DIGITAL STEM DEMONSTRATION

STUDENT AND FAMILY GUIDE

Spring 2020

Purpose

Typically, each spring Everett Public Schools hosts a STEM competition for students in grades 4 – 8. This year, due to school closures, the district will host a ***Digital STEM Demonstration*** – ***an optional, self-guided, non-competitive opportunity for grade 4 – 8 students*** to design and carry out an experimental, scientific research, or engineering design project and then present the project in a digital manner.

Students may collaborate on projects – students living in the same household may collaboration in person; students may also collaborate using communication tools such as phone calls, email, and Zoom.

The Spring 2020 Digital STEM Demonstration provides opportunity for students to be creative, develop understanding of science and engineering, and build 21st Century Skills.

Goals

1. To emphasize and support state science and engineering standards through meaningful applications of science, engineering and mathematics.
2. To provide a focus for students to apply skills and concepts learned in science, engineering, mathematics, reading, writing, technology and art.
3. To help students develop self-reliance, organizational skills, and productive work habits.
4. To provide our schools and community with the opportunity to recognize and encourage student interest in STEM.

PROJECT CHECKLIST:

- ✓ **Identify a Project Idea**
- ✓ **Use the Project Steps in the Self Assessment to draft a plan**
- ✓ **Develop a timeline and use the Self Assessment to guide your work**
- ✓ **Develop a Family Safety Agreement**
- ✓ **Pick a Digital Platform to create your presentation**
- ✓ **Send your presentation to STEMCelebration@everettsd.org by May 29, 2020**
- ✓ **View your and others' presentations at everettsd.org/digitalstem**

PROJECT SUPPORT:

While the Digital STEM Demonstration projects are meant to be self-guided, there will be two support webinars to help students and families with questions about projects planning and use of digital platforms. Please visit everettsd.org/digitalstem for webinar information to be hosted these two dates:
Wednesday, May 13, 5:30 – 6:30
Wednesday, May 20, 5:30 – 6:30

Pick a Project Idea

These questions are provided as examples of topics you could focus on for your project or they may be used to help you format your own question. You may come up with your own idea as long as it is safe, you have the materials, and you can measure the results.

Experiment

–Students will conduct an experiment to investigate a scientific question/problem. Using the **steps of the inquiry process**, students will ask a testable question, do preliminary research, make a prediction, plan and conduct an experiment, and analyze their results in order to make a conclusion that answers their question.

Example Experiment Questions:

How does the amount of salt in water affect how quickly it boils?
How does the amount of salt in water affect the amount of time until the top freezes over?
How does the size of a parachute affect the time it takes an object to fall to the ground?
How does the size of a model vehicle's tires affect the distance it will travel when rolled down a ramp?
How does the temperature of a cup of water affect the time it takes a sugar cube to fully dissolve in it?
How does changing the shape of a wing affect how far a paper airplane will fly?

Research Project

–Students will come up with an interesting science or math question/problem to research and will look for the answer/solution by reading books, talking to experts, and websites. Students can use independent reading time to research their questions using informational texts. The research projects students do will become their presentations.

Example Research Questions:

How do clouds form?
How does camouflaging help animals?
How are snowflakes mathematical?
Why do plants need water and sunlight to stay alive?
How is nature mathematical?
How do caterpillars change into butterflies?
Why does erosion happen faster along bends in a river or stream?

Engineering Design

- Students will use science, math, and creativity to redesign an object or a process to solve a real-life problem. The **engineering design process** will take students through all the necessary steps: asking a question, imagining or brainstorming possible solutions, planning, creating, testing, and redesigning the chosen solution to make it even better.

Example Engineering Design Questions:

How can I design/redesign _____ to make it work better?
How can we redesign packaging to keep fruit fresh for a longer period of time?
How can we redesign a hand pollinator to work better at moving pollen from one flower to another?
How can we design a bridge to be safer and stronger?
How can we redesign a container so that it protects its contents from the impact of being dropped?
How can we redesign product packaging to hold the most product with the least amount of packaging?

Draft a Plan & Timeline

This should be a fun project! Success is when your student asks their own question, completes their project with a smile, and knows more than when they started. The goal is that your student applies their understanding of the steps of the inquiry process, research skills, or the engineering design process through direct experience. It is best to guide and answer your student's questions with questions. You may know the answer but help them discover it themselves.

