

REQUEST FOR PROPOSALS FOR PROFESSIONAL SERVICES
Next Generation Science Assessment System for Delaware Learners Phase II:
Development and Implementation
ISSUED BY DELAWARE DEPARTMENT OF EDUCATION
RFP # DOE 2017-16

I. Overview

The State of Delaware Department of Education (DDOE) seeks high –quality proposals from qualified bidders to work with DDOE to design, develop, and implement an innovative science assessment system to measure student learning of the *Next Generation Science Standards* (NGSS). This request for proposals (“RFP”) is issued pursuant to 29 *Del. C. §§ 6981 and 6982*.

The proposed schedule of events subject to the RFP is outlined below:

Public Notice	Date: June 15, 2017
Deadline for Questions	Date: June 30, 2017
Response to Questions Posted by:	Date: July 7, 2017
Deadline for Receipt of Proposals	Date: July 20, 2017 at 2:00 PM (Local Time)
Oral Presentations (if required)	TBD
Estimated Notification of Award	Date: August 2017

Each proposal must be accompanied by a transmittal letter which briefly summarizes the proposing firm’s interest in providing the required professional services. The transmittal letter must also clearly state and justify any exceptions to the requirements of the RFP which the applicant may have taken in presenting the proposal. (Applicant exceptions must also be recorded on Attachment 3). Furthermore, the transmittal letter must attest to the fact that no activity related to this proposal contract will take place outside of the United States. The DDOE reserves the right to deny any and all exceptions taken to the RFP requirements.

MANDATORY PREBID MEETING

A mandatory pre-bid meeting has not been established for this Request for Proposal.

II. Scope of Services

Section II.1—Introduction

1.A Purpose

The purpose of this RFP is to solicit high-quality proposals from qualified bidders to work with the DDOE to develop and implement an innovative science assessment system to measure student learning of the *Next Generation Science Standards* (NGSS) statewide.

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Work detailed in this RFP is expected to directly produce assessments for operational use. DDOE has already completed a preliminary research phase, involving the development of preliminary claims and blueprints, as well as limited set of item cluster prototypes. To fulfill the requirements of this RFP, the successful bidder will use the information from this preliminary phase to develop, administer, score, report and maintain a complete science assessment system aligned to the NGSS. As outlined in later sections, Delaware’s NGSS assessment system is made up of multiple types of assessments. The successful bidder will be responsible for the End-of-Unit (EoU) assessments in grades 3 to 10, and the Integrative Transfer Task assessments in grades 5, 8 and 10 (High School Standards Based Biology). The number of assessments by assessment type is provided below. The required number of EoU assessments may change as instruction changes, and DDOE expects the vendor to be able to respond to such instructional changes by modifying the EoU development process to meet these changes.

Grade (or Subject)	Number of Assessments	
	End-of-Unit	Integrative Transfer
3	3	
4	3	
5	3	1
6	4	
7	3	
8	3	1
9 (Integrated Physical & Earth Science)	3	
10 (Standards Based Biology)	3	1
Total:	25	3

The assessment system must meet standards of best practice laid out in the *Standards for Educational and Psychological Testing* (American Educational Research Association, American Psychological Association, and the National Council on Measurement in Education, 2014). The Integrative Transfer Task assessments must also satisfy the requirements laid out in the *U. S. Department of Education Peer Review of State Assessment Systems: Non-Regulatory Guidance for States* (U. S. Department of Education, 2015). The 2017-18 administration will be completed as a census field test, and results from the 2018-19 school year will be reported for state and federal requirements.

1.B Delaware’s Context

Delaware has a long history of commitment to science teaching, learning, and assessment. Delaware first adopted the state science content standards in 1995 and has had a state science assessment since 2001. The current science assessment is administered to students in grades 5, 8, and 10.

A unique feature in Delaware’s science education is the long-standing leadership of the Science Coalition, which unifies school educators, local education associations (LEAs), partnering state

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agencies, higher education and the business community. The Science Coalition has been integral in the development of a common understanding throughout the state on learning targets, shared science curriculum, instructional supports, assessment policies and procedures, and general policy supports. The efforts benefit Delaware with an unusual coherence of the content standards, local curriculum, and state and local assessments across the state. This coherence is maintained through coordinated resources and efforts, such as professional development that involves over 2000 science teachers—over 25% of the science teachers in the state – annually. The DDOE strongly wishes to build on these strengths to develop an assessment system that reflects and fosters systemic coherence through a robust channel of feedback loops where teachers, the Coalition, and the State each contribute to a cycle of continuous improvement in the following way:

- Teachers review individual and group performance and student learning at the day-to-day classroom level throughout the year;
- The Coalition reviews curriculum and professional development decisions with collective data and evidence measured at the topical/unit level and;
- The Coalition and State further review curriculum, instruction, and professional development using integrated transfer data/evidence collected once in elementary (grade 5), once in middle (grade 8) and once in high school (Biology).

The assessment design and reporting will need to support Delaware teachers, the Science Coalition, and the DDOE in this cycle of continuous improvement in the context of student learning of the Delaware science content standards.

1.C Delaware’s Elaboration of the NGSS

Delaware adopted the NGSS as the state’s science content standards in October 2013. The NGSS and associated materials were developed in a state led process managed by Achieve, which built on the previously developed Framework for K-12 Science Education. These standards are significantly different from previous content standards in that they are “tri-partite” in nature, consisting of “Disciplinary Core Ideas,” “Science and Engineering Practices,” and “Cross-cutting Concepts.” A key choice made in the development process of the NGSS was to develop a set of Performance Expectations for each grade level/span. Each of these Performance Expectations typically involves a single content, practice, and cross-cutting concept. Another key design choice was to recommend a set of instructional topics for each grade/span that organized sets of Performance Expectations. The NGSS Performance Expectations and suggested curricular topic sequences are shown in Appendix B. These have been adopted by Delaware as part of their adoption of the NGSS.

Delaware has elaborated upon the NGSS in two important ways.

- 1) Delaware has divided the NGSS’s grade-span middle and high school standards into grade-specific sets.
- 2) Delaware has made a distinction between the NGSS as assessment targets and the broader treatment of the NGSS—particularly the Science and Engineering Practices—for instruction. In general, teachers are expected to have students learn science through the application of all of the Science and Engineering Practices even if the NGSS performance expectation states that a specific Practice is to be paired with a specific Disciplinary Core Idea (science content).

1.D Delaware's Vision of Science Assessment

This section first details Delaware's vision for a science assessment system, then provides additional details on the assessments that make up the system. This additional detail is also meant to highlight the work solicited under this RFP, that is, the specific parts of the assessment system the proposal should address (i.e., development in grades 5, 8 and high school biology on the End-of-Unit and Integrative Task Assessments).

A Comprehensive Assessment System

Delaware envisions a comprehensive science assessment system in grades 3 to 10, consisting of three distinct types of assessment. Under this system, throughout the academic year students will take teacher developed, *Embedded Classroom Assessments* to provide information on learning in real time. Primarily for instructional use, these Embedded Classroom Assessments will be numerous, short, and administered at the discretion of each teacher. Students will also take *End-of-Unit Assessments* shortly after the completion of each instructional unit. In each grade, the academic school year is divided into three to four units, each of which is aligned to a specific disciplinary content domain¹ (see Appendix B for more detail). Each End-of-Unit assessment is meant to provide information on student learning of the NGSS content in each unit for the purposes of instruction (e.g., determining if additional instruction on previously instructed topics is needed, to be used in place of a classroom assessment for grading purposes) and evaluation (e.g., informing curriculum adoption, adaptation, and modification) at classroom, school, district and state levels. Finally, students in grade 5, grade 8, and high school biology will also take an *Integrative Transfer Assessment* (whereas the Embedded Classroom Assessments and End-of-Unit Assessments are taken by students in every grade, 3 to 10). These Integrative Transfer Assessments are meant to capture students' learning of the content instructed during the entire year, in greater depth than on the End-of-Unit Assessments. That is, the Integrative Transfer Assessments are meant to capture the ways that students integrate, transfer and apply science knowledge and skills learned during the year. The integrative transfer assessments will be used to meet federal requirements under the Every Student Succeeds Act.

Details on Each Type of Assessment

This section provides more detail about each type of assessment briefly outlined in the prior section. **Bidders are only expected to address the End-of-Unit and Integrative Transfer Assessments in grades 3-10.**

More detail on each assessment type is given below.

- ***Embedded Classroom Assessments*** will consist of the wide range of assessments teachers use, including embedded instructional assessments. Embedded instructional assessments will be used by teachers and students as part of instruction and learning in real time. The results from these classroom assessments will be for use at the local level. Teachers will develop the embedded instructional assessments with consultant assistance as part of the Coalition's NGSS lead teacher program with ongoing professional development. **Bidders are not expected to propose development (or any other services related to) of classroom assessments under this contract.**

¹ Although virtually all students are taught units covering the same or similar content, the ordering of the units may differ across classrooms, schools and districts.

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- **End-of-Unit Assessments** will eventually be developed for all of grades 3-10. End of Unit assessments will consist of a variety of task types, the collection of which will provide evidence regarding students' mastery of the NGSS standards targeted in the instructional unit. End-of-Unit assessments will be given at the end of each unit of instruction. Each grade has three to four units. It is expected that each End of Unit assessment will be limited to 60 minutes in grades 3-5 and a 90-minute test taking period, likely divided into two, 45-minute testing sessions in grades 6-10. Teachers may use the results in place of traditional classroom unit assessments, e.g., as part of student grading/monitoring process. Results will also be used at the classroom, school, district, and Coalition levels to inform curriculum adoption, adaptation, and modification, as well as instructional shifts. End-of-Unit assessments will be developed by the successful bidder with vetting from local teacher teams.
- **Integrative Transfer Assessments** will consist of a variety of task types, the collection of which will provide evidence regarding students' ability to integrate, transfer, and apply the science knowledge and skills (NGSS scientific disciplinary content knowledge, science and engineering practice skills, and cross-cutting concepts) learned during the year (grade 5, 8 and 10/Biology). To assess students' ability to integrate, transfer, and apply their three-dimensional learning, an integrated, problem-based context will be required. Each Integrative assessment will be limited to a 90 minute test taking period in grade 5 and a 120 minute test taking period (which may be broken into more than one session) for grade 8 and high school biology. The results from the Integrative assessments will inform professional development and instructional practices at the school, district, and Coalition and state levels. The results of the integrative transfer assessment will be used by the state for meeting federal ESSA assessment requirements and incorporated into a school accountability system. Integrative tasks will be developed by the vendor with vetting from local teacher teams.

The tables below provide a high level summary of the End-of-Unit assessments and Integrative Transfer assessments. The information provided in the tables is illustrative and may shift, with DDOE's approval, during the assessment development process.

