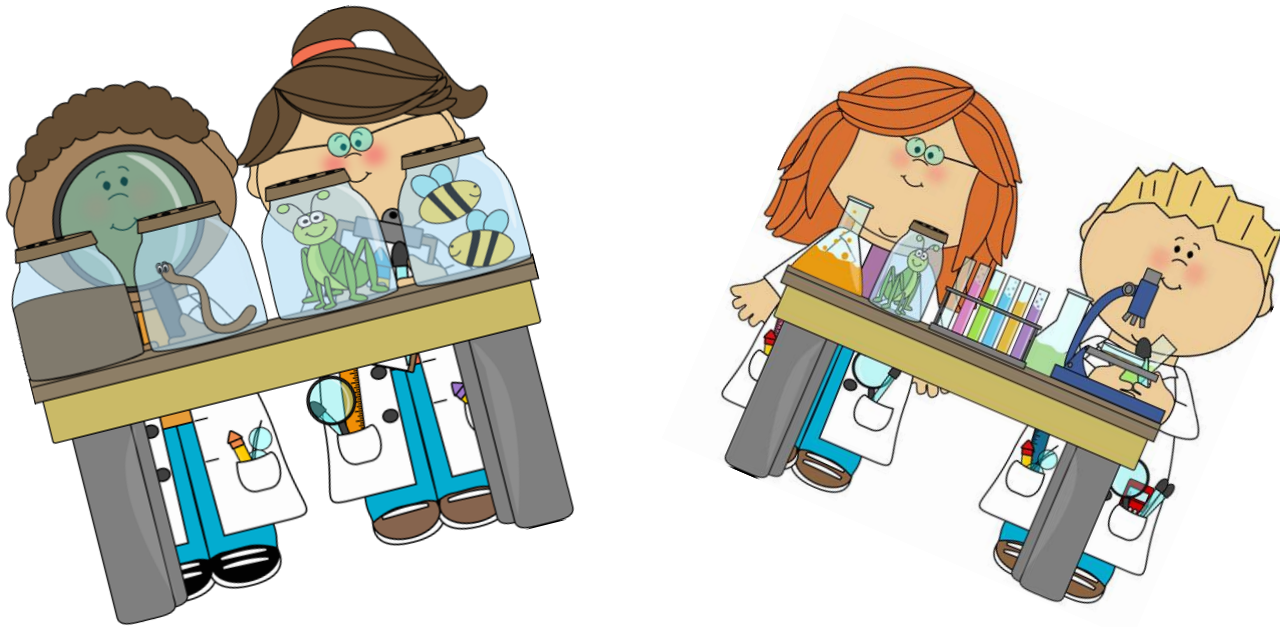


# **Baylor College of Medicine Academy at James D. Ryan**

## **STEM Investigation Handbook**

### **In it to Love it and Never Give Up**

**2019-2020**



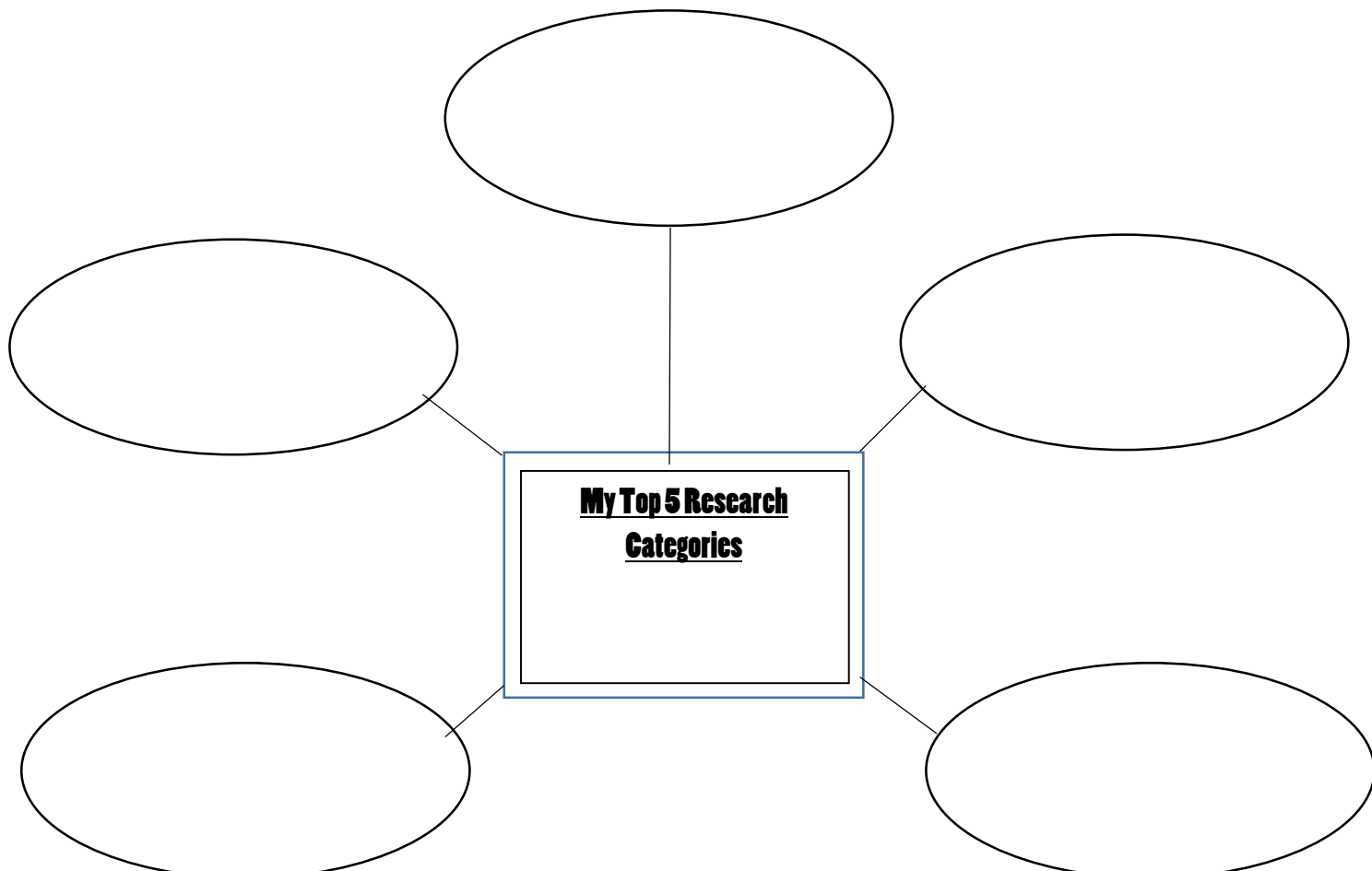
**Here at BCMAR, we are committed to doing whatever it takes to achieve advancements in science, technology, mathematics, engineering, and math. Every year, students submit proposals to investigate their own scientific inquiries and/or engineering innovations. Now it is your turn to complete a proposal for a science or engineering investigation to contribute to the world around you! This is only the proposal. Do not begin your investigation until approvals by teachers have been made. Come prepared for the start of this great experience and turn this packet in on the first two days of school as soon as you see your health science teacher! You will be doing similar work as soon as school starts. An electronic copy may be found here:**

<https://www.houstonisd.org/Page/130646>.

**Your family and friends can help by listening to your ideas and questions and helping you find where to research information. You may find the following resource helpful as you work: <https://www.sefhouston.org/sefh-curriculum.html>**

**Let's begin...**

**PROPOSAL PREPARATION STEP 1: Brainstorm! Using the Project Categories on the next page, please write down 5 categories that are interesting to you**



Which category (of the 5 you chose above) is your favorite? Write it down below. What are three possible topics from the category you chose that you would like to learn more about and possibly investigate? Write those three topics in the form of three questions below.