For their daily reading, recommend they choose online science or engineering readings that can be a research resource for their project. Verify that websites are "correct" and then let them use the research found there. *Remember:*

- Anyone can create a web site; this does not mean its information is correct!
- Make sure the web site is run by a large, recognized group such as a college or organization. (DOT "org", "gov" or "edu" are generally trustworthy for accuracy of content).

Encourage your student's artistic side with the display. For example, you can show how the use of color, shapes, and graphics can be used to draw attention to important parts of the display.

You and your student are encouraged to use simple materials that can be found around your home.

Project Steps

Experiment	Research Project	Engineering Design
Develop a Guiding Question	**Develop a Guiding Question**	**Identify a Problem**
Make a Prediction	**Make a Prediction**	**Imagine a Solution**
Create a Matrials List and Write a Procedure	**Conduct your Research**	**Make a Plan**
Conduct your Experiment and Collect Data	**Write a Conclusion**	**Create your Solution**
Write a Conclusion	**Cite your Sources**	**Improve your Solution**
Create your Digital Presentation	**Create your Digital Presentation**	**Create your Digital Presentation**

Experimental Project | Self Assessment

Project Steps:	Basic	Attempted	Proficient	Advanced Proficient
Develop a *Guiding Question*	• Does not state the problem as a question	• States the guiding question as a question that cannot be tested in an experiment	• States guiding question as a question that can be tested	• States a unique, original guiding question as a testable question • States the changed and measured variables in the question
Make a *Prediction*	• Does not make a prediction	• Makes a prediction that does not connect to the stated guiding question	• Makes a prediction that connects to the stated guiding question	• Makes a prediction that connects to the stated guiding question and includes scientific reasoning
Create a *Materials List* and Write a *Procedure*	• Material list is missing • Procedure is missing two or more of the following: ○ steps to do the experiment ○ one changed or one measured variable ○ how often measurements should be taken and recorded	• Materials list is incomplete to carry out investigation • Procedure is missing one or more of the following: ○ steps to do the experiment ○ one changed or one measured variable ○ how often measurements should be taken and recorded	• Materials are listed but lack detail • Procedure includes: ○ relevant steps to do the experiment ○ one changed variable ○ one measured variable ○ how often measurements should be taken and recorded	• All materials are listed with details such as quantity and size • Procedure includes: ○ Clear and logical steps for the experiment ○ one changed variable ○ one measured variable ○ how often measurements should be taken and recorded
Conduct your Experiment and *Collect Data*	• Data are missing	• Only performed one trial of experiment • Data are incomplete	• Performed more than one trial of experiment • Data are organized	• Performed experiment at least three times • Data are organized and clearly labeled with appropriate measurement units, identifying the changed and measured variables
Write a Conclusion	• Does not answer the experimental question • Supporting data not used	• Answers the experimental question • Includes limited **supporting** data from the data table • Does not explain how these data **support** your conclusion	• Answers the experimental question • Includes **supporting** data from the data table • Explains how these data **support** your conclusion	• Answers the experimental question • Includes relevant **supporting high and low** data from the data table • Clearly explains how these data **support** your conclusion
Create your Digital Presentation	• Project is not clearly described • Presentation is missing two or more of the following parts: **Guiding Question, Prediction, Materials, Procedure, Data, Conclusion** • Presentation is missing pictures or visuals	• Project is not clearly described • Presentation is missing one of the following parts: **Guiding Question, Prediction, Materials, Procedure, Data, Conclusion** • Presentation is missing pictures or visuals	• Project is clearly described • Presentation is organized and includes all of the following parts: **Guiding Question, Prediction, Materials, Procedure, Data, Conclusion** • Presentation includes pictures or visuals	• Project is clearly described • Presentation includes all parts listed in "Proficient" and is organized neatly • Presentation includes pictures, visuals, data with appropriate measurement units and/or models that support the research in an inventive/creative way