Assessment Component	Intended High-level Claim(s)/ Assessment Focus	Type of Reporting/Intended Score Use	Evidence to be Elicited	Proposed Task Type Descriptions
End-of-Unit Assessment	<p>Students can apply the NGSS science knowledge and skills taught within a given unit to contexts similar to those encountered in instruction.</p> <p>Specific to proficiency related to the PEs for the specific grade and the established combinations of dimensions for the targeted PEs. Phenomena defined in relation to these targeted PEs.</p> <p>Mastery of knowledge and skills relative to the established NGSS PEs.</p> <p>Proximal transfer of science knowledge and skills</p>	<p>Proficiency on the standards instructed in each unit (See Appendix QQQ for the groupings of standards by units).</p> <p>Subscores may include generalized dimensional scores such as:</p> <ul style="list-style-type: none"> • Gathering data and information practices score • Reasoning with evidence practices score • Constructing explanations practices score • Core idea/Content scoring <ul style="list-style-type: none"> • Instruction (formative) • Grading <ul style="list-style-type: none"> ○ School (evaluative) ○ Teacher (formative) <p>Interest in reporting EoU scores for grade 5 with grade 5 ITA, grade 8 EoU scores with grade 8 ITA and Biology EoU scores with Biology ITA. Scores will not be combined but provided on same report to provide through year performance and overall science proficiency in one complete parental report.</p>	<p>Application of the SEP in context of the DCI</p> <p>Understanding of the CCC with respect to the given DCI and context</p> <p>Integration of all three dimensions (i.e., text of the PE, clarification statements, and assessment boundaries)</p>	<ul style="list-style-type: none"> • Stand-alone items and Regular Item Clusters¹, which include the following item types: <ul style="list-style-type: none"> ○ Selected Response ○ Evidence-Based Selected Response ○ Constructed Response • In-depth Item Clusters¹, including: <ul style="list-style-type: none"> ○ Performance Tasks ○ Classroom Kit Assessments ○ Open Ended Constructed Response
Integrative Transfer Assessment	<p>Students can integrate, transfer, and apply the NGSS science knowledge and skills taught during the year to contexts that span those encountered in instruction to relatively novel contexts.</p> <p>Unique contexts, phenomena, and (potentially) combinations of unique dimensions for PEs (i.e., apply a “unique” SEP, that is a SEP not present in the grade-level PEs while demonstrating understanding of a DCI and a CCC present in the grade-level standards).</p> <p>Mastery of knowledge and skills relative to the K-12 Framework and NGSS progressions.</p> <p>Distal transfer of science knowledge and skills.</p>	<p>Overall science proficiency at student, school, district and state level (to meet federal requirements).</p> <p>Subscores may include generalized dimensional scores such as:</p> <ul style="list-style-type: none"> • Gathering data and information practices score • Reasoning with evidence practices score • Constructing explanations practices score • Core idea/Content scoring 	<p>PE Bundled across DCI Domains</p> <p>Application of a unique SEP in context of the PE’s DCI(s)</p> <p>Understanding of the CCC with respect to the given DCI and context (or crossover to a unique CCC)</p> <p>Integration of three dimensions in a unique context, and potentially, a unique combination of dimensions</p>	<ul style="list-style-type: none"> • Stand-alone items and Regular Item Clusters, which include the following item types: <ul style="list-style-type: none"> ○ Selected Response ○ Evidence-Based Selected Response ○ Constructed Response ○ Technology Enhanced Items • In-depth Item Clusters¹, including: <ul style="list-style-type: none"> ○ Performance Tasks ○ Open Ended Constructed Response ○ Simulation-Based Tasks • Classroom kit and assessment dry Lab

¹Defined in section 2.1.B. Briefly, an in-depth item cluster requires extended amounts of time and is akin to tasks found on performance assessments, whereas a regular item cluster is more limited.

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Assessment Component	Applicable Standards & Design Guidelines	Development & Delivery Specifications	Applicable grades	Test Build Expectations
End-of-Unit Assessment	<ul style="list-style-type: none"> Individual items or item clusters that are aligned to PEs or PE Bundles, as well as the PE specific SEPs, CCCs, and DCIs. Additional SEPs and CCCs can be incorporated into the tasks, with alignment specified, but the PE specific SEPs and CCCs must be addressed and central to the task. Subsets of the grade-level PEs, grouped by instructional units Length of any one task (as part of the overall assessment) is 15 min at grades 3-5; 22 min at grades 6-10. 	<ul style="list-style-type: none"> Delivered via paper & pencil only, computers cannot be used to deliver any test content. All scoring and data entry will be done by local educators. Data will be entered into Delaware’s content management system, Performance Plus. Security: non-secure, released to teachers on a limited, as needed basis. Each EoU assessment will have a single form, which will be held static across multiple years. 	<ul style="list-style-type: none"> Grades 3-8 and HS. 3-4 EoU Assessments per grade (21 to 28 assessments total) 	<ul style="list-style-type: none"> Maximum testing time <ul style="list-style-type: none"> Grades 3 to 5: 45 mins Grades 6 to 8 & HS: 90 mins Development & Maintenance: developed once and then released to teachers on an ongoing basis. That is, no continuous cycles of development (i.e., assessments will be produced once and then available to teachers in an ongoing basis).
Integrative Transfer Assessment	<ul style="list-style-type: none"> Individual items or item clusters that are aligned to PEs or PE Bundles, as well as the PE specific SEPs, CCCs, and DCIs. Additional SEPs and CCCs can be incorporated into the tasks, with alignment specified, but the PE specific SEPs and CCCs must be addressed and central to the task. All PEs in the grade level (i.e., grade 5, 8 , and Biology) PEs may be Bundled across DCI Domains (Earth/Physical/Life) Length of any one task (as part of the overall assessment) is XXXX 	<ul style="list-style-type: none"> Computer delivered. Anticipate that non-science teachers will be delivering/proctoring the assessment. All activities associated with tasks must be able to be completed in a computer lab setting. All items, including those requiring scoring by trained raters, will be scored by the vendor. Security: assessments are secure with annual release of XXXX item clusters and XXXX stand-alone items. Each ITA assessment will have one or more forms within each year. Forms will need to be equated across years to produce comparable scores. 	<ul style="list-style-type: none"> Grade 5, Grade 8, and HS. 1 ITA per grade (3 in total) 	<ul style="list-style-type: none"> Maximum testing time <ul style="list-style-type: none"> Grade 5: 90 mins Grade 8 & HS: 120 mins Development & Maintenance: maintained year-to-year, with continuous cycles of development and appropriate supports (e.g., year-to-year equating).

1.E Preliminary Research and Feasibility (Phase I)

DDOE has recognized the challenges of developing assessments that address the richness of the NGSS, as well as the innovation required to create a comprehensive assessment system. As such, the development of this system has been broken into two phases.

- *The first phase*—procured through a previous RFP—was to develop and evaluate tasks and task templates, identify and solve challenges, and help prepare the field. The main outcomes of the first phase included (a) tasks and task templates, with scoring rubrics and pilot task analysis and scoring rules and (b) recommendations for the design of the operational assessments, based on lessons learned during the task development process. Additionally, a set of preliminary test claims and specifications were prepared as part of phase I.
- *The second phase*—procured through this RFP—will be to use the information gathered from the first phase to develop all aspects of an operational NGSSS aligned assessment system, including the development, administration, scoring, reporting and maintenance of the system. The assessments will be administered as census field test during the 2017-2018 school year. The first operational administration will take place during the 2018-19 school year, with the results reported for state and federal requirements.

Summary of Phase I

Phase I was preceded by DDOE articulating a comprehensive assessment system, which includes classroom embedded assessments, end of unit assessments, and integrative transfer assessments. The work of Phase I was intended to inform DDOE for Phase 2, to use the information gathered from the first phase of development to fine-tune the assessment system design, clarify the scoring and aggregation rules, establish achievement levels, and develop all other aspects of an assessment system associated with administering an operational state science assessment as a census field test in 2017-2018, with results from the 2018-19 school year reported for state and federal requirements.

Phase I provided a systematic approach for developing recommendations and processes for developing and administering End-of-Unit Assessments and Integrative Transfer Assessments that work strategically with the proposed Embedded Classroom Assessments to yield results from which students, teachers, parents, and administrators can draw valid inferences about student performance. Test design recommendations addressed known system constraints, such as burden to students, teachers, and schools; limited resources and competing priorities.

Below is the listing of initial documentation provided in Appendices C, D and E with some notes for each:

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1. Delaware Task Types Organizer (Appendix C)
 - a) This document captures a range of task description information as well as assessment type information and preliminary test design expectations
2. Spring Cognitive Interview Draft Summary (Appendix D)
3. Sample tasks as administered at cognitive interviews. These tasks afford a platform for DDOE to describe how the tasks do and do NOT represent the task expectations as explicated in other documentation (e.g., sample tasks were developed to take up to 60 minutes in length and the maximum length for live tasks will be 22 minutes). (Appendix E)

Section II.2—Assessment Design

2.1 Overall Approach

2.1.A Development Process

DDOE expects the successful bidder to employ a principled approach to assessment design (e.g., Evidence-Centered Design) to structure the activities outlined in this RFP. The structure and documentation afforded by such an approach will be particularly important in managing the nonlinear and iterative nature of the development process. In addition, drawing on a principled assessment design approach will provide coherent documentation that supports a validity argument, is sensitive to the state’s particular context, and supports the future development of science items, item-clusters and assessments.

By drawing on a principled framework, DDOE expects that the successful bidder will:

- Have a well-structured, coherent and comprehensive process that encompasses all of the activities required to successfully implement Delaware’s NGSS assessment system.
- Use the Phase I work (outlined in section 1.6) to inform development.
- Follow a principled approach to create the claims, subclaims and related Achievement Level Descriptors² (ALDs) early on in the development process and used to guide all following work, including, but not limited to, the development of test blueprints, templates for stand-alone items and item-clusters, the actual items and item-clusters, psychometric models, scoring and reporting. Multiple opportunities to revise the claims, subclaims and ALDs will need to be accounted for by the successful bidder with their proposal - particularly in the proposed scope, schedule and budget.
- Develop clear documentation that supports the validity of the intended interpretations and uses of the assessments (detailed in sections 2.2.A, 2.2.B, 2.3.A and 2.3.B; also see section 5 for specifics on documentation).
- Create item and item-cluster templates that allow future development be conducted efficiently and expediently. The successful bidder must also explore ways in which templates and quality criteria can be developed for phenomenon, which are integral to Delaware’s item development approach.

The activities outlined in this RFP cover the full range of services necessary to successfully develop, administer, report and maintain two types of assessments - the EoU assessments and ITAs. These types of assessments have different purposes and designs. The most important

² ALDs will only be developed for the ITA assessments.

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differences are (1) that the ITA assessments will be used for accountability purposes whereas the EoUs will be used to inform instruction and (2) that the ITA assessments are meant to assess students' ability to integrate, transfer and apply their three dimensional learning to solve problems in novel contexts, whereas the EoUs are meant to assess students ability to solve problems in to contexts similar to those encountered in instruction. **The process by which these assessments will be developed is similar, however the items used to populate the forms for each type of assessment must be separate and different.** The only exception to this rule is that items phased out³ for use on the ITAs may be revised and used on the EoU assessments.

The complete set of ITAs (grades 5, 8 and 10 – biology) will be administered as a census field test in 2017-18 and operationally in 2018-19. The development of the complete set of EoU assessments, on the other hand, will be developed in a staggered fashion, as shown in the figure below. DDOE intends for the EoU assessments in grades 5, 8 and 10 (high school biology) to be field tested in the 2018-2017 school year and operationally administered in the 2019-20 school year. The intent is that assessments for the remaining grades - 3, 4, 6, 7, 9 – will be field tested in the 2018-2017 school year and operationally administered in the 2019-20 school year. **The EoU assessment items will be highly visible to educators, thus the items must clearly demonstrate the types of learning required by the NGSS.** This requirement, coupled with the need to quickly produce multiple EoU assessment per grade means that DDOE willing to consider modifications to the schedule proposed below.

School Year	Integrative Transfer Assessments			End-of-Unit Assessments		
	Field Test	Operational	Maintenance	Field Test	Operational	Maintenance
2017-18	5, 8, Biology	--	--	--	--	--
2018-19	--	5, 8, Biology	None	5, 8, Biology	--	--
2019-20	--	--	5, 8, Biology	3, 4, 6, 7, 9	5, 8, Biology	--
2020-21	--	--	5, 8, Biology	--	3, 4, 6, 7, 9	5, 8, Biology
2021-22	--	--	5, 8, Biology	--	--	3, 4, 5, 6, 7, 8, 9, Biology

³ ITA items phased out for poor item functioning or flags from the item review committee cannot be used on the EoU assessments.

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RESPONSE REQUIRED

- An outline, with corresponding timeline, of the proposed development process for the EoU and ITA assessments, highlighting key stages in the development process, inclusive of the development, administration, scaling and maintenance of the assessments. The entirety of Section 2, and sections 2.2 and 2.3 in particular, provides detail on the EoU assessments and ITAs. These details should be referenced within the outline. Tabular or graphical representations of the development process and timeline are encouraged.
- A summary of experience with, or other qualifications relevant to, principled approaches to assessment design. Example templates for items or tasks similar to those that might be found on an NGSS aligned assessment should be included in this summary (also required in sections 2.2.C and 2.3.C).
- A summary of previous experiences developing and implementing a large scale assessment program used for accountability.

