CONNECTICUT STEM FOUNDATION, INC.

CURRICULUM FOR A HIGH SCHOOL STEM RESEARCH PROGRAM

DRAFT 2: OBJECTIVES

GENERAL:
1. Students will learn how to select a STEM research topic in an area of interest to them.
2. Students will learn how to conduct an extensive literature search, using a wide variety of sources, on the STEM topic, question or problem that they have selected to research.
3. Students will learn how to develop an original line of research for the STEM topic, question or problem that they have selected to study.
4. Students will be able to secure an outside mentor who is a professional in the STEM topic they have selected.
5. Students will become proficient in the use of statistical analysis techniques.
6. Students will learn how to present their research project clearly and succinctly with appropriate charts, graphs and other visual aids.
7. Students will become proficient at providing constructive criticism and feedback to their fellow research students.
8. Students will become proficient at incorporating constructive criticism and feedback at intermediate points in their research project and in their final project presentation.

FOR EXPERIMENTS:
1. Students will be able to form a hypothesis based on the original line of research they have developed from their literature search.
2. Students will be able to identify both the independent and dependent variables for their experiment.
3. Students will be able to identify all other variables that must be controlled during the course of the experiment.
4. Students will be able to design an effective control for their experiment.
5. Students will be able to design and conduct an experiment that addresses the hypothesis they formulated, effectively studies the effect of the independent variable on the dependent variable, effectively controls all other variables and includes an appropriate control.
6. Students will be able to effectively analyze data collected from the experiment, using appropriate statistical analysis techniques.
7. Students will be able to draw valid conclusions that accurately reflect the experimental data collected and analyzed.
8. Students will be able to use their conclusions to project the next steps that should be pursued for their research project, where appropriate.

FOR ENGINEERING DESIGN PROJECTS:

1. Students will be able to break down the real world problem into smaller parts.

2. **Students will be able to design engineering solutions for each of the smaller parts of the real world problem they have selected to address.**
3. **Students will be able to synthesize the individual solutions into a larger more complex format that addresses the whole real world problem.**
4. **Students will take into account safety, cost, feasibility, reliability and aesthetics into their engineering design, as well as societal considerations, effects on the environment and cultural norms.**
5. **Students will be able research a variety of materials to be used in the engineering design and select the optimal materials in terms of safety, cost, durability and reliability.**
6. **Students will be able to create and use a test of the engineering design and/or employ computer simulation to model the engineering design.**
7. **The student will be able to evaluate the effectiveness of the engineering design, based on the outcome of the test and/or computer simulation results and make needed adjustments to the engineering design based on the outcome of the test and/or computer simulation.**

FOR SURVEYS OF EXISTING PUBLISHED DATA:

1. **Students will be able to formulate a hypothesis for their research question or problem.**
2. **Students will be able to identify the appropriate variables that affect their hypothesis.**
3. **Students will be able to select appropriate sources of data that contain or reflect the appropriate variables and do not contain extraneous variables to use to test their formulated hypothesis.**
4. **Students will be able to employ statistical analysis to the data to look for trends, similarities or differences among the data.**
5. **Students will be able to evaluate the outcome of the data analysis and determine whether or not their hypothesis was supported.**
6. **Students will be able to draw valid conclusions that accurately reflect the outcome of the data analysis**
7. **Students will be able to use their conclusions to project the next steps that should be pursued for their research question or problem, where appropriate.**