

Arkansas K-12 Science Standards Public Comment Survey Results and Responses

Grades K-4 and Grades 5-8

Arkansas Department of Education Curriculum and Instruction Unit fielded a public comment survey from April 15 to May 15, 2015. This survey allowed respondents to download and review a draft of the K-8 portion of the Arkansas K-12 Science Standards and indicate whether the standards were appropriate as written, or if not, to provide comments specific to each standard.

Demographics of Respondents

Two hundred and thirty (230) respondents logged on to the survey of which 135 Arkansas respondents commented on the standards. Participants were given the option to respond as individuals or as a group. An additional respondent was from a national non-profit group from Ohio called the Citizens for Objective Public Education (see the comments supplied by this group at the end of the matrix below).

Overall Findings from the Teacher Survey on the Arkansas K-12 Science Standards for Grades K-4 and Grades 5-8

For each topic (e.g., Earth’s Systems) within the standards, respondents could select between two options with the results for each option shown below:

- I have read the standards and think they are appropriate as written.
 - K-4 standards- 83.5% agreed.
 - 5-8 standards- 81.5% agreed.
- I have read the standards and offer the following comments. (See public comments and K-8 sub-committee and ADE responses below)

Grade Level	Science Standards by Topic	Comment	K-8 Sub-Committee Response and ADE Response
Kindergarten	Forces and Interactions: Pushes and Pulls	<ul style="list-style-type: none"> • I think it will be extremely difficult for kindergarteners to analyze data. Discussion to determine a solution would be more affective. • I like that the standards provide examples of what the teacher could do as an activity. • These are satisfactory but truly not exciting. Science should be exciting at this age to spark an ongoing interest. • The clarification statement really helps make the standard clear. 	<p>Comments considered. The Arkansas Department of Education (ADE) will continue to provide Professional Development (PD) to help teachers to understand the connections between math and science concepts and skills.</p> <p>Curricular choices are determined by districts, schools, and/or teachers. Science PD engages teachers in the use of tools and strategies to engage students in meaningful investigations.</p>

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		<ul style="list-style-type: none"> I think that there is a possibility for meaningful, developmentally appropriate learning to occur based upon these standards. I also like the idea of introducing ideas related to engineering and physics in kindergarten. 	
Kindergarten	Weather and Climate	<ul style="list-style-type: none"> Most Kindergarten classrooms cover the weather for each day and talk a little about the differences. I think that a more in depth look at weather would be wonderful. K-PS3-2 seems unnecessary to me...knowing that it's cooler in the shade? All others are clear and relevant. <input type="checkbox"/> I think that these standards would do a great job of extending current science standards relating to charting weather 	Comments considered. The ADE will continue to provide PD to support implementation of the Arkansas K-12 Science Standards.
Kindergarten	Interdependent Relationships in Ecosystems: Animals, Plants, and Their Environment	<ul style="list-style-type: none"> I like these standards. I like the detail given. K-LS1-1 States plants do not need food when they do, they just make their own. I also feel that K-ESS2-1 needs more clarification. It is very confusing. These standards are in no way appropriate for kindergarten learners. Constructing an argument and comparing models is not appropriate at all. If we want to encourage more students to pursue STEM careers, we don't need to turn them against science in kindergarten. Realistic, inquiry-based science is much more appropriate. We need a realistic, exploratory focus in science in which students experience living things firsthand and engage in hands-on experiments. These standards are 	<p>Comments considered. The ADE will continue to provide PD regarding the purpose and use of the clarification statements and the supporting information located in the foundation boxes (LS1.C and ESS3.A).</p> <p>These standards are developmentally appropriate and based on current cognitive developmental research as established in the <i>Framework for K-12 Science Education</i> (NRC, 2012). The NRC Framework is available as a free download and is accessible through the ADE website.</p>

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		<p>unacceptable.</p> <ul style="list-style-type: none"> • I believe that the concept of Life Cycles should also be included here. This is an important concept and plants and animals is a perfect place to teach this concept. The students enjoy observing and predicting through this stage. In my classroom this unit study is one that my children get excited about and are able to tie this concept to other things 	<p>The ADE will continue to provide PD to support teachers in the implementation of the student performance expectations.</p> <p>Curricular choices are determined by districts, schools, and/or teachers. Science PD engages teachers in the use of tools and strategies to engage students in meaningful investigations.</p>
Kindergarten	Engineering, Technology, and Applications of Science	<ul style="list-style-type: none"> • Analyzing information will be extremely difficult. Again, I believe discussion would be a better form of measuring understanding. • I think students will need more help when covering these standards. • There are no clarification statements for these standards. I feel that there may be one needed for each of these standards. • These all need clarification and samples for this grade level. • need clarifications • These standards are developmentally inappropriate. If we want to encourage students to pursue engineering, we will need to create better standards than this for kindergarten. 	<p>Comments considered. The ADE will continue to provide PD, communication, and tools to support implementation of the Engineering, Technology, and Applications of Science (ETS) standards.</p> <p>The K-8 committee chose not to add clarification statements to the ETS standards to avoid limiting teacher and student creativity and to maintain relevance within individual communities. The ETS standards are intended to support students' understanding of disciplinary core ideas and are not meant to be taught in isolation.</p> <p>These standards are developmentally appropriate and based on current cognitive developmental research as established in the <i>Framework for K-12 Science Education</i> (NRC, 2012). The NRC Framework is available as a free download and is accessible through the ADE website.</p>

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Grade 1	Waves: Light and Sound	<ul style="list-style-type: none"> • These standards don't focus enough on the background knowledge students need to understand these things. Especially students who lack home experiences and haven't had their parents teach them about "common" things. They are bordering on developmentally inappropriate for this age group. • 1-PS4-3 to say the assessment boundary does not include the speed of light seems to be a very far reaching boundary. I would like to see a more appropriate assessment boundary, as there seems to be a great deal of content and understanding between this performance standard and understanding the speed of light. • The clarification statements are helpful. 	<p>Comment considered. These standards are developmentally appropriate and based on current cognitive developmental research as established in the <i>Framework for K-12 Science Education</i> (NRC, 2012). The NRC Framework is available as a free download and is accessible through the ADE website.</p> <p>Curricular choices are determined by districts, schools, and/or teachers. Science PD engages teachers in the use of tools and strategies to engage students in meaningful investigations.</p> <p>The ADE will continue to provide PD to support teachers in the purpose and use of the assessment boundaries. Assessment boundaries are primarily for large-scale assessment item development and can be used to inform the scope of instruction.</p>
Grade 1	Structure, Function, and Information Processing	<ul style="list-style-type: none"> • These standards don't focus enough on the background knowledge students need to understand these things. Especially students who lack home experiences and haven't had their parents teach them about "common" things. They are bordering on developmentally inappropriate for this age group. • LS1-1 Students at my school and in many other schools come from many different cultures. Background knowledge differs for all students. This standard seems to be challenging for students to achieve without common standards to help connect prior learning. The vocabulary of mimicking can be 	<p>Comment considered. These standards are developmentally appropriate and based on current cognitive developmental research as established in the <i>Framework for K-12 Science Education</i> (NRC, 2012). The NRC Framework is available as a free download and is accessible through the ADE website.</p> <p>Curricular choices are determined by districts, schools, and/or teachers. Science PD engages teachers in the use of tools and strategies to engage students in meaningful investigations.</p>

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		<p>taught but needs to be demonstrated in prior lessons to be able to meet the assessment. I can see that these standards need to be thought through by educators and planned with the standard being the end goal.</p> <ul style="list-style-type: none"> 1-LS1-1 is not appropriate for first graders. More detail needed on all three. Sample lessons would be helpful. 	<p>The ADE will continue to provide PD to support teachers regarding the purpose and use of the clarification statements and the supporting information located in the foundation boxes (LS1.A).</p>
Grade 1	Space Systems: Patterns and Cycles	<ul style="list-style-type: none"> These standards don't focus enough on the background knowledge students need to understand these things. Especially students who lack home experiences and haven't had their parents teach them about "common" things. They are bordering on developmentally inappropriate for this age group. Students need to be aware of the celestial bodies and their sizes and where they appear in the sky before they can attempt to make observations and predict patterns in the sky. For 1-ESS1-2 I feel that it would be very difficult to keep up with observations throughout the entire year or to refer to other times of the year. I feel that the children will forget or lose focus of what it is they observed at that time in relation to what they are observing at the present time. Moon appears in during the day- should this be taught in first grade? 	<p>Comment considered. These standards are developmentally appropriate and based on current cognitive developmental research as established in the <i>Framework for K-12 Science Education</i> (NRC, 2012). The NRC Framework is available as a free download and is accessible through the ADE website.</p> <p>Curricular choices are determined by districts, school, and/or teachers. Science PD engages teachers in the use of tools and strategies to engage students in meaningful investigations.</p> <p>The ADE will continue to provide PD to support teachers regarding the purpose and use of the clarification statements and the supporting information located in the foundation boxes (ESS1.B).</p>
Grade 1	Engineering, Technology, and Applications of Science	<ul style="list-style-type: none"> These standards don't focus enough on the background knowledge students need to understand these things. Especially students who lack home experiences and haven't had their parents teach them about "common" things. They are bordering on developmentally inappropriate for this age 	<p>Comments considered. The ADE will continue to provide PD, communication, and tools to support implementation of the Engineering, Technology, and Applications of Science (ETS) standards.</p>

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		<p>group.</p> <ul style="list-style-type: none"> All ETS standards- teachers will see these standards as separate performance standards as opposed to integrated with the other standards. Please make this clear with examples and ideas to help teachers educate the minds of the future. I believe that these standards need clarification statements to make it easier for teachers to understand. Need clarification statements. These are vague. 	<p>The K-8 committee chose not to add clarification statements to the ETS standards to avoid limiting teacher and student creativity and to maintain relevance within individual communities. The ETS standards are intended to support students' understanding of disciplinary core ideas and are not meant to be taught in isolation.</p> <p>These standards are developmentally appropriate and based on current cognitive developmental research as established in the <i>Framework for K-12 Science Education</i> (NRC, 2012). The NRC Framework is available as a free download and is accessible through the ADE website.</p>
Grade 2	Structure and Properties of Matter	<ul style="list-style-type: none"> I like the examples and how these standards build upon one another. The standards are appropriate for second grade with the clarification statements. The standards are very vague. 	<p>Comments considered. The new standards focus on deeper understanding as well as application of science content. The standards were written in a way that leaves a great deal of discretion to educators and curriculum developers and are not intended to be an exhaustive list of all that could be included in a student's science education.</p>
Grade 2	Interdependent Relationships in Ecosystems	<ul style="list-style-type: none"> Possibly more clarification on 2-LS4-1. Adding a clarification statement to 2-LS2-2 would be beneficial The standards are appropriate for second grade with the clarification statements. 2-LS4-1 Where will students observe these habitats? 	<p>Comments considered. The ADE will continue to provide PD regarding the purpose and use of the clarification statements and the supporting information located in the foundation boxes (LS4.D and LS2.A).</p> <p>Curricular choices are determined by districts, schools, and/or teachers.</p>

