

## **HTSNA STEM Fair 2018**

Background: HTS is committed to providing to our youth educational opportunities in a wide range of academic field at the HTS Ganesa Patasala - Language, Religion, Visual and Performing Arts, Math, Science and Technology. HTS has held programs such as Art Exhibition, Battle of the Brains, and Debate/Elocution to give participants a forum to showcase their talents. STEM (Science Technology Engineering and Math) education has been a focus in the school systems and many of our youth are very familiar with the acronym. From the NYC Education website: STEM education involves the study of science and mathematics, and the meaningful integration of technology and engineering to provide opportunities for innovative problem solving. In recognition of the importance of STEM education in the school systems today and as part of process necessary for college, career and life readiness, HTS would like to hold the 2<sup>nd</sup> STEM Fair on **April 22, 2018**.

<http://schools.nyc.gov/Academics/STEM/default.html>

## **What are the goals of the HTSNA STEM Fair?**

1. To provide a forum where science, math, technology and engineering skills and knowledge can be used to answer questions or solve problems just as scientists, engineers, and technology/ mathematicians do in the real world.
2. To understand different approaches as such scientific method and engineering process in developing a STEM fair project to identify problems, develop and test possible solutions, and reach a final solution.
3. To learn how to develop a STEM project with the HTS advisors:  
**Science:** Sandhiya Kannan  
**Technology:** Vinod Narayanan  
**Math:** Chandrashekar Vellur  
**Engineering:** Vaidhyanathan Krishnan
4. To learn to organize a project and presentation that is written clearly, communicates effectively, and justifies their conclusion based on their data, processing, research and evidence obtained during their experiments, and/or solving a problem.
5. To encourage the exploration of STEM as career options.



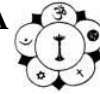
## **GUIDELINES**

1. Projects for categories III and IV should be presented on a tri-fold board with appropriate steps/process, charts, results, and diagrams clearly displayed in a neat and organized fashion (refer to recommendations from “how to put together a project”).
2. Prepare a 2-3 minute oral presentation of your project.
3. Be prepared to answer questions from the judges and visitors.
4. Choose one of the STEM subjects for your project. The advisors/mentors can guide you and assist you in deciding what project would be right for you (see each subject guidelines attached).
5. Decide if the scientific method or engineering process is appropriate for your project.
6. - No flames, explosives or flammable materials  
- No dry ice, dangerous chemicals liquid containers  
- No animals, live or preserved, no parts of animals (vertebrate or invertebrate)  
- No hazardous and/or controlled substances No projects involving eating, drinking, exercise, inhaling, injection, etc.
7. Your final project presentation should include: (see recommendations/suggestions from each advisor/mentor.
8. Group projects are allowed with only 2 participants per project.
9. Categories:  

<b>I</b> - Grades 1- 2	<b>III</b> - Grades 6-8
<b>II</b> - Grades 3- 5	<b>IV</b> - Grades 9-12

## **TOPICS**

- **Science, Technology, Engineering, Math**
- Choose a problem or phenomenon in our world today that you would like to address.
- Gain background knowledge regarding that topic.
- Why is it such a large problem today? [Provide some statistics]
- Causes of the problem.



- Areas where the problem has a large effect.
- In terms of the science, what part would you want to address?
- Provide a possible hypothesis that you could study regarding the problem you've chosen and the literature you have read & explained.
- Provide a literature review of the background information regarding your project.
- Reliable Sources: Journals or websites (.edu or .gov, only)
- Give a funnel effect: start from general and go to the specifics.
- Bring in the sources that you have added in your presentation.
- Show your results in the form of figures and diagrams.
- Provide figure legends, or captions, explaining the figures.
- Provide a few bullets stating the most important findings and why they are so important.

## **SCIENCE**

### **The Scientific Method:**

- The scientific method is a process for experiment that is used to explore observations and answer questions.

