

## Summerbridge Science Curriculum – 2018

Summerbridge Goals	Our Students Need Help With...	Basic Terms Students Should Know	Summerbridge Curriculum
<ul style="list-style-type: none"> <li>• Teach students organization skills that can be used in and out of the classroom, particularly when addressing a problem or obstacle.</li> <li>• Encourage students to be self-sufficient problem solvers.</li> <li>• Provide students with hands-on learning experiences in which they can observe, discover, predict, analyze, and generate conclusions.</li> <li>• Teach students appropriate lab safety and procedures.</li> <li>• Encourage students to be inquisitive, to formulate appropriate questions, and seek out answers to those questions.</li> <li>• Help students to generate connections between material within science class and across the curriculum.</li> <li>• Teach students how to work with other people in pairs and small groups effectively.</li> <li>• Help students to become more coherent communicators.</li> </ul>	<ul style="list-style-type: none"> <li>• Developing good patterns, habits, and general procedures.</li> <li>• Identifying appropriate questions when attempting to understand a particular phenomenon.</li> <li>• Understanding what it means to collect data and what might actually be considered data.</li> <li>• Organizing data</li> <li>• Analyzing data</li> <li>• Differentiating between relevant and irrelevant data</li> <li>• Drawing valid conclusions based on their findings.</li> <li>• Reworking a solution based on new information, findings, and results.</li> <li>• Presenting findings through writing, graphing, and illustration.</li> <li>• Communicating with their peers and with teachers.</li> <li>• Working in partners and small groups.</li> </ul>	<ul style="list-style-type: none"> <li>• Cause and effect</li> <li>• Conclusion</li> <li>• Controlled variable</li> <li>• Data</li> <li>• Data table</li> <li>• Experiment</li> <li>• Findings</li> <li>• Graph</li> <li>• Hypothesis</li> <li>• Log book/Lab book</li> <li>• Manipulated variable</li> <li>• Measurement</li> <li>• Observation</li> <li>• Operational definition</li> <li>• Predictions</li> <li>• Problem</li> <li>• Procedures</li> <li>• Raw data</li> <li>• Scientific method</li> <li>• T Table</li> <li>• Variable</li> </ul>	<p style="text-align: center;"><b>The Scientific Method</b></p> <p>Students Should:</p> <ol style="list-style-type: none"> <li>1. Know what the scientific method is, why it is important, and how to use it.</li> <li>2. Be able to perform all elements of this process as independent steps and as a whole process, including:               <ol style="list-style-type: none"> <li>a. Asking questions</li> <li>b. Making predictions</li> <li>c. Making relevant observations</li> <li>d. Recording data</li> <li>e. Analyzing results</li> <li>f. Communicating findings</li> </ol> </li> </ol> <p>* Your curriculum is open because it caters to a diverse subject matter. It is critical that you develop routines in your classroom that help students to form positive classroom habits. It is also important that you have a clear plan in which each new subject builds on the previous one.</p>

## Scientific Method

Step	Objectives	Questions
<b>Ask Questions</b>	<i>Inquire</i>	<ol style="list-style-type: none"> <li>1. <b>What is a phenomenon?</b> <ol style="list-style-type: none"> <li>a. How will students know when they see a phenomenon?</li> <li>b. Do phenomena fall into different categories?</li> <li>c. Are there particular phenomena that are specific to the subject you are teaching?</li> </ol> </li> <li>2. <b>Model good questions to ask in science class</b> <ol style="list-style-type: none"> <li>a. How does that work?</li> <li>b. Why does it do that?</li> <li>c. Where and when does it occur?</li> <li>d. What happens if I add to or take away from that?</li> <li>e. What is the cause and effect?</li> </ol> </li> </ol>
<b>Make Observations</b>	<i>Observe</i>	<ol style="list-style-type: none"> <li>1. What does it mean to make an observation?</li> <li>2. How should students make observations?</li> <li>3. Observations include what students:             <ol style="list-style-type: none"> <li>a. See, Smell, Taste, Hear, Touch (touch = physical; feel = emotional)</li> </ol> </li> <li>4. How will a student know what observations are relevant or irrelevant to the study?</li> <li>5. How should students collect and record data?</li> <li>6. What counts as data?</li> </ol>
<b>Define the problem</b>	<i>Identify</i>	<ol style="list-style-type: none"> <li>1. What is the focus of the study?</li> <li>2. How will students know what the focus of the study is supposed to be?</li> <li>3. How can asking questions help students define a particular problem?</li> <li>4. How might one specific problem be related to a variety of other problems or questions?</li> <li>5. How can students identify relevant information from irrelevant information when determining the problem?</li> </ol>
<b>Investigate the Known</b>	<i>Identify, organize</i>	<ol style="list-style-type: none"> <li>1. <b>What prior knowledge and skills do students have?</b> <ol style="list-style-type: none"> <li>a. Individually</li> <li>b. As a group</li> </ol> </li> <li>2. What conclusions can be drawn from what students already know?</li> <li>3. How should students decide what prior information and skills are relevant to the problem or question at hand? What ideas, concepts, or skills will be useful to students during this experiment?</li> <li>4. How should students identify those ideas, concepts, or skills as relevant?</li> <li>5. What is the difference between facts, inferences, educated guesses, and hearsay?</li> <li>6. What sources can be considered credible?</li> <li>7. How should students organize the information they already know in order to utilize that information in the current experiment?</li> </ol>