Research Project | Self Assessment

Project Steps:	Basic	Attempted	Proficient	Advanced Proficient
Develop a *Guiding Question*	Does not state the problem as a question	The guiding question is vague or there is no connection to a scientific or mathematical concept Addresses an issue to which the student already knows the answer	States the problem as a question Shows a connection to a scientific or mathematical concept	States the problem as a question Addresses a connection to a scientific or mathematical concept Unique, or original question applies to a current world problem or issue
Make a *Prediction*	Does not make a prediction	Prediction doesn't connect to the question Prediction appears to be completed after the research is done	Prediction connects to the question and is made before the research is done Prediction is made using text features or prior	Prediction connects to the question and is made before the research is done Prediction is made using both text features and prior
Conduct your *Research*	Does not use sources or little research completed on topic Research doesn't connect to the question	Only one quality source is used Some research is completed Limited connection to the question or prediction Not written in the student's own words	Two or more quality sources are used One supporting quote is used Research demonstrates a connection to the guiding question Written in student's own words	Four or more quality sources are used Two or more supporting quotes are used Research demonstrates a clear, in-depth connection to the guiding question Research states how this affects the environment and/or people
Write a *Conclusion*	No conclusion or conclusion doesn't answer the question	Conclusion answers the question, but does not refer back to the prediction Contradicts the evidence found in the research	Conclusion answers the question States if prediction was supported or rejected Quotes evidence from research Explains the connection between the evidence and the conclusive statement	Conclusion answers all aspects of the question States if the prediction was supported or rejected Quotes evidence from research Explains the connection between the evidence and the conclusive statement
Cite your *Sources*	No sources listed	Sources at the end of the written report are listed by title only, or represent an incomplete list	Two or more sources are cited with most of the information given, i.e., name, title, web address, date	Four or more sources are cited correctly with complete information
Create your *Digital Presentation*	Project has limited appeal Project is not organized Presentation is missing pictures or visuals	Project has limited appeal Project has limited organization Presentation visuals are confusing	Project is appealing, organized and clear Presentation uses understandable visuals and/or models	Project is appealing, organized and clear Display includes pictures, visuals and/or models that support the research in an inventive/creative way

Engineering Design Project | Self Assessment

Project Steps:	Basic	Attempted	Proficient	Advanced Proficient
Identify a *Problem*	• States the problem as a statement, instead of a question • Doesn't share prior learning about the problem from sources	• States the problem in the form of a question • Describes one thing learned about the topic from informational sources (such as books, videos, interviews) that helped find possible solutions	• States the problem in the form of a question • Describes 2-3 things learned about the topic from informational sources (such as books, videos, interviews) that helped find possible solutions	• States the problem in the form of a unique, original question • Describes 4 or more things learned about the topic from informational sources (such as books, videos, interviews) that helped find possible solutions
***Imagine* a Solution**	• No possible solutions listed or solutions listed without descriptions	• Lists one or two solutions to the problem • Includes limited description of each solution	• Lists at least three practical solutions to the problem • Includes a description of each solution	• Lists three or more practical, creative solutions to the problem • Includes a clear, detailed description of each solution
Make a *Plan*	• No chosen solution, or no description of how the solution will work • No diagram of chosen solution • No materials list	• Limited description of how your chosen solution will work • Unlabeled diagram of your solution • Materials list is incomplete	• Includes a description of how your chosen solution will work • Includes a labeled diagram of your solution • Major materials are listed for you solution	• Includes a detailed description of how your chosen solution will work • Includes a detailed, labeled diagram of your solution • All relevant materials are listed for your solution
***Create* your Solution**	• No explanation for how solution was built • No test of the solution	• Limited explanation of how solution was built • Performs an incomplete test of the solution • Missing description of successes and challenges (troubles) during testing	• Explains how solution was built • Perform a test of your solution, with appropriate data measurements • Includes description of successes and challenges (troubles) during testing	• Clearly explains how solution was built • Performs a test of your solution with multiple trials and appropriate data measurements • Includes detailed description of successes and challenges (troubles) during testing
***Improve* your Solution**	• No explanations for redesign • No test of redesigned solution • No conclusion • No explanation of real-world application	• Limited explanation of how solution was redesigned to work better • Incomplete retest of solution • Limited conclusion to explain how your redesigned solution solved the problem • Limited explanation of how what you learned applies to the real world	• Explains how solution was redesigned to work better • Retests solution • Writes a conclusion to explain how your redesigned solution solved the problem • Some explanation of how what you learned applies to the real world	• Explains in detail how solution was redesigned to work better • Retests solution • Writes a detailed conclusion with supporting data to explain how your redesigned solution solved the problem • Clearly explains how what you learned applies to the real world
Create your *Digital Presentation*	• Project not clearly described • Presentation is missing two or more of the following parts: **Ask, Imagine, Plan, Create, Improve** • Presentation is missing pictures or visuals	• Project not clearly described • Presentation is missing one or some of the following parts: **Ask, Imagine, Plan, Create, Improve** • Presentation is missing pictures or visuals	• Project clearly described • Presentation is organized and includes all of the following parts: **Ask, Imagine, Plan, Create, Improve** • Presentation includes pictures and/or visuals and data with appropriate measurement units	• Project clearly described • Presentation is organized and includes all of the following parts: **Ask, Imagine, Plan, Create, Improve** • Presentation includes pictures, visuals and/or models supporting research in an inventive/creative way

