in the activity and helped my group?

1 2 3 4 5

Working in groups can help to create better ideas than working alone?

1 2 3 4 5

Student Feedback

Ava

Ms. Dery's Synergy Feedback

My favourite activity

was cup building!

I liked the activity

because you had to wrke together!

Using a scale of 1-5, answer the following:

The STEM activities that we did were fun?

1 2 3 4 5

The activities helped me work better with others?

1 2 3 4 5

I was a leader in the activity and helped my group?

1 2 3 4 5

Working in groups can help to create better ideas than working alone?

1 2 3 4 5

matthew

Ms. Dery's Synergy Feedback

My favourite activity

was Building bridges

I liked the activity

because becues I LOVE Building

Using a scale of 1-5, answer the following:

The STEM activities that we did were fun?

1 2 3 4 5

The activities helped me work better with others?

1 2 3 4 5

I was a leader in the activity and helped my group?

1 2 3 4 5

Working in groups can help to create better ideas than working alone?

1 2 3 4 5

Aspen

Ms. Dery's Synergy Feedback

My favourite activity

was cup pyramid

I liked the activity

because I liked it beaucus I
that it was fun and I
got to cum with you and
stacing the cups

Using a scale of 1-5, answer the following:

The STEM activities that we did were fun?

1 2 3 4 5

The activities helped me work better with others?

1 2 3 4 5

I was a leader in the activity and helped my group?

1 2 3 4 5

Working in groups can help to create better ideas than working alone?

1 2 3 4 5

Student Feedback

Name Presio

Ms. Dery's Synergy Feedback

My favourite activity
was sports

I liked the activity
because I got to buy my ingredients

Using a scale of 1-5, answer the following:

The STEM activities that we did were fun?

1 2 3 4 5

The activities helped me work better with others?

1 2 3 4 5

I was a leader in the activity and helped my group?

1 2 3 4 5

Working in groups can help to create better ideas than
working alone?

1 2 3 4 5

Ms. Dery's Synergy Feedback

My favourite activity
was cup pyramid

I liked the activity
because I liked my group

Using a scale of 1-5, answer the following:

The STEM activities that we did were fun?

1 2 3 4 5

The activities helped me work better with others?

1 2 3 4 5

I was a leader in the activity and helped my group?

1 2 3 4 5

Working in groups can help to create better ideas than
working alone?

1 2 3 4 5

Name Adalynn

Ms. Dery's Synergy Feedback

My favourite activity
was sparty tour

I liked the activity
because it was cool seeing
all the bills. it was fun.

Using a scale of 1-5, answer the following:

The STEM activities that we did were fun?

1 2 3 4 5

The activities helped me work better with others?

1 2 3 4 5

I was a leader in the activity and helped my group?

1 2 3 4 5

Working in groups can help to create better ideas than
working alone?

1 2 3 4 5

Observations

- One thing that I realized at the beginning of each rotation and activity was that students displayed unease when I introduced the activity. I believe that if students participated in early STEM activities they would be more inclined to jump into the activity.
- Throughout all the groups and all the activities, a common statement was “We can’t do this”. The Grade 2 team has been discussing a growth mindset recently. As students work together, they experimented with different strategies to reach their end goal. It was rewarding to see students work together and realize that their goal was achievable, as long as they worked together.

Final Results

- The majority of the students were able to identify, in a team, the strategy needed for each STEM activity.
- Most students found the activities to be engaging.
- Student feedback shows that a large number of the students who participated in my synergize activity found that they learned to work better with others.
- Individually, students felt that they contributed and were a leader in their group.
- Upon reflection, the students have come to realize the importance of collaboration, more specifically, every student bringing their own unique ideas to the group.

Moving Forward

- STEM education has become an essential component of today's educational strategies.
- The principles of STEM are becoming more critical to success in the global marketplace.
- “The Importance of Innovation” → Innovative thinkers are the future individuals who have the potential to change the world.
- STEM is something that can always happen in the classroom. Setting aside time weekly can benefit students in various ways but especially in developing collaboration skills.
- The Leader in Me program is outstanding and students often engage the 7 habits when participating in STEM activities. However, STEM is something that can be implemented in the classroom and every program.

Teachers Resources

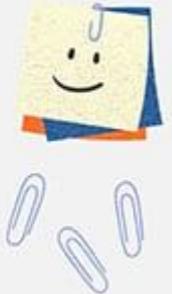
- Please use these resources below to find simple STEM activities that promote collaboration and creativity.
 - [Spaghetti Tower Marshmallow Challenge - TinkerLab](#)
 - [Back to School STEM Challenges — Carly and Adam](#)
 - [A Week of STEM activities! | The Ardent Teacher](#)
 - [Easy Engineering Lesson Plans & Activities for Ages 4-18](#)
 - [25 Second Grade STEM Challenges To Help Kids Think Creatively](#)
 - [Second Grade STEM Activities](#)
 - [20 STEM Challenges for Kids | Education to the Core](#)



3



Stack 5 paper plates and 10 toilet paper tubes to make a structure that can support the most books.



