Fair for Emerging Researchers

Need Help Picking a Topic??????

Picking a Topic

- In Mentorship Session 2 you ranked topics from below. In the following slides you will see example topics for each field. You can use them as starting points or just as inspiration.

Machines and Robots

1. **How does wheel size affect how far a simple robot travels?**
   Build a small motor-powered robot or rubber-band–powered car using cardboard and different-sized wheels (bottle caps, CDs, jar lids). Run the robot on the same surface and measure the distance traveled with each wheel size. Compare results to determine which wheel size produces the greatest travel distance.
2. **Does the surface texture affect how efficiently a robot moves?**
   Use the same simple robot and run it across different surfaces (tile, carpet, sandpaper, cardboard). Measure how long it takes the robot to travel a fixed distance on each surface. Analyze which surface allows the robot to move fastest and why.
3. **How does weight affect the speed of a robot?**
   Add small, equal weights (coins or washers) to a simple wheeled robot. Measure the time it takes to travel a fixed distance as weight increases. Determine how added mass impacts robot speed and efficiency.
4. **Which ramp angle allows a robot or car to travel the farthest?**
   Release the same robot or toy car from ramps set at different angles made from books and cardboard. Measure the distance traveled after leaving the ramp. Compare results to find the angle that produces the greatest distance.
5. **Does wheel grip affect a robot's ability to climb a slope?**
   Cover robot wheels with different materials (rubber bands, tape, felt). Test how far up an inclined ramp the robot can climb before stopping. Determine which wheel covering provides the best traction.

Computers

1. **Does typing speed change depending on the type of keyboard used?**
   Test typing speed and accuracy using different keyboards (laptop keyboard, external keyboard, tablet keyboard). Have the same person type the same paragraph multiple times on each device and record words per minute and errors. Compare results to see which keyboard allows for faster and more accurate typing.
2. **How does screen brightness affect eye fatigue during computer use?**
   Use a computer at different brightness levels while completing the same task for a set amount of time. After each session, record eye strain symptoms using a short survey (headache, eye tiredness, difficulty focusing). Analyze whether brightness level affects perceived eye fatigue.
3. **Does background noise affect computer task performance?**
   Perform the same computer-based task (typing, math problems, or memory game) in different sound conditions (silence, music, talking noise). Measure task completion time and accuracy for each condition. Determine which environment leads to the best performance.
4. **How does internet speed affect file download time?**
   Download the same file at different times of day or on different networks (home Wi-Fi vs. hotspot, if available). Measure how long each download takes using a timer. Compare results to see how internet speed impacts download efficiency.
5. **Does screen size affect how quickly information can be found online?**
   Search for the same set of answers using different screen sizes (phone, tablet, laptop). Record how long it takes to find each answer. Analyze whether larger screens help users locate information more quickly.
6. **Which AI gives the most accurate and useful answers for a specific task?**
   Pick one function like “summarize a paragraph,” “write an email,” or “generate a study quiz,” and use the *same exact prompt* in 3 different AIs (or 3 different settings/models if available). Create a scoring rubric (e.g., accuracy, completeness, clarity, number of mistakes, and how well it follows instructions) and have 3 people rate each output without knowing which AI wrote it. Compare the scores to determine which AI performs best for that function and whether the results are consistent across multiple trials.

The Brain

1. **Does background music affect memory recall while studying?**
   Study a list of words or facts with different background conditions (silence, instrumental music, music with lyrics). After a fixed study time, test recall using the same quiz. Compare scores to determine which condition leads to the best memory performance.
2. **How does sleep length affect reaction time?**
   Measure reaction time using an online reaction-time test after nights with different amounts of sleep. Keep the test conditions the same and record multiple trials each day. Analyze whether more sleep improves reaction speed.
3. **Does color affect how well information is remembered?**
   Present the same information written in different colors (black, blue, red, green). Test recall after a set time delay. Compare which color leads to the highest memory retention.
4. **How does multitasking affect brain performance?**
   Complete a simple task (math problems or reading comprehension) while either focusing fully or multitasking (texting, background video). Measure accuracy and completion time. Compare results to see how multitasking affects brain efficiency.
5. **Does practice improve learning speed over time?** *(Learning & Memory Focus)*
   Learn a new skill such as a short sequence in a memory game or a new set of vocabulary words each day. Measure how long it takes to learn the material across several days. Analyze whether learning becomes faster with repeated practice.

