Maryland
STATE DEPARTMENT OF EDUCATION

Science

High-Quality Instructional Materials Identification Framework

2024-2025

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Why Instructional Materials Matter for Maryland Students

The students of Maryland are a vibrant community of diverse learners, including a growing number of multilingual students and students from various racial and cultural backgrounds.[1] Instructional materials designed to best serve these students must facilitate enriching, culturally responsive, and language affirming environments for all students.

Students deserve the opportunity to make sense of phenomena through the use of science and engineering practices (SEPs) to build a strong foundation for their educational journey and empower them with essential learning skills. High-quality instructional materials offer students engagement with relevant phenomena and problems that foster critical thinking abilities and language development and amplify student voice and agency. Additionally, these materials prioritize the affirmation of students' cultural and linguistic identities, attending to inclusive learning communities that connect education to their real-world experiences and provide the support and skill to ensure that students with diverse learning needs thrive.

By aligning with college and career readiness standards and research-based approaches, high-quality instructional materials unlock and support knowledge-building that encourages active learning and leads to dynamic demonstrations of knowledge from students. Furthermore, these materials offer support for educators, equipping them with the necessary tools, content knowledge, pedagogical expertise, and research-based practices to effectively engage students and adapt to diverse community and school contexts. With this comprehensive approach, instructional materials in Maryland have the potential to create transformative learning environments that prepare students from kindergarten through graduation for a future of choice and opportunity.

[1] In 2022, Maryland's student population included 33% Black, 33% White, 22% Latinx and 7% Asian students, as well as 12% English learners, 12% students with disabilities, and an increasing proportion who face economic challenges (Maryland Department of Education).

Document Introduction

This framework serves as a valuable resource for educators and stakeholders across the education sector to identify key criteria in truly high-quality instructional materials. It outlines the essential elements of outstanding curricula and offers clear guidance on the instructional shifts and educator supports needed to foster meaningful learning experiences for students. To deliver the world-class education that the Blueprint for Maryland's Future envisions, educators and leaders can rely on this framework in service of identifying the research-based, high-quality materials that are necessary to provide students with rigorous instruction, nurture spaces that affirm their cultural and linguistic identities, and ensure their continued progress and success each year.

This framework is grounded in extensive research aimed at defining the content, instructional practice, and instructional design present in high-quality instructional materials. These research-based elements are central to the criteria within this framework and critical to support the kinds of learning experiences that Maryland students deserve.

Despite its strengths as a resource for identifying high-quality instructional materials, there are limitations for how this framework can be used. While the document provides crucial guidelines, it is NOT intended to be exhaustive in addressing all the elements of instructional materials and practices needed to create an equitable experience for students. Additionally, this document is NOT a rubric, meaning it does not provide a checklist or a scoring system for the evaluation of instructional materials. Instead, it offers guidance on the essential components of high-quality materials, encouraging educators to exercise professional judgment and adapt to their specific educational context.

It is also important for educators and leaders to recognize any and all humanizing considerations beyond the framework that may be necessary based on their unique students, classroom contexts, and school/district conditions in their review and selection of high-quality materials. Overall, this framework serves as a roadmap, empowering educators to select and use instructional materials that foster inclusivity, rigor, and relevance, ultimately resulting in enhanced learning outcomes for all students.

DOCUMENT ORGANIZATION

This document, intended for use when considering K–12 science core instructional materials, is organized into four categories (Designed to Affirm Students, Grade-Level and Standards-Aligned, Instructional Design, and Educator Supports), with domains that highlight key criteria in each section.

While specific categories have been included for culturally responsive-sustaining pedagogy and language-affirming instruction, related considerations for affirming students are woven throughout the framework. Similarly, considerations for diverse learning needs and Universal Design for Learning have been embedded throughout to reflect the way that these practices must be interlaced in thinking about content, instructional practice, and support for educators.

A collection of research and scholarship used to inform this framework is included as an appendix.