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			Science PD engages teachers in the use of tools and strategies to engage students in meaningful investigations.
Grade 2	Earth's Systems: Processes that Shape the Earth	<ul style="list-style-type: none"> The standards are appropriate for second grade with the clarification statements. 	Comment considered.
Grade 2	Engineering, Technology, and Applications of Science	<ul style="list-style-type: none"> These need to be more specific. The overall layout of the printed standards is difficult to read. Please make them user friendly. Need to clarify 	<p>Comments considered. The ADE will continue to provide PD, communication, and tools including "How to Read" diagrams to support implementation of the Engineering, Technology, and Applications of Science (ETS) standards.</p> <p>The K-8 committee chose not to add clarification statements to the ETS standards to avoid limiting teacher and student creativity and to maintain relevance within individual communities. The ETS standards are intended to support students' understanding of disciplinary core ideas and are not meant to be taught in isolation.</p> <p>These standards are developmentally appropriate and based on current cognitive developmental research as established in the <i>Framework for K-12 Science Education</i> (NRC, 2012). The NRC Framework is available as a free download and is accessible through the ADE website.</p>
Grade 3	Forces and Interactions	<ul style="list-style-type: none"> We appreciate the assessment boundaries to assist teachers in focusing instruction. Clarification statements are helpful with the suggested examples for student investigations. 	Comment considered.

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Grade 3	Interdependent Relationships in Ecosystems	<ul style="list-style-type: none"> • Does 3-LS4-3 apply to animals found with in a specific ecosystem, or would a student argue why a certain animal does not live in that specific ecosystem? (ex. why a polar bear does not live in the desert) • We like the connection to CCSS in the argumentative writing with these PE's. 3-LS2-1, 3-LS4-3 	<p>Comments considered. The standard (3-LS4-3) does not specify animal habitats.</p> <p>Curricular choices are determined by districts, schools, and/or teachers. Science PD engages teachers in the use of tools and strategies to engage students in meaningful investigations.</p>
Grade 3	Inheritance and Variation of Traits: Life Cycles and Traits	<ul style="list-style-type: none"> • 3-LS4-2 AR Clarification. Plants are less likely to be eaten by herbivores, not predators. • May want to include information in the front matter for these standards to guide teachers back to the nextgenscience website or to the Framework for K12 Science Education for further clarification and direction on the grade band endpoints for the Core Ideas. 3-LS1 - SLS4-2 seemed like quite a bit of information for 3rd graders at first reading. Also might want to guide teachers in the understanding that students will engage in multiple SEP's with each PE in addition to the one that is spelled out in the performance expectation. 	<p>Comments considered. The K-8 committee chose to remove “by predators” from the Arkansas-specific clarification statement for the standard (3-LS4-2).</p> <p>The standards clarify what students need to know and do at the end of a grade. Multiple sources of support are available to schools as they develop coherent instructional programs.</p>
Grade 3	Weather and Climate	N/A	No comments to consider.
Grade 3	Engineering, Technology, and Applications of Science	<ul style="list-style-type: none"> • Need clarifications • Why are there no clarification statements or assessment boundaries for the Engineering Performance Expectations? We think these might be helpful for Arkansas teachers who are very new to incorporating Engineering practices in instruction. 	<p>Comments considered. The ADE will continue to provide PD, communication, and tools to support the implementation of the Engineering, Technology, and Applications of Science (ETS) standards.</p> <p>The K-8 committee chose not to add clarification statements to the ETS standards to avoid limiting teacher and</p>

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			<p>student creativity and to maintain relevance within individual communities. The ETS standards are intended to support students' understanding of disciplinary core ideas and are not meant to be taught in isolation.</p> <p>These standards are developmentally appropriate and based on current cognitive developmental research as established in the <i>Framework for K-12 Science Education</i> (NRC, 2012). The NRC Framework is available as a free download and is accessible through the ADE website.</p>
Grade 4	Structure, Function, and Information Processing	<ul style="list-style-type: none"> • They are too broad & rigorous for a 9 or 10 year old to understand let alone perform. • Clarification Statement: Examples could include using a digital camera or a digital microscope to image small objects and compare / contrast how that technology "sees" with how animal eyes behave. • I don't see why reproduction has to be included in 4-LS1-1. The concept is structures that perform tasks. Reproduction structures are just going to bring up controversy and 4th graders are not to the age where they need to be dealing too much with that. It just doesn't make any sense. • I believe that there should be some other content covered in life science. Life science should have more content than other areas. • 4-LS1-1 AR clarification - if the stem is an appropriate 	<p>Comments considered. These standards are developmentally appropriate and based on current cognitive developmental research as established in the <i>Framework for K-12 Science Education</i> (NRC, 2012). The NRC Framework is available as a free download and is accessible through the ADE website.</p> <p>The standards clarify what students need to know and do at the end of a grade. Multiple sources of support are available to schools as they develop coherent instructional programs.</p> <p>The K-8 committee chose not to add a clarification statement to standard 4-PS4-2 to avoid limiting teacher and student creativity and to maintain relevance within individual communities.</p>

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		<p>structure to support growth, then wouldn't the skeleton (or exoskeleton and its molting) be comparable from animals, rather than identifying the stomach which is essential for nutrition?</p>	<p>Curricular choices are determined by districts, schools, and/or teachers. Science PD engages teachers in the use of tools and strategies to engage students in meaningful investigations.</p> <p>The standards are designed to provide a coherent progression aimed at developing scientific literacy with instruction focused on a smaller set of ideas.</p> <p>The K-8 committee revised the Arkansas-specific clarification statement for standard 4-LS1-1 to include only macroscopic plant structures.</p>
Grade 4	Waves: Waves and Information	<ul style="list-style-type: none"> • They are too broad & rigorous for a 9 or 10 year old to understand let alone perform. • I believe that this is too specific. There are other items besides waves that could be covered in this strand. • We are concerned about the clarification statement on 4-PS4-3 being confusing for AR teachers. We suggest removing the reference to "using a grid of 1's and 0's representing black and white to send information about a picture" 	<p>Comments considered. These standards are developmentally appropriate and based on current cognitive developmental research as established in the <i>Framework for K-12 Science Education</i> (NRC, 2012). The NRC Framework is available as a free download and is accessible through the ADE website.</p> <p>The standards clarify what students need to know and do at the end of a grade. Support is available from multiple sources to support schools as they develop coherent instructional programs.</p> <p>Standard 4-PS4-3 is foundational to building understanding of disciplinary core ideas in later grades.</p>
Grade 4	Energy	<ul style="list-style-type: none"> • They are too broad & rigorous for a 9 or 10 year old to 	<p>Comments considered. These standards are developmentally appropriate and</p>

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		<p>understand let alone perform.</p> <ul style="list-style-type: none"> • Again, I feel that this strand is too specific. There are so many other ideas and topics that could be discussed in this strand. • We noticed that Energy is showing up only under Earth and Space Science in the K-4 Topic arrangement overview at the front of the draft standards for K-4. The PE's grouped under the Energy topic in 4th grade suggest that this topic should be connected to both Physical and Earth and Space Science. 	<p>based on current cognitive developmental research as established in the <i>Framework for K-12 Science Education</i> (NRC, 2012). The NRC Framework is available as a free download and is accessible through the ADE website.</p> <p>The K-8 committee acknowledges that the fourth grade standards in the Energy topic includes physical science and earth and space science disciplinary core ideas. In addition, Energy is a crosscutting concept across all science domains.</p>
Grade 4	Earth's Systems: Processes that Shape the Earth	<ul style="list-style-type: none"> • They are too broad & rigorous for a 9 or 10 year old to understand let alone perform. 	<p>Comments considered. These standards are developmentally appropriate and based on current cognitive developmental research as established in the <i>Framework for K-12 Science Education</i> (NRC, 2012). The NRC Framework is available as a free download and is accessible through the ADE website.</p>
Grade 4	Engineering, Technology, and Applications of Science	<ul style="list-style-type: none"> • They are too broad & rigorous for a 9 or 10 year old to understand let alone perform. These are expectations they are not cognitively ready to live up to. 	<p>Comments considered. The ADE will continue to provide PD, communication, and tools to support the implementation of the Engineering, Technology, and Applications of Science (ETS) standards.</p> <p>The K-8 committee chose not to add clarification statements to the ETS standards to avoid limiting teacher and student creativity and relevance within individual communities. The ETS standards are intended to support students' understanding of disciplinary core ideas and are not meant to be</p>

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			<p>taught in isolation.</p> <p>These standards are developmentally appropriate and based on current cognitive developmental research as established in the <i>Framework for K-12 Science Education</i> (NRC, 2012). The NRC Framework is available as a free download and is accessible through the ADE website.</p>
Grade 5	Earth's Systems	<ul style="list-style-type: none"> • The terminology is different than what I currently teach. • 5-ESS2-1 If the intent is for students to develop a model of how the land, living things, water, and air interact, why doesn't the standard provide specific examples to assist teachers? If this refers to such things as the water cycle and carbon cycle etc. it would be helpful to have these suggestions. 5-ESS2-2 This does not seem to address basic understandings needed by students at this grade level. What type of graph is needed? How much data should be graphed? Would students compare one lake to one ocean or all ocean water to all lakes? This will be very confusing to teachers and students. • These seem to lack specificity and detail. The "could" in the clarification statement may lead to very different content being taught depending on what a particular school or district decides to include in its pacing guides. Overall, this seems to be a rather limited view of science content. I am beginning to understand the statement that these are science appreciation standards more so than science content standards. 	<p>Comment considered. Curricular choices are determined by districts, schools, and/or teachers. Science PD engages teachers in the use of tools and strategies to engage students in meaningful investigations.</p> <p>5-ESS2-1 and 5-ESS2-2 are correlated to the Grade 5 math standards.</p> <p>The K-8 committee chose not to add clarification statements to the Grade 5 ESS standards to avoid limiting teacher and student creativity and to maintain relevance within individual communities.</p>
Grade 5	Space Systems	<ul style="list-style-type: none"> • How can a graphical display in the daily changes in length and direction of shadows "NOT" include a causal relationship for 	<p>Comments considered. These standards are developmentally appropriate and based on current cognitive developmental</p>