### **Your Question & Approach:**

- One of the most important considerations in picking a topic for your science fair project is to find a subject that you consider interesting.
- You must be able to control other factors that might influence your experiment, such as environment, fairness & others.
- Is your experiment safe to perform?
- Do you have all the materials and equipment you need for the STEM fair?
- Is your family okay with the time and cost for the science fair?
- Do you have enough time to do your experiment before the STEM fair?
- Does your science fair project meet all the rules and requirements?

### **Science Project Conclusion:**

- Summarize and conclude your science project results in few sentences.
- State whether your results support or contraindicate your hypothesis.



- If appropriate, state the relationship between the independent and dependent variable.
- Summarize and evaluate your experiment procedure, making comments about its success and effectiveness.
- Suggest changes in the experimental procedure (or design) and/ or possibilities for further study.

**For further guidance, contact:**

Sandhiya Kannan (email: [sandhiya.kann@gmail.com](mailto:sandhiya.kann@gmail.com))

**TECHNOLOGY**

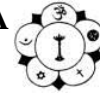
Technology follows the engineering design process. Scientific method asks the question “why” and engineering method asks “how” or “what”. Any project should start with a question that states a problem. For example “*Plants die without water when we go on a vacation, how can we automate this task?*” The next step is to research on the different methods and materials available. For example “*Arduino humidity sensors and triggers for water to go off using an electric switch*”. If alternatives are available, document why the alternatives were eliminated. If no alternatives are available, document with sufficient proof. All the research steps should be duly documented and presented on the day of the STEM fair. Project design and list of required materials should also be documented and presented. If required build a prototype and test before building the final product.

As a reminder - Present the final product with the following supporting documentation:

- Problem being solved
- Research findings
- Alternatives and elimination process
- Final design
- Final presentation will be judged based on the ability to coherently talk about the problem design and the solution.

**For further guidance, contact:**

Vinod Narayanan (email: [nvinod1977@gmail.com](mailto:nvinod1977@gmail.com))



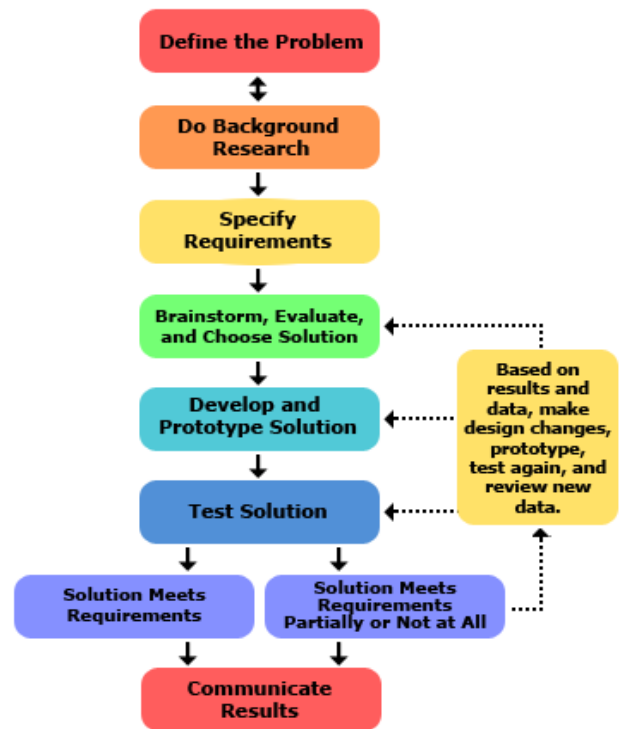
## ENGINEERING

Engineering projects involve creative problem solving, and they are not hypothesis testing. Each engineering design, software application or device project should have a clear engineering goal, which can fit the following model statement:

Engineering Design Process - “*The design and construction of an (engineered product) for (target user) to do (some useful function)*”.