2.1.B Item Clustering Approach and the Role of Phenomena

Both EoU assessments and ITAs will be made up of (1) “integrated” item clusters, (2) “regular” item clusters⁴ and (3) stand-alone items. The approach taken by Delaware to item clusters reflects the recommendations laid out within the *Science Assessment Item Collaborative Assessment Framework for the Next Generation Science Standards* (SAIC Assessment Framework; WestEd & CCSSO, 2015). However, Delaware has differentiated between integrated item clusters – which require extended amounts of time, allowing students to more fully demonstrate their three dimensional learning by solving problems and designing solutions – and regular item clusters – which require less time and afford more limited opportunities for student demonstration. The integrated item clusters are akin to performance tasks and involve a set of interrelated items that are integrated with the stimulus. That is, each item within an integrated item cluster asks students to demonstrate their three dimensional learning in ways that complement the demonstrations elicited by the other items within the cluster. Delaware has developed prototype integrated item clusters for both EoU assessments and ITAs under the Phase I contract (see Appendix E and sections 2.2.c and 2.3.c for more detail). The regular item clusters closely resemble item testlets commonly found in traditional large scale assessments, as well as those detailed by the SAIC Assessment Framework (<http://www.ccsso.org/Documents/SAICAssessmentFramework%20FINAL.pdf>), in that these clusters generally contain a common stimulus and multiple items that reference the stimulus.

Under Delaware’s approach, each integrated item cluster, regular item cluster or stand-alone item must be specified in terms of a particular natural *phenomenon* (i.e., an “observable events that occur in the universe that humans can use knowledge of science to explain or predict. The goal of building knowledge in science is to develop general ideas, based on evidence, that can explain and predict phenomena.”⁵). That is, each item cluster or stand-alone item is defined in relation to one phenomenon that provides context for the stimuli and question(s) students are

⁴ This cluster design builds on the work of the *Science Assessment Item Collaborative Assessment Framework for the Next Generation Science Standards* (WestEd & CCSSO, 2015). However, in contrast to the approach proposed by WestEd & CCSSO, Delaware is *not* using the evidence statements to inform the design of the item clusters. The framework is Available at http://www.ccsso.org/Resources/Publications/Science_Assessment_Item_Collaborative_Assessment_Framework.html

⁵ See *Using Phenomena in NGSS-Designed Lessons and Units* (2016). Available at <https://www.nextgenscience.org/sites/default/files/Using%20Phenomena%20in%20NGSS.pdf>

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asked. The level of detail provided about the phenomenon, and reflected in the stimulus and item(s), will be primarily defined by whether an integrated item cluster, regular item cluster or stand-alone item is used, with the first generally providing the most detail, the latter generally providing the least detail.

The EoU assessments and ITAs differ in how phenomenon are selected or developed. The EoU assessments are meant to provide direct feedback on three dimensional student learning in relation to the standards taught in a specific instructional unit. That is, each unit is aligned to a specific set of PEs and each EoU assessment is to be aligned to these PEs (and the SEPs, DCIs and CCCs that define these PEs). Therefore, the phenomena used in each EoU assessments are meant to align to one or more PEs and their related SEPs, DCIs and CCCs. A single PE may serve as the basis for an item cluster, or multiple PEs may be bundled and used as the basis for an item cluster. The ITAs are meant to provide information on how well students can integrate, transfer, and apply their three dimensional learning to novel phenomena that span those encountered during instruction over the course of the academic year. **Thus, instead of starting with a PE or bundle of PEs to define the item cluster and select the phenomenon, the design of an ITA starts with the phenomenon.** The ITA phenomenon are meant to span instructional units, allowing students to demonstrate their knowledge and skills in relation to problems that span multiple disciplinary core idea areas.

2.1.C Design Requirements for all Items and Item Clusters

Although the EoU and ITA assessments differ in multiple ways, there are a number of requirements for the design of the items and item-clusters that apply to both assessments:

- Each item must be defined in terms of a Phenomenon, PE, the DCI for that PE as well as at least one other dimension – either an SEP or CCC.
- Each PE must have its DCI, SEP and CCC covered by each least one item. Therefore, unless an item can be developed that aligns to all of the dimensions, two items – one aligning to the DCI and SEP, and another aligning to the DCI and CCC – must be developed.
- The items and item-clusters draw on additional, supplemental SEPs as needed. That is, Delaware anticipates that items and item-clusters may, and often will, incorporate SEPs *not* called for by the PE so that students may more fully demonstrate their three dimensional learning. Delaware’s perspective is that in instruction, the SEPs should be a target of instruction continually and thus inclusion of additional SEPs is warranted.
- The items within each cluster must be targeted to level(s) of complexity reflected in the Performance Expectation and related dimensions.
- The item types must be varied, with particular emphasis on selecting the best item type to assess the specific aspect of the PE in question.
- The specific phenomenon must provide context for a student to demonstrate three-dimensional learning.
- Each item and item-cluster must be tagged with relevant meta-data.

In terms of the blueprints for both types of assessments, Delaware expects that:

- Each PE be assessed by an item-cluster or standalone items.
- Each EoU blueprint to contain as many item clusters as possible, given the time constraints, with the remaining test content covered by stand-alone items. The number

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of item clusters needs to be carefully considered in terms of testing time, as Delaware's work in Phase I showed that some integrative item clusters can take upwards of 40 minutes. The Phase I work also suggests that the testing time in the later grades allows for approximately two to four integrative item clusters.

- Each item cluster or stand-alone item be defined in relation to one or more PEs (the groupings of PEs that align to clusters are referred to as bundles).
- Each item cluster or stand-alone item be defined in terms of a specific scientific or engineering phenomenon, which is clearly related to PEs in question. The phenomenon must provide students context for understanding and solving problems.
- Each item cluster be defined in terms of a cluster (or task) type, which specifies the stimuli for the cluster, the administration materials and the overall structure for the cluster. Delaware has developed several prototype item cluster types, and expects to develop several more through this RFP.
- That the items within each item cluster align to the DCIs, SEPs and CCCs of the PEs that define that cluster. In addition, additional "supporting" SEPs or CCCs may be defined for one or more PEs within the cluster, in order to allow for a more complete demonstration of student learning,
- Cognitive complexity or rigor be appropriately accounted for. Doing so may entail designating levels of complexity for item-clusters or items (both items within item-clusters as well as stand-alone items) – however adequately addressing cognitive complexity will likely require additional steps above and beyond its inclusion as a design criteria in the blueprint.
- The design supports the claims and subclaims and affords the possibility of subclaim reporting. To do so, a sufficient number of items need to fall into each of the subclaims (draft subclaims, which are currently the same across assessment types, are provided in sections 2.2.B and 2.3.B.I). In addition items should be aligned to the full range of SEPs captured in the subclaims, even if they are not present in the specific combination of dimensions defining the PES for the unit in question.
- The distribution of items and score points for each EoU should approximate the emphasis on PEs and related dimensions within the NGSS.

2.2 End-of-Unit (EoU) Assessments

2.2.A Purpose

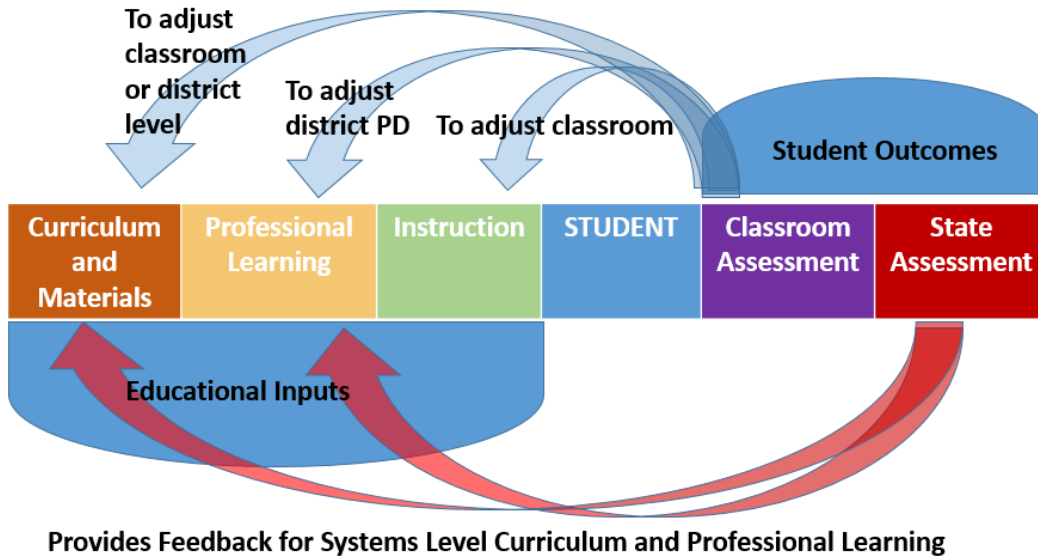
The EoU assessments are meant to:

- (a) **Provide instructional information to students and teachers.** This information is meant to signal the need for shifts in instruction for individual students or the classroom. In addition, teachers may use the results in place of traditional classroom unit assessments, e.g., as part of student grading/monitoring process.
- (b) **Provide evaluative information at the classroom, school and district levels.** The results of the EoU assessments will be aggregated to the classroom, school and district levels to inform decisions about the adoption, adaptation, modification and replacement of professional development, curriculum and supporting materials.
- (c) **Signal shifts in the standards.** The three-dimensional learning captured by the NGSS is profoundly different than prior science standards. The interpretive guide, score report, and other outward facing material must clearly convey the three-dimensional nature of

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the NGSS while also highlighting that the standards call for the integration of the dimensions.

These uses are reflected in the figure below:



RESPONSE REQUIRED

The successful bidder's response to the requirements outlined in all of the sections contained in Section II.2, part 2: *End-of-Unit Assessments* should reference these uses, as is appropriate. For example, the bidder's response to section 2.2.g, reporting, should convey what approaches will be used to provide reports that support the stated purposes of EoU assessment.

2.2.B Design

Delaware's unique common curriculum is made up of instructional units tied to investigations in specific domains of science and engineering. As such, each unit is aligned to a specific set of Performance Expectations. For example, in fifth grade, there are three units: (1) Structure & Properties of Matter (aligned to PEs 5-PS1-1, 5-PS1-2, 5-PS1-3, 5-PS1-4), (2) Ecosystems & Earth Systems (5-PS3-1, 5-LS1-12, 5-LS2-1, 5-ESS2-1, 5-ESS2-2, 5-ESS3-1) and (3) Space Systems (5-PS2-1, 5-ESS1-1, 5-ESS1-2). Each EoU assessment will align to the groups of performance expectations for the unit in question (See Appendix B for the groupings of standards by unit for grade 5, grade 8 and high school biology).

Delaware believes that successful science instruction integrates all three dimensions of the NGSS. To that end, the EoU assessments will be designed to characterize student performance in terms of the PEs for each unit, as well as the Science and Engineering Practices (SEPs), Disciplinary Core Ideas (DCIs) and Cross Cutting Concepts (CCCs) that are combined to produce each PE. **It is expected that each EoU assessment will be aligned to the PEs for that unit.**

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Delaware is involved in an ongoing effort to define the claim and subclaims that will be used to both organize the development of the EoU assessments and, potentially, to serve as reporting categories. This effort will continue throughout the assessment development process – involving iterative development by both Delaware and the successful bidder. Currently, Delaware has developed a claim and subclaim structure presented in the following table.

Claim and Subclaim structure for Grade 5 EoU Assessment, Unit Topic: Structure and Properties of Matter.			
OVERARCHING CLAIM: The student is able to draw on the concepts of cause and effect and scale, proportion, and quantity and accurately uses scientific and engineering practices to engage with science phenomena specific to the structure and properties of matter .			
Subclaim #1: (SEP Asking questions and defining problems & SEP Planning and carrying out investigations)	Subclaim #2: (SEP Analyzing and using data, SEP Using mathematics and computational thinking & SEP) Engaging in argument from evidence	Subclaim #3: (SEP Developing and using models & SEP Constructing explanations and designing solutions)	Subclaim #4: (CCC Scale, Proportion, & Quantity, CCC Cause & Effect)
Gathering Data and Investigating Scientific Questions:	Reason with Evidence and Evaluate Scientific Claims and Questions:	Construct Scientific Explanations:	Making Connections:
The student is able to obtain information, ask questions or define problems, plan and carry out investigations, use models to gather data and information and/or use mathematics and computational thinking to gather evidence relevant to a scientific question or problem relating to the structure and properties of matter.	The student is able to evaluate information, analyze data, use mathematics and computational thinking, construct explanations, develop arguments from evidence and/or use models to predict and develop evidence to make sense of scientific phenomena specific to the structure and properties of matter.	The student is able to explain or develop an argument to support or refute another explanation of scientific phenomena relevant to the structure and properties of matter by arguing from evidence and/or using models to communicate information.	Student is able to use crosscutting concepts to define the physical system being investigated, recognize changes in the system, and/or to find patterns to use as evidence to support explanations or arguments of how or why the phenomenon occurs.

