# **The Instructional Resources Alignment Rubric:**

***Kentucky Academic Standards (KAS) for Science***

Rationale

Curriculum design and review is a continuous process. Flexibility when determining the detail of the design and shape of the curriculum is given to each school in Kentucky so the teaching and learning is meaningful and beneficial to the particular communities of learners. The design of each district/school’s curriculum allows teachers to make interpretations in response to the particular needs, interests and talents of individuals and groups of students. While Kentucky’s academic standards define the minimum content that must be taught, it is not a regimented curriculum.

In Kentucky, traditionally, districts have created a range of curriculum resources and components, ranging from pacing guides and maps to very detailed plans outlining specific instructional resources (books, articles, manipulatives, etc.) as well as specific common assessments for units and courses.

While the standards do define the content (or the WHAT), they do not prescribe HOW to teach or assess them. Instead, that is the function of the curriculum. Likewise, the published *Kentucky Academic Standards* define the WHAT. Local districts need to define the HOW.

Since the standards are incorporated into state regulation, all standards must be addressed in an aligned curriculum.

Purpose of this rubric

The Instructional Resources Alignment Rubric is meant to guide districts and schools in reviewing existing or purchasing new instructional resources to determine what revisions may be needed to ensure alignment to the *Kentucky Academic Standards (KAS)* *for Science*.

Prior to conducting this review the evaluator or evaluating team should assemble all of the resources necessary for the review. It is essential for evaluators to have resources for all courses covered by the program in question, as some criteria cannot be rated without having access to each course. In addition, each evaluator should have a reference copy of the *KAS for Science.*

Before conducting the review, it is also important to develop a protocol for the process. The protocol should include having evaluators study the Instructional Resources Alignment Rubric and reference material. Additionally, it will also be helpful for evaluators to get a sense of the overall purpose and function of the instructional resources before beginning the process.

Criteria for Evaluation

These are the criteria on which your instructional resources will be evaluated for alignment to the *KAS for Science*:

1. Integrates the Three Dimensions
2. Phenomena and Problems
3. Coherence
4. Supports for All Students
5. Teacher Supports
6. Assessment Design and Supports
7. Usability

Instructional resources are designed for use by students and teachers as a learning resource for students to acquire essential knowledge, skills, abilities and dispositions. This includes print and non-print resources, including comprehensive/core textbooks, supplemental resources, Web-based and electronic textbooks and assessments.

# **Reference Information**

Using the Tool

The first three criteria identified in this tool are key to alignment. Materials that provide strong evidence of these criteria ensure that students will have appropriate science learning and experiences as demanded by the *KAS for Science.*

Schools/districts may be reviewing materials at varying grain-size (i.e., lesson-, unit- or program-level). Each indicator in this tool identifies the appropriate level(s) for reviewing.

Key Terms and Concepts

1. Engagement with Three-Dimensions

The three dimensions of science are the disciplinary core ideas (DCIs), science and engineering practices (SEPs) and the crosscutting concepts (CCCs). The materials should provide students ample opportunities to actively explore phenomena and/or problems using the SEPs and CCCs in order to understand the DCI. In other words, all dimensions should work in service of one another, not separately.

1. Phenomenon/Phenomena

These are any observable event or fact that can be investigated to gather evidence in order to support a scientific explanation. It is important to note that phenomena do not have to be phenomenal.

1. Problems

A problem is an issue of which a solution is desired. Problems should be a natural component of the lesson sequence such that students are using their understanding in order to design a solution.

1. Sense-making

Students work towards understanding, and being able to explain, a phenomenon or problem to be solved. The materials should not simply explain.

1. Phenomena or Problems Drive Lessons/Units

A phenomenon or problem is often introduced at the beginning of a lesson/unit. If it captures the students’ attention to the topic but there is no follow-through as to how the phenomenon works, it is likely being used as a “hook.” In order to *drive* the instruction, students should be actively learning to understand and figure out (sense-making) the phenomenon or problem.

