

**Hess' Cognitive Rigor Matrix & Curricular Examples:** Applying Webb's Depth-of-Knowledge Levels to Bloom's Cognitive Process Dimensions – *M-Sci*

<b>Revised Bloom's Taxonomy</b>	<b>Webb's DOK Level 1 Recall &amp; Reproduction</b>	<b>Webb's DOK Level 2 Skills &amp; Concepts</b>	<b>Webb's DOK Level 3 Strategic Thinking/ Reasoning</b>	<b>Webb's DOK Level 4 Extended Thinking</b>
<b>Remember</b> Retrieve knowledge from long-term memory, recognize, recall, locate, identify	<ul style="list-style-type: none"> <li>Recall, observe, &amp; recognize facts, principles, properties</li> <li>Recall/ identify conversions among representations or numbers (e.g., customary and metric measures)</li> </ul>			
<b>Understand</b> Construct meaning, clarify, paraphrase, represent, translate, illustrate, give examples, classify, categorize, summarize, generalize, infer a logical conclusion (such as from examples given), predict, compare/contrast, match like ideas, explain, construct models	<ul style="list-style-type: none"> <li>Evaluate an expression</li> <li>Locate points on a grid or number on number line</li> <li>Solve a one-step problem</li> <li>Represent math relationships in words, pictures, or symbols</li> <li>Read, write, compare decimals in scientific notation</li> </ul>	<ul style="list-style-type: none"> <li>Specify and explain relationships (e.g., non-examples/examples; cause-effect)</li> <li>Make and record observations</li> <li>Explain steps followed</li> <li>Summarize results or concepts</li> <li>Make basic inferences or logical predictions from data/observations</li> <li>Use models /diagrams to represent or explain mathematical concepts</li> <li>Make and explain estimates</li> </ul>	<ul style="list-style-type: none"> <li>Use concepts to solve <u>non-routine</u> problems</li> <li>Explain, generalize, or connect ideas <u>using supporting evidence</u></li> <li>Make <u>and justify</u> conjectures</li> <li>Explain thinking when more than one response is possible</li> <li>Explain phenomena in terms of concepts</li> </ul>	<ul style="list-style-type: none"> <li>Relate mathematical or scientific concepts to other content areas, other domains, or other concepts</li> <li>Develop generalizations of the results obtained and the strategies used (from investigation or readings) and apply them to new problem situations</li> </ul>
<b>Apply</b> Carry out or use a procedure in a given situation; carry out (apply to a familiar task), or use (apply) to an unfamiliar task	<ul style="list-style-type: none"> <li>Follow simple procedures (recipe-type directions)</li> <li>Calculate, measure, apply a rule (e.g., rounding)</li> <li>Apply algorithm or formula (e.g., area, perimeter)</li> <li>Solve linear equations</li> <li>Make conversions among representations or numbers, or within and between customary and metric measures</li> </ul>	<ul style="list-style-type: none"> <li>Select a procedure according to criteria and perform it</li> <li>Solve routine problem applying multiple concepts or decision points</li> <li>Retrieve information from a table, graph, or figure and use it solve a problem requiring multiple steps</li> <li>Translate between tables, graphs, words, and symbolic notations (e.g., graph data from a table)</li> <li>Construct models given criteria</li> </ul>	<ul style="list-style-type: none"> <li>Design investigation for a specific purpose or research question</li> <li>Conduct a designed investigation</li> <li>Use concepts to solve non-routine problems</li> <li><u>Use &amp; show reasoning, planning, and evidence</u></li> <li>Translate between problem &amp; symbolic notation when not a direct translation</li> </ul>	<ul style="list-style-type: none"> <li>Select or devise approach among many alternatives to solve a problem</li> <li>Conduct a project that specifies a problem, identifies solution paths, solves the problem, and reports results</li> </ul>
<b>Analyze</b> Break into constituent parts, determine how parts relate, differentiate between relevant-irrelevant, distinguish, focus, select, organize, outline, find coherence, deconstruct	<ul style="list-style-type: none"> <li>Retrieve information from a table or graph to answer a question</li> <li>Identify whether specific information is contained in graphic representations (e.g., table, graph, T-chart, diagram)</li> <li>Identify a pattern/trend</li> </ul>	<ul style="list-style-type: none"> <li>Categorize, classify materials, data, figures based on characteristics</li> <li>Organize or order data</li> <li>Compare/ contrast figures or data</li> <li>Select appropriate graph and organize &amp; display data</li> <li>Interpret data from a simple graph</li> <li>Extend a pattern</li> </ul>	<ul style="list-style-type: none"> <li>Compare information within or across data sets or texts</li> <li>Analyze and <u>draw conclusions from data, citing evidence</u></li> <li>Generalize a pattern</li> <li>Interpret data from complex graph</li> <li>Analyze similarities/differences between procedures or solutions</li> </ul>	<ul style="list-style-type: none"> <li>Analyze multiple sources of evidence</li> <li>analyze complex/abstract themes</li> <li>Gather, analyze, and evaluate information</li> </ul>
<b>Evaluate</b> Make judgments based on criteria, check, detect inconsistencies or fallacies, judge, critique			<ul style="list-style-type: none"> <li><u>Cite evidence and develop a logical argument</u> for concepts or solutions</li> <li>Describe, compare, and contrast solution methods</li> <li><u>Verify reasonableness of results</u></li> </ul>	<ul style="list-style-type: none"> <li>Gather, analyze, &amp; evaluate information to draw conclusions</li> <li>Apply understanding in a novel way, provide argument or justification for the application</li> </ul>
<b>Create</b> Reorganize elements into new patterns/structures, generate, hypothesize, design, plan, construct, produce	<ul style="list-style-type: none"> <li>Brainstorm ideas, concepts, or perspectives related to a topic</li> </ul>	<ul style="list-style-type: none"> <li>Generate conjectures or hypotheses based on observations or prior knowledge and experience</li> </ul>	<ul style="list-style-type: none"> <li>Synthesize information within one data set, source, or text</li> <li>Formulate an original problem given a situation</li> <li>Develop a scientific/mathematical model for a complex situation</li> </ul>	<ul style="list-style-type: none"> <li>Synthesize information across multiple sources or texts</li> <li>Design a mathematical model to inform and solve a practical or abstract situation</li> </ul>