Chemical Reactions

1. **How does temperature affect the speed of a chemical reaction?**
   Mix baking soda and vinegar at different temperatures (cold vinegar, room temperature, warm vinegar). Measure how fast the reaction occurs by timing how long bubbling lasts or how quickly a balloon inflates. Compare reaction speeds to see how temperature affects reaction rate.
2. **Does the concentration of reactants change how much gas is produced?**
   React different amounts of baking soda with the same amount of vinegar. Measure the size of a balloon inflated by the gas or the mass lost during the reaction. Determine whether increasing reactant concentration produces more gas.
3. **How does surface area affect reaction speed?**
   React whole pieces of Alka-Seltzer tablets versus crushed tablets in water. Time how long it takes for the reaction to finish in each case. Compare results to see how surface area affects reaction rate.
4. **Does the type of acid affect the strength of a reaction?**
   React baking soda with different household acids (vinegar, lemon juice, soda). Measure the amount of gas produced or reaction time. Analyze which acid produces the strongest reaction.
5. **How does temperature affect rust formation (a slow chemical reaction)?**
   Place identical steel wool pieces in warm, cold, and room-temperature environments. Observe and record rust formation over several days. Compare which condition causes rust to form fastest.

Space

1. **Does the color of a planet affect how much heat it absorbs?**
   Place identical objects painted different colors under a lamp to model sunlight. Measure temperature changes over time using a thermometer. Compare which color absorbs the most heat and relate it to planetary temperatures.
2. **How does crater size change with meteor speed?**
   Drop the same object from different heights into flour or sand to simulate meteor impacts. Measure crater diameter and depth after each drop. Analyze how impact speed affects crater size.
3. **Do larger planets have more moons?**
   Collect data on planet size (diameter or mass) and number of moons from reliable astronomy sources. Create a graph comparing planet size to moon count. Analyze whether a relationship exists and discuss exceptions.
4. **How does distance from the Sun affect orbital speed?**
   Gather data on each planet's distance from the Sun and orbital period. Calculate orbital speed and compare across planets. Determine whether planets farther from the Sun move more slowly and why.
5. **Are certain types of stars more likely to have planets?**
   Use publicly available exoplanet databases to categorize stars by type (e.g., red dwarf, sun-like). Count how many known planets orbit each type. Analyze patterns and discuss limitations of current discovery methods.

Gardening

1. **How does watering frequency affect plant growth?**
   Grow identical plants and water them on different schedules (daily, every 3 days, once a week). Measure plant height and leaf number over two weeks. Compare which watering schedule leads to the healthiest growth.
2. **Does compost improve plant growth compared to regular soil?**
   Plant the same seeds in soil with and without compost mixed in. Track growth, leaf color, and height over time. Analyze whether compost helps plants grow faster or healthier.
3. **How does sunlight duration affect plant growth?**
   Grow identical plants in areas receiving different amounts of sunlight (full sun, partial sun, shade). Measure height and leaf number every few days. Compare how sunlight exposure affects growth.
4. **Do native plants require less water than non-native plants?**
   Research common native and non-native garden plants in your area and record their water requirements from gardening guides. Compare average water needs between the two groups. Analyze whether native plants are more water-efficient.
5. **Which vegetables grow fastest in home gardens?**
   Collect data from seed packets, gardening websites, or extension service resources on days-to-harvest for different vegetables. Graph and compare growth times. Determine which vegetables are best for quick home gardening.

Animals

1. **Does the type of food affect how quickly ants find it?**
   Place different food types (sugar, bread, fruit) equal distances from an ant trail. Time how long it takes ants to discover each food and count how many ants visit. Compare which food attracts ants fastest and most strongly.
2. **Do pets respond differently to familiar versus unfamiliar sounds?**
   Play recorded familiar sounds (owner's voice) and unfamiliar sounds at the same volume. Observe and record animal reactions such as movement, alertness, or approach. Analyze whether familiarity affects animal behavior.
3. **How does camouflage affect animal visibility?**
   Place paper "prey" of different colors on various backgrounds outdoors. Count how many are "found" or removed over time. Determine which colors provide the best camouflage.
4. **Do larger animals sleep more than smaller animals?**
   Collect data on animal body size and average sleep time from reliable biology sources. Create a graph comparing body mass and hours of sleep. Analyze whether a relationship exists and discuss exceptions.
5. **Are certain animal traits linked to speed?**
   Gather data on animal leg length, body size, and top speed from published sources. Compare traits between fast and slow animals. Determine which physical traits are most strongly associated with speed.