1. Elicit vs Leveraging Prior Knowledge

To *elicit* prior knowledge, students will be reminded about prior learning. To *leverage* prior knowledge, students will use prior learning to make sense of the phenomenon or help in the design of a solution to the problem.

1. Strong vs Moderate Evidence

Strong evidence implies that there is a consistency across lessons, units and/or programs. It is clear that students are actively engaged in the learning of science as they seek to understand phenomena or solve problems. Assessments, both formative opportunities and summative, require students to engage with the three dimensions. Moderate evidence suggests that some lessons, units and/or programs provide these opportunities, but it is not consistent. There are some lessons, units and/or programs in which students may be given information without them being actively coming to an understanding.

# **The Instructional Resources Alignment Rubric:**

***Kentucky Academic Standards (KAS) for Science***

**Criterion A: Integrates the Three-Dimensions**

Instructional resources integrate the three dimensions within student learning experiences and assessment

Indicator A1. Designed for three-dimensional learning (lesson, unit and program)

Instructional resources are designed to integrate the Science and Engineering Practices (SEPs), Disciplinary Core Ideas (DCIs) and Crosscutting Concepts (CCCs) into student learning. These dimensions are used to support meaningful sensemaking.

Evidence to look for:

* Students are actively engaged (individual learning opportunities and learning sequences) in scientific and engineering practices and apply crosscutting concepts to deepen their understanding of the core ideas.
* Students’ meaningful and intentional use of the three-dimensional integration of the SEPs, CCC, and DCIs where all three dimensions support student sensemaking.

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Strong Evidence Moderate Evidence Little to No Evidence

Indicator A2. Designed for three-dimensional assessment (lesson, unit and program)

Materials are designed to elicit direct, observable evidence related to the three-dimensional learning in the instructional resources. The evidence is derived from assessments that are both formative and summative. Assessments are centered around a scenario based upon a phenomenon or problem to solve.

Evidence to look for:

* Identify learning objectives as the lesson level and determine if these build towards three-dimensional objectives for the larger learning sequence (i.e., unit level).
* Assessments should provide evidence of the learning objective and guide the instructional process.
* Formative
  + Lessons and units support the formative assessment process by providing diagnostic feedback to teachers and students during course of instruction
  + Multiple component tasks (a set of interrelated questions) incorporate the three dimensions and provide information of student understanding of the targeted learning objective(s) for the lesson.
* Summative
  + Assessments (performance tasks, multiple choice questions, written/constructed responses, etc.) integrate the three dimensions.
  + Multiple component tasks are measure student achievement of the targeted learning objective(s) for the unit.

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**Criterion B: Phenomena and Problems**

Instructional resources leverage science phenomena and engineering problems to drive student learning of the three dimensions.

Indicator B1. Drive individual lessons (lesson)

Phenomena and/or problems drive individual lessons and learning experiences using key elements of the three dimensions. Students should be actively engaged using the three dimensions as they are also engaged with the phenomenon or problem.

Evidence to look for:

* Individual lessons or learning experiences are designed to engage students in making sense of natural phenomena or solving design problems in meaningful ways.
* Lessons and learning experiences use phenomena or problems as a central component (drive instruction) for the lesson or learning experience and connect student sensemaking to the three dimensions.
* Resources engage all students in learning experiences that connect phenomena and/or problems with the three dimensions and are not separated from the DCIs.
* Student engagement of phenomena and/or problems develop understanding of the DCIs as well as an understanding of the CCCs and the SEPs.
* Resources incorporate, or have the ability to be modified to include, phenomena and/or problems that are relevant to local conditions.

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Indicator B2: Drive multiple lessons (unit and/or program)

Phenomena/problems drive multiple lessons for students to use and build knowledge of all three dimensions.

Units, chapters or learning modules designed to engage students in making sense of natural phenomena or solving design problems in meaningful ways, across multiple lessons. Students should be actively engaged using the three dimensions as they are also engaged with the phenomenon or problem.