Delaware is also involved in an ongoing effort to develop blueprints for the EoUs that support the claims and subclaims and also meet the purposes laid out in 2.1.A. The successful bidder will develop blueprints for each EoU assessment to support the overall claim and subclaims. The blueprint development will also be an iterative process involving input from Delaware and its stakeholders. In addition the design criteria in section 2.1.C, the design of each EoU assessment should

- Have similar numbers of items and score points for each PE bundle should be represented in the test blueprint by approximately the same number of items and score points.

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- Represent each dimensional category (i.e., the specific DCIs, SEPs and CCCs) proportion to the number of times that category appears for each PE bundle, in terms of the number of items and score points. For example, the fifth grade EoU assessment for the Structures and Properties of Matter Unit contains three PE bundles – (1) 5-PS1-1, (2) 5-PS1-2 and 5-PS1-3 and (3) 5-PS1-3. Two of the PE bundles are based on CCC 3 – Scale, Proportion and Quantity. Thus Delaware expects that the roughly two thirds of the items to be aligned to the Scale, Proportion and Quantity CCC. Similar logic applies to the DCIs and SEPs.

A draft blueprint for the fifth grade EoU assessment for the Structure and Properties of Matter unit is shown below. This draft blueprint is incomplete, as only one item cluster, cluster 2, has been assigned a cluster type, phenomena and supporting dimensional categories. In addition, designations of cognitive complexity or rigor have also been omitted. For internal use, Delaware expects the final blueprints to also contain an entry for *each item*, as demonstrated by the item-level entries for the second item cluster.

RESPONSE REQUIRED

- The bidder must describe a proposed development process, structured and facilitated by the bidder, to develop claims, subclaims and blueprints for the EoU assessments that meet the specifications provided in section 2.2.B above, as well as those laid out in section 2.1 – particularly 2.1.C. This development process must involve multiple opportunities for Delaware and its stakeholders to provide input. Blueprints will be reviewed by DDOE and a small cohort of trained district representatives. Blueprint reviews may be held via digital interface, but face to face meetings are preferred. The process for blueprint and claim development must continue until Delaware approves the claims, subclaims and blueprints. Delaware will have the authority to approve or reject claims, subclaims and blueprints. Finally, the process must be flexible to accommodate for unexpected challenges that occur during the development process. The successful bidder will provide DDOE with finalized blueprints that contain information down to the item-level, as illustrated in the example blueprint below.
- The description of the proposed blueprint development process must describe the ways in which the following characteristics will be accounted for in each blueprint:
 - PE Bundles and Item Clusters, as well as the type of task used for each Item Cluster (e.g., classroom kit, performance task).
 - Phenomenon, which need to be identified or developed to closely match phenomenon found in instruction (see Section 2.1.B).
 - Groupings of items across sections or stimuli within a cluster.
 - The level of cognitive complexity or rigor for item-clusters or items. The bidder should suggest at what level (item-cluster, item or both) cognitive complexity should be defined with the blueprint, along with a rationale for that suggestion.
 - The items within each item cluster. Each item must be defined in terms of type and its alignment to the applicable PE, DCI, SEP and DCIs within the cluster.
 - Estimated time required to complete each item-cluster or stand-alone item, as well as an estimated time to complete the entire assessment.
- The bidder may also provide an example, preliminary blueprint for an EoU assessment (e.g., the Grade 5 - Structure and Properties of Matter End-of-Unit Assessment) that addresses the requirements outlined in this section.

Grade 5 - Structure and Properties of Matter End-of-Unit Assessment (total testing time 45 minutes)

Cluster/ Item	Cluster/ Item Type	Phenomena	PE	PE/Item Description	NGSS (Primary Alignment)			Supporting (Secondary Alignment)	
					DCI	SEP	CCC	SEP	CCC
					Item Cluster 1	TBA (33% of Score Points)	TBA	5-PS1-1	Develop a model to describe that matter is made of particles too small to be seen.
Item Cluster 2	Classroom Kit Assessment (33% of Score Points)	Forensic Detective (Example)	5-PS1-2	Measure and graph quantities to provide evidence that regardless of the type of change that occurs when heating, cooling, or mixing substances, the total weight of matter is conserved.	PS1.A, PS1.B	Using Mathematics and Computational Thinking (SEP 5 - MCT)	Scale, Proportion, & Quantity (CCC 3 - SPQ)	Constructing explanations & designing solutions (SEP 6 - CE&DS); Analyzing and interpreting data (SEP 4 - DAT); Using mathematics and computational thinking (SEP 5 - MCT)	N/A
			5-PS1-3	Make observations and measurements to identify materials based on their properties.	PS1.A	Planning and Carrying Out Investigations (SEP 3 - INV)	Scale, Proportion, & Quantity (CCC 3 - SPQ)	N/A	N/A
1 (2 pt)	Table fill in & Sort Answer	Section 1	5-PS1-3	Design an Investigation...	PS1.A	INV	--	--	--
2 (1 pt)	Multiple Choice	Section 1	5-PS1-3	Identify materials given data...	PS1.A	INV	SQP	--	--
⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮
Item Cluster 3	TBA (33% of Score Points)	TBA	5-PS1-4	Conduct an investigation to determine whether the mixing of two or more substances results in new substances.	PS1.B	Planning and Carrying Out Investigations (SEP 3 - INV)	Cause & Effect (CCC 2 - C&E)	TBA	TBA

2.2.C Item and Item-Cluster Development

Delaware expects the successful bidder to develop all items for the EoU assessments, both those within item-clusters and those that stand-alone, to meet blueprints following a principled approach to assessment design, as mentioned in section 2. This expectation includes the development or refinement of types of item-clusters and item types, as expressed in item-cluster and item templates. Additional item-cluster types may also be developed. Delaware has developed several item-cluster types, which they expect to be used in the design of new EoU assessment items. The EoU items will be reviewed by DDOE staff and Delaware educators in item review committees (IRCs) hosted by the successful bidder in Dover, Delaware. IRCs will be conducted at least once a year.

All EoU item-clusters and stand-alone items must be appropriately reviewed and field tested, with the development processes clearly documented. This review includes, but is not limited to review by IRCs for content and fairness. Given the number of EoU assessment items that need to be developed, DDOE expects that items phased out of use for the ITAs be used on the EoU forms. The exception is items omitted from the ITAs due to poor item functioning or flags from the item review committees.

The EoU assessments will be distributed to teachers in a non-secure manner. DDOE expects that all items on the EoUs will be available to teachers for instructional purposes, and thus cannot be treated as secure. Therefore, the items used on the EoU assessments must not also be used on the current ITA assessments. All EoU assessments will be administered via pencil and paper, therefore only items that can be administered in that format may be included on the EoU assessments.

Each operational EoU assessment will be administered as a single paper fixed form. DDOE expects each EoU assessment to be made up of approximately two integrated or regular item clusters and a set of stand-alone items.

RESPONSE REQUIRED

The bidder must:

- Detail how they will apply a principled assessment approach design, taking into account the claims, subclaims and blueprints, to create item-cluster and item specifications, and how those specifications will guide development.
- Describe all potential sources of content for the EoU assessments. This description must include sufficient detail so that DDOE can insure that the potential sources of content are of quality and aligned to the NGSS. The description should also include a description of what involvement, if any, Delaware educators will have with the item development process, including the IRC meetings mentioned above. For each EoU, explain what proportion of content will be drawn from preexisting sources and what will need to be created.
 - For previously developed items, details on (a) the development and revision process, (b) item writers and reviewers training and qualifications, (c) the standards the items were developed to and evidence of alignment, if any, (d) pilot and field test results, including item test statistics, bias review results, and cognitive labs.

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- For items to be developed, a plan that details the requirements for, and processes around, points (a) to (d) in the previous bullet. The plan should detail how the item pool will be revised in light of the 2017-18 field test.
- For items to be developed, a plan that outlines involvement of an NGSS professional training consultant to train item writers on the appropriate use of NGSS language in developing three-dimensional assessment prompts.
- For all items:
 - Bidder's approach to innovative item types and the manner in which they would eventually support Delaware's inclusion of complex items such integrated item clusters.
 - Criteria that will be used to judge content validity and the technical quality of the items
 - Criteria that will be used to develop test items across a wide range of content and cognitive difficulty levels;
 - Criteria that will be used to judge the item quality and procedures for ensuring that the above criteria will be used consistently throughout the item development process.
 - Consider cost-efficient item development/acquisition processes which include, but are not limited to, collaboration and item sharing with other states; purchase of items from multiple sources, including the bidder; and development of new items.
- Acknowledge that the items on the EoU assessments will *not* be held securely by DDOE and that any sources of items for the EoU assessments must allow for this lack of security.
- Explain approaches to insuring that all test content is fair and free of bias, in accordance with the best practices of Universal Design.
- Provide example item or task templates that are relevant to science assessment, and if possible, templates for item-clusters or similar tasks.
- Describe form assembly and quality assurance procedures for field test and operation assessments, including whether multiple forms will be used for each field tested EoU assessment to insure that the item pool is adequate for operational form construction (detail on data transfer of the EoU item response data from DDOE to the successful vendor is provided in section 2.2.F).

2.2.D Administration

Delaware educators will administer the EoU assessments with minimal support from the successful bidder. The EoU assessment forms will be distributed by DDOE through Delaware's current content management system, Performance Plus. Local educators will print paper copies of the EoU assessments and administer them in state approved windows multiple times a year. To support this, Delaware expects the successful bidder to provide a final, print ready version of EoU assessments in Adobe PDF format, as well as in an easily editable format, such as Microsoft word document format or rich file text format. In addition, the successful bidder will work with DDOE staff to develop an administration manual for the EoU assessments.

The successful bidder will develop a test administration manual with input from DDOE. The successful bidder also will collaborate with DDOE staff to create data collection design on

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administration problems for the 2018-19 field test administration. Delaware will implement this design, collect data, and then collaborate with the successful bidder to revise the test administration manual.

RESPONSE REQUIRED

The bidder must provide details on test form construction, including quality assurance procedures. The bidder must also propose a plan to collaborate with DDOE staff to develop an administration manual/test user manual as well as a process, to be implemented by DDOE, to capture problems with the EoU administration.

2.2.E Scoring

Delaware educators will score the EoU assessments and enter the results into Performance Plus. To facilitate this scoring, the successful bidder will provide scoring keys for all EoU assessments, providing the correct response for all assessment items. For items that are not selected response, the successful bidder must provide scoring rubrics with multiple levels that clearly differentiate different levels of student performance with corresponding student work exemplars.

RESPONSE REQUIRED

The bidder must describe their plan to develop scoring materials for the EoU assessments. This plan may be supported by previously developed rubrics and related exemplars.

2.2.F Psychometric Analysis

The EoU assessments will be reported as classical test theory (CTT) total scores. The successful bidder will use CTT analysis and related methods on both field test and operational data to insure that the items, item-clusters and forms meet the best practices outlined in *the Standards for Psychological and Educational Measurement* (AERA, APA & NCME, 2014). In addition, while the scores will not be comparable from each assessment, the operational EoU assessments should have similar distributions of item difficulties (p-values) and these distributions must allow for differentiation among students.

The successful bidder will be provided multiple data files, one per EoU assessment, by DDOE in Microsoft Excel file format. Each data file will be extracted by DDOE staff at the end of each EoU administration window. The successful bidder will use this data to conduct item-, item-cluster- and test-level analysis to produce a number of statistics, including:

- Item p-values and item-total correlations (e.g., biserial correlation) for both dichotomously and polytomously scored items. For dichotomous items, the p-values and item-total correlations should be investigated for the correct response, as well as the incorrect responses – to insure that the distractors are functioning as intended.
- Differential item functioning, as defined through a non-parametric approach like the Mantel-Haenszel procedure.