***Favorite Category:*** \_\_\_\_\_

***Possible Investigation Questions:***

1. \_\_\_\_\_

\_\_\_\_\_

2. \_\_\_\_\_

\_\_\_\_\_

3. \_\_\_\_\_

\_\_\_\_\_

## **PROJECT CATEGORIES**

It is time to think and organize our thoughts and ideas. Below is a list of categories that your research project will fall into. Read the brief descriptions and then use the graphic organizer to select your top category of interest. The categories from SEFH are as followed:

- **Aerospace Engineering:** the study and designing and testing of aircrafts and related systems
- **Animal Sciences:** animals, animal life, life cycles, and animal interactions within their environment
- **Behavioral & Social Sciences:** the study of the thought processes and behavior of humans and animals
- **Biochemistry:** the study of the chemical processes occurring in living organisms
- **Biomedical and Health Sciences:** focuses on issues of human health and disease
- **Cellular and Molecular Biology:** studies the structure, function, pathways, and formation of cells
- **Chemical Engineering:** using chemistry, biology, and physics to solve problems in man-made products
- **Chemistry:** the science of the composition, structure, properties, and reactions of matter
- **Civil Engineering:** includes the design, construction, and maintenance of the “built” environment
- **Computational Biology and Bioinformatics:** studies focused on the discipline and techniques of computer science and math as they relate to biological systems using modeling and simulations
- **Earth & Space Sciences:** the study of sciences related to planets, solar systems, and the universe
- **Electrical Engineering:** includes electronics, digital computers, power engineering, and radiofrequency
- **Energy & Transportation:** includes alternative fuels, fossil fuel energy, and vehicle development
- **Environmental Engineering:** creating processes and infrastructure to solve environmental problems
- **Materials & Bioengineering:** the study of the characteristics and uses of various materials with improvements to their design which may add to their advanced engineering performance
- **Mathematics:** studies using algebra, analysis, or probability
- **Mechanical Engineering:** involves the generation/application of heat and use of machines and tools
- **Microbiology:** the study of micro-organisms, including bacteria, viruses, and antibiotic substances
- **Physics & Astronomy:** studies related to the science of matter and energy and of interactions between the two; astronomy is study of anything in the universe beyond the Earth
- **Plant Sciences:** studies of plants and how they live, structure, development, and classification
- **Robotics and Intelligent Machines:** studies on how the use of machine intelligence can potentially reduce the reliance on human intervention

## **PROPOSAL PREPARATION STEP 2: Read and Take Notes on Information Regarding Your Question**

*Look for and Record Information that Helps Answer Your Favorite Question: Pick a favorite question from Step 1. Using online resources, research your favorite question. Record at least 4 of the most important pieces of information that answered or helped answer your question in the table below. For each piece of information, quote/copy the text from the source, rewrite the text in your own words, write the website link from which you obtained the information.*

<b>A quote from your readings that helps answer or address your favorite question</b>	<b>A paraphrase of the quote (rewrite the quote in your own words)</b>	<b>Source: Website Link</b>

### **PROPOSAL PREPARATION STEP 3: Narrow Down Your Favorite Question to a Specific Question**

*Based on what you learned from Step 2, narrow down your favorite question to a **specific question** that you hope to investigate further in the form of experiments, real life observations or through engineering. A specific question can be realistically investigated in 3 weeks with supplies that you can realistically obtain. An investigation has multiple trials and must be original. Your project cannot be copied from online sources like science buddies. The following resources will help you:*

<https://www.sefhouston.org/assets/1.a.-pointers-for-finding-a-topic.pdf> and

<https://www.sefhouston.org/assets/1.c.the-four-question-topic-selection--strategy.pdf>

*Write your specific question here:*

*Predict the answer. A hypothesis is a prediction. It reflects the answer you expect for your question above. It is based on things you learned and read about; it is not a guess. To begin creating a hypothesis/prediction, record some notes from sources you read that help answer your specific question. These notes can come from your prior notes in Step 2, or be in addition, but they must be connected directly to your proposed specific question.*

A quote from your readings that helps answer or address your possible investigation questions in some way.	A paraphrase of the quote	Source: Website Link

*Using your notes, make a predicted answer to your specific question and write it here:*

## Investigation Proposal

*Investigation Question:*

*Hypothesis (predicted answer to your question):*

*Because Statement: Write a one sentence summary that tells us why you are making your prediction (use your notes from Step 3 and possibly Step 2).*

*Methods/Procedures:*

- *What will you do/test? What will you change (this is your independent variable) in your test and/or what will you compare your results to in your test? Your test is also called a trial or replicate.*
  
- *Materials- Including equipment and chemical information.*
  
- *Steps you will take to test the hypothesis or address a problem/question (include the number of trials or replicates you will perform).*
  
- *Location where research will take place (Microbes like bacteria, fungus and mold cannot be grown at home).*