The below outlines an overall design process and guidelines for the science fair engineering projects:

- Define or identify a need or problem.
- Conduct background Research
- Establish design criteria and constraints (Specify Requirements)
- Brainstorm, Evaluate and choose alternative design solution.
- Build or develop a prototype of best design.
- Test and evaluate the prototype against important design criteria to show how well the product meets the need.
- Analyze test results; make design changes, and retest.
- Communicate, Prepare and Present the design - All steps to be documented and presented on the day of the STEM Fair.



**For further guidance, contact:**

Vaidhyanathan Krishnan (email: [kvaidhya@yahoo.com](mailto:kvaidhya@yahoo.com))

## MATH

### **Proposed Goals:**

- Participant carries creative idea; an idea can be copied as long as "it is owned and nourished by the candidate"



- Participant carries simple and good reasoning skills
- Participant is able to communicate clearly and concisely
- Participant is confident and able to present
- Participant is clear about what he knows and what he is doubtful or not sure
- The project need not be super-duper or conceptually big. Even a simple subject of adding two 3-digit numbers is acceptable, if the candidate has something creative and convincing.
- Candidate should carry logical sequence of events while presenting, and the logical sequence is that of common knowledge.
- Participant should answer questions related to research using presentation material and concepts that are of common understanding.

Overall, we want participants to talk, present and debate their understanding of the core concept. We want them to sell their idea and make think the idea is creative. The core concept should be clear and described in simple words.

Proof or support for the core concept should be one of:

- Deduction
- Induction
- Mixture of Induction & logical reasoning
- Regression/Extrapolation/Quantitative type

Proof or support for the core concept could be based on an existing proof provided; the existing proof is not the core concept. Meaning, there should be some original idea as that of the candidate and that is proved using other proven concepts.

Participant should have supporting arguments to convince the judges. To repeat, the supporting arguments should be in proper sequence, logical and using proven concepts.

Participant should have a minimum write-up of one page and that should carry:

- Problem statement.
- Expected background.
- Breaking up the problem into simple ideas.
- Providing convincing proofs for each idea.
- Putting all the related ideas into one common goal.
- Conclusion; and that should include, what is candidate's idea.



- Resource references.
- Candidates can use an optional project display board with pictures/presentations to help sell the idea.
- Candidates can use an optional model or working exhibit or computer demo to help sell the idea.

### **Project Suggestions:**

- Please note that these are just suggestions, any other project is always welcome. If in doubt, please refer with the relevant subject advisor, mentor or teacher.
- You may get additional suggestions or feedback from teachers, advisors or mentors.
- Quality entries from previous fairs are good sources of ideas and best practices.
- Some high school technology curricula address the engineering design process and many college and professional engineering societies have on-line resources.

### **For further guidance, contact:**

Chandrashekar Vellur (email: [cvellur@gmail.com](mailto:cvellur@gmail.com))

### **Science:**

- Are fingerprint patterns inherited?
- Why aren't all medicines pills?
- Are there bugs under your feet?

### **Technology:**

- Problems that need technological solutions:
- How can we sell products across the world?
- How can I show my talent to the world?
- How can I share my thoughts to the world? □
- How to test the life of a battery?
- How can I protect my secrets in a box?
- What does it take to know the location of your pet at any given time?
- How can we build a tool that helps detectives to catch a lie?
- What does it take to graphically display the New York weather for any given



period?

- How can computer tools be used to animate any given sport and analyze the outcome?
- How can computer aid as a study tool for subjects like mathematics and science?
- Some suggested tools:
  - Arduino programming
  - Scratch
  - Excel or similar tools
  - Web technologies
  - Other programming tools such as python or c#.

You may use some of these websites for inspiration. However your idea should be original.

[www.sciencebuddies.org](http://www.sciencebuddies.org), [www.sciserv.org](http://www.sciserv.org), [www.madsci.org](http://www.madsci.org) [www.science-fair.org](http://www.science-fair.org), [www.projectsincere.org](http://www.projectsincere.org)

All of those involved in developing, advising, judging and promoting the HTSNA STEM Fair 2018 are volunteers and all decisions are final. We welcome recommendations/suggestions participants/parents