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- Overall test reliability. The bidder should suggest an approach to define reliability and measurement error, for the assessments. These approaches should define what the appropriate unit is for examinations of reliability and measurement error (e.g., item, item-cluster, task), the methods used to define reliability, and the ways in which satisfactory levels of reliability and measurement error will be obtained.

To do so, the successful bidder will need to develop:

- Evaluative criteria indicating what acceptable levels are for each statistic, and what actions will be taken if those criteria are not met.
- Specifications for the appropriate sample(s) of students to be used in the psychometric analysis. Because of variation in instruction, each EoU assessment will be administered in each assessment window, albeit to different sets of students. The specifications should detail whether all students will be included in the sample or only students within a specific administration window will be included. A rationale should also be provided. Similarly, the specifications should also detail whether restrictions will be used to select a subset of students within each administration window.

The results of the psychometric analyses from the each field test administration must be used to revise the EoU items as needed, in order to insure that the EoU assessments used in the operational administrations are of the best possible quality. Therefore the 2018-19 field test administrations of the EoU assessments in grades 5, 8 and high school biology must be used to inform the development of the operational assessments administered in 2019-20. Similarly, the 2019-20 field test administrations of the EoU assessments in grade 3, 4, 6, 7 and 9 must be used to inform the development of the operational assessments administered in 2020-21. *Assuming the characteristics of the operational EoU assessments are satisfactory after the first operational administration DDOE does not expect the vendor to conduct psychometric analyses on any subsequent administration.*

In addition, the successful bidder must define and implement one or more approaches to detect possible floor or ceiling effects. Given the complexity of the standards, DDOE is concerned about the difficulty of the assessments, and in particular that the assessment will be too difficult for some students (i.e., exhibit floor effects).

RESPONSE REQUIRED

The bidder must provide a detailed plan for psychometric analyses, which accounts for the requirements listed above. The successful bidder will be responsible for all steps necessary to complete the analyses and the plan should reflect this. These steps include working with DDOE to obtain student item response data from the Performance Plus platform, cleaning the resulting data, running analyses, summarizing the results in written and tabular form, and using the results to guide the revision of the item pool and fixed forms, as needed.

2.2.G Reporting

The overall scores for the EoU assessments will be provided automatically through the Performance Plus platform to Delaware educators, who have the sole responsibility for their distribution to students, parents, and other stakeholders. The successful bidder's responsibility

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is to develop, with input from Delaware, interpretive materials for the EoU assessments. These materials must explain, in clear, user friendly language, the purpose of the EoU system of assessments, the supported score interpretations for each assessment, and appropriate and inappropriate uses of the scores

RESPONSE REQUIRED

The bidder must specify the types of interpretative resources that will be created or otherwise provided to support the interpretation and use of the EoU assessment results. These interpretive resources must be tailored to the purposes provided in section 2.2.A. The bidder may provide examples of materials, if relevant.

2.3 Integrative Transfer Assessment (ITA)

2.3.A Purpose

The primary purpose of the ITAs is to meet the requirements of the Every Student Succeeds Act (ESSA) of 2015. That is, the overall scores from the ITAs will be used in Delaware's ESSA compliant accountability system to meaningfully differentiate among schools. Therefore, ITAs must also meet the requirements of Federal Peer Review, provided in the *U. S. Department of Education Peer Review of State Assessment Systems: Non-Regulatory Guidance for States* (2015), as well as those provided in the *Standards for Educational and Psychological Testing* (AERA, APA, & NCME, 2014).

In addition, the ITA results may also be used, in conjunction with the EoU assessment results or independently, to fulfill some of the same purposes described from the EoU assessments, specifically to:

- **Provide evaluative information at the classroom, school and district levels.** The results of the EoU assessments will be aggregated to the classroom, school and district levels to inform decisions about the adoption, adaptation, modification and replacement of professional development, curriculum and supporting materials.
- **Signal shifts in the standards.** The three dimensional learning captured by the NGSS is profoundly different than prior science standards. The interpretive guide, score report, and other outward facing material must clearly convey the three dimensional nature of the NGSS while also highlighting that the standards call for the integration of the dimensions.

RESPONSE REQUIRED

As with the responses in section 2.2, the responses in section 2.3 should reference these purposes, as needed.

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2.3.B Design

The ITAs are meant to provide students the opportunity to demonstrate their ability to integrate, transfer, and apply their three-dimensional learning to solve problems in novel contexts. Doing so will require that students have an integrated, problem-based context that spans those found in instruction. To do so, the development of each item cluster or stand-alone item must start with the selection of a phenomenon that will support these types of student demonstrations. The presentation of the phenomenon will vary in depth, depending on whether that phenomenon is tied to an integrative item cluster, regular item cluster or stand-alone item, with the former providing the most depth and the latter providing the least depth.

DDOE expects that the ITAs will employ as many integrative item clusters as is feasible, given the time constraints (90 minutes for grade 5, and 120 minutes for grade 8 and high school biology). The results of Phase I indicate that approximately 2-4 integrative item clusters are feasible, with the remainder of the ITA made up of regular item clusters and stand-alone items (see Appendix C).

2.3.B.I Claims & Blueprints. As with the EoU assessments, DDOE is involved in an ongoing effort to define the claim and subclaims for the ITA assessments. Again, this effort will continue throughout the assessment development process – involving iterative development by both Delaware and the successful bidder. An example of the current claim and subclaim structure, for grade 5, is presented below.

<p>OVERARCHING CLAIM: Students can use crosscutting concepts to define a system and identify cause and effect relationships and patterns that provide an opportunity for using scientific practices such as analyzing data, gathering information, communicating information, developing models or constructing explanations/arguments and applying foundational disciplinary core ideas to make sense of phenomenon relating to the structure and properties of matter, earth and ecosystems and/or space systems.</p> <p>“Policy version: Students can make sense of a novel phenomenon by accurately engaging the three dimensions of scientific inquiry: disciplinary core ideas, practices and crosscutting concepts.”</p>			
<p>Subclaim #1: Gathering Data and Investigating Scientific Questions:</p>	<p>Subclaim #2: Reason with Evidence and Evaluate Scientific Claims and Questions:</p>	<p>Subclaim #3: Construct Scientific Explanations:</p>	<p>Subclaim #4: Making Connections:</p>
<p>The student is able to obtain information, ask questions or define problems, plan and carry out investigations, use models to gather data and information and/or use mathematics and computational thinking to gather evidence relevant to a scientific phenomenon.</p>	<p>The student is able to evaluate information, analyze data, use mathematics and computational thinking, construct explanations, develop arguments from evidence and/or use models to predict and develop evidence to make sense of scientific phenomenon.</p>	<p>The student is able to explain or develop an argument to support or refute another explanation of scientific phenomena by arguing from evidence and/or using models to communicate information.</p>	<p>Student is able to use crosscutting concepts to define the phenomena being investigated, recognize changes in the system, and/or to find patterns to use as evidence to support explanations or arguments of how or why the phenomenon occurs.</p>

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Currently, the claim and subclaim structures for the EoUs and ITAs are virtually identical; however, DDOE is open to other approaches and expects the successful bidder to engage in an iterative development process, throughout the assessment development cycle, to determine the final set of claims and subclaims that will best support the intended uses of the ITA results (as outlined in section 2.3.A).

Unlike the EoU assessments for a specific grade, the ITAs are meant to cover at least 80% of the standards defined for each grade level (5, 8 and Biology), including the grade-specific PEs and the Engineering and Design PEs. Given that a minimum of 80% of the PE's must be represented on the test blueprint (as per 2.1.C), DDOE expects that item-clusters will contain more PEs than on the EoU assessments. As noted in 2.1.B, the bundling of PEs should be based on phenomenon that allow for students to demonstrate their ability to integrate, transfer, and apply their three dimensional learning. However, to the extent possible, the bundling of the PEs on the ITA should also take into account the PE bundles on the EoU assessments in that grade.

RESPONSE REQUIRED

The bidder must provide a process proposed for the development of the blueprints for the three ITA assessments. The provided process for the development of the ITA blueprints can be presented as a modification of the process proposed for the EoU blueprints in 2.2.B. Regardless, the development process for the ITA blueprints must meet the specifications provided in 2.3.B.I, as well as those required for the EoU assessments, as outlined in the required response to section 2.2.B. However, the process for the development of the ITA blueprints must differ, in that the ITA assessments:

- Are meant to assess the degree to which students can integrate, transfer and apply their three dimensional science learning to solve problems in novel contexts. Doing so requires that (i) phenomena be carefully selected and (b) supplemental SEPs be selected to augment item-clusters and stand-alone items, so that students have the opportunity to fully demonstrate their learning.
- Should capture all of the grade-level PEs as well as the Engineering and Design PEs.
- Be at a higher level of cognitive complexity or rigor (by nature of the expected level of knowledge transfer) than the EoU assessments, but still be appropriate for the given grade-level.

The bidder must also provide one example, preliminary blueprint for an ITA (e.g., the Grade 8).

2.3.B.II Achievement Level Descriptors. Given that the ITA results will be used for accountability purposes, DDOE expects the successful bidder to develop policy, range, threshold and reporting achievement level descriptors (ALDs). DDOE expects that the policy and range ALDs be developed iteratively in conjunction with the claims and subclaims, and that these ALDs reflect the claims and subclaims. DDOE also expects that the policy ALDs will be used along with the claims and subclaims to guide the entire development process. Delaware currently uses four achievement levels for ELA and mathematics and expects that science will also have four levels (below, meets,

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above and well above). The threshold and policy ALDs are detailed in the standards setting process.

DDOE will engage Delaware educators to develop a preliminary set of policy ALDs. The successful bidder will then use this preliminary set of policy ALDs in a workshop to first refine the policy ALDs and then create range ALDs. This workshop may also be coupled with refinement of the claims and subclaims, as detailed in 2.3.B.I. DDOE will recruit a set of participants for the workshop and also arrange the initial logistics, including the time, date and location. The successful bidder will be responsible for all other aspects of the ALD workshop, with communications to participants and the workshop structure subject to approval by DDOE. The result of the workshop will be a report documenting the recommended ALDs.

RESPONSE REQUIRED

The bidder must provide a preliminary plan for a workshop that creates revised policy ALDs and range ALDs. This preliminary plan must include training to be provided to the participants as well as the actual processes used to create the revised policy ALDs and range ALDs. The bidder must also provide the name of the staff who will develop and conduct the ALD workshop. Finally, the bidder must provide an example table of contents from a prior ALD workshop or complete report from a prior workshop.

2.3.C Item, Item-Cluster and Form Development

Delaware expects the successful bidder to develop or modify all items for the ITA assessments, both those within item-clusters and those that stand alone, to meet the blueprints following a principled approach to assessment design, generally in the same fashion outlined by the requirements for the EoU assessments, given in section 2.2.C. However, there are notable distinctions between the item-cluster and item development required for the EoU and the development required for the ITA:

- DDOE expects that the requirement that the item clusters and items elicit integration, transfer and application will necessitate the development of an item pool tailor made for this purpose. Preexisting item clusters and items may be used, so long as they are modified to match DDOE requirements.
- The ITA items will be reviewed by DDOE staff and Delaware educators in item review committees (IRCs) hosted by the successful bidder in Dover, Delaware. IRCs will be conducted at least once a year. The IRCs for the ITAs may be hosted concurrently with the IRCs for the EoU assessments, provide that the successful bidder can provide sufficient staff to support multiple groups of reviewers or can extend the IRC to include separate rounds of review for each assessment.
- Unlike the EoU assessments, the ITAs will be computer administered. All ITA items must remain secure and the bidder must have appropriate safeguards in place.
- DDOE expects each ITA assessment to be made up of approximately four integrated or regular item clusters and a set of stand-alone items.

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The bidder must describe, in detail, their processes and procedures for creating a sufficient pool of item and item-clusters, as well as their processes and procedures for creating appropriate test forms. This description may be provided as a modification or addendum of 2.1.C. Special attention should be given to the ways in which the bidder will ensure that the item-clusters and items elicit the integration, transfer and application of students' three dimensional learning.

2.3.D Administration

Delaware educators will administer the ITA assessments using an online fixed form for grades 5, 8 and high school biology. Paper and pencil forms will be provided only for students with specific accommodations (see section 3.4.J). A robust administration platform with failover contingencies is expected.