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		<p>seasonal determinations? Do fifth graders not realize the relationship between the tropic of Capricorn and the tropic of cancer in relation to the equator? This is a golden opportunity to emphasize geography, social studies, and the relationship solar heating to "Hurricane season". I recommend removing the assessment boundary or at least limiting not include calculations of the Earth's tilted axis.</p> <ul style="list-style-type: none"> • The concept of gravity seems very abstract for an argument piece. • 5-PS2-1 This standard seems very simplistic. What are students expected to do, state that every time they drop an object it falls to earth? There just isn't enough direction for teachers to determine what students should know or do. 5-PS2-2 These standards seem fairly simple, until you examine the idea that the pattern of stars in the night sky is different during different seasons. Since schools are not open at night, students are limited to what they are able to read or information they are told. If they did try to observe stars, it would be very difficult for students at this age to track any star over several months. • Again, these seem to be rather weak on science content compared to current ADE science standards for the grade. Where is the rigor in these three standards? 	<p>research as established in the <i>Framework for K-12 Science Education</i> (NRC, 2012). The NRC Framework is available as a free download and is accessible through the ADE website.</p> <p>The ADE will continue to provide PD to support the purpose and use of the assessment boundaries. Assessment boundaries are primarily for large-scale assessment item development and can be used to inform the scope of instruction.</p> <p>The ADE will continue to provide PD to support in the purpose and use of the clarification statements and the supporting information located in the foundation boxes.</p> <p>Curricular choices are determined by districts, schools, and/or teachers. Science PD engages teachers in the use of tools and strategies to engage students in meaningful investigations.</p>
Grade 5	Structure and Properties of Matter	<ul style="list-style-type: none"> • 5-PS1-2 What type of graph would be useful with this standard? For example students could weight 6 grams of salt and 20 grams of water then mix the two. They would have 26 grams of salt water. Students could perform the calculation and then what graph would they use? Even with clarification 	<p>Comments considered. The ADE will continue to provide PD to support the purpose and use of the clarification statements and the supporting information located in the foundation boxes.</p>

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		<p>this is confusing. 5-PS1-4 If students are expected to identify evidence that a chemical change has, or has not, occurred, why don't the standards simply say this. When standards and expectations are clear, clarifications aren't really needed.</p> <ul style="list-style-type: none"> In examining standard 5 PS1-1 Measure and graph... I am concerned that we don't have the materials nor a safe place to heat or cool substances. 	<p>Curricular choices are determined by districts, schools, and/or teachers. Science PD engages teachers in the use of tools and strategies to engage students in meaningful investigations.</p> <p>Teachers are encouraged to communicate with district leadership to address their needs and concerns for science resources and safety.</p>
Grade 5	Matter and Energy in Organisms and Ecosystems	<ul style="list-style-type: none"> 5-PS3-1 Again, the standards seem to be 'dancing around' the real expectations. Assuming that suitable models would be food webs, chains or pyramids, why not just use these terms? 5-LS2-1 The clarification makes no sense in relation to the standard. The standard seems to address matter moving from plants to animals then decomposers, but the clarification seems to deal with photosynthesis (air, water and decomposed materials are changed by plants into food). 	<p>Comments considered. These standards are developmentally appropriate and based on current cognitive developmental research as established in the <i>Framework for K-12 Science Education</i> (NRC, 2012). The NRC Framework is available as a free download and is accessible through the ADE website.</p> <p>The standards are designed to provide a more coherent progression aimed at developing scientific literacy with instruction focused on a smaller set of ideas.</p>
Grade 5	Engineering, Technology, and Applications of Science	<ul style="list-style-type: none"> These do not seem developmentally appropriate. These are so vague that I see much opportunity for confusion among teachers and parents as to exactly what content is expected to be understood. There are no PE's in 5th grade that designate a specific Engineering practice, so it might be helpful to AR teachers to have some explanation that the ETS PE's are intended to be 	<p>Comments considered. The ADE will continue to provide PD, communication, and tools to support the implementation of the Engineering, Technology, and Applications of Science (ETS) standards.</p> <p>The K-8 committee chose not to add clarification statements to the ETS standards to avoid limiting teacher and student creativity and to maintain</p>

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		<p>integrated throughout instruction of the other PE's and not taught in isolation.</p> <ul style="list-style-type: none"> • 5-ETS1-3 Students will need obtain background information in order to determine what a fair test is, they will need to have additional lessons about controls and variables 	<p>relevance within individual communities. The ETS standards are intended to support students' understanding of disciplinary core ideas and are not meant to be taught in isolation.</p> <p>These standards are developmentally appropriate and based on current cognitive developmental research as established in the <i>Framework for K-12 Science Education</i> (NRC, 2012). The NRC Framework is available as a free download and is accessible through the ADE website.</p>
Grade 6	Energy	<ul style="list-style-type: none"> • 6-PS3-5 is connected to a 7th and 8th grade CCSS for mathematics. Teachers might need additional guidance to explain how they can prepare students to meet this performance expectation in 6th grade even if they don't have some of the math concepts mastered until 7th or 8th grade. • I feel these are developmentally appropriate and would lead well to a PBL for engineering design. • I would like more of the scientific method involved in each set of standards such as control variable, independent variable, dependent variable as sixth grade is such a foundational grade for all of the sciences taught in high school. I do like the inquiry project based verbs used in the writing of the standards. 	<p>Comments considered. The K-8 committee removed connections to math standards in higher grades.</p> <p>These standards are developmentally appropriate and based on current cognitive developmental research as established in the <i>Framework for K-12 Science Education</i> (NRC, 2012). The NRC Framework is available as a free download and is accessible through the ADE website.</p> <p>These standards include connections to the nature of science.</p>
Grade 6	Structure, Function, and Information Processing	<ul style="list-style-type: none"> • This was moved up from 5th and I feel this would be a much better at the 6th grade level. I believe the assessment boundary limits and they would be able to do more. 5th could 	<p>Comments considered. The ADE will continue to provide PD, communication, and tools to support the implementation of the new standards.</p>

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		<p>probably handle this with these limitations.</p> <ul style="list-style-type: none"> • I would like more of the scientific method involved in each set of standards such as control variable, independent variable, dependent variable as sixth grade is such a foundational grade for all of the sciences taught in high school. I do like the inquiry project based verbs used in the writing of the standards. • 6-LS1-3 Students would need to understand what an "argument" is before being able to use an argument and show evidence for that argument. • 6-LS1-2: This standard is difficult for older students to comprehend. I believe this would be more appropriate for higher grades. • I teach this currently in seventh grade and they are mature enough to understand this material. Sixth grade teachers are not qualified to teach this as they have not even had the advanced Science courses to understand the material and students are not ready. It will have to be retaught in seventh grade as these are basics for everything else. It needs to stay in seventh grade. 	<p>These standards include connections to the nature of science. The focus on practices avoids the misconception that there is one common scientific method. Scientists employ a broad range of methods.</p> <p>The ADE will continue to provide PD to support the purpose and use of the connections to literacy and math standards.</p> <p>These standards are developmentally appropriate and based on current cognitive developmental research as established in the <i>Framework for K-12 Science Education</i> (NRC, 2012). The NRC Framework is available as a free download and is accessible through the ADE website.</p>
Grade 6	Growth, Development, and Reproduction of Organisms	<ul style="list-style-type: none"> • I recommend that an Assessment Boundary be added to 6-LS-3-2. Assessment Boundary: Characteristics should be limited to plant gene transmission at this grade level." • Recommend moving 6-LS3-2 to eight grade. I think it would be a better fit because the concepts are rather abstract and more suited to a higher level. Plus, eighth grade has standards that would align would be a good fit for that standard to be bundled 	<p>Comments considered. Curricular choices are determined by districts, schools, and/or teachers. Science PD engages teachers in the use of tools and strategies to engage students in meaningful investigations.</p> <p>These standards include connections to the nature of science. The focus on</p>

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		<p>with.</p> <ul style="list-style-type: none"> • Punnett Square analysis has been a difficult concept for 8th graders to grasp. Concerned with 6th grade trying to understand and keep understanding moving in to high school biology, this is a concern. Right now the state test is in biology and this is a long gap for students. • I would like more of the scientific method involved in each set of standards such as control variable, independent variable, dependent variable as sixth grade is such a foundational grade for all of the sciences taught in high school. I do like the inquiry project based verbs used in the writing of the standards. • Will humans be part of these reproduction discussions? If so, this is not age appropriate. Many 6th graders are only 10 years old. I have many parents whom at 7th grade do not want male and female reproduction shared with their student. What happened to the study of organs? How can we have responsible adults in AR if we do not teach them the foundation of how their body organs and systems work? Is this all being moved to Health? Where has this instruction gone to? • Once again, I teach this in seventh grade and they are not ready for reproduction. It does not need to be taught in sixth by teachers who have no idea what they are doing and have not had proper training. This standard needs to stay in 7th grade or higher. Sixth grade teachers don't even take upper level Science courses like A and P and are not qualified to teach this material. 	<p>practices avoids the misconception that there is one common scientific method. Scientists employ a broad range of methods.</p> <p>The standards are designed to provide a more coherent progression aimed at developing scientific literacy with instruction focused on a smaller set of ideas.</p>
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Grade 6	Earth's Systems	<ul style="list-style-type: none"> I would like more of the scientific method involved in each set of standards such as control variable, independent variable, dependent variable as sixth grade is such a foundational grade for all of the sciences taught in high school. I do like the inquiry project based verbs used in the writing of the standards 	<p>Comments considered. These standards include connections to the nature of science. The focus on practices avoids the misconception that there is one common scientific method. Scientists employ a broad range of methods.</p>
Grade 6	Human Impacts	<ul style="list-style-type: none"> The clarification statement for 6-ESS3-3 makes a mockery of the dams and levees constructed to minimize the profound impact that historical flooding has had on Arkansas communities. I would advocate a more balanced approach of identifying the consequences of human development versus the human costs of this "minimal" approach caused. I appreciate the * indicating the Engineering practices. It weighs heavily on sixth graders to examine population in relation to per-capita consumption. The standard inherently forces a value statement that greater population is always going to be a bad outcome for society. I would like more of the scientific method involved in each set of standards such as control variable, independent variable, dependent variable as sixth grade is such a foundational grade for all of the sciences taught in high school. I do like the inquiry project based verbs used in the writing of the standards. This is a great expectation for 10 year old students. (6-ES S3-4). Where will these grade-appropriate databases come from? How will a ten year old know and understand the impact in the consumption of natural resources? 	<p>Comments considered. These standards address current scientific research.</p> <p>These standards include connections to the nature of science. The focus on practices avoids the misconception that there is one common scientific method. Scientists employ a broad range of methods.</p> <p>Curricular choices are determined by districts, schools, and/or teachers. Science PD engages teachers in the use of tools and strategies to engage students in meaningful investigations.</p> <p>Teachers are encouraged to communicate with district leadership to address their needs and concerns for science resources.</p>

