Building Science Literacy Skills – Course Map

This document identifies a learning opportunity focused on improving science literacy among middle school students and outlines the profile of learners who will benefit from this course. Examining learner characteristics, organizational needs, and instructional challenges provides the foundation for targeted curriculum design. The insights gathered here will guide the development of engaging, measurable learning experiences and serve as a cornerstone for future course design and refinement in the program.

(Module 2)
Course Foundation Components

Learner Profile Summary	Course Description
The learners are middle school students in grades six through eight, ages 11 to 14, enrolled in a diverse magnet school setting. They represent varied socioeconomic and cultural backgrounds, with many qualifying for free or reduced lunch, English Language Learners, and students with individualized education plans. Academically, learners often struggle with reading comprehension, applying scientific concepts, interpreting data, and constructing evidence-based explanations. They are motivated by interactive, real-world applications of science and prefer technology-enhanced, collaborative, and scaffolded instruction, though access to digital resources outside of school may be inconsistent. Despite these challenges, strengthening science literacy offers students the opportunity to build critical thinking, communication, and problem-solving skills that support future STEM success and informed citizenship.	This course is designed to strengthen middle school students' ability to read, interpret, and communicate scientific information. Learners will explore key strategies for analyzing scientific texts, interpreting data from charts and graphs, and constructing evidence-based explanations. Through engaging activities and collaborative projects, students will develop the confidence to approach science with curiosity and clarity. By the end of the course, learners will have stronger literacy skills that support success in science and other content areas, preparing them for high school, future STEM pathways, and informed decision-making in everyday life.

Course Objectives
CO1 Analyze scientific texts to identify key ideas, vocabulary, and supporting evidence.
CO2 Interpret data from graphs, tables, or simulations to draw valid conclusions.
CO3 Construct short written explanations and arguments that use scientific reasoning and evidence.

Learner Profile Summary	Course Description
CO4 Evaluate scientific claims and information sources for accuracy, credibility, and relevance.	
CO5 Collaborate with peers to present findings through oral or digital presentations that communicate scientific concepts clearly.	

Summative Assessment Idea

Science Literacy Portfolio & Presentation. Learners will compile a portfolio of three artifacts:

i. An annotated analysis of a short science article,
ii. A data interpretation task involving a chart or graph,
iii. A written evidence-based explanation of a scientific phenomenon.

As a capstone, students will collaboratively present one of their artifacts to the class, demonstrating their ability to communicate scientific concepts orally and visually.

Rationale: This summative task evaluates all course objectives: reading and analysis, data interpretation, written reasoning, and communication. It emphasizes authentic, performance-based assessment aligned with the skills learners will need in high school and beyond.

(Module 3)
Learning Design – Building Science Literacy Skills

	M1	M2	M3
Module Title	**Reading Science with Purpose.**	**Making Meaning from Data**	**Communicating Science Clearly**
Course Objective Alignments	**CO1**: Analyze scientific texts to identify key ideas, vocabulary, and supporting evidence.	**CO2**: Interpret data from graphs, tables, or simulations to draw valid conclusions. **CO5**: Evaluate scientific claims and information sources for accuracy, credibility, and relevance.	**CO3**: Construct short written explanations and arguments that use scientific reasoning and evidence. **CO4**: Collaborate with peers to present findings through oral or digital presentations that communicate scientific concepts clearly.
Module Objectives	a. Identify key ideas in short science texts. b. Define and use key scientific vocabulary. c. Locate supporting evidence in a passage.	a. Interpret information from graphs and tables. b. Draw conclusions from simple data sets. c. Evaluate the credibility of a scientific claim.	a. Construct written explanations supported by evidence. b. Collaborate with peers to plan and present findings. c. Use digital tools to communicate science effectively.
Topics/Skills to Teach	a. Scientific vocabulary development. b. Text annotation strategies. c. Evidence-based reading.	a. Data interpretation (charts, tables, graphs) b. Evaluating scientific claims. c. Linking data to reasoning.	a. Writing evidence-based explanations. b. Presentation skills. c. Collaboration in science communication.
Learning Resource	a. **SAVVAS Elevate Science** – Core curriculum resource that introduces key concepts through structured lessons and accessible texts, building foundational science literacy.	**a. STEMScopes** – Inquiry-based program that incorporates data analysis tasks, hands-on activities, and digital simulations to support data interpretation. **b. Khan Academy** – Provides interactive lessons, videos, and	a. **Developing Science Writing Skills** – Focused activities that teach students to construct explanations, arguments, and evidence-based reasoning in writing.

