STEM Research Project and Presentation

Here is What's New this Year

There are important changes to the STEM Research Project and Presentation for this season.

- The STEM Research Project and Presentation is no longer a requirement for the VEX IQ Challenge Excellence Award.
- The STEM Research Project and Presentation is now a video submission turned in prior to the event.
- The STEM Research Project and Presentation is no longer part of the Standard Event trophy pack.
- The STEM Research Project Award is optional at local events and will be offered at the discretion of the Event Partner.

Note: Teams should check the Awards tab on the VEX IQ Challenge event pages to determine if the STEM Research Project is being offered at each event.

Overview

The focus for this project is to have students learn about the relationship among the STEM fields of science, technology, engineering, and math. Each season one of the fields will be featured providing the students with an opportunity to learn more about how it relates to robotics and how what they are learning in the classroom has a practical application in their lives.

STEM Research Project Award at Local Events

STEM Research Project Award is optional at local events and will be offered at the discretion of the Event Partner. Teams are encouraged to view the Awards tab on the VEX IQ Challenge event page to determine if the event will offer this award. Event Partners that decide to offer the STEM Research Project Award at local events will share with teams the procedure for submitting the link for the video submission.

STEM Research Project Award at State/Provincial/National Championships

The STEM Research Project Award will be awarded at all State/Regional/Provincial/National Championships.

- Teams will submit an online video submission information to the Event Partner at least **two weeks prior** to the State/Regional/Provincial/National Championship. Submissions will include your team number and the YouTube URL to the video.
- **Only one entry is allowed per team.** However, each team in a multi-team school or club program may submit a separate entry. For example, both teams 123A and 123B may submit separate videos, but team 123A may not submit two videos.

STEM Research Project Award at World Championship

Only teams that win the STEM Research Project Award or the Excellence Award at a State/Regional/Provincial/National Championship event will be eligible to submit an online video presentation for the VEX IQ Challenge World Championship.

Teams will submit an online video submission through the VEX Awards system:

- www.vex.com/awards

Teams which are eligible to submit STEM Research Project and Presentation videos for VEX IQ Challenge World Championships will be notified one month prior to World Championship. A list of eligible teams will also be posted on the Robotevents.com VEX IQ Challenge World Championship event pages.

STEM Research Topic: Math

This year we are featuring the STEM field of math. Math is the language of science and engineering. We use numbers, quantities, measurements, and the relationships between them to communicate our ideas on how things work. Studied in several branches including arithmetic, algebra, geometry, trigonometry, and calculus, math enables us to describe the world around us through patterns and models using logical reasoning. This season, your goal is to learn more about the exciting world of math and how it can be used to find solutions to interesting problems around us.

Steps for Developing a STEM Research Project

Follow these steps to develop your STEM research project.

1. Identify topic of interest
2. Search for accurate information about your topic
3. Develop a thesis, which is a sentence that tells the reader what you believe about your topic
4. Organize all the information that you have found about your topic
5. Make an outline
6. Work on your project by filling in your outline with information that you learned in your research.
7. List all books, Internet sources, magazines, encyclopedias and anything else that you used to gather information.

Other Helpful Steps

Keep these tips in mind as you develop your STEM research project.

- Involve all of your team members in some way.
- Talk to engineers in your community to explore what challenges exist and how your team can solve these challenges by applying math.
- Identify one challenge topic that your team can solve by using math.
- Narrow your focus so that your team can effectively share your results in four minutes.
- Research your challenge topic using a variety of reliable sources, such as engineering and scientific journals and publications, electronic resources from various professional organizations, ask your librarian for help, including human experts in the area you are researching.
- Identify possible solutions that have already been proposed or tried for your challenge.
- Organize, study, and explain the research that your team completed.
- Apply your research and creativity to develop your proposed solution (your "hypothesis"). Which can be sketches or a simple prototype.
- Test your solution to make sure it works, consider consulting with math teachers or mathematicians.
- If your solution does not work well, consider modifying your solution and testing it again.
- Students do the research, choose the challenge and solution, make the decisions, and select the format to share their research results. Adults may offer guidance.

Video Presentation

Create a video of no longer than 4 minutes. You may choose to explore any one of the topics below or one of your own related to math.

The video may be your team speaking, a voice over storyboard, a voice over PowerPoint or any other video format of your choosing.

Potential Topics

Here is a list of Potential Topics for your Project:

- **Design your dream school.** The driving question for this Project based learning opportunity is: How can you use math to design your dream school? This project is designed to inspire all of you to connect with your entire school community. Math disciplines you will be able to address may include budgets, finances, maps, geometry, population, scale modeling, problem solving, team work, communication, writing. You will be able to work with your school administration, school board, physical plant staff, city planners, district offices, architecture and engineering firms and local politicians.

Develop a learning environment that will help students who struggle with math. You have an opportunity to make a difference for your classmates who need some help. This can include making games, tutoring programs on the computer or in person.

- **Develop a math super hero!** Their mission is to make math approachable, fun and highlights its importance. When leaping over buildings you first need to calculate height, wind speed...
- **Develop a project using Queuy or Sammy, the little snap together IQ character.** What types of problems may they encounter on their adventures? Demonstrate math calculations including cost, distance, time, and commerce. Tell their story using the language of numbers.
- **Create a playground that would be fun and accessible for all kids to play on together!** Almost every community has a neighborhood park or playground with swings, slides, and other equipment. All kids enjoy playing at the playground. Unfortunately, some areas are not accessible to everyone, especially kids with disabilities. They may hard time playing on swings, slides, sandpits, and other park features with their friends. Look at pictures or visit existing playgrounds to get an idea of what kinds of equipment is available and discuss how math can be used to design your ideal playground.