Key Criteria for High-Quality Instructional Materials

DESIGNED TO AFFIRM STUDENTS

Affirming students creates opportunities for cultural and linguistic backgrounds to be an asset and a source of validation in the learning experience. In addition to a foundation of grade-level content, high-quality instructional materials must prioritize instructional practices that affirm students' cultural and linguistic backgrounds and support students with a range of diverse learning needs to thrive through science. This support includes developing culturally responsive-sustaining learning communities that center who students are and the cultural identities they bring with them. These learning communities use science as a tool for building cultural competence; perspective-taking; and social, political, and ecological thinking and for engaging in the content in ways that foster relationships, community, and a sense of pride and understanding of students' contexts. Science instruction must also intentionally affirm students' languages and language practices through a focus on building upon students' multilingualism and ensuring that all students can meaningfully access and engage with science ideas and practices using their unique linguistic assets. Through these instructional choices, materials have the potential to ensure that all learners find success in science and can cultivate identities as scientists and engineers.

Key Criteria for Culturally Responsive-Sustaining Instruction[2]

- **Affirm and Center Students:** Instructional materials affirm, engage, and center past and current knowledge of Black/African, Indigenous, Brown, and non-Western literary expressions and highlight multilingualism. Instructional materials are designed to encourage students to anchor learning in their individual experiences, backgrounds, and cultural knowledge to support and further their scientific knowledge and skills. These materials include all of the following elements:

    a. regular opportunities for students to share who they are and what they know, bringing their unique funds of knowledge to their science experiences;[3]

    b. reflection and conversation within the context of the text or topic under study that affirm students' identities and experiences; and

    c. authentic and meaningful activities (e.g., scenarios, investigations, tasks) that reflect both the authenticity of the discipline (i.e., how science is done in a variety of real-world contexts) and authenticity to students' lived experiences.

- **Science as a Tool for Civic Engagement:** Instructional materials consistently include phenomena and tasks that prompt students to apply and develop their civic engagement skills and examine social context and current events, using science to question the world and the current status quo.

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[2] This conceptualization of culturally responsive-sustaining instruction is built on the evidence from its predecessors—culturally relevant, responsive, and sustaining pedagogies. This scholarship underscores the importance of leveraging the diverse backgrounds of students as assets in the classroom that can and should be sustained through intentional instructional design. For more information about relevant scholarship, please see the citations section in the Appendix.

[3] Moll, L. C., Amanti, C., Neff, D., & González, N. (1992). Funds of knowledge for teaching: Using a qualitative approach to connect homes and classrooms. *Theory Into Practice, 31*(2), 132–141.

- **Real-World Connections:** Instructional materials consistently connect with students' lives, their future goals, their communities, and the world and nurture ways to engage in their own communities and beyond. These materials include all of the following elements:

    a. use of scientific phenomena and tasks to connect to current events;

    b. collaborative tasks and/or projects that involve real-world problem-solving through meaningful interactions with peers and their local communities;

    c. structures (e.g., tasks, classroom activities, routines, assignments) to explore scientific phenomena from current events and data that are relevant to students' lives and communities so that students see themselves in the tasks and understand how they relate to their context and promote a sense of belonging;[4]

    d. opportunities for students to reflect on how science phenomena, problems, and activities affect themselves, their families, and their communities and how their specific communities might shape the phenomena/problems/activities; and

    e. teacher guidance to support students in developing SEPs and disciplinary knowledge that are relevant to their academic and professional goals.