Evidence to look for

* Sequenced lessons and learning experiences use phenomena and/or problems as a central component (drive instruction) across multiple lessons or learning experience.
* Phenomena and/or problems can be explained through the application of targeted grade-appropriate SEPs, CCCs and DCIs.
* Resources engage all students in learning experiences that connect phenomena and/or problems with the three dimensions and are not separated from the DCIs.
* Student engagement of phenomena and/or problems develop understanding of the DCIs as well as an understanding of the CCCs and the SEPs.

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Indicator B3. Leverage prior knowledge (lesson, unit and/or program)

Resources elicit students’ prior knowledge and experience about phenomena and/or problems. This elicited knowledge should then be leveraged as students make sense of phenomena and/or solve problems.

Evidence to look for:

* Resources elicit and leverage students’ prior knowledge and experience to allow for meaningful learning of phenomena and/or solving problems that allows them to make connections between what they are learning and their own knowledge.
* Resources elicit and leverage students’ prior knowledge and experiences to address potential areas of misunderstanding.
* Resources accommodate different entry points to the learning of phenomena and/or solving problems.

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Indicator B4: Connected to grade band/grade level Disciplinary Core Ideas (lesson, unit and/or program)

Phenomena and/or problems are used to connect student sense-making to one or more DCIs within the appropriate grade band/grade level.

Evidence to look for:

* Resources engage all students in learning experiences about phenomena and/or problems that are not separated from the DCIs.
* Phenomena and/or problems can be explained through the application of the targeted grade-appropriate DCIs.
* Student engagement with the phenomenon and/or problem develops understanding of the targeted DCIs.

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**Criterion C: Coherence**

Resources are designed for students to build and connect their knowledge and use of the three dimensions. The opportunities provided are scientifically accurate and incorporate the appropriate use of science ideas to ensure students are engaged in grade appropriate work.

Indicator C1: Build and connect student learning (unit and/or program)

Science concepts are built coherently across a grade band/grade level. Resources provide opportunities for students to connect their learning and use of the three dimensions within or between units/chapters/learning modules.

Evidence to look for:

* Resources make clear the connections of the three dimensions *within* units of instruction.
* Resources make clear the connections of the three dimensions units/chapters/learning modules to connect prior, current and future learning.
* Resources connect DCIs, SEPs and CCCs across multiple learning sequences to help students build and connect knowledge
* Resources are designed with an intentional or suggested sequence that build and connect knowledge
* Students tasks related to explaining phenomena and/or solving problems increase in sophistication and complexity

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Indicator C2. Scientifically Accurate (lesson, unit and/or program)

Instruction, assessments and supplemental resources present DCIs, SEPs and CCCs that are scientifically accurate as students make sense of phenomena and solve problems.

Evidence to look for:

* The DCIs, SEPS and CCCs are presented in a scientifically accurate way
* Two-dimensional or three-dimensional learning is scientifically accurate
* Assessments present DCIs, SEPs and CCCs in a scientifically accurate way

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Indicator C3. Grade appropriate dimensions

Each of the three dimensions must encompass and build toward grade-level/grade-band understanding and their components. While some lessons may include some off-grade components, these should be included as supports or scaffolds and not the focus of the learning.

The dimensions may be reviewed at the lesson and unit level. However, materials should be reviewed across the entire program to ensure completeness of all components of the dimensions.

C3i. Disciplinary Core Ideas

Evidence to look for:

* Students develop grade-level/grade-band understanding of each of the four disciplinary core ideas and their components.
* Lessons/units/learning modules allow students to use and build grade-level/grade-band DCI-related knowledge.