Administration times for grade 5 should be limited to 90 minutes with grades 8 and high school biology limited to 120 minutes (potentially separated into two sections). Teachers will administer the ITA assessments to approximately 10,000 students per grade level.

To ensure proper test security and item longevity, three to four forms will be necessary for grades 5, 8 and 10. Item development will be the responsibility of the Vendor with content advisory oversight and review being the responsibility of Delaware educators.

2.3.E Scoring

All items, including those requiring scoring by trained raters, will be scored by the vendor.

Some items included on the NGSS ITA assessments will require human scoring or complex artificial intelligence (AI) scoring. The successful bidder will provide a complete description of human scoring training, monitoring and quality control processes AND/OR propose a description of quality AI programming, previous successes, quality and cost comparisons with human scoring as an alternative.

The successful bidder shall use rubrics and scoring criteria developed for items and item clusters when hand-scoring responses to open-ended questions. The bidder shall propose procedures for hand-scoring open-ended items, including but not limited to procedures that utilize a single scorer and a systematic process of checks to ensure accuracy. The development of rubrics for constructed response items to be hand-scored will be the responsibility of the Vendor or designated item developer. In either case, all rubrics must be submitted to DDOE for approval.

The bidder shall propose a method to ensure that responses to hand-scorable items are separated from identifying information and that the full set of assessment responses at a particular grade level is randomized prior to hand scoring. This procedure must ensure that the student responses and the scores can be matched back to the student's identifying information.

Benchmarking refers to the process of using experienced scorers to select papers that will serve as anchors for the score points of a rubric, as well as the selection of papers to be used

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in training readers, monitoring the scoring process, and in recalibrating readers. All open-ended items which require students to write a response will be benchmarked. The successful bidder shall be responsible for all benchmarking processes, and Delaware educators must be involved. The bidder shall propose a plan including all costs for including Delaware teachers in the process by holding benchmarking meetings within the State of Delaware. New open-ended items to be included in each subsequent administration of an assessment will need to be benchmarked prior to the administration so that the live administration can be scored immediately.

RESPONSE REQUIRED

The bidder shall propose procedures for monitoring the accuracy of readers' scores throughout the scoring process using papers from benchmarking sessions. The readers should be unaware they are scoring papers with pre-established scores. The bidder shall propose methods for periodically recalibrating readers to ensure they continue to read accurately and do not drift off scale.

The bidder shall propose a strategy for selecting, training, and qualifying readers. The strategy should include content specialists from the DDOE to attend and observe team leader and/or reader training. The successful bidder shall be required to prepare all training materials from the benchmarking meeting in sufficient quantities for the reader training sessions.

The bidder shall propose a reader quality control reporting system for hand-scoring and indicate how they will use that system to ensure quality scoring. The bidder shall include the following items in that system:

- tracking of reader scores/discrepancies;
- use of training reports that show reader performance during training and qualifying;
- inter-reader reliability reports;
- recalibration reports that show reader scores on the recalibration sets;
- troubled paper identification in which papers with extremely personal and/or offensive content are flagged and forwarded to DDOE along with the necessary identifying information; and
- other reports and/or procedures as deemed necessary by the Vendor to ensure a quality scoring.

If the bidder suggests the use of AI scoring, an alternative proposal outlining cost, quality and accuracy comparisons to human scoring is required.

2.3.F Psychometric Analysis & Scaling

The successful bidder will be responsible for all required psychometric analysis needed to support the development, administration, reporting and maintenance of the ITA assessments. These responsibilities include, but are not limited to, the analyses required to support the review of item quality, creation of operational test forms, item scoring, item and test form reviews, scaling and equating of test forms, and establishing the reporting scale. DDOE expects the completion of these activities to produce evidence that supports the validity of intended interpretations and uses of the ITA scores, as well as evidence of their reliability.

The successful bidder's responsibilities include:

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- Collecting, cleaning and storing of all necessary data. Unlike the EoU assessments, the vendor bears the sole responsibility for these tasks.
- Using item response theory methods to create an overall scale for each ITA in grades 5, 8 and high school biology. DDOE expects that the scale for each ITA assessment be established in 2018-19, using a post-calibration approach based on the complete dataset from the 2018-19 operational administration. The bidder may instead propose a novel method to scaling the ITA assessments (e.g., cognitive diagnostic model). Any novel method will need to the same standards of quality laid out in the *Standards for Educational and Psychological Testing* (AERA, APA, & NCME, 2014) and the *U. S. Department of Education Peer Review of State Assessment Systems: Non-Regulatory Guidance for States* (2015). If a bidder selects a novel method, the following requirements will need to be adapted by the bidder.
 - 1) Conducting appropriate quality control and quality assurance procedures, using both classical test theory and the method used to scale the assessments, to insure the final items, item-clusters and forms are of quality.
 - 2) Insuring that all forms for each ITA assessment are placed onto the same scale (i.e., horizontally equated within year), and also insure that the assessments are equated from year-to-year to support the accountability uses (i.e., horizontally equated across years). If a novel method is used, a method must be proposed to insure results are comparable across forms within and across years.
 - 3) Conduct investigations of differential item functioning for all applicable subgroups.
 - 4) Examining the internal structure of the ITA assessments using commonly accepted methods, including exploratory or confirmatory factor analysis or specialized methods, including DETECT.
 - 5) Examining potential problem issues, specifically:
 - a. Local item dependence - given the item-cluster design, the ITA assessments may exhibit greater signs of local item dependence (LID) than traditional assessments. DDOE expects the successful bidder to investigate whether LID is present to a significant extent and if so, whether the levels of LID compromise the intended interpretations and uses of the ITA scores.
 - b. Floor or ceiling effects - given the complexity of the standards, DDOE is concerned about the difficulty of the assessments, and in particular that the ITA assessment will be too difficult for some students (i.e., exhibit floor effects). The successful bidder must define and implement one or more approaches to detect possible floor or ceiling effects, as well as propose and implement solutions, should these effects be detected.
 - 6) Relating ITA scores to external variables. DDOE will provide data on relevant variables to the successful bidder in a single merged Microsoft Excel data file.
 - 7) Quantifying measurement and classification error for, both the student population overall and each student subgroup, by providing analyses of
 - a. Classical reliability (e.g., Cronbach's Coefficient Alpha), marginal reliability, standard errors of measurement and conditional standard errors of measurement.
 - b. Analyses of the classification accuracy or consistency of the achievement level cut scores produced by the standards setting process.
 - c. Appropriate measures of measurement error or classification error for any reported subscores.

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- 8) Providing summaries of test information functions to provide evidence that student scores are adequately precise across the full performance continuum, as well as to support the investigation of floor and ceiling effects.

Additional, special studies are detailed in section 4.

RESPONSE REQUIRED

The bidder must provide a detailed description of their proposed analyses plan, providing details on how, when and by whom the analyses for each point will be conducted.

2.3.G Standard Setting

The successful bidder must host a multiday workshop to set the achievement standards for the ITA assessments. The workshop participants will be selected by DDOE to represent relevant constituencies. The successful bidder is responsible for conducting all advance preparations (logistical and methodological), conducting the meeting, and generating a final report documenting the validity evidence to support the results. In addition, the vendor is expected to present the results to the TAC and policy makers to gain final support. The workshop will use the previously generated threshold ALDs

The workshop must incorporate the previously developed policy and threshold ALDs, with a process in place for limited revision. As noted earlier, the intention is to use the threshold ALDs both during the task development and during the standard setting meeting. Given the unique structure of the assessment, a person centered standards setting method that draws upon reviewing samples of student work is preferred.

RESPONSE REQUIRED

The bidder must provide a detailed description of their proposed standards setting plan, accompanied by a preliminary agenda or agenda from a past standards setting workshop.

2.3.H Reporting

For each administration, the successful bidder must provide reports and data files, developed by the process detailed in 2.3.H.I, to schools, Districts and the DDOE for the use of students, parents, educators and the public. The successful bidder must have an online reporting system that allows properly permissioned users to access score reports for individual students, classrooms, schools, districts as well as for the state overall. In addition, the reporting system must allow for results at the classroom, school, district and state level to be disaggregated for all subgroups identified by DDOE. Any publically available information based on subgroups must have appropriate suppression rules, as defined by the state, in place. The reporting system must allow users to download data reports in commonly used spreadsheet formats, such as comma-separated values (CSV) format or Microsoft Excel format.

Potential reporting categories include (a) an overall ITA score and ITA subscores based on the claims and subclaims presented in 2.3.B and (b) EoU overall scores. In terms of (b), DDOE is interested in exploring how EoU and ITA scores could be combined on a single report after the

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administration of the ITA assessments. Reporting both EoU and ITA scores on a combined score report will require the successful bidder develop a streamlined method for processing student total scores or item responses from the Performance Plus data files provided by DDOE, as well as necessary quality control or quality assurance processes). Given the novelty of this approach, DDOE also expects the successful bidder to develop and examine multiple prototype score student reports, containing mock ITA and EoU assessments, for DDOE to use within department run focus groups. Using the results of the focus groups DDOE will work with the successful bidder to develop the format of the final student report.

After administration, the successful bidder must, at minimum provide:

- Printed student reports for every tested student.
- Access to a populated reporting system containing score reports for individual students, classrooms, schools, districts as well as for the state overall. Individual student reports must be downloadable, in PDF format. As noted above, group level reports must be downloadable in commonly used spreadsheet formats, such as comma-separated values (CSV) format or Microsoft Excel format.

2.4 Alignment

Delaware's approach to alignment takes into account both the EoU assessments and ITAs. The EoU assessments are meant to cover all PEs, and related SEPs, DCIs & CCCs, defined in the NGSS – ensuring that the curriculum is not unduly narrowed. The ITA, used for accountability, is meant to provide evidence of students' overall mastery of the NGSS as well as their ability to draw on the NGSS to solve problems in novel scenarios. Delaware expects this design to meet the United States Department of Education Standards and Assessment Peer Review Criteria, as well as meet the standards of best practice laid out in the *Standards for Educational and Psychological Testing* (American Educational Research Association (AERA), American Psychological Association (APA), and the National Council on Measurement in Education (NCME), 2014). To do so, Delaware assumes that the successful bidder will work with the state to produce one or more documents articulating the state's unique approach to covering the NGSS.

In addition, after completing this documentation, the successful bidder must provide independent evidence of alignment for the EoU assessments and ITAs in fifth grade, eighth grade and high school biology through the an independent alignment study. This study must be conducted by an experienced, qualified contractor not affiliated with the successful bidder. The review must take into account the documentation explaining Delaware's approach to alignment, as well as more traditional evidence of alignment (e.g., assessment blueprints). Delaware will have the authority to approve or reject the independent contractor proposed by the bidder. The state will also approve the proposed alignment methodology. Potential alignment methodologies must acknowledge that one-to-one associations between an item and a standard are insufficient to capture the complexity of assessments of the NGSS (see chapter six of the *Science Assessment Item Collaborative Assessment Framework for the Next Generation Science Standards*). One such methodology that does so, at least partially, is based on the Chief Council of State School Officers' (CCSSO) *Criteria for Procuring and Evaluating High-Quality Assessments* (2014) – specifically Doorey & Polikoff's (2016) implementation of the *Guide to Evaluating Assessments Using the CCSSO Criteria for High Quality Assessments*:

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Focus on Test Content (NCIEA, 2016). This methodology would, however, need to be adapted for the NGSS as it was developed in the context of English language arts/literacy and mathematics. Again, such adaptation must account for the complexity of the NGSS, particularly in regard to the three dimensional nature of the standards.

RESPONSE REQUIRED

The bidder should provide a preliminary plan for alignment. This plan should acknowledge the complexity of the NGSS, as well as Delaware’s approach to alignment build on the EoU assessments and the ITAs. Specific details to be included, but not limited to, in the provided plan include:

- The alignment methodology that will be used or developed. If the methodology has been used previously, the plan should provide details on implementation and revision. If the methodology has not been used previously, the plan should outline the proposed development process and ways in which the methodology will be evaluated.
- What level alignment will be evaluated at – at the level of the PEs, at the level of the foundational dimensions (DCI, SEP and CCC), or both.
- The name and qualifications of a contractor, not affiliated with the successful bidder, who will design and implement the necessary alignment study or studies.
- Planned responses should the alignment study indicate problematic areas.