Key Criteria for Language-Affirming Instruction

- **Multilingualism in Science:** Instructional materials are deliberately designed to honor and build upon students' language(s) as an asset, encouraging students to use their linguistic repertoire to communicate with one another via reading, writing, speaking, and listening while engaging in scientific learning. These materials include all of the following elements[5]:

    a. promoting sustained oral and written communication, including explicit encouragement to use a range of language practices and registers and to use their full language repertoire through translanguaging so all students express themselves in a language they are comfortable with while working to learn science content and meet language objectives in the target language;

    b. building vocabulary and understanding of new concepts in English and home language(s), including use of social and academic vocabulary;

    c. making cross-linguistic connections, including identifying and comparing similarities and differences between home language(s) and English (e.g., cognates) or registers and registers of instruction;

    d. stating clear and specific integrated three-dimensional goals that emphasize the ways students use language for learning and communicating meaning in science;

    e. introducing students to new language after students have developed conceptual understanding so they can understand and communicate science ideas;

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[4] Tate, W. F. (1995). Returning to the root: A culturally relevant approach to mathematics pedagogy. Theory Into Practice, 34(3), 166–173.

[5] García, O., Johnson, S. I., & Seltzer, K. (2017). The translanguaging classroom: Leveraging student bilingualism for learning. Caslon. For more, see Translanguaging Strategies, English Learner Success Forum.

f. making the purpose of using language to communicate about scientific phenomena clear to students and teachers;

g. offering ongoing discussion opportunities for students to listen actively, express, revisit, and refine their three-dimensional understanding and language over time; and

h. offering ongoing opportunities for students to revisit and refine their three-dimensional understanding and language over time through reading, viewing, writing, and representing.

- **Language Objectives:** Instructional materials provide explicit alignment between language and content objectives to ensure that the language goals embedded within the standards are being attended to in every lesson. This includes language objectives for both expressive (writing and speaking) and receptive (listening and reading) communication that are aligned to the science performance expectations.
- **Phenomena/Text Selection to Support Language Development:** Instructional materials use texts that have all of the following elements:

  a. authentic language;

  b. rich vocabulary and syntax;

  c. content that is written in home languages, when possible, and is high quality (e.g., not poor-quality translations); and

  d. formats that support sensemaking and language development (e.g., text engineering)and examine social contexts and current events, using science to question the world and the current status quo.

GRADE-LEVEL AND STANDARDS ALIGNED

Grade-level, standards-aligned opportunities to develop and demonstrate sense-making with the three dimensions in science serve as a necessary foundation for equitable student experiences in the classroom. Engaging in three-dimensional, phenomenon- or problem-driven teaching and learning from kindergarten through graduation sets students on a path to informed lives as critical thinkers. This includes ensuring that all students make sense of phenomena and problems that are meaningful and compelling and do so in ways that build understanding that is transferrable through the use of SEPs, disciplinary core ideas (DCIs), and crosscutting concepts (CCCs)

Key Criterial for Sense-Making

- **Phenomenon- or Problem-Driven Learning and Performance:** Instructional materials are organized to center student learning around making sense of phenomena (i.e., specific occurrences in the natural or designed world) and/or problems (i.e., situations people want to change). These materials include all of the following elements:
    a. compelling phenomena and/or problems that are specific, meaningful to particular communities, and of the appropriate scope to drive student sense-making and promote learning of the targeted grade-appropriate standards;
    b. opportunities to engage with a range of phenomena, such as everyday occurrences and those that are relevant to society or culturally significant;
    c. student questions about phenomena/problems, and experiences (both prior experiences and those cultivated in the moment in class) related to the phenomena/problems, to motivate student sense-making and/or problem-solving; and
    d. instructional activities that help students answer questions they have about the phenomena and surface new questions that future lessons will help them answer.
- **Three Dimensions Development:** Instructional materials build student understanding of explicit, grade-appropriate elements of SEPs, DCIs, and CCCs through engagement with the phenomena/problems. Moreover, the identified dimensions are required to explain the selected phenomenon or solve the identified problem.
- **Scientific Accuracy:** Instructional materials use scientifically accurate and grade-appropriate scientific information, phenomena, and representations to support students' three-dimensional learning.
- **Nature of Science Development:** Instructional materials organize learning around using the SEPs, CCCs, DCIs, and nature of science together in service of sense-making. Nature of science expectations in the Next Generation Science Standards offer a route to building an understanding of the history and inequities in science.[6] Instructional materials build students' understanding of the nature of science elements, explicitly connected to understanding. These materials include all of the following elements:
    a. how specific scientific understandings have been constructed;

[6] Next Generation Science Standards. Appendix H – Understanding the scientific enterprise: The nature of science in the Next Generation Science Standards.

b. who has been included and excluded in scientific activities and communication of findings;

c. the impact of how science has been, and is, done on a range of human and nonhuman communities and environments; and

d. connections between the nature of science and problem/question definition and critical interpretation of findings.