When planning your playground, you may want to consider:

- How big should the playground be?
- How many pieces of equipment would need to be at the playground?
- Do you need to create a new piece of equipment?
- How would you redesign existing equipment to accommodate wheelchairs, walkers, etc.?
- How much space would be needed to operate all pieces of equipment safely?

Video Requirements

To learn how to post a video to YouTube, please read this instruction page.

When teams submit their videos, they must meet the following criteria:

- Create and post your video on YouTube.
- The video should summarize your project from start to finish. The video should effectively share the story of your research project and the significance of the math used to accomplish your selection.
- Videos may be up to four (4) minutes long and include credits.
    - At the end of the video, there must be a credits section which includes the name of the entrant or entrants, the team number, the name of the video, proper music credit, plus any other information the creators want to include (software used, recognition of sponsors, etc.). The credits should be no longer than 15 seconds and must appear at the end of the video (**Total allowed video length is 4 minutes 15 seconds with credits included**).

- This video must be student produced! Adults may help with software or camera operation, but only enough to empower the students to do the required work themselves.

Note: You must use music in the public domain, or YouTube may delete your video. Use music only if necessary.

Evaluation Criteria

Your video must focus on a current or historical power of Mathematics, demonstrate to the audience how your project is significant, and how you have used this research to advance the Math portion of the STEM fields.

The Judges will evaluate each entry using the STEM Research Project Rubric and will also focus on:

- The students featured in the video are demonstrating the work they have done for the project.
- The students have demonstrated how many different math components played a role in their project or how the subject of their research affected math as we know it today.
- The video is easily understood, clearly presented, creative and is enjoyable to watch – it engages the learner.
- The video is produced by the student with minimal adult help. It is of good quality, including resolution, editing and sound (all music must be in the public domain and/or credited properly).

Helpful Tip: Focus on making learning fun and engaging – be creative with your presentation! You may elect to:

- Submit a brief documentary
- Teach a virtual classroom or stage a real one
- Film your presentation to your community
- Or any method that appeals to an audience of your peers

Further Resources

The following is a list of Professional organizations and Math resources:

- National Council of Teachers of Math
- Association of Math Teacher Educators
- Zap Zap Math
- Academic Skills Builder
- Buzz Math
- Matific
- Mathway
- Math Duko
- Middle School Math
- Sushi Monster
- Chalkboard Math
- Reflex Student
- Operation Math
- Flat Stanley

STEM Research Project and Presentation Rubric

Teams will share the results of their STEM Research Project with VEX IQ Challenge event Judges in a creative and effective four (4) minute video presentation. Following the video there must be a 15 second credits section which includes the name of the entrant or entrants, the team number, the name of the video.

Team Name: _____ **Team Number:** _____

☐ Elementary ☐ Middle **Judges:** _____

For details, review the STEM Research Project and Awards Appendix:

- www.roboticseducation.org/vex-iq-challeng/viq-current-game/

Directions: Mark the descriptor that best describes the team's performance for each criterion.

Criteria	Expert (3 points)	Proficient (2 points)	Emerging (1 point)	Points
Identifies a challenge topic of interest that relates to the STEM theme for the season	Challenge topic clearly identified, with a strong connection to the STEM theme for the season	Challenge topic identified, with some connection to the STEM theme for the season	Topic not identified and/or limited connection to the STEM theme for the season	
Completes research and collect evidence using reliable sources	Provides evidence of thorough research using 3-5 reliable and credible sources	Provides evidence of research using 1-3 reliable sources	Provides evidence from no reliable sources	
Demonstrates a well-organized and documented process to study/explain research findings	Demonstrates highly organized and well documented process to study and explain the research data	Demonstrates some organization and documentation of the project	Demonstrates little to no documentation of the project	
Describes how the research findings were applied to develop and test the solution	Demonstrates an in-depth understanding of the application of the research to develop and test the solution	Demonstrates some under-standing of the application of the research to develop and test the solution	Demonstrates little to no application of research to develop and test the solution	
Shares the solution in an effective and creative high quality video	Video provides clear, effective, and creative explanation of how solution was developed and how it works	Video provides adequate explanation of how the solution was developed and how it works	Video lacks detail needed to understand the team's solution	
Students demonstrate an understanding of the research process	All students demonstrate mastery of the research process	Most students demonstrate some understanding of the research process	Students demonstrate little or no understanding of the research process	
Students demonstrate teamwork and effective communication skills in a student produced video	All students demonstrate high levels of cooperation, courtesy, enthusiasm, confidence, accuracy, and clarity	Students demonstrate some cooperation, courtesy, enthusiasm, confidence, accuracy, and clarity	Students demonstrate limited cooperation, courtesy, enthusiasm, confidence, accuracy, and clarity	
Describe the best features of this video presentation. *(Continue on back of sheet)*		Add a 3-point bonus for staying within the 4-minute allotted time and including up to 15 seconds of appropriate credits.		**Total Points**

NOTE: This is a confidential judging document. It should not leave the Judge's room after a competition. Return to the Judge Advisor for disposal.