2.5 Validity

Validation shall be a joint responsibility between the successful bidder and the DDOE. The successful bidder will be responsible for furnishing relevant evidence and a rationale in support of any test score interpretations for specified uses intended by the developer. Relevant evidence shall include, but not be limited to:

- Evidence of careful test construction
- Adequate score reliability
- Appropriate test administration and scoring
- Accurate score scaling, equating and standard setting
- And careful attention to fairness for all test takers as appropriate to the test interpretation in question.

2.6 Supporting Materials & Interpretative Guides

2.6.A Informational Brochures

The successful bidder shall produce informational brochures that describe the new assessments for science. The brochures will be designed for parents, teachers, and students, as well as policy makers and administrators. Although all elements of production and distribution to schools will be the responsibility of the bidder, the work will be closely managed by the DDOE to ensure that the brochures adequately and accurately reflect the nature and goals of the Science Assessment System. The brochures must be produced in English and

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Spanish in print for distribution with copies in Adobe PDF and Microsoft Word formats sent to the DDOE. The brochures will also be available on the DDOE website. These brochures shall be produced annually, with updates, as deemed necessary by the DDOE. Extra copies of the brochures will be needed in the first year of the assessment in response to public relations needs (sufficient copies to allow for one for every student/parent, teacher, and school administrator in the State of Delaware, as well as all the DDOE staff, and representatives from various state organizations and media). In subsequent years, sufficient copies will be needed to allow for one brochure for every student at each assessed grade.

2.6.B Public and Educator Practice Sites

The successful bidder will provide a practice test site available to the public that can be accessed with a non-secure browser and uses released items to display the functionality of the test and to help prepare students to use the test interface and tools successfully. Assessment items used on the practice site must reflect the full range of the types of assessment items which a student might encounter while taking the assessment. As new types of assessment items are introduced, the Vendor will provide practice items of that type sufficiently ahead of time so students may experience these new item types before they appear on actual, secure assessments. The practice site should contain the same essential functionality as the operational site but must be altered as necessary to maintain security, enforce copyrights or otherwise make the site accessible to the general public. The practice site must have the capacity on a grade and/or content area basis to allow instant score results. In addition, the successful bidder must provide a training site that mimics the entire test administration system such that DDOE, school districts and school staff will be able to learn to use the system.

RESPONSE REQUIRED

The bidder must propose development and delivery of efficient and informative score reports for assessments. Under the supervision of DDOE, the Vendor will design student score report documents, both for online and print reports.

- The bidder shall propose processes and a timeline for the design, creation, and production of various school, district, and state-level reports for the science assessment, with review and approval by the DDOE. The proposal shall include a process for obtaining feedback and suggestions from a sample of members of the intended Delaware audience.
- Interpretive sheets will be included to assist parents in understanding what the score report means and will include a table of the appropriate cut scores. The interpretive information may be a separate sheet or integrated into the student score report.
- The Vendor should propose options for the student score reports to include, but not be limited to the following: reporting standard error of measurement, increased use of graphics, use of color, utilization of the content-specific performance level descriptors as part of the score reporting system, reporting of sub-scores, narrative descriptions, etc.
- See section 2.3.H for further information.

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2.6.C Printing of Score Reports

All printed reports shall be laser-printed in a highly readable font and provide the maximum amount of usable information. Vendors shall submit sample reports to illustrate possible formats.

2.6.D Reprints

The Vendor shall include in the proposal the ability to print corrected copies of student reports, as needed, up to several months after each test administration. All requests for corrections will be initiated by and/or approved by the DDOE.

2.6.E Timeline for Delivery of Score Reports

All printed reports must be distributed to schools, districts, charter schools and the DDOE in accordance with an agreed upon schedule in key project dates to be determined in the initial project planning meeting.

2.6.F Shipment of Score Reports

The Vendor shall assume all costs associated with shipping reports to the schools, districts, charter schools and DDOE within the specified timeline. The Vendor's proposal shall include the capability and procedures for mailing printed reports directly to the student's home address. The Vendor shall include as a cost option mailing all student score reports directly to the student's home address.

2.7 Technical Advisory Committee

A Technical Advisory Committee (TAC) comprised of national measurement experts will provide feedback and suggestions on the technical aspects of the assessment program. The Vendor shall work collaboratively with the DDOE to ensure that appropriate materials are developed and made available for TAC members review at least three (3) weeks prior to scheduled meetings of the Technical Advisory Committee in support of the meeting agenda. The Committee typically holds two, two-day meetings each year. Vendor staff may be required to be in attendance, at the request of the DDOE, and the Vendor must cover the costs of such attendance.

Section II.3 – Operational Administration

3.1 Help Desk and Additional Support

Ability to provide 24/7 systems engineer support for problem resolution during testing windows with expedited support for problems that occur during test sessions. Help desk support provided for extended hours on weekdays for routine user issues and problems. The DDOE reserves the right to impose fines or other consequences as a result of unplanned system failure, as negotiated in the Contract.

3.2 Data Requirements

3.2.A Security of Test Items and Student Information

Security of student information, student performance data, and test items must be maintained. Individual test information shall only be made available to DDOE and school district authorized personnel, and, if requested under FERPA guidelines, to the student's parent/guardian. No other individuals or organizations shall have access to test results. All applications, data transactions and reports must be built such that they protect individual student's privacy consistent with Delaware public records laws and FERPA and other federal laws.

3.2.B Archiving

The proposed system must support collecting and maintaining records for students as they move through the school system, and archived until four years after graduation from high school or the student's 22nd birthday, whichever occurs first.

RESPONSE REQUIRED

The bidder should provide a description of each of the following in their proposal:

- The mechanism for detailed test results (test history) to be archived in off-line storage
- The normal time period for maintaining historical on-line information
- The process to archive data off-line through user-controlled purge criteria
- The process to restore archived data into current system, use it, and then purge it in a controlled manner, retaining the archived data off-line
- The method used to automatically restore all databases, including indices, pointers and tables, to a status prior to any system-wide failure
- The method used to manually restore all databases, including indices, pointers and tables, to a status prior to any system-wide failure
- The automated backup, recovery, and restart procedures for the system

3.3 System Interfaces

The successful bidder shall develop the interfaces with the DDOE's Student Information System (Delaware Student Information System - DELSIS), the DDOE Code Library, and DDOE's Identity Management System. Data to be used includes the statewide unique student identifier, and District and School identifier. Bidders must describe their proposed approach for developing and implementing the interfaces. Interfaces must include data transfer capabilities from DELSIS and the Delaware Code Library.

The proposed system must offer a means by which Delaware Student Identifier (SID), first name, last name, grade level to be tested, and other demographic data delineated by DDOE can be automatically uploaded from DDOE's database daily. Firewall issues may mean exploration of technology such as a Web Service or SFTP file upload from DDOE to proposed system. Some requirements for the data are:

- Assessment results files must provide both student level and item level data.
- Student test records must be identified with student SID.

3.4 Assessment Features and Development

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3.4.A Assessment Windows

The proposed system shall be designed to allow the DDOE to establish and set assessment windows for each grade level.

3.4.B Electronic Student Resources

The successful bidder shall make available allowed electronic student resources required for student completion of the assessment including, but not limited to, periodic tables, documents, and science formulas as specified by DDOE and by the item development process.

RESPONSE REQUIRED

The bidder should provide a detailed description of the method that students will use to log in to the test. The description must include at a minimum:

- A secure method for test administrators to define test event opportunities
- A secure method for students to log in to the system and for the system to validate the login
- A method by which test administrators can approve students to begin tests, choose testing enhancements, and terminate tests, if required.
- The system will allow a testing session to be saved and, with Test Administrator approval and log-in, for the test session to be resumed.
- Within a single test session, the system will allow students to mark items for subsequent review, go back, and change responses.
- The system will allow the DDOE to establish an expiration period for tests if not completed after a certain number of days. This period is anticipated to be approximately 45 days.
- The system will recover data from any unforeseen test interruption and return the test-taker to the point of interruption. Students must not be able to submit an answer to a test question unless all elements of the item are presented to the student.

3.4.C Score Availability and Data Files

Data files containing scores must be available at the DDOE within forty-five (45) calendar days after a student completes the assessment. Assessment results files must provide both student level and item level data. The output file must conform to DDOE specifications.

Student test records must be identified with Delaware Student Identifier (SID). DDOE will supply the SID file to the successful bidder on a daily basis to import and update their system. The successful bidder will restrict student login to matches based on the SID file.

RESPONSE REQUIRED

Bidder must provide a method for:

- Changing the SID associated with a test without having to end the test.

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- Ending a test event in cases where the test results are likely invalid
- Changing an Institution Identifier associated with a test
- Restarting a test from the beginning and while not incrementing the total number of opportunities used by a student
- Restarting or resuming a test after a student moves to another location within the Delaware public schools, based on the SID.

3.4.D User Menu

The system will provide user login and menus, with appropriate information control by user type (role), for system users including administrators at the state, district, school, and teacher levels. The roles should be assigned via DDOE's Identify Management System. A minimum of the following user menus will be provided:

- State Administrator Menu
- District Test Coordinator (DTC) Menu
- School Test Coordinator (STC) Menu
- Teacher/Test Administrator Menu

Final design of each user menu is subject to DDOE approval. The proposal shall describe typical functionality of each menu. Examples of possible functionality include:

3.4.D.I State Administrator Menu

- add, modify, or delete DTC and school accounts and information;
- access reports detailing system usage by school and district;
- access the User Guide that covers all state administrator-level functions;
- enter and record student voids for every test administration; and
- assign the testing windows for each administration.

3.4.D.II District Test Coordinator Menu

- add, modify, or delete school test coordinator accounts and information;
- access reports detailing system usage by school within the district;
- access a report of students not tested;
- access the User Guide that covers all district administrator-level functions;
- schedule each school for testing in the district;
- add and edit school information (e.g., site code, school name); and
- monitor the registration progress of each school throughout the registration period.

3.4.D.III School Test Coordinator Menu

- add, modify, or delete teacher and test administrator accounts and information;
- access reports detailing system usage within the school;
- access the User Guide that covers all school administrator-level functions;
- register each school for testing;
- assign new classes to a teacher;
- delete a teacher's class(es);

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- print and/or e-mail teacher user ID and password letters;
- view teacher rosters;
- add, edit, or delete students;
- access a report of students not tested;
- assign students to a class;
- view and/or print class and student rosters;
- assign accommodations to students with disabilities; and
- add, edit, or delete test administrators.

3.4.D.IV Test Administrator Menu

- add, edit, or delete students;
- access a report of students not tested;
- assign students to a class;
- view and/or print class and student rosters; and
- start, stop and resume student test sessions.

3.4.E Security Documentation

RESPONSE REQUIRED

The bidder **MUST** provide a detailed description of the following:

- The security controls over all system aspects
- The “levels” of security provided in the system
- The ability to limit access to specific system functions or modules
- The authentication process to ensure that an individual is the person logging-in to the system (e.g., the student taking the test is who they say they are)
- Restrictions of students to tests within the system and to the number of times that they can access tests

3.4.F Languages

The NGSS Science ITA Assessments must be fully translated into Spanish, include a glossary for up to six (6) other languages (determined by student population), and the system must have the capacity to add additional languages if required in the future by DDOE. End of Unit assessments must be translated into Spanish.

3.4.G Copyright and Permissions

All passages, stimuli, and resources developed for this project, unless otherwise agreed and specified, shall become the property of the Delaware Department of Education to avoid web copyright issues. Informational text shall meet Delaware specifications and industry standards for quality and appropriateness. Resources developed or selected will be a combination of materials commonly used by students in performing research for personal and academic projects such as tables of contents, indexes, appendices, glossaries, advertisements, charts, graphs, maps, tables, articles, or web pages. The items that require graphics and all other

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types of graphics shall be formatted for electronic use as .jpg files, and the original files shall be supplied to DDOE in addition to the Word documents with the graphics embedded.