- **Hands On:** Instructional materials provide students with the opportunity to regularly take part in hands-on investigation, modeling, and engineering. Learning experiences emphasize students' thinking as scientists with opportunities to pose questions; plan and carry out investigations that include the collection, organization, and analysis of data; develop and use models to construct and represent their understanding; and develop explanations and arguments based on evidence.

Key Criteria for Coherence

- **Lesson and Unit Coherence:** Instructional materials include logical sequences within units, across units, and within a grade band. Lessons and units in the materials build on prior lessons and experiences by addressing questions raised in previous lessons and leading students to pose new questions that will be explored in subsequent lessons. In doing so, the materials build understanding toward a defined set of three-dimensional expectations.
- **Three-Dimensional Coherence:** Instructional materials build DCIs, SEPs, and CCCs progressively from one lesson or unit to the next. In the materials, scaffolding to support student development of SEPs and CCCs decreases over progression to support student independence.
- **Instructional Model Coherence:** Instructional materials include routines and strategies situated within an instructional model that offer coherence in the types of learning experiences and the approach to learning.
- **Assessment Coherence:** Instructional materials include an approach to assessment that aligns with the approach to instruction.

INSTRUCTIONAL DESIGN

Instructional materials must support meaningful engagement for all students to be deemed high quality. It is through this intentional design that instructional materials contribute to learning communities in which students develop a deep understanding of the natural and designed world; are authentically engaged as scientists and engineers; have the support they need; and regularly demonstrate their learning in dynamic ways.

Key Criteria for Student Agency

- **Metacognitive Processes:** Instructional materials develop and surface students' metacognition by teaching and supporting students to monitor understanding while engaging in science learning. These materials include all of the following elements:
    a. setting goals, self-monitoring growth, and reflecting on the impact of students' choices and ongoing development as scientists and engineers;
    b. providing opportunities for students to think about how language is used in science for sense making, expression of complex relationships, describing phenomenon and problems;
    c. providing opportunities to revisit student models, explanations, and designs as part of the process of intentional reflection; and
    d. providing strategies to help students understand the relationship between the three dimensions and the variety of language used (e.g., everyday, science specific, home language).[7]
- **Choice and Voice:** Instructional materials include a balance of student-choice and teacher-defined tasks and offer a variety of phenomena/problems that support student choice and leverage students' approaches to sense-making.
- **Authentic Engagement as a Scientist:** Instructional materials promote productive struggle and the sense-making process through engaging, relevant phenomena that are sequenced to build conceptual understanding of DCIs, concepts, and practices; provide opportunities to take risks; allow for iterative building of knowledge and multiple approaches; and use misconceptions as opportunities for entry points for learning.
- **Collaborative Learning:** Instructional materials engage all students in collaborative learning through a variety of routines, structures, and tasks that allow for whole-group, small-group, and independent thinking. Materials explicitly plan for students to demonstrate their curiosity and share their tentative thinking; ask questions; and adjust their understanding by building on one another's ideas through speaking, listening, reading, and writing.

Key Criteria for Monitoring Progress and Supporting Students

- **K–12 Progressions:** Instructional materials identify and build on students' prior learning in all three dimensions. These materials include all of the following elements:

[7] English Learner Success Forum. Guidelines for improving science and engineering materials for multilingual learners

a. explicit identification of prior student learning expected for all three dimensions; and

b. clear explanations of how the prior learning will be built upon.