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Grade 6	Weather and Climate	<ul style="list-style-type: none"> • Is or is not the Coriolis Effect to be taught at the sixth grade level. To introduce it in the Clarification Statement and then specifically exempt it in the assessment boundary seems contradictory. How can a rudimentary presentation of Coriolis Effect not include its dynamics? I recommend this part of atmospheric behavior be postponed until a grade level presentation of its dynamic effects may be assessed. • I would like more of the scientific method involved in each set of standards such as control variable, independent variable, dependent variable as sixth grade is such a foundational grade for all of the sciences taught in high school. I do like the inquiry project based verbs used in the writing of the standards. • Wow! Latitudinal banding and the Coriolis Effect are difficult for 7th graders to understand. I am in awe that a ten year old will be better able to understand this concept (6-ESS2-6) • 6-ESS2-5: My experience is that even older students struggle with these concepts. I don't find this to be age appropriate. • I'm happy to see that climate change is addressed here. 	<p>Comments considered. These standards include connections to the nature of science. The focus on practices avoids the misconception that there is one common scientific method. Scientists employ a broad range of methods.</p> <p>The ADE will continue to provide PD to support the purpose and use of the assessment boundaries. Assessment boundaries are primarily for large-scale assessment item development and can be used to inform the scope of instruction.</p> <p>The standards are designed to provide a more coherent progression aimed at developing scientific literacy with instruction focused on a smaller set of ideas.</p> <p>These standards are developmentally appropriate and based on current cognitive developmental research as established in the <i>Framework for K-12 Science Education</i> (NRC, 2012). The NRC Framework is available as a free download and is accessible through the ADE website.</p>
Grade 6	Engineering, Technology, and Applications of Science	<ul style="list-style-type: none"> • 6-ETS1-2 should be amended to add: "Assessment Boundary: Determinations should be limited to qualitative criteria rather than precise quantitative relationships. • I would like more of the scientific method involved in each set of standards such as control variable, independent variable, 	<p>Comments considered. The ADE will continue to provide PD, communication, and tools to support the implementation of the Engineering, Technology, and Applications of Science (ETS) standards.</p>

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		<p>dependent variable as sixth grade is such a foundational grade for all of the sciences taught in high school. I do like the inquiry project based verbs used in the writing of the standards.</p> <ul style="list-style-type: none"> • These are good but for educators it would be great to have examples to go with the standards. 	<p>The K-8 committee chose not to add clarification statements to the ETS standards to avoid limiting teacher and student creativity and to maintain relevance within individual communities. The ETS standards are intended to support students' understanding of disciplinary core ideas and are not meant to be taught in isolation.</p> <p>These standards are developmentally appropriate and based on current cognitive developmental research as established in the <i>Framework for K-12 Science Education</i> (NRC, 2012). The NRC Framework is available as a free download and is accessible through the ADE website.</p> <p>These standards include connections to the nature of science. The focus on practices avoids the misconception that there is one common scientific method. Scientists employ a broad range of methods.</p> <p>The ETS standards in Grade 7 are aligned to quantitative math standards.</p>
Grade 7	Structure and Properties of Matter	<ul style="list-style-type: none"> • After hearing that the standards will go deeper, I do not see that with Standards 7-PS1-1, 3, 4. Why are students not accountable for understanding valence electrons? How will they predict properties of atoms without an understanding of the structure of atoms and why they bond? This is basic to how those atoms are going to regroup in a chemical reaction. Chemical equations needs to also be introduced and is 	<p>Comments considered. The committee chose to follow the research-based recommendation that students learn science best when content is integrated.</p> <p>Curricular choices are determined by districts, schools, and/or teachers. Science PD engages teachers in the use</p>

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		<p>appropriate with the math skills of 7th graders.</p> <ul style="list-style-type: none"> • Sometime needs to be spent on elements and the periodic table before jumping into developing models of molecules and this needs to be clarified in the document, especially for new teachers. • Instead of saying what "could" be included, make a list of REQUIRED examples so teachers can actually prepare for standardized exams. Educational standards should enumerate exactly what is expected rather than make suggestions about what "could" be covered. Having a list of standards that merely says "could include" creates a hopeless, assessment lottery mentality for students and teachers. Be specific and list exactly what is expected. • 7-PS1-1 To use molecular models and drawings students will need to understand valence and types of bonding, if they are to develop the model themselves. Even if it isn't assessed it seems teachers will need to teach the ideas. 7-PS1-4 This is a very clear standard, and goes to basic understanding of concepts. • I feel as though the standard is very vague and a lot of background information will have to be taught before you could even talk about molecules. • See overall comments at the end • 7-PS1-1 Why do students need to know about specific crystal structures at the age of 12? I feel that this standard is unnecessarily detailed. 7-PS1-4 Again, why is this necessary at such a young age? As a science teacher, I have found that 	<p>of tools and strategies to engage students in meaningful investigations.</p> <p>The ADE will continue to provide PD, communication, and tools to support the implementation of the standards.</p> <p>These standards are developmentally appropriate and based on current cognitive developmental research as established in the <i>Framework for K-12 Science Education</i> (NRC, 2012). The NRC Framework is available as a free download and is accessible through the ADE website.</p>
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		<p>the majority of 7th grade students do not think science is important because "the only things that matter are math and literacy. I don't understand why we have to take science." (Several students have actually told me this.) Unfortunately, it is true that math and literacy are emphasized so greatly that students don't think science is necessary. The primary thing at this age is to impress upon students that science is both exciting and important; in fact, it holds the key to the future. This can be done by demonstrating the immediate relevance of scientific study. More emphasis should be placed on the science behind things that are most relevant to the students' world, things that they can relate to real life, instead of trying to conceptualize abstract things like thermal energy (which is not visible). These kids are 11 and 12 years old. Thermal energy and molecular structure are not important or relevant to them. The relationship between a zebra and a lion, however, will grab their interest. Focus more on the macro than the micro level. Save the molecular energetics for when they are older</p> <ul style="list-style-type: none">• I believe that each grade level should be teaching a single branch of science. 6th-Earth; 7th Life; 8th; Physical It makes more sense to do things this way to allow the instructor to go deeper into a specific discipline instead of jumping around continuing to brush the surface.• You are asking teachers to teach things that they have no training for at this level. We will need detailed curriculum and PD training on teaching these things. Most 7th grade teachers are not Science majors and teach an integrated science. I am not saying we can't teach it--we will need a lot of time and training.	
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Grade 7	Chemical Reactions	<ul style="list-style-type: none"> • How can you teach the law of conservation of matter without teaching chemical equations? This age is ready for this instead of a just asking them to trust you that atoms are never lost or gained. The periodic table should be used included here to support patterns. • Instead of saying what "could" be included, make a list of REQUIRED examples so teachers can actually prepare for standardized exams. Educational standards should enumerate exactly what is expected rather than make suggestions about what "could" be covered. Having a list of standards that merely says "could include" creates a hopeless, assessment lottery mentality for students and teachers. Be specific and list exactly what is expected. • 7-PS1-2 This standard seems to indicate teachers need an understanding of chemistry at levels higher than you normally found in middle level teachers who often do not have science degrees. For example, if table sugar melts at 186C, and burns at even higher temperatures, how is that interpreted and analyzed? If you react fat with sodium hydroxide, would you analyze the melting point, boiling point, solubility of both, or the just the new substance? This seems a very lofty goal for 7th graders. • There is no flow of material being taught it's as if random things are being put in our standards. • See overall comments at end • 7-PS1-6: too advanced a concept for the average 7th grader 	<p>Comments considered. The committee chose to follow the research-based recommendation that students learn science best when content is integrated.</p> <p>Curricular choices are determined by districts, schools, and/or teachers. Science PD engages teachers in the use of tools and strategies to engage students in meaningful investigations.</p> <p>The ADE will continue to provide PD, communication, and tools to support the implementation of the standards.</p> <p>These standards are developmentally appropriate and based on current cognitive developmental research as established in the <i>Framework for K-12 Science Education</i> (NRC, 2012). The NRC Framework is available as a free download and is accessible through the ADE website.</p> <p>Teachers are encouraged to communicate with district leadership to address their needs and concerns for science resources and safety.</p>
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		<ul style="list-style-type: none"> I believe that each grade level should be teaching a single branch of science. 6th-Earth; 7th Life; 8th;Physical It makes more sense to do things this way to allow the instructor to go deeper into a specific discipline instead of jumping around continuing to brush the surface. The standards as written are appropriate but my thoughts are with the schools who may not have the materials/chemicals or facilities associated with 7-PS1-2 and 7-PS1-6. 	
Grade 7	Interdependent Relationships in Ecosystems	<ul style="list-style-type: none"> Symbiotic relationships need to be included. Instead of saying what "could" be included, make a list of REQUIRED examples so teachers can actually prepare for standardized exams. Educational standards should enumerate exactly what is expected rather than make suggestions about what "could" be covered. Having a list of standards that merely says "could include" creates a hopeless, assessment lottery mentality for students and teachers. Be specific and list exactly what is expected. I believe that this standard is a little too elementary for seventh grade. This seems like a simple concept that is easy to understand; therefore, I suggest it be placed into the fifth grade curriculum. This seems as if it is more appropriate in elementary science. 	<p>Comments considered. Curricular choices are determined by districts, schools, and/or teachers. Science PD engages teachers in the use of tools and strategies to engage students in meaningful investigations.</p> <p>The ADE will continue to provide PD, communication, and tools to support the implementation of the standards.</p> <p>These standards are developmentally appropriate and based on current cognitive developmental research as established in the <i>Framework for K-12 Science Education</i> (NRC, 2012). The NRC Framework is available as a free download and is accessible through the ADE website.</p>
Grade 7	Matter and Energy in Organisms and Ecosystems	<ul style="list-style-type: none"> Once again, why would you not teach the chemical changes necessary for photosynthesis and cellular respiration? 7th graders can handle this and will better understand that atoms can be rearranged to create new substances. Why would you not include the chemical reactions? (PS3.D Energy in 	<p>Comments considered. Curricular choices are determined by districts, schools, and/or teachers. Science PD engages teachers in the use of tools and strategies to engage students in meaningful investigations.</p>