Sports

1. **Does stretching affect sprint speed?**
   Time short sprints after no stretching, static stretching, and dynamic stretching. Keep distance and rest time the same for each trial. Compare average sprint times to see which stretching method leads to the fastest performance.
2. **How does hydration level affect reaction time?**
   Measure reaction time using an online test before and after drinking water. Keep testing conditions the same and repeat multiple trials. Analyze whether hydration improves reaction speed.
3. **Does music tempo affect exercise performance?**
   Perform the same exercise (jumping jacks or push-ups) while listening to slow, medium, or fast-tempo music. Count repetitions completed in a fixed time. Compare performance across music tempos.
4. **Are taller athletes more likely to play certain sports?**
   Collect height data of professional athletes from different sports using publicly available statistics. Compare average heights by sport. Analyze whether certain sports favor specific body types.
5. **Is a specific body build linked to better performance in basketball skills?**
   Gather publicly available data on basketball players' height, wingspan, and performance stats (rebounds, blocks, shooting percentage). Compare skill performance across different body builds using averages or scatter plots. Determine whether certain physical traits are associated with specific basketball skills.

Health and Medicine

1. **Does handwashing method affect how many germs are removed?**
   Press unwashed and washed hands onto bread slices or agar plates using different handwashing methods (water only, soap for 5 seconds, soap for 20 seconds). Observe and count mold or bacterial growth over several days. Compare which method is most effective at reducing germs.
2. **How does screen time affect sleep quality?**
   Track screen use before bedtime and sleep duration or sleep quality using a daily log. Keep bedtime consistent and record data over one to two weeks. Analyze whether increased screen time is linked to shorter or poorer sleep.
3. **Does hydration level affect concentration?**
   Complete the same focus or memory task before and after drinking water. Measure accuracy and completion time. Compare results to determine whether hydration improves concentration.
4. **How has childhood vaccination changed disease rates over time?**
   Collect public health data on disease rates before and after vaccine introduction from reliable sources. Graph changes in cases over time. Analyze how vaccination impacted public health outcomes.
5. **Do healthier diets reduce the risk of certain diseases?**
   Research published studies on diet patterns (high sugar vs. balanced diets) and health outcomes. Compare findings across multiple sources. Summarize trends and discuss limitations of the data.

Cosmetics

1. **Does lipstick color affect how people perceive confidence?**
   Show participants the same face wearing different lipstick colors (red, nude, dark). Ask them to rate perceived confidence using a survey scale. Compare ratings to see whether color influences perception.
2. **How does makeup affect facial recognition accuracy?**
   Show participants photos of faces with and without makeup. Test how accurately they can recognize or match faces after a delay. Analyze whether makeup affects recognition accuracy.
3. **Does nail polish thickness affect how fast it dries?**
   Apply nail polish in thin, medium, and thick layers on identical surfaces. Measure drying time using the same test method. Compare how thickness affects drying speed.
4. **Are “natural” cosmetics less irritating than conventional ones?**
   Collect ingredient lists and reported irritation warnings from cosmetic labels and safety databases. Compare the frequency of common irritants between “natural” and conventional products. Analyze trends and discuss labeling limitations.
5. **Do higher-priced cosmetics last longer than cheaper ones?**
   Test wear time of different price-range cosmetics (lipstick, eyeliner) under the same conditions. Record when visible fading occurs. Compare durability relative to price.

People's Behaviors

1. **Does positive wording change how likely people are to help?**
   Ask people for help using differently worded requests (polite vs. neutral). Record how often people agree to help. Compare which wording leads to higher cooperation rates.
2. **Does phone presence affect attention during a task?**
   Have participants complete the same task with a phone on the desk versus out of sight. Measure task completion time and accuracy. Analyze whether visible phones reduce attention.
3. **Do people choose healthier foods when given more information?**
   Present snack options with and without nutrition information. Record which options people choose. Compare whether added information influences healthier decisions.
4. **Does time pressure affect decision accuracy?**
   Give participants the same set of simple questions with and without a time limit. Measure accuracy and completion time. Analyze whether time pressure increases mistakes.
5. **Do habits form more easily with rewards?**
   Track how long it takes people to form a simple habit (daily stretching or reading) with or without a reward. Record consistency over time. Compare whether rewards speed up habit formation.