- **Supports and Scaffolds:** Instructional materials are designed to support a variety of student strengths and diverse learning needs in ways that are based in research and do not interfere with their ability to engage with grade-level content. These materials include all of the following elements:

  a. guidance on potential individual student needs so that supports, scaffolds, and extensions can be effectively differentiated to support three-dimensional sensemaking;

  b. resources that provide acceleration opportunities for students who are not yet proficient in reading, writing, and language grade-level skills;

  c. resources that provide extensions for students who have met performance expectations to continue growth; and

  d. supports and scaffolds that are designed to shift to student independence over time.

- **Simultaneous Science Sense-Making and Language Development:** Instructional materials include intentional language learning opportunities alongside appropriate, research-based supports for multilingual learners and students with diverse learning needs to develop scientific sense-making and language simultaneously.

- **Relevant Contexts:** Instructional materials provide contextualized tasks and problems that are relevant to students and their communities and emphasize phenomena and sense-making that incorporate student and community interests and agency. Instructional materials lift up diverse cultures via asset-oriented narratives.

- **Three-Dimensional Performance Progress Monitoring:** Instructional materials embed frequent opportunities to monitor and develop students' progress in scientific sense-making using the three dimensions and nature of science. These opportunities are fully coherent with instructional design, implying that they reflect students' opportunities to learn, and the same criteria as instructional materials, as appropriate to the scope and nature of the assessment(s). These materials include all of the following elements:

  a. consistent multidimensional assessment opportunities that center on making sense of phenomena and addressing problems with the three dimensions and nature of science;

  b. embedded and consistent formative assessment practices to surface student understanding and inform instructional decision-making;

  c. varied and multiple means of surfacing sense-making with multiple dimensions that coherently measure and signal what is most valued about student learning in science, including attention to culturally and linguistically responsive practices;

  d. routine opportunities to demonstrate understanding at a range of complexity, including simple checks on understanding and more complex performance tasks at appropriate intervals; and

  e. routine opportunities to surface data about students' experience and to triangulate this with performance information to inform instruction.

- **Meaningful Feedback:** Instructional materials provide frequent opportunities for feedback to advance content understanding and disciplinary literacy skills, as appropriate to the type of literacy instruction. These materials include all of the following elements:
    a. peer and teacher cycles of feedback, including communicating progress;
    b. normalization of mistake-making and affirmation of effort and growth;
    c. guidance for explicit, timely, informative, and accessible formative feedback to address partial understandings about tasks, texts, and topics in ways that allow learners to monitor their own progress effectively and to use that information to guide their own effort and practice;
    d. focusing of students' attention on sense-making and/or metacognitive processes; and
    e. guidance on how and when to collect data, as well as how to respond to specific student strengths and needs.

EDUCATOR SUPPORTS

To promote facilitation of meaningful learning experiences for all students, instructional materials ensure effective support for educators to engage all students in meaningful three-dimensional phenomenon-/problem-based learning through reflection; background focused on content and pedagogical content knowledge in the lessons, units, and/or program; and supports for understanding and use of research-based practices. In addition, resources are thoughtfully designed for ease of use and fit to community context.

Key Criteria for Educator Knowledge

- **Examination of Self:** Instructional materials support teachers in examining their own identities, biases, and belief systems to help them understand how these factors might influence instructional choices and the lens through which they interpret student thinking. These materials may include reflection prompts, examples of educator thinking, or embedded professional learning.