Physical Sciences

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Life Sciences

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Earth and Space Sciences

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Engineering, Technology and Applications of Science

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C3ii. Science and Engineering Practices

Evidence to look for:

* Individual lessons or learning experiences develop grade-band understanding of each of the components within all eight SEPs.
* SEPS connect across lessons and units/chapters/learning modules in a way that allows students to use and build SEP-related knowledge and skills.
* SEPs purposefully engage students in learning and using them in increasingly more sophisticated ways throughout units/chapters/learning modules

Asking Questions and Defining Problems

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Developing and Using Models

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Planning and Carrying out Investigations

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Using Mathematics and Computational Thinking

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Constructing Explanations and Designing Solutions

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Engaging in Argument from Evidence

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Obtaining, Evaluating and Communicating Information

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C3iii. Crosscutting Concepts

Evidence to look for:

* Individual lessons or learning experiences develop grade band understanding of each of the components within all seven CCCs.
* CCCs connect across lessons and units/chapters/learning modules in a way that allows students to use and build CCC-related knowledge and skills.
* CCCs purposefully engage students in learning and using them in increasingly more sophisticated ways throughout units/chapters/learning modules

Patterns

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Cause and Effect: Mechanism and Explanation

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Scale, Proportion and Quantity

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Systems and System Models

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Energy and Matter

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Structure and Function

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Stability and Change

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**Criterion D: Supports for all Students**

Resource supports the learning for all students. This would include students from diverse cultural backgrounds and those that require appropriate supports and modifications.

Indicator D1. Diverse Backgrounds (unit and/or program)

Resource designed to leverage diverse cultural and social backgrounds of students.

Evidence to look for:

* Learning goals, instructional activities, text, images, problems or phenomena are likely relevant, interesting and/or motivating for students
* Resource promotes equity and access across genders, cultures or countries of origin.
* Images or information about people, representing various demographic and physical characteristics, is balanced.
* Guidance to encourage teachers to draw upon student home language to facilitate learning.

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Indicator D2. Supports and accommodations for special populations (lessons, unit and/or programs)

Appropriate supports, accommodations and/or modifications for numerous special populations are suggested. These supports allow all students to actively participate in learning science and engineering.

Evidence to look for:

* Materials support special populations (e.g., ELL, over/under proficiency, special education, students with physical and cognitive disabilities) in their regular participation and engagement in learning grade-level or grade-band science and engineering.
* Materials provide varied approaches to learning tasks over time and variety in how students are expected to demonstrate their learning.
* Appropriate supports and/or modifications for advanced students working at a greater depth.

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Indicator D3. Other supports (lessons and/or units)

Instruction should support all students. Resources should provide multiple access points for students at varying ability levels and backgrounds to make sense of phenomena and design solutions to problems, as well as those at different reading levels.

Evidence to look for:

* Lessons or activities provide multiple access points for students of varying backgrounds (are phenomena and problems relevant and accessible from cultural, geographic or socioeconomic perspectives).
* Lessons or activities allow multiple approaches to explaining phenomena or solving problems based on varying backgrounds (cultural, geographic or socioeconomic perspective).
* Strategies are provided that help teachers validate and build on students’ relevant personal or social experiences with scientific ideas.
* Specific supports or strategies (graphic organizers, note-taking, pronunciation guides, etc.) to support, accommodate or modify lessons or activities for students who read, write, speak or listen below grade level, or in a language other than English.
* Scaffolds for vocabulary or concepts support readers below grade level.

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Indicator D4. Assessment (lessons and/or units)

Assessments are accessible to diverse learners regardless of gender identification, language, learning exceptionality, race/ethnicity or socioeconomic status.

Evidence to look for:

* Assessments accessible to all students regardless of background.
* Appropriate modifications are suggested for those students in special populations, but are grade level/grade band appropriate.
* Assessments are free of bias.

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**Criterion E: Teacher Supports**

Resources provide supports to teachers in understanding 1) the integration of the three dimensions, 2) how to support students in engaging in the three dimensions in increasingly sophisticated ways and 3) how targeted dimensions support students in explaining phenomena or solving problems. In this way, teachers become more knowledgeable in understanding the expectations of the standards.

Indicator E1. Background (program)

Resource provides background information to help teachers support students in using the three dimensions to explain phenomena and solve problems.