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		<p>Chemical Processes and Everyday Life)</p> <ul style="list-style-type: none"> • Did the writers of the standards above at any point consider the availability of student resource materials, on the specific content above? • These concepts seem to be better suited for younger students. • Good grief can we teach something besides ecosystems!!!! • See overall comments at the end 	<p>The ADE will continue to provide PD, communication, and tools to support the implementation of the standards.</p> <p>These standards are developmentally appropriate and based on current cognitive developmental research as established in the <i>Framework for K-12 Science Education</i> (NRC, 2012). The NRC Framework is available as a free download and is accessible through the ADE website.</p> <p>Teachers are encouraged to communicate with district leadership to address their needs and concerns for science resources and safety.</p>
Grade 7	Earth's Systems	<ul style="list-style-type: none"> • Kharst is misspelled. (ESS2-1) • The geophysical process knowledge needed for a student to successfully create the explanation required in in 7-ESS3-1 could be taught in a yearlong course. The content casually mentioned in the clarification statement is immense. It is not practical for those geophysical processes to be background knowledge or even for those concepts to just be a part of a unit of instruction. The idea of a clarification statement that just breezes through concepts taught in several semesters of college undergrad courses is ridiculous. • Arkansas specific processes are Kharst topography, bauxite, and diamonds - wording is problematic. These are examples of earth materials, not processes. 	<p>Comments considered. There are multiple spellings for the term "Kharst".</p> <p>Curricular choices are determined by districts, schools, and/or teachers. Science PD engages teachers in the use of tools and strategies to engage students in meaningful investigations.</p> <p>The ADE will continue to provide PD, communication, and tools to support the implementation of the standards.</p> <p>These standards are developmentally appropriate and based on current cognitive developmental research as established in the <i>Framework for K-12 Science Education</i> (NRC, 2012). The</p>

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		<ul style="list-style-type: none"> • I feel that these two pieces seem to be missing something. Where are the standards that go with it? What meaning does it have in the overall picture? I would suggest adding more to this component to give it substance or meaning. • Does this mean the rock cycle? • See overall comments at the end • I believe that each grade level should be teaching a single branch of science. 6th-Earth; 7th Life; 8th;Physical It makes more sense to do things this way to allow the instructor to go deeper into a specific discipline instead of jumping around continuing to brush the surface. • This has been long removed from our curriculum and will need to be reintroduced to teachers who have never taught. Teacher programs are going to have to restructure their science programs. 	<p>NRC Framework is available as a free download and is accessible through the ADE website.</p> <p>The K-8 committee revised the Arkansas-specific clarification statement by changing “geologic processes” to “geologic materials”.</p> <p>The committee chose to follow the research-based recommendation that students learn science best when content is integrated.</p> <p>ADE has aligned licensure competencies to the new standards, and these will be implemented in teacher-preparation programs beginning 2015-2016.</p>
Grade 7	History of Earth	<ul style="list-style-type: none"> • 7th graders will not be engaged. I guess this didn't fit in another grade level. I am afraid that there aren't as many high interest topics that engaged and inspired students to love science in 7th grade as before. Body systems and weather went to 6th grade, while Newton's Laws went to 8th grade. I do think that Newton's Laws to 8th grade is an appropriate move because of the math skills. • Why not actually provide the "data" mentioned in 7-ESS2-3. Otherwise at least offer a specific list of places from which to pull the "data" from. Consider this standard from an instructor's point of view. Any teacher that reads this would immediately wonder from where they get the needed data. Here in the 21st Century, it is not too much to expect an included a list of 	<p>Comments considered. Curricular choices are determined by districts, schools, and/or teachers. Science PD engages teachers in the use of tools and strategies to engage students in meaningful investigations.</p> <p>The ADE will continue to provide PD, communication, and tools to support the implementation of the standards.</p> <p>These standards are developmentally appropriate and based on current cognitive developmental research as established in the <i>Framework for K-12</i></p>

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		<p>suggested online resources for each instructional standard that was updated in real time in a living document that was</p> <ul style="list-style-type: none"> • So, will we be teaching students about volcanoes, plate movement, and continental shelf? Aren't these concepts prerequisite to these standards? This seems so disjointed and not connected to any overall concept. • See overall comments at the end • Could you add something about dinosaurs? Students love dinosaurs, and if it isn't in the framework, there won't be time to teach it. • I believe that each grade level should be teaching a single branch of science. 6th-Earth; 7th Life; 8th; Physical. It makes more sense to do things this way to allow the instructor to go deeper into a specific discipline instead of jumping around continuing to brush the surface. 	<p><i>Science Education</i> (NRC, 2012). The NRC Framework is available as a free download and is accessible through the ADE website.</p> <p>Teachers are encouraged to communicate with district leadership to address their needs and concerns for science resources and safety.</p> <p>The committee chose to follow the research-based recommendation that students learn science best when content is integrated.</p>
Grade 7	Human Impacts	<ul style="list-style-type: none"> • Will the state assessments be limited only to the suggestions? Again, please give a specific list of what the assessments will be limited to. • Is this supposed to tie into the standards with the History of the Earth? • See overall comments at the end • I believe that each grade level should be teaching a single branch of science. 6th-Earth; 7th Life; 8th;Physical It makes more sense to do things this way to allow the instructor to go deeper into a specific discipline instead of jumping around 	<p>Comments considered. Curricular choices are determined by districts, schools, and/or teacher. Science PD engages teachers in the use of tools and strategies to engage students in meaningful investigations.</p> <p>The ADE will continue to provide PD, communication, and tools to support the implementation of the standards.</p> <p>These standards are developmentally appropriate and based on current cognitive developmental research as established in the <i>Framework for K-12</i></p>

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		<p>continuing to brush the surface.</p> <ul style="list-style-type: none">• This is confusion. Why are natural hazards the only thing mentioned under "Human Impacts". It seems like global climate change and greenhouse gases should be included here. Tectonic forces operate outside the influence of humans (natural), whereas CO2 concentrations are a direct consequence of human behavior (human impacts)	<p><i>Science Education</i> (NRC, 2012). The NRC Framework is available as a free download and is accessible through the ADE website.</p> <p>The committee chose to follow the research-based recommendation that students learn science best when content is integrated.</p> <p>Research recommends that the focus should be on classroom-level formative assessment to support instruction and not on large-scale summative assessment.</p> <p>Connections to standards in other grade levels are included in the connection boxes.</p>
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Grade 7	Engineering, Technology, and Applications of Science	<ul style="list-style-type: none"> • Instructors and learners will need exemplars of these tasks. • As I study the standards you have given this grade level, I am afraid you give us little to use in terms of Engineering, Technology, and Application of science. It's difficult to design lessons based on the criteria without some substantial in the curriculum. • I would like to know what kind of design labs you are going to use. These standards don't look like there is much opportunity for design labs. • See overall comments at the end • I believe that each grade level should be teaching a single branch of science. 6th-Earth; 7th Life; 8th;Physical It makes more sense to do things this way to allow the instructor to go deeper into a specific discipline instead of jumping around continuing to brush the surface. • 7th grade teachers are not trained to teach engineering! 	<p>Comments considered. The ADE will continue to provide PD, communication, and tools to support the implementation of the Engineering, Technology, and Applications of Science (ETS) standards.</p> <p>The K-8 committee chose not to add clarification statements to the ETS standards to avoid limiting teacher and student creativity and to maintain relevance within individual communities. The ETS standards are intended to support students' understanding of disciplinary core ideas and are not meant to be taught in isolation.</p> <p>These standards are developmentally appropriate and based on current cognitive developmental research as established in the <i>Framework for K-12 Science Education</i> (NRC, 2012). The NRC Framework is available as a free download and is accessible through the ADE website.</p> <p>The committee chose to follow the research-based recommendation that students learn science best when content is integrated.</p>
Grade 8	Waves and Electromagnetic Radiation	<ul style="list-style-type: none"> • Being in a socioeconomic community.... students will need vocabulary building before understanding the concept. • 8-PS4-3 will be completely over their heads at this age group and half of them are not even sure what a fiber optic cable is or what it looks like 	<p>Comments considered. These standards are specifically written for all students.</p> <p>Curricular choices are determined by districts, schools, and/or teacher. Science PD engages teachers in the use of tools and strategies to engage students in</p>

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		<ul style="list-style-type: none"> Where is the basic content knowledge that students need before they can apply any of this? The standards are way too broad. These standards do not take into account the different levels of learner needs. 	<p>meaningful investigations.</p> <p>The ADE will continue to provide PD, communication, and tools to support the implementation of the standards.</p> <p>These standards are developmentally appropriate and based on current cognitive developmental research as established in the <i>Framework for K-12 Science Education</i> (NRC, 2012). The NRC Framework is available as a free download and is accessible through the ADE website.</p>
Grade 8	Forces and Interactions	<ul style="list-style-type: none"> 8-PS2-4 - suggest edit for clarification statement to clarify that gravitational interactions depend on distance between all objects...not just distance from the Sun. Students will need visuals..... Something that students do not have access to.... I agree with all of the above standards, but in reality for all this to occur funding for more classroom/lab supplies would need to be increased Is there going to be buy mandate for science departments to have for tools. I have taught in poor districts and rich districts. The opportunities for kids differ based on what materials can be purchased or used or borrowed. We are blessed in having a college by us who helps out. I have been in rural school districts where those opportunities for funds exist. Where is the basic content knowledge that students need before they can apply any of this? The standards are way too broad. These standards do not take into account the different 	<p>Comments considered. Curricular choices are determined by districts, schools, and/or teachers. Science PD engages teachers in the use of tools and strategies to engage students in meaningful investigations.</p> <p>The ADE will continue to provide PD, communication, and tools to support the implementation of the standards.</p> <p>These standards are developmentally appropriate and based on current cognitive developmental research as established in the <i>Framework for K-12 Science Education</i> (NRC, 2012). The NRC Framework is available as a free download and is accessible through the ADE website.</p> <p>These standards are specifically written for all students.</p>