	M1	M2	M3
Module Title	**Reading Science with Purpose.**	**Making Meaning from Data**	**Communicating Science Clearly**
	b. **Spectrum Science** – Provides leveled reading passages with comprehension questions, supporting vocabulary development, and text analysis. c. **Daily Science** – Offers short, focused readings and practice tasks that reinforce science concepts and evidence-based reading.	practice problems in interpreting graphs, analyzing claims, and connecting reasoning to evidence. **c. STEM Lessons and Challenges** – Hands-on project challenges where students use data to solve real-world problems, reinforcing application of scientific practices.	b. **Engineering Design Notebook** – Encourages collaborative problem solving and structured documentation of scientific ideas, preparing students for presentations. c. **TCAP Assessment** – State-aligned assessment resource that measures mastery in science literacy, communication, and reasoning, providing summative evidence of learning.
Assessment Ideas	Students annotate a short science passage, highlighting vocabulary and evidence, and write a summary of the main idea.	Students analyze a provided dataset (table/graph) and write a short explanation of conclusions, including an evaluation of a related claim.	Groups create a digital presentation explaining a science concept using evidence. Individually, students write a short evidence-based explanation.

(Module 5)
Alignment Analysis & Reflection

Alignment – Key Terms

The key terms most central to this curriculum are Science literacy, data interpretation, evidence-based reasoning, communication, and collaboration. These terms represent the recurring themes of the course objectives and assessments. Literacy and evidence-based reasoning align with the goal of strengthening students' ability to analyze and construct arguments from scientific texts. Data interpretation emphasizes skills in reading and analyzing graphs or charts. Collaboration and communication reflect the emphasis on peer interaction and presenting findings..

Key Terms (3–5)				
Science Literacy	Data interpretation	Evidence-based reasoning	Communication	Collaboration
11	9	8	6	5

Alignment Analysis

Conducting an alignment analysis through the highlighting activity allowed me to evaluate how well course and module objectives, assessments, and resources supported learning. By color-coding connections, I identified areas of strong support and where reinforcement was needed. For instance, the course's focus on science literacy aligned with module objectives like data analysis and scientific communication. The highlighting also showed a strong connection between selected resources (e.g., Elevate Science, STEMScopes) and their supporting objectives, demonstrating coherence across the curriculum and ensuring a logical progression for learners.

The analysis revealed gaps and redundancies that could disrupt curriculum flow. Some objectives were associated with similar assessments, leading to unnecessary repetition, while one communication-focused objective lacked adequate assessment coverage. Addressing these issues improved curriculum alignment, ensuring every objective was measurable and supported by meaningful activities. This process highlighted that alignment analysis is about enhancing validity, accountability, and learner engagement. Regularly revisiting alignment allows for refining the curriculum to meet learners' needs and ensures assessments effectively demonstrate growth in science literacy.

Analysis of Findings

The highlighting activity showed that literacy and evidence-based reasoning were the most common terms in the course description, objectives, and assessments, indicating a focus on developing critical engagement with scientific texts and data-driven arguments. Data interpretation appeared consistently, but less frequently than literacy. Collaboration and communication were adequately featured in assessments, particularly in the capstone project, suggesting that while students will build collaborative skills, there is an opportunity to integrate more opportunities for oral and digital communication throughout the modules.

Reflection on Curriculum Design

The alignment analysis indicated that the course design is cohesive and intentional, with clear connections between objectives, activities, and assessments. One of its strengths is the strong alignment between course objectives and authentic assessments. For example, the portfolio requires students to demonstrate skills such as annotation, data analysis, and evidence-based writing, all of which are key skills outlined in the objectives.

Another strength is the integration of diverse resources, including Elevate Science, Khan Academy, Spectrum Science, and STEMScopes. These resources provide multiple pathways for students to access content and practice skills.

However, a potential weakness is the underrepresentation of collaboration and oral communication in formative assessments. Research indicates that opportunities for collaborative meaning-making and verbal reasoning enhance literacy development in middle school science contexts (NRC, 2012). Incorporating more peer-to-peer discussions or mini-presentations would strengthen this aspect of the course.

Recommendations for Improvement

To enhance alignment, formative assessments should provide more opportunities for students to practice communication and collaboration prior to the summative capstone. For instance, incorporating structured peer reviews of evidence-based explanations or small group presentations of data can be beneficial. While literacy and reasoning skills are well supported, increasing the frequency of data interpretation tasks will help ensure that students feel equally confident across all learning objectives. Finally, making sure that assessments use measurable verbs aligned with Bloom's taxonomy (Anderson & Krathwohl, 2001) will further strengthen clarity and rigor.

References

Anderson, L. W., & Krathwohl, D. R. (2001). A taxonomy for learning, teaching, and assessing: A revision of Bloom's taxonomy of educational objectives: complete edition. Addison Wesley Longman, Inc.. Chicago

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