Evidence to look for:

* Resource helps teachers understand how the materials integrate the three dimensions and support three-dimensional learning
* Resource clearly connects the purpose of activities to support students as they engage in three-dimensional learning to explain phenomena or solve problems.
* Annotations or suggestions support teachers in understanding how students build understanding of each of the targeted dimensions as they explain phenomena and/or solve problems.

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Indicator E2. Planning learning experiences (program)

Guidance is provided that supports teachers in planning and providing effective learning experiences to engage students in understanding phenomena and solving problems.

Evidence to look for:

* Guidance in planning and providing effective learning experiences, including student discourse, student thinking, reasoning, sensemaking, problem-solving and metacognition related to understanding phenomena and solving problems.
* Guidance or supports to help teachers engage students in understanding phenomena and solving problems.

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Indicator E3. Using student materials (lessons, unit and/or programs)

Teacher guidance, with sufficient and useful annotations and suggestions for how to enact student materials, is provided. This may include guidance in the use of embedded technology to support student learning.

Evidence to look for:

* Narrative information that will assist teachers in presenting the student material
* Learning goals are explicitly and clearly described so that teachers understand the goals for instruction
* Guidance for when and how adaptations could be made without detracting from the learning goals
* Background content knowledge provided for the teacher is accurate, understandable and gives true assistance

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**Criterion F: Assessment Design and Supports**

Assessments are designed to provide information in regards to student understanding of the three dimensions as they explain phenomena or solve problems. Supports for interpreting the assessment results are provided.

Indicator F1: Variety (lessons, units and/or programs)

Assessments include a variety of modalities and measures

Evidence to look for:

* Assessments include a variety of modalities (writing, illustrating, demonstrating, modeling, oral presentations, performance tasks)
* Assessments include a variety of measures (performance tasks, discussion questions, constructed response questions, project- or problem-based tasks, portfolios)
* When appropriate, multiple modalities are used within a single assessment.

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Indicator F2: Feedback (lessons and/or units)

Resources provide opportunities and guidance for oral and/or written peer and teacher feedback and self-reflection, allowing students to monitor and move their own learning.

Evidence to look for:

* Provide for ongoing review, practice, self-reflection and feedback
* Guidance for multiple feedback strategies (oral and/or written)
* Guidance for multiple strategies for peer and teacher feedback.
* Opportunities for students to monitor their own progress based on feedback and self-reflection

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Indicator F3: Assessment Tools (lessons and/or units)

Tools are provided to scoring assessment items (sample student responses, rubrics, scoring guidelines, etc). The tools also incorporate guidance for interpreting range of student understanding for relevant SEPs, CCCs and DCIs.

Evidence to look for:

* Types of tools provided for scoring assessment items.
* Guidance provided for interpreting range of understanding for relevant SEPs, CCCs, and DCIs as students explain phenomena or solve problems.
* Assistance provided to teachers in interpreting student responses to diagnose what learning difficulties remain.
* Provide specific suggestions to teachers about how to use the information from the assessments to make instructional decisions about what ideas or learning needs to be addressed through further learning experiences.

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**Criterion G: Usability**

Resource is designed to be usable, support teachers in using the materials and understand how the materials are designed.

Indicator G1: Sequencing (program)

Resource provides a rationale for how units/chapters/learning modules are intentionally sequenced to build coherence and student understanding.

Evidence to look for:

* Unit/chapter/lesson/learning module overview explains progression of content and how it connects to previous and upcoming content.
* Supports for making instructional decisions about modifications to the materials when instructional time is short, while still maintaining coherence, is provided.
* Learning experiences are sequenced in a conceptual and developmental way that will likely make sense to students.

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Indicator G2: Other Instructional Supports (unit and/or program)

To support effective science instruction, teachers will need information about required materials.

Evidence to look for:

* A comprehensive, accurate list of required materials is provided
* Clear science safety guidelines for teachers and students are embedded across the resource.
* Information about maintenance and safe use of equipment and materials is provided.

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