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		levels of learner needs.	
Grade 8	Energy	<ul style="list-style-type: none"> • Need resources to build the background experiences that are lacking due to high poverty location • Students do not have access to technology when away from school. • Where is the basic content knowledge that students need before they can apply any of this? The standards are way too broad. These standards do not take into account the different levels of learner needs. 	<p>Comments considered. Curricular choices are determined by districts, schools, and/or teachers. Science PD engages teachers in the use of tools and strategies to engage students in meaningful investigations.</p> <p>The ADE will continue to provide PD, communication, and tools to support the implementation of the standards.</p> <p>These standards are developmentally appropriate and based on current cognitive developmental research as established in the <i>Framework for K-12 Science Education</i> (NRC, 2012). The NRC Framework is available as a free download and is accessible through the ADE website.</p> <p>These standards are specifically written for all students.</p>
Grade 8	Space Systems	<ul style="list-style-type: none"> • This standard says assessment does not include recalling facts but it seems to be on the lower level of Blooms • Where is the basic content knowledge that students need before they can apply any of this? The standards are way too broad. These standards do not take into account the different levels of learner needs. • Mathematical representations can be added, especially angles and orientation of the orbits. 	<p>Comments considered. The science standards are aligned to the appropriate math standards.</p> <p>Curricular choices are determined by districts, schools, and/or teachers. Science PD engages teachers in the use of tools and strategies to engage students in meaningful investigations.</p> <p>The ADE will continue to provide PD, communication, and tools to support the</p>

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			<p>implementation of the standards.</p> <p>These standards are developmentally appropriate and based on current cognitive developmental research as established in the <i>Framework for K-12 Science Education</i> (NRC, 2012). The NRC Framework is available as a free download and is accessible through the ADE website.</p> <p>These standards are specifically written for all students.</p>
Grade 8	History of Earth	<ul style="list-style-type: none"> We will need resources for background knowledge to build common background experiences that are lacking due to high poverty. Where is the basic content knowledge that students need before they can apply any of this? The standards are way too broad. These standards do not take into account the different levels of learner needs. 	<p>Comment considered. Curricular choices are determined by districts, schools, and/or teacher. Science PD engages teachers in the use of tools and strategies to engage students in meaningful investigations.</p> <p>The ADE will continue to provide PD, communication, and tools to support the implementation of the standards.</p> <p>These standards are developmentally appropriate and based on current cognitive developmental research as established in the <i>Framework for K-12 Science Education</i> (NRC, 2012). The NRC Framework is available as a free download and is accessible through the ADE website.</p>
Grade 8	Growth, Development, and	<ul style="list-style-type: none"> We will need resources for background knowledge to build common background experiences that are lacking due to high 	<p>Comment considered. Curricular choices are determined by districts, schools, and/or teachers. Science PD engages</p>

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	Reproduction of Organisms	<p>poverty.</p> <ul style="list-style-type: none"> On 8-LS3-1 may want to include notes on include outcomes in regards to the mutations: disorders, benefits, etc. Where is the basic content knowledge that students need before they can apply any of this? The standards are way too broad. These standards do not take into account the different levels of learner needs. Clarification of mutations that can be inherited and those that cannot be inherited 	<p>teachers in the use of tools and strategies to engage students in meaningful investigations.</p> <p>The ADE will continue to provide PD, communication, and tools to support the implementation of the standards.</p> <p>These standards are developmentally appropriate and based on current cognitive developmental research as established in the <i>Framework for K-12 Science Education</i> (NRC, 2012). The NRC Framework is available as a free download and is accessible through the ADE website.</p> <p>These standards are specifically written for all students.</p>
Grade 8	Natural Selection and Adaptations	<ul style="list-style-type: none"> 8-LS4-3 The Biogenetic Law or "ontogeny recapitulates phylogeny" no longer applies to evolution. This has been abandoned by informed institutions but is still found in textbooks. For an article from UC Berkeley explaining this, please go to http://evolution.berkeley.edu/evolibrary/article/history_15. We should not be perpetrating a myth in our public schools, which is the fraud Ernst Haeckel is known for. He did not draw his infamous embryos correctly. Students will need strong math background How do you handle school districts that don't allow or desire evolution to be taught in schools? I have been in that situation. Which means these standards will be missed out in lessons. 	<p>Comment considered. Curricular choices are determined by districts, schools, and/or teachers. Science PD engages teachers in the use of tools and strategies to engage students in meaningful investigations.</p> <p>ADE Standards for Accreditation 9.01.2 states "each accredited school shall use these curriculum frameworks to plan instruction leading to student's demonstration of student proficiency in Arkansas content standards."</p> <p>The ADE will continue to provide PD, communication, and tools to support the implementation of the standards.</p>

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		<ul style="list-style-type: none"> ☐ Where is the basic content knowledge that students need before they can apply any of this? The standards are way too broad. These standards do not take into account the different levels of learner needs. 	<p>These standards are based on current scientific research.</p> <p>These standards are specifically written for all students.</p> <p>The science standards are aligned to the appropriate math standards.</p>
Grade 8	Engineering, Technology, and Applications of Science	<ul style="list-style-type: none"> As it is currently written, it can be interpreted that this is to be taught as a stand along, separate unit. I believe we would want to incorporate engineering design concepts within the units as the content lends itself. I would recommend these are included within specific content pieces. Students will need repeating experiences to generate data. Glad the engineering and application process is being added to the standards. Where is the basic content knowledge that students need before they can apply any of this? The standards are way too broad. These standards do not take into account the different levels of learner needs. 8-ETS1-1 through 1-4: I'm thinking that there might need to be some clarification statements added to these that would help teachers with the level that they should be working at here. Such as; 8-ETS1-4: Could this read Develop a working model to generate data for iterative testing and modification of a proposed object, tool, or process such that an optimal design can be achieved. (Emphasis is to be placed on the development and use of the model, in order to generate data 	<p>Comments considered. The ADE will continue to provide PD, communication, and tools to support the implementation of the Engineering, Technology, and Applications of Science (ETS) standards.</p> <p>The K-8 committee chose not to add clarification statements to the ETS standards to avoid limiting teacher and student creativity and to maintain relevance within individual communities. The ETS standards are intended to support students' understanding of disciplinary core ideas and are not meant to be taught in isolation.</p> <p>These standards are developmentally appropriate and based on current cognitive developmental research as established in the <i>Framework for K-12 Science Education</i> (NRC, 2012). The NRC Framework is available as a free download and is accessible through the ADE website.</p> <p>These standards are specifically written for all students.</p>

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		and changes made to improve the working of the model.)	
Overall Comments, Questions, and Concerns			Comments considered. These general comments, questions, and concerns were considered by the K-8 sub-committee and ADE and are determined to have been addressed in the responses above.
		This is by the far the best set of standards I have seen. As a 7th/8th grade science educator, department chair, and college professor, I am so excited to see standards that are appropriate, and provide real science knowledge to our students. Intensive Professional Development will be needed for teachers to understand the new standards.	
		I would like to comment that I am pleased that the ADE has incorporated the new NGSS standards within our state curriculum.	
		<p>Yes, I have lots of questions and concerns. I want to be included in these discussions over these frameworks. Anything that is open to the public, please email me at bmccormickbms@yahoo.com. I spoke to a rep from the ADE and was told that portfolios may have to be used in assessment. WHY? Students will still have to take EOC and ACT exams for college. WE ARE NOT PREPARING OUR STUDENTS TO BE MORE SUCCESSFUL.</p> <p>NGSS is a joke. Look at the current successful states in science and you will see that each of those uses 6th grade Earth, 7th grade Life and 8th grade physical. STUDENTS must reach a developmentally appropriate age to learn certain material. Furthermore, the standards from which NGSS supposedly came from (page 23 from "A Framework for K-12 Science Education" all use the same structure as I mentioned before. In order for the state to assess and for students to be successful--standards must be written that can be tested. Higher education expects us to teach students basic skills and vocabulary. Please get politics out of my classroom and put teaching back in before we have a generation of students who KNOW NOTHING about science.</p>	
		It would be very helpful if teachers are provided with a list of resources (suggestions) or activities that could be used with each standard. This would make planning much more efficient.	
	These standards are very difficult to comprehend, and I have a Master's degree. Students, at this level, need to be able to understand		

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	<p>what the standards are & make sense of them when they read them. I understand the need to prepare them for life outside of school, but it doesn't make sense to try to prepare them for college in fourth grade. They are leaving my class on their way to fifth grade not college. The educational decisions that have been made, as of late, are having a negative effect on education and student morale. They're causing teacher burnout and creating more pressure on students and teachers. We have to do more for them than create more difficult tasks to perform for the sake of keeping up with the rest of the country. We need them to be able to survive here. The rest will take care of itself.</p>	
	<p>It appears that little effort has been made to include Arkansas specific content into these standards. In many of the engineering and human impacts performance expectations we have a wonderful opportunity to illustrate the benefits to our society of environmental alterations rather than to castigate all human effects upon the environment as bad, ill-conceived, questionable. We need to emphasize these examples rather than examine some foreign or remote problem somewhere else in the world. Let's tie our standards to Arkansas Specific issues where possible. How they affect us matters most.</p>	
	<p>The PE's in 8th grade under the topic Natural Selection and Adaptations raised concerns in our group because they seem to lead students to particular inferences or conclusions regarding evolutionary concepts rather than engaging them with the evidence and then allowing them to make a variety of inferences based on the evidence like real scientists do in the field.</p>	
	<p>The new Arkansas Science Standards are great for our students and teachers. I am concerned with funding for some of our schools.</p>	
	<p>I love that some standards have Arkansas clarification.</p>	
	<p>Getting teachers on board</p>	
	<p>I did not review any secondary standards, but if they have any that deal with evolution I do not agree with those. To take something and call it a standard means that we support it as truth and important learning. Evolution is subjective. It cannot be called fact because there is no true hard evidence. Also, it is a topic that is controversial according to personal beliefs. If it is included this leaves avenues for</p>	