Natural Disasters

1. **How does soil type affect flooding severity?**
   Build small land models using sand, soil, and gravel in trays. Pour the same amount of water over each and measure runoff or pooling. Compare which soil absorbs water best and which floods fastest.
2. **Does building shape affect earthquake stability?**
   Build simple structures from straws or blocks with different shapes (wide base vs. tall and narrow). Shake them on a tray or table to simulate an earthquake. Record which structures stay standing the longest.
3. **How does wind speed affect hurricane damage?**
   Use a fan to simulate wind on lightweight model houses or trees. Test at different fan speeds and distances. Measure movement or damage to determine how wind strength affects impact.
4. **Are coastal areas more likely to experience certain natural disasters?**
   Collect data on where hurricanes, tsunamis, or floods most commonly occur. Compare disaster frequency between coastal and inland regions. Analyze patterns and explain why geography matters.
5. **Have natural disasters increased over time?**
   Gather historical data on earthquakes, hurricanes, or wildfires over several decades. Graph the number of events per year. Analyze trends and discuss whether changes may be due to climate, technology, or reporting methods.

Climate Change

1. **Does increased carbon dioxide raise temperature in a closed system?**
   Create two sealed containers under a lamp: one with normal air and one with added CO_2 (from vinegar and baking soda). Measure temperature changes over time using thermometers. Compare whether higher CO_2 levels lead to greater warming.
2. **How does surface color affect heat absorption?**
   Place black, white, and reflective surfaces under the same light source. Measure temperature changes over time. Analyze which surface absorbs the most heat and relate this to ice melt and urban heat islands.
3. **Are average temperatures increasing in your local area?**
   Collect historical temperature data for your city or state from public climate records. Calculate average temperatures by decade and graph the results. Analyze whether a warming trend is present locally.
4. **Is there a relationship between carbon emissions and temperature change by country?**
   Gather data on national carbon emissions and average temperature changes. Create scatter plots or compare country groups. Determine whether higher emissions are associated with greater warming.
5. **Which everyday actions reduce carbon emissions the most?**
   Research estimated carbon savings from actions like biking instead of driving, reducing meat consumption, or lowering energy use. Compare the impact of different behaviors using charts. Identify which actions have the greatest effect.

Bridges and Buildings

1. **Which bridge shape holds the most weight?**
   Build different bridge designs (beam, arch, truss) using the same materials and length. Add weight gradually using coins or washers until failure. Compare which design supports the most weight relative to its mass.
2. **How does triangle placement affect structural strength?**
   Construct structures with different triangle patterns using straws or craft sticks. Apply weight from the top until the structure bends or collapses. Analyze which triangle arrangement provides the greatest stability.
3. **Does building height affect earthquake stability?**
   Build towers of different heights using the same materials and base size. Shake them on a tray or simulated shake table. Record how long each structure stays standing.
4. **Do bridges made from different materials have different strength-to-weight ratios?**
   Build small bridges using paper, cardboard, or wooden sticks. Measure how much weight each bridge supports and its own mass. Compare strength-to-weight ratios to determine the most efficient material.
5. **What bridge designs are most commonly used for long spans?**
   Collect data on famous long-span bridges and categorize them by type (suspension, cable-stayed, arch). Compare span length by bridge type. Analyze which designs are best suited for long distances and why.

Colors

- **Does color affect how hot an object gets in sunlight?**
  Place identical objects painted different colors under sunlight or a lamp. Measure temperature changes over time. Compare which colors absorb the most heat.
- **Do different colors affect memory recall?**
  Study the same information written in different colors. Test recall after a fixed time. Analyze whether certain colors improve memory.
- **Does color influence taste perception?**
  Give participants the same flavored food or drink with different food coloring. Survey perceived taste intensity or flavor. Compare how color changes taste perception.
- **How does color affect visibility in different environments?**
  Place colored objects in various backgrounds (grass, sand, pavement). Measure how long it takes people to find each object. Determine which colors are most visible in each setting.
- **Are certain colors used more often in warning signs?**
  Collect images of warning signs from different countries. Categorize colors used and count frequencies. Analyze why certain colors may be chosen for safety communication.