<p><b>Form a research question</b></p>	<p><i>Write</i></p>	<ol style="list-style-type: none"> <li>1. What is the purpose of a research question?</li> <li>2. How does a research question differ from a regular question (the questions students asked before the experiment began)?</li> <li>3. What is the proper format for writing research questions?</li> <li>4. How do research questions guide the experiment and procedure?</li> <li>5. How do students answer the research question?</li> </ol>
<p><b>Articulate expectations</b></p>	<p><i>Predict, hypothesize</i></p>	<ol style="list-style-type: none"> <li>1. <b>Predictions:</b> <ol style="list-style-type: none"> <li>a. Why should students make predictions?</li> <li>b. What information are predictions based on?</li> <li>c. How does a student know which information is relevant when making a prediction?</li> <li>d. What is the goal of the experiment and how will that goal affect students' predictions?</li> </ol> </li> <li>2. <b>What is a hypothesis?</b> <ol style="list-style-type: none"> <li>a. Why should students write a hypothesis?</li> <li>b. How should a student write a hypothesis?</li> <li>c. How can students use predictions to create a sound hypothesis?</li> <li>d. How should a student test a hypothesis?</li> <li>e. What is the difference between a hypothesis and a theory?</li> </ol> </li> </ol>
<p><b>Carry out the research study</b></p>	<p><i>Collect data</i></p>	<ol style="list-style-type: none"> <li>1. <b>Data</b> <ol style="list-style-type: none"> <li>a. What kinds of data should students be collecting?</li> <li>b. Where should students record data?</li> <li>c. Is there a specific system your students should use to collect and record data?</li> </ol> </li> <li>2. <b>Procedure</b> <ol style="list-style-type: none"> <li>a. What procedures should students follow when conducting the experiment and collecting data?</li> <li>b. Where are the supplies located and how should students use those supplies?</li> <li>c. Is there a specific set of safety measures students should take while working?</li> </ol> </li> </ol>
<p><b>Examine the results</b></p>	<p><i>Analysis</i></p>	<ol style="list-style-type: none"> <li>1. <b>What is analysis?</b> <ol style="list-style-type: none"> <li>a. Why should students analyze data?</li> <li>b. How should students analyze data?</li> <li>c. How should a student determine which data to analyze?</li> </ol> </li> <li>2. <b>Publishing</b> <ol style="list-style-type: none"> <li>a. Is there a particular procedure for writing up results, analysis, and conclusions?</li> <li>b. Should students create graphics to make the results and analysis more clear?</li> <li>c. Who should students talk through their results and analysis with?</li> </ol> </li> </ol>

<p><b>Reflect on the findings</b></p>	<p><i>Evaluate</i></p>	<ol style="list-style-type: none"> <li>1. <b>What is the importance of the analysis students performed?</b></li> <li>2. <b>Can students</b> <ol style="list-style-type: none"> <li>a. Compare and contrast their findings with other students who performed the same experiment?</li> <li>b. Compare and contrast their findings with other findings from other experiments?</li> <li>c. Make predictions, based on their findings, about what might happen if elements of the experiment were changed?</li> <li>d. Draw conclusions about a particular phenomena?</li> <li>e. Evaluate the possible human error in the experiment?</li> </ol> </li> </ol>
<p><b>Communicate with others</b></p>	<p><i>Articulate</i></p>	<ol style="list-style-type: none"> <li>1. <b>Communicating</b> <ol style="list-style-type: none"> <li>a. Who should students talk with before, during, and after the experiment?</li> <li>b. What specifically should students discuss with each other?</li> <li>c. How should students help each other troubleshoot?</li> </ol> </li> <li>2. <b>Publishing</b> <ol style="list-style-type: none"> <li>a. How should students communicate and get feedback on their predictions?</li> <li>b. How should students communicate and get feedback on their conclusions?</li> <li>c. In what form should they communicate?           <ol style="list-style-type: none"> <li>i. Talking</li> <li>ii. Reading silently</li> <li>iii. Graphs and charts</li> <li>iv. Illustrations</li> <li>v. Writing</li> <li>vi. Log books/Journals</li> </ol> </li> </ol> </li> </ol>