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	<p>teachers with personal agendas and beliefs to discriminate and persecute students who have different beliefs, and don't tell me that no teacher would take their class platform to do that. If there are teachers out there who lose their license because they have inappropriate contact with students (and we all know there are) then we can put nothing past teachers as individuals.</p>	
	<p>It is my opinion that the narrower focus of the standards will result in much deeper understanding of those standards. I appreciate that students will have a lot more time to model, engineer, and discover these concepts.</p>	
	<p>I like that the clarification statements are included with each standard. Will those be included in the final draft?</p>	
	<p>The overall layout of the standards is difficult to follow. Please make them user friendly.</p>	
	<p>The format on the website is hard to use and understand!!</p>	
	<p>When reviewing the standards for Kindergarten specifically I feel that there have been a lot of good standards that have been cut. I think that the standards that are given are important and that Kindergarten students need to learn about them, but I also feel that space and life cycles are equally as important.</p>	
	<p>I have taught math and science for 12 years. I have never felt so overwhelmed (including PARCC, Common Core, and TESS) than I have with using these standards. The new Social Studies standards are written in such a friendly manner. These standards are EXTREMELY overwhelming and unfriendly. Why are these not written in a format similar to Common Core or the new S.S. standards? Why give teachers new standards in all the content areas and write them ALL in a different format? Common Core and the Social Studies standards are much easier to digest as a teacher. I would also like to add that I feel these standards are so specific that they are taking the learning and fun out of science for a child. Children are natural explorers. When we limit their learning to "waves" in physical science, we have taken away a world of exploration in so many other areas of physical science. Thank you for your time and consideration of my opinions.</p>	
	<p>On the front matter, the boxes in the table showing what topics are at</p>	

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	<p>each grade are different sizes. Does a bigger box mean that more time should be spent in that topic? If not, please make the size similar so that no one will misinterpret. Or, add a disclaimer.</p>	
	<p>These standards are wonderful and will help our students become competitive and knowledgeable in the 21st century. Finally, I will have time to have students design experiments, do engineering design projects and do research!!!!!! I hope everyone realizes how much work and research about learning has gone into preparing these standards.</p>	
	<p>The new science standards are exciting to teachers in K-2, as we see ourselves teaching the same concepts over and over rather than deeper. Every K-2 teacher I have talked to is glad to be getting new standards.</p>	
	<p>I am excited about teaching deeper within my grade level. Having a chance to make sure students have a true understanding of the science concepts is a move into the right direction. Thanks for your hard work.</p>	
	<p>In talking with other 7th grade science teachers in my district, we feel that many of the content areas students seem to enjoy the most have been put into other grades. These include human body systems (6th grade), weather (also 6th grade), and Newton's laws (which apparently has been cut down to 3rd law).</p>	
	<p>I strongly support the use of NGSS written as is in the state of Arkansas. I find them to be appropriate for all grades.</p>	
	<p>In general, I feel the standards are appropriate, but I REALLY hope you will drop the embryology from evolution in 8th grade, as it is incorrect.</p>	
	<p>I am concerned that these standards are very detailed and in depth planning will go into the carrying out of these standards. With the press for the math and literacy standards being so heavy on teachers it is going to be challenging to fit these detailed standards into the science instruction.</p>	
	<p>I would love for you to look at the seventh grade standards again and give me example of how I should teach design lessons for the curriculum you have given in this grade. Thank you for your time.</p>	
	<p>I am concerned about testing for these standards. Will science</p>	

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	<p>continue to be tested only at 3 grade levels and if so, what goal is achieved by limiting science testing to 5th, 7th, and EOC Biology? It has been my experience that when the content is not tested then teachers neglect addressing them. This makes teaching more stressful for those particular teachers. Since this version of our standards is so well aligned I believe that other grade levels should be included in testing for science standards.</p>	
	<p>Science needs to be fun and exciting! Students need to explore the wonders of the world and be engaged at an early age.</p>	
	<p>My only concern is that if these standards are tied to Common Core and then Common Core is phased out, where does that leave us in Science?</p>	
	<p>How can science teachers play a part in the writing of these standards?</p>	
	<p>As an educator of the science field I would like to have some workshops and throughout the year training so I can make sure I teach these new frameworks correctly. Also, it would be great if they came with examples, suggestions in what to use or how to teach it, vocabulary to use, Higher blooms questions maybe to ask, etc...</p>	
	<p>I know some grade levels have issues with some of the new science standards. I do think we need to update the standards since it has been delayed for some time now. I think we should include a way to make amendments as needed. I know as an educator that sometimes we can't see the problem clearly until we see it in a real life classroom. Thank you for your time.</p>	
	<p>I can't believe that you would completely change the curriculum shifting so much of the 7th grade standards to 6th grade. Where is the alignment in the grade levels? It seems like the 7th grade standards are just random subjects stuck together. YUCK for the teachers and for the students!!!!!!!!!!</p>	
	<p>I think the new layout makes a lot of sense and gets rid of some of the repetitive issues that the old frameworks had. I teach 7th grade science and am excited about the prospect of working with these objectives. My only concern is testing. Just as there was a lag for math and English (switching over to Common Core one year but still testing on the old frameworks that year), I worry that will occur in</p>	

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	<p>science. For instance, Newton's Laws will no longer be in 7th grade, but have been a major component of the 7th grade Benchmark in science (based on released items I have seen). I hope the testing issue is addressed the same time these are implemented.</p>	
	<p>I am a 7th grade teacher in Rogers. I am concerned about the overall lack of "meat" in the proposed 7th grade content. Everything that we have taught for the past 6 years or so has been mostly moved to the 6th grade. I think most ecosystem material is a much lower level content and should be taught at lower grade levels. I feel that it will be very difficult to make a whole year of curriculum with any flow at all with what is now proposed! Cells, Human Body Systems, and Weather have all been moved out!</p>	
	<p>I think the standards would be great if it was worded in student friendly language as well...also there are parts that I feel will still leave behind those who are struggling learners because they lack the social interactions as well as resources</p>	
	<p>If students in poverty areas are to be successful...which includes students that have parents that are in jail: not coming to school because they have to babysit their sibling: up all night because of parents partying... and the list goes on.... then the standards need to take into consideration the background these students come from....they do not have resources to achieve success.</p>	
	<p>Add a standard that will teach students what energy IS. All this talk about energy is very pervasive throughout the standards (thermal energy, energy transfer/flow, earth's energy resources)... it has to be a concrete concept for them before they can begin working with it.</p>	
	<p>I think these are a well-researched set of standards that will create a deep understanding for children in science. I especially approve of the engineering standards. I like how the NGSS document explains everything so well.</p>	
	<p>I think the added explanations really help the parent and community members at large to understand what each standard means in relation to what they should be expecting the child to demonstrate/understand. I know not every parent will have in-depth conversation with their child to reinforce school learning.</p>	
	<p>Some of these standards are suitable for kindergarten students;</p>	

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	<p>however, several are completely unrealistic and developmentally inappropriate. The individuals in charge of adapting these standards need to consider the needs of young learners and create standards to best meet their needs. If our goal in Arkansas is to encourage more students to pursue STEM careers, we need to create science standards for kindergarten that promote inquiry and do not discourage students by being unrealistic and overwhelming. Young learners are naturally curious and have an avid interest in nature and creating things. Please take this into consideration when adapting these standards (and they DO need to be adapted).</p>	
	<p>I believe that each grade level should be teaching a single branch of science. 6th-Earth; 7th Life; 8th;Physical It makes more sense to do things this way to allow the instructor to go deeper into a specific discipline instead of jumping around continuing to brush the surface.</p>	
	<p>I am concerned about how little content is included in these standards compared to current ADE standards for 5th grade science. If I teach using these standards and my students are assessed using current Arkansas State augmented Benchmark assessments while new assessments are developed for these standards, my students will be poorly prepared for state testing.</p>	
	<p>The standards seem to be relevant to a 2nd grade classroom. The issue we have with this is the layout. It is too difficult and confusing to read. We appreciate the connections and clarifications; it is just not easy to understand in the current layout.</p>	
	<p>I am the elementary science specialist and Instructional Facilitator at London Elementary in Russellville, Arkansas. I am writing to express my concerns regarding two house bills aimed at ending the endorsement of the Next Generation Science Standards (NGSS) as a basis for creating new science standards for our state. HB 1967, sponsored by Representative Bentley and HB 1998, sponsored by Representative C. Douglas claim the NGSS are “flawed” and “inferior.” HB 1967 relies upon the research of the Fordham Institute as the basis for the claim that the standards are inferior. This is one isolated study. The vast majority of educational research supports the move to shifting toward the NGSS. Arkansas has been well overdue for an update to the science standards. The existing Arkansas Science</p>	

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	<p>Curriculum Frameworks have been in place since 2005. Revisions of these standards, originally scheduled for 2011, were put on hold in anticipation of the NGSS. Please know that a great deal of time, effort, and expense has been devoted to develop the NGSS in a responsible, deliberate manner, and teacher feedback was sought and provided during the multi-year development process. One of the major shortcomings I see in the current Arkansas Science Curriculum Frameworks is the complete lack of focus around all the major components of Science, Technology, Engineering, and Math (STEM,) particularly the fact that no engineering standards exist for elementary grades and such content is sparse in secondary grades. NGSS would change that reality by requiring more STEM related science content, namely principles of engineering and the use of technology within an inquiry-based environment, be taught at all grade levels, which will better prepare students for college and career pathways in the fields of science and computer science, one of Governor Hutchinson's primary education goals. The three pillars upon which the NGSS were built (the scientific practices, cross-cutting concepts, and the core disciplinary ideas) allow for a greater emphasis to be placed on inquiry-based learning opportunities in which students are expected to ask questions, research solutions, develop and use models, and make evidence-based arguments consistent with the scientific process. It is this sort of critical thinking that separates the NGSS from our current Arkansas Science Curriculum Frameworks. If HB 1967 and HB 1998 are enacted, student learning for my students will be limited by the narrow constraints of the existing outdated 2005 elementary science standards.</p>	
	<p>It seems to me that the state has really thought out the different strands based on grade level. Though I see some very big differences in NGSS standards and the current standards in use in 7th grade. How will this impact the students at the transition to the next grades?</p>	
	<p>The format of these standards is confusing. I also do not like that we are not teaching as many standards...electricity, magnetism...so many interesting topics have been deleted from the new standards. Furthermore, there are not as many standards to teach. It will not take any time at all to teach these standards...they can all be done in a</p>	