Resources

- Covey, S. R., Covey, S., Summers, M., Hatch, D. K., & Platzer, I. (2015). *The leader in me*. Business Contact
- *Collaborative Learning Activities Help Kids Gain Stem skills*. Bricks 4 Kidz Kids Franchise. (n.d.). Retrieved March 13, 2022, from <https://www.bricks4kidz.com/blog/collaborative-learning-activities-help-kids-gain-stem-skills/>
- *Elementary the 7 habits of happy kids*. The 7 Habits of Happy Kids - Leader In Me. (n.d.). Retrieved March 13, 2022, from <https://www.leaderinme.org/the-7-habits-of-happy-kids/>
- Hadani, H. S., & Elizabeth Rood. (n.d.). *The roots of stem success*. Retrieved March 15, 2022, from https://37726n2dobnw25rhl01gna4e-wpengine.netdna-ssl.com/wp-content/uploads/2020/04/Roots_of_STEM_Paper_WO_RKING_v2.pdf
- Leader In Me. (2020, November 5). *Leader In Me Intro*. Leader In Me Intro--YouTube. Retrieved March 13, 2022, from <https://youtu.be/07cl9wYLLaQ>
- *Leadership and STEM Education*. Leader in me. (n.d.). Retrieved March 15, 2022, from <https://www.leaderinme.com/resources/leadership-and-stem-education>
- Lynch, M. (2019, January 23). *7 benefits of STEM Education*. The Edvocate. Retrieved March 13, 2022, from <https://www.theedadvocate.org/7-benefits-of-stem-education/>
- Rachelle. (2022, January 22). *Spaghetti Tower Marshmallow Challenge*. TinkerLab. Retrieved January 27, 2022, from <https://tinkerlab.com/spaghetti-tower-marshmallow-challenge/>
- *Second grade stem activities*. The Stem Laboratory. (2022, March 3). Retrieved March 27, 2022, from <https://thestemlaboratory.com/second-grade-stem-activities/>
- Speicher, C. (2018, August 24). *Back to school STEM challenges*. Carly and Adam. Retrieved January 20, 2022, from <https://carlyandadam.com/thecarlyandadam/2018/7/27/back-to-school-stem-challenges>

Resources

- *STEM Lesson Plans*. TryEngineering.org Powered by IEEE. (2022, March 21). Retrieved March 25, 2022, from <https://tryengineering.org/teachers/lesson-plans/>
- The Ardent Teacher. (2016, July 1). *A week of STEM activities!*. The Ardent Teacher. Retrieved February 2, 2022, from <https://theardentteacher.com/2015/05/26/a-week-of-stem-activities/>
- *The benefits of STEM education for children*. The Benefits of STEM Education for Children. (n.d.). Retrieved March 13, 2022, from <https://www.invent.org/blog/trends-stem/value-stem-education>
- *The importance of collaboration in STEM*. Collaboration In STEM | National Inventors Hall of Fame®. (n.d.). Retrieved March 13, 2022, from <https://www.invent.org/blog/trends-stem/collaboration-learning-STEM>
- *The roots of stem success*. Bay Area Discovery Museum. (n.d.). Retrieved March 13, 2022, from <https://bayareadiscoverymuseum.org/roots-stem-success>
- Webfx. (n.d.). *Benefits of early STEM education*. Bricks 4 Kidz Kids Franchise. Retrieved March 13, 2022, from <https://www.bricks4kidz.com/blog/benefits-of-early-stem-education/>
- *What is leader in me?* Leader in Me - Educational & Student Leadership Programs & Curriculum. (n.d.). Retrieved March 13, 2022, from <https://www.leaderinme.org/>
- *What is stem?* Online College Degree Programs for Students & Business. (n.d.). Retrieved March 13, 2022, from <https://pearsonaccelerated.com/blog/stem>
- Wujec, T. (n.d.). *Build a tower, build a team*. Tom Wujec: Build a tower, build a team | TED Talk. Retrieved January 27, 2022, from https://www.ted.com/talks/tom_wujec_build_a_tower_build_a_team?language=en

Resources

- *20 stem challenges for kids*. Education to the Core. (2020, October 12). Retrieved March 27, 2022, from <https://educationtothecore.com/2020/10/20-stem-challenges-for-kids/>
- *25 second grade stem challenges to help kids think creatively*. We Are Teachers. (2021, September 10). Retrieved March 27, 2022, from <https://www.weareteachers.com/second-grade-stem-challenges/>
- *49 stem activities to engage your students on National Stem Day*. Waterford.org. (2019, October 28). Retrieved March 15, 2022, from <https://www.waterford.org/resources/national-stem-day-activities/>