- **Pedagogical Content Knowledge:** Instructional materials explicitly support teachers in building students' science understanding by helping educators understand how students learn science. These materials include all of the following elements:
  a. explanations, examples, additional conceptual information, and related phenomena to support teachers in building their own knowledge of the targeted phenomena, problems, SEPs, DCIs, and CCCs;
  b. explicit guidance for instructional strategies and routines that support authentic student sense-making (e.g., how to elicit student ideas and surface student questions that drive ongoing learning experiences); and
  c. explicit guidance for instructional strategies and routines that are consistent with how students learn science (e.g., rather than simply providing teachers with alternative conceptions or common student ideas, provide information about what experiences young children often have that lead them to believe one thing and how to use that facet of understanding to build a more accurate and complete understanding in grade-appropriate ways).
- **Students' Linguistic and Cultural Assets:** Instructional materials support educators in understanding how to surface and value diverse sense-making repertoires and how to leverage students' linguistic and cultural assets in service of scientific sense-making across the three dimensions. These materials include all of the following elements:
  a. integrated structures for educators and prompts for them to learn about and integrate the knowledge, strengths, and resources of students, families, and the community — especially those who have been historically marginalized;
  b. diverse examples of how different student experiences and language can be leveraged within specific instructional contexts; and
  c. explicit prompts and supports for surfacing student assets within teacher guides or other facilitator materials.

- **Supporting Language Development for All Learners:** Instructional materials build educators' understanding of research-based practices to support language development for all learners, especially for multilingual learners. These materials include all of the following elements:
    - use of home language, translanguaging, and developing cross-linguistic connections to deepen understanding of the linguistic features across languages and registers; and
    - development of oracy skills.

- **Inclusive Classroom Environments:** Instructional materials include specific guidance, instructional strategies, and routines for cultivating classroom cultures in which all students can have a voice and feel a sense of belonging. These materials include all of the following elements:
    a. structures for ensuring that all students can share their ideas;
    b. opportunities for students to see their ideas as valued elements/expertise within the science classroom setting; and
    c. opportunities for students to recognize self and peer assets while celebrating diversity of experiences.

Key Criteria for Supporting Principled Adaptation to Local Contexts and Specific Student Experiences

- **Related and Alternative Phenomena:** Instructional materials provide guidance for how to identify and use alternative phenomena and problems as part of instructional activities, including locally relevant and compelling phenomena/problems.
- **Surfacing of Student Experiences:** Instructional materials include explicit structures for collecting student interest and experience data and triangulating this information with performance/proficiency data to inform possible needed adaptations of materials.
- **Student-Centered Extensions and Alternatives:** Instructional materials provide guidance for possible extension activities, alternative investigations, or design projects that allow for student choice and adaptation to specific communities and students. These materials may include structures and guidance, with opportunities for teachers and students to have complete autonomy over content, or they may include more structured opportunities, with specific elements that are open to choice and adaptation.
- **Clear Guidance on Constant and Variable Features:** Instructional materials are designed such that they assume some local adaptation will be needed to authentically support diverse learners. Instructional materials explicitly support teachers in understanding which elements of the materials should not be adapted (or should be done so very carefully) and which elements have been designed such that teachers and students can modify them with great success (e.g., to connect with local resources and priorities, to be appropriate to available time for instruction).

Key Criteria for Usability

- **Design and Functionality:** Instructional materials are designed to support ease of student and teacher use. These materials include all of the following elements:
    a. visually appealing design with an organized and logical format;
    b. appropriate pacing;
    c. clear and concise educator-facing guidance;
    d. a variety of ways to engage with the content, including leveraging current technology and tools;
    e. manipulatives that are well organized, with an emphasis on ease of setup; and
    f. appropriate guidance for hands-on activities.
- **Adaptability for Context:** Instructional materials contain materials and/or meaningful suggestions for how to adapt for district, school, and/or classroom context. These materials may include varied selections for topics under study; flexibility to modify tasks to connect to local resources, organizations, or issues; or varied pacing suggestions based on number of school days or minutes of instruction.
- **Program Coherence:** Core instructional materials work in concert with (or have the potential to work in concert with) additional supplemental science materials (e.g., Maryland Environmental Literacy Standards Framework, local projects, school-based science/STEM initiatives). These materials include aligned and research-based content and instructional approaches across materials.

Research & Scholarship Supporting the Framework

A robust research and scholarship base underpins this framework. For more information about research-supported practice, see Student Achievement Partners' Essential X Equitable Instructional Practice Framework™.

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