Suggested Family Safety Agreement

Planning for my STEM Demonstration:

I will care for science materials by handling objects carefully. I will not eat, drink, or taste any science materials.

I will follow all safety rules.

I will not use any toxic chemicals in my STEM Demonstration project. All materials must be appropriate for use in school and at home and approved by an adult at my home.

I will not use fire or burning objects in my STEM Demonstration project.

I will not use firearms, tobacco, drugs or alcohol in my STEM Demonstration project.

I will not harm any animals in my STEM Demonstration project.

Materials I plan to use for my project are:

_____

_____

_____

_____

_____

Student Signature:

I will follow the above safety rules and complete my STEM Demonstration project in a safe manner.

Student Print Name: _____ Signature: _____

Parent Signature:

I acknowledge that the above safety precautions will be followed and that this project will be completed in a safe manner. I also acknowledge that no animals (vertebrates or invertebrates) will be harmed in any way.

Parent Print Name: _____ Signature: _____

Digital Presentation Guidance

Students interested in presenting their STEM projects are encouraged to submit a digital presentation to be posted to the district's Digital STEM Demonstration website (please see the Project Form for instructions to submit a digital presentation).

Following are the acceptable digital platforms for STEM project presentations:

- Google Slide PDF
- Power Point PDF
- Word document PDF
- FlipGrid video

Instructions for Google Slides, Power Point and FlipGrid can be found on the Digital STEM Demonstration website: everettsd.org/digitalstem

Recommended length of PDF files: 5 to 10 pages
Recommended length of FlipGrid video: approximately 2 minutes

Important note: FERPA clearance is required to include a student's image in the presentation. The federal Family Educational Rights and Privacy Act (FERPA) allows school districts to only share directory information you allow to be shared. If you requested information not be shared, then your students name and photo cannot be used in conjunction with this online project. If you have questions about whether or not a student has FERPA clearance, please contact the school's front office.

Digital STEM Demonstration Project Form

If you would like your project posted to the district's Digital STEM Demonstration website, please submit the following information via email to **STEMCelebration@everettsd.org** no later than **May 29, 2020**
(Copy the information below into the body of an email and then add in the requested information.)

Student Name(s)	School	Grade

Project Title:

Project Type:

(Experiment, Research, or Engineering Design)

Project Description:

(Brief – about 3 lines – description that will appear on the website)

- What was the question you asked or problem you solved?
- What was the outcome?
- What did you learn?

Contact Information:

(Best way to be in contact if there is a question)

Preferred Mailing Address:

(To mail a participation award)

Presentation Format:

- Google Slide PDF (send as an attachment to the email)
- Power Point PDF (send as an attachment to the email)
- Word document PDF (send as an attachment to the email)
- FlipGrid video (list name and title used for FlipGrid video)

Important note: FERPA clearance is required to include a student's image in the presentation. The federal Family Educational Rights and Privacy Act (FERPA) allows school districts to only share directory information you allow to be shared. If you requested information not be shared then your students name and photo cannot be used in conjunction with this online project. If you have questions about whether or not a student has FERPA clearance, please contact the school's front office.