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	<p>quarter. What is the reasoning behind this change? For a state that wants to build STEM knowledge, deleting science standards doesn't seem like a good choice. How are we supposed to stretch these standards out over the course of a year and not have the students get bored??? I do not like them at all.</p>	
	<p>I really liked the way you all related these standards to the CCSS. The clarification statements were very helpful as well.</p>	
	<p>These standards, although, are very good and will lead to higher thinking are not realistic for the kids we are teaching today. Come to any 7th grade classroom and see what we see every day. Training needs to take place in teacher programs to implement these standards. Time, money and training are essential. We are told almost daily there is no money. We have to beg for things like test tubes and have no microscopes for our kids. And, we are not even one of the poorest districts! Our teachers have not received a raise in over 10 years and it doesn't look good for the near future. As good as these ideas are for standards, things have to be prioritized and put in to place.</p>	
	<p>The performance assessments, along with the clarification statements, are much more detailed which will be beneficial for teachers and students. The addition of the Science and Engineering Practices, Disciplinary Core Ideas, and Crosscutting Concepts are a huge improvement for the state of Arkansas's educational goals.</p>	
	<p>I am concerned that there is no mention of sex education in these new standards. While I understand that this should be taught in health class, it is not covered as often as it should be. In addition, students do not take a formal health class until upper middle school. This is often too late to separate myth from fact. We are seeing more and more girls under the age of 16 who are becoming pregnant.</p>	
	<p>I have noticed with the current standards taught that material being taught in 5-6th grade is not being retained for use in 8th grade as background knowledge. It appears as if this would be less of an issue with the new standards and I look forward to working with the potential new standards.</p>	
	<p>Just keep it simple and adopt the National Standards rather than coming up with a bunch of Arkansas unique stuff.</p>	

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	<p>Our concern is that elementary and middle school teachers will have trouble with the content. So many of these teachers are moved around in their teaching assignments. This does not afford them the opportunity to work on their science knowledge. Also, a science endorsement does not mean a person has the knowledge and skills to teach to the depth of knowledge of NGSS.</p> <p>These standards are Utopian at best. Not only will it cost a great deal of money to provide supplemental training for all science teachers in the state of Arkansas, it will cost huge sums of money to re-outfit and make school labs engineering ready. New equipment and supplies don't come cheap. For smaller schools this could spell fiscal distress. These standards are no better than the standards being used now. These standards have not been through third party verification. There is no research to support that these standards will work even if fully funded.</p> <p>Yet again we have a group of non-educators and book writers (Those that used to teach and got out) with a monetary agenda trying to sell the state on a product. In this case a bad product. What looks good on paper is NOT always good for the classroom. This set of standards will be a logistical nightmare. How are you going to test this? The story I got was that we will adopt these now and figure out how they will be tested later. That in and of itself should be a huge red flag to anyone. How can you adopt standards and not have a clear assessment for those standards? That would be ludicrous. I understand time and money has been spent. I also understand that if this set of standards continues through channels it is going to cost copious amounts of money to set it up and it will still collapse. You will not be able to achieve district buy in. This will be one more top down edict in a long line of failed top down legislation. If standards need to be re-written then why not have teachers on a district level get together and re-write them. I guarantee you will get a better, more efficient, less costly, product than this garbage that's about to cross your desk.</p> <p>I highly suggest adding the body systems and reproduction back to seventh grade. Sixth grade teachers have not had the course work needed to teach these subjects and therefore it will not be taught</p>	
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	<p>properly and will be retaught in seventh. Also, my seventh graders can barely handle reproduction. It does not need to go down in the standards</p>	
	<p>I see 8th grade standards are mainly gear to Physical Science. I agree with those schools that go directly to Physical Science. My concern is for those who go to Biology (we have some in this case), will be given enough information to be able to succeed. We are gearing to make changes in the science curriculum, yet not making schools provide funds for it. Funds are great for literacy and mathematics, but not so much for science. This needs to be addressed. Glad engineering and application of science is being added. Is there still going to be a benchmark standard test for grades and Biology classes?</p>	
	<p>I think these are the worst set of standards ever established for the science curriculum. What ever happened to learning basics before building a house?</p>	

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On Saturday, May 9, 2015, an individual from Ohio representing the organization, Citizens for Objective Public Education (COPE), submitted comments on the proposed adoption of the Arkansas K–12 Science Standards.

Similar comments were made by COPE in other states as they reviewed their own science standards. For example, COPE unsuccessfully sued the Kansas Commissioner of Education, the Kansas State Department of Education, and the Kansas State Board of Education, in a case that was subsequently dismissed.

While COPE admitted the majority of the proposed standards are appropriate as written, below are specific comments COPE submitted:

Grade Level	Science Standards by Topic	Citizens for Objective Public Education Comments	K-8 Sub-Committee and ADE Response
Grade 6	Human Impacts	<ul style="list-style-type: none"> • These emphasize negative effects of human activity. A performance expectation should be added that stresses positive effects and good stewardship of the Earth; e.g., reuse/recycling, pollution control, water purification, habitat development, protection of endangered species, pest/disease control, reforestation, fuel efficiency improvement, agricultural production improvement, and responsible waste disposal. 	Comments considered. Changes to Earth’s environments can have different impacts – negative and positive. This standard (6-ESS3-3) is intended to help students construct objective explanations and design objective solutions as they study Earth and Human Activity. Students will be able to reference multiple sources of evidence that are consistent with scientific ideas, principles, and theories as they explore various ways to monitor or minimize human impact on the environment.
Grade 6	Weather and Climate	<ul style="list-style-type: none"> • 6-ESS3-5. This relates to climate change. Temperatures have both risen and fallen during Earth's long history, and the standard should cover the past several centuries (not just 100 years). Also, important factors in climate change should be specifically listed; e.g., variations in solar radiation, volcanic eruptions, large meteorite impacts, and the burning of fossil fuels. Students should objectively study whether fossil fuel combustion is a significant factor in global warming. 	Comments considered. This standard (6-ESS3-5) prepares students to think critically, and students are expected to consider what changes in global or local temperatures mean, while thinking about scale. Students will be able to demonstrate their understanding of various contributing factors affecting long-term global temperature changes, including both human activities, and natural processes.

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Grade 8	History of Earth	<ul style="list-style-type: none"> The Clarification Statement seems to assume that biological evolution (common descent) took place. I suggest substituting "existence" for "evolution." NOTE that the standard is incorrectly labeled; it should be 8-ESS1-4. 	<p>Comments considered. For this standard (8-ESS1-4), the proposed substitution of “existence” for “evolution” is unnecessary. “Existence” refers to “the state or fact of existing; being” while the latter term merely supports deeper analyses, including but not limited to determining how rock formations and the fossils they contain help to establish relative ages of major events throughout the Earth’s history.</p>
Grade 8	Growth, Development, and Reproduction of Organisms	<ul style="list-style-type: none"> 8-LS3-1. The standard should inform students that (a) genetic mutations are almost always harmful or neutral, (b) that accumulation of mutations leads to a lack of fitness of the organism, (c) that mutational variation is a key part of the neo-Darwinian mechanism for macroevolution (common descent), and (d) that it is questionable whether this mechanism can provide the variation needed for entirely new species (new body parts and body plans). 8-LS4-5. This concerns microevolution (small change within a species; adaptation) and should be labeled as such. 	<p>Comments considered. As is true across the Arkansas K-12 Science Standards, students are encouraged to be objective, critical thinkers when using any oral or written arguments that are supported by empirical evidence and scientific reasoning. Further, because mutations can result in beneficial, harmful, or neutral effects to an organism, this standard (8-LS3-1) focuses on the fundamental concept of what mutations are and how they can manifest as observable phenomena.</p>
Grade 8	Natural Selection and Adaptations	<ul style="list-style-type: none"> 8-LS4-1, 2, 3 concern macroevolution and should be delayed until high school biology. Students in middle school lack the scientific background and intellectual maturity to objectively examine complex issues dealing with origins. 8-LS4, 5, 6 concern microevolution and should be labeled as such. NOTE that 8-LS4-5 has been inadvertently omitted. These are appropriate for middle school under the title of microevolution (adaptation; small change within a species). Students should know that the mechanisms for microevolution are different than those proposed for macroevolution. 8-LS4-1. This is deceiving since "natural laws" (materialism) 	<p>Comments considered. A goal for this standard (8-LS4-2) is for students to be able to demonstrate critical, objective consideration of evidence concerning the idea that common anatomical features can be used to infer relatedness among species.</p> <p>Further, 8-LS4-5 has not been inadvertently omitted. It is located under “Growth, Development, and Reproduction</p>

Arkansas K-12 Science Standards Public Comment Survey Results and Responses

Grades K-4 and Grades 5-8

		<p>cannot necessarily explain the origin of life's diversity. Students should objectively compare both materialistic (unguided evolution) and teleological (purposeful design) explanations of the fossil record.</p> <ul style="list-style-type: none"> • 8-LS4-2. This is deceiving since it assumes evolutionary relationships among organisms. Students should objectively compare both materialistic and teleological explanations for similarities. Homologies/similarities could be due to either common ancestry or common design. • 8-LS4-3. This assumes that evolutionary relationships exist. Students should know that different genes can give rise to similar structures, and that similar genes can give rise to dissimilar structures. This sheds doubt on embryological development as an argument for macroevolution. 	<p>of Organisms” topic instead of “Natural Selection and Adaptations” topic.</p>
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Responders

The following educators responded to the public comments, questions, and concerns:

Steve Long – Rogers School District
Catherine Mackey – Arkansas Department of Education
Kathy Prophet – Springdale School District
Virginia Rhame – Northwest Arkansas Education Cooperative
Carolyn Smith – El Dorado School District
Michele Snyder – Arkansas Department of Education
Greg Wertenberger – Henderson University STEM Center