The bidder shall provide reference sources for content passages that state the author, title of work, publisher, and year, and shall provide documentation of permission to use any material if the use of which is restricted by copyright. The DDOE would prefer not to use any materials that need copyright permission. When necessary, the successful bidder shall be responsible for any copyright permission costs. Released items will be posted on the DDOE website from time-to-time and may appear in school newspapers, brochures or newsletters. Any materials developed for this project shall not appear in other publications outside of Delaware without prior written approval from the DDOE. These assurances shall be so stated in the bidder's proposal.

3.4.H Accommodations and ADA

Assessments must comply with the provisions of the Americans with Disabilities Act of 1990. Assessment must include accommodations and enhancements to individual students including capacity to securely print reading passages, use tests presented in a language other than English, adjust the size of the items and graphics, use pre-recorded wave files and convert item text to speech, and meet as many as possible of the other accommodations outlined in the [Accessibility Guidelines](#) and [Update](#). Accommodations must be able to be set by test administrators while approving students to take tests. Accommodations must also be set through an upload process in advance of student testing. Bidder should identify all accommodations available with the system and allow for online monitoring/tracking of accommodations by approved state, district and school personnel. Proposals shall include a discussion of the impact of the proposed accommodations on the validity of the tests and a method for "flagging" students' scores resulting from nonstandard test administrations or those that result in invalid score.

3.4.I Universal Design

The principles and practices of "universally designed" (UD) assessments are to be followed in the development and implementation of all components of the DeSSA. Any UD principles used must not affect the assessment validity for students with or without disabilities. As part of the development process, items should be reviewed by a fairness and bias committee to determine if they meet the following UD principles:

- Multiple means of Representation – variations in the manner in which the test is presented
- Multiple means of Expression – allowing a variety of ways in which a student can show what they know
- Multiple means of Engagement – allowing opportunities for establishing interest in tasks

See:

- NCEO: Considerations for the Development and Review of Universally Designed Assessments <http://www.cehd.umn.edu/nceo/onlinePubs/Technical42.htm>
- NCEO: A State Guide to the Development of Universally Designed Assessments <http://www.cehd.umn.edu/nceo/OnlinePubs/StateGuideUD/default.htm>

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- NCEO: Universal Design Applied to Large Scale Assessments
<http://www.cehd.umn.edu/NCEO/onlinepubs/synthesis44.html>

3.4.J Production of Paper/Pencil tests

Appropriate accommodations for English language learners and students with disabilities will be available. A single paper/pencil version of the summative assessments in each of the content areas will be available as an accommodation and for use in case of a temporary failure of the online system. A Braille version of each paper/pencil test shall be made available as an accommodation. The paper/pencil version shall be administered on the same day(s) across the state, as determined by the DDOE. Further, the pencil/paper version shall be scanned and scored within 10 business days of the receipt of the assessment by the Vendor.

For each test administration that requires a paper/pencil version of the assessment, either for all students or for students requiring the accommodation of a paper/pencil version of the assessment, the bidder shall produce sufficient copies of test booklets and answer documents. The paper/pencil version of the tests shall meet all technical qualities and aspects described in this RFP.

3.4.K User Feedback

The bidder shall propose a process for annually soliciting feedback from users on potential enhancements to the system. Users shall include district and school level educators, teachers, parents/guardians, and students. The bidder shall include a proposal for efficiently collecting and tabulating such feedback. The DDOE shall be responsible for making final decisions about communicating this to various constituency groups.

3.4.L System Enhancements

The successful bidder shall annually identify and make available to DDOE options offered to other clients without incurring an additional development charges beyond those which are necessary to integrate the enhancement into Delaware's system.

3.5 Technology Requirements

3.5.A Use of Existing Technology Infrastructure

The DDOE operates a computer center that houses approximately 100 servers. These servers are largely Microsoft based, and host a number of applications that use Microsoft technologies such as SQL Server, IIS, and .NET based programming languages. The Department's computer center is connected to the education network via high-speed optical fiber backbone. This connection is shared by all of the application users as well as all Department employees that reside in the Townsend Building.

Any technologically required portions of the proposed system must be designed to conform to existing technology installed in school districts and the DDOE. The proposed system must also

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adhere, at a minimum, to the DDOE's current Software Standards and state technology and communication standards, which can be found at <http://dti.delaware.gov/information/standards-policies.shtml>, with the expectation that these standards will evolve over time. The proposed system shall allow for connections to DDOE's systems and Delaware school districts with a minimum degree of latency. It should be noted that school districts in the state of Delaware are largely independent entities; however, the Department of Technology and Information has created and maintains the WAN connections for all the school districts. Most upper level schools such as high schools and middle schools are connected to the education network via TLS circuits. These circuits run at a minimum of 10Mb/sec but some schools have connections in excess of 100Mb/sec. In many cases these connections run at 70-80% utilization during the day due to educational and business traffic. Any new applications that the school districts are required to use will need to cooperate with existing applications such as eSchoolPlus, PHRST, and First State Financials, Schoology, and other educational systems.

Due to the level of utilization on most network connections, it is very important that the proposed system be as bandwidth efficient as possible and all possible steps are taken to ensure beforehand that the system will work with the bandwidth available at each school. More detailed information about bandwidth can be obtained from the Department of Technology and Information staff. The Vendor should also submit a per-student estimate of the bandwidth requirements of their proposed system, so that districts, DDOE, and the Department of Technology and Information can plan accordingly. If the Vendor proposes that DDOE host the proposed system, the Vendor should include an estimate of the number and type (role) of full-time staff it would take to ensure the system would still meet the requirements outlined in the RFP.

RESPONSE REQUIRED

The bidder shall describe how the system is hosted, and identify any minimum technology architecture, computing hardware infrastructure, and software requirements needed within Delaware to meet the following technical requirements for the Assessment System:

1. A secure browser that restricts access to other applications and to the internet.
2. The browser and other components of the system must function on
 - i. Macintosh OS 10.6 and any subsequent versions of Macintosh
 - ii. Windows 8 and any subsequent versions of the Microsoft operating system
 - iii. Linux K12 LTSP and any subsequent versions of Linux lynx
 - iv. Google Chrome OS
3. Updates to the allowed operating systems must be supported by the Vendor within 45 days of their official release without diminishing functionality under the older operating systems.
4. All applications will be available 24 hours per day, 365 days a year. Down time for application maintenance and for security purposes may be negotiated.
5. The system must support a minimum of 10,000 concurrent users with a mean

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refresh time of less than one second.

3.5.B Data Dictionary and Models

The successful bidder will maintain:

1. An active data dictionary function including cross-reference between data elements, recording and tracking, output definitions, outputs, screen displays, etc.
2. A detailed system model and entity relationship model

RESPONSE REQUIRED

The bidder will describe in the proposals:

1. Its facility and timeline for systematic archival process, recovery, and restart procedures for the systems including indices, pointers and tables, to a status prior to any system-wide failure.
2. The design and implementation of its database architecture including critical features to ensure data integrity such as record level locking
3. A method to rerun processes
4. The controls to ensure only authorized and tested changes are made to application source and compiled code
5. Procedures to ensure adequate program configuration management.
6. Controls and procedures for operations problem management.
7. Controls and procedures for operations change management.
8. Security and authentication policies and procedures
9. Change management procedures to control the movement of code from the development to the production environment

3.5.C Secure System Design

Each component of the system must be built in accordance with best practices in secure system design including:

1. The use of IDs and passwords that meet the requirements of the DDOE UserID and Password Policy.
 - a) The ability to utilize IDs and password already in place for teachers, administrators, and DDOE staff. DDOE has developed a custom Identity Management System. This system has a Web Service module which would allow for current User IDs and Passwords to be utilized across the network for access to remote systems, thus removing the need for creating another

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authentication method.

- b) DDOE's Identity Management System currently has IDs for the teachers and administrators in the Delaware School System. This system utilizes a paperless system for creation of IDs and Passwords, for granting access to various systems, and for Password recovery. The Vendor's proposal shall indicate the ability to integrate with our Identity Management System.
2. All materials backed up in full at least weekly, and backed up incrementally nightly.
 3. All backup tapes/media stored off site in a secure, locked fireproof container.
 4. Database information logged in real time and should be demonstrated to be recoverable up to the point of failure; a minimum amount of data should be lost.
 5. A backup site with all equivalent hardware and software needs in place to allow failover in the event of a problem at the primary host facility (up at second location within 4 hours).
 6. Communication lines of equivalent capacity from multiple different communication vendors and locations in the event communication lines go down.
 7. The application hosted on multiple application/web servers that provide instant failover in the event of failure.
 8. The application associated with database servers configured for high availability in order to provide for instant failover in the event of failure.
 9. Backup power that allows operation without the primary power source for a minimum of 12 hours. A disaster recovery plan in the event of a disaster (e.g., fire) at the hosting facility that allows the Delaware application to be up and running within 24 hours.
 10. A security plan satisfactorily meeting all industry standards for physical access, electronic access control, intrusion protection and virus protection should be in place and documented/updated on at least an annual basis.
 11. Current 24/7 maintenance and support agreements for all hardware and software used by the application.
 12. Up-to-date licenses in place for all software used with the application; all software should use either the most recent version or one version back—nothing older, but with the ability to interact with older operating systems at the schools.
 13. DDOE must be informed prior to the implementation of any software updates that may impact the operation of the system, software requirements or hardware requirements for DDOE, or Delaware's districts and schools. DDOE reserves the option to reject or delay implementation of any software updates.
 14. Remote secure data transmission from the schools/school districts to the Vendor and to DDOE.

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15. Automated validations and reports regarding system and data errors. System reports will include, but not be limited to:
- a) Data backup logs
 - b) Server response time/down time reporting
 - c) User accounts and domains
 - d) System event logs to track system, application and security events
 - e) System access summary reports
 - f) Results of load tests
 - g) QA reports of tests
16. Bandwidth use and capacity among Delaware schools.

Section II.4 – Special Studies

4.1 Subscore Reporting

Given the complexity of the NGSS, as well as DDOE's desire to develop subclaims and related subscores, the successful bidder must examine multiple approaches to creating and reporting subscores. While the latter can and should be addressed under the bidder's response to section 2.3.H, the former constitutes a unique investigation in the properties of subscores. This investigation is independent of any necessary work required to support the reporting of the EoU scores alongside ITA scores on a composite student report, as detailed in section 2.3.H.

DDOE is interested in collaborating with the successful bidder on novel ways that items and item-clusters can be assigned to subclaim reporting categories to estimate subscores that add more value (e.g., Haberman, 2008; Sinharay, 2013) than traditional subscores. DDOE expects the successful bidder to investigate these novel approaches empirically and also multiple distinct approaches to defining and estimating subscores. The results of these investigations must be presented by the successful bidder to the Technical Advisory Committee, and if approved, used operationally.

4.2 Examining Relationships Between EoU Assessment Results and ITA Results

The EoU assessments and ITAs represent hypotheses about how students can transfer their three dimensional science learning. The EoU assessments are meant to elicit students' near transfer of their three dimensional science learning by asking students to solve problems similar to those found in the classroom. The ITAs are meant to elicit students' far transfer of their three dimensional science learning. DDOE is interested in collaborating with an independent researcher to investigate whether the assessments are capturing transfer as intended, based on qualitative review of the documentation compiled through the development process, as well as through quantitative analysis comparing the EoU and ITA assessment results to one another. In terms of the latter, DDDOE is practically interested in determining whether there are students who appear to be able to do near transfer, as shown by high scores on the EoUs, but fail to do far transfer, as shown by low scores on the ITAs. Developing approaches to communicating and addressing any problems arising from these types of differences in student performance is also of interest.

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RESPONSE REQUIRED

The bidder must provide a description of their proposed investigations and include all projected costs as a clearly demarcated section of their submitted budget proposal. DDOE does not preclude the use of external consultants for these studies; however, costs should be outlined appropriately in the budget proposal.

Section II.5 – Organization of Evidence

5.1 Technical Manual

The successful bidder must provide a technical manual which describes the system in-depth including the item management process and specifications, test design as supported by the system, reports, as well as formats used for examinee results and item responses. The bidder must provide psychometric services, and additional documentation and amend the manual as required by external audits of DDOE or federal compliance review (e.g. USED peer review and Title I audits).

5.2 Organization of Evidence for Peer Review

As part of state and federal requirements, Delaware will submit their assessment for Federal Peer Review. As such, the documentation should be tailored to the peer review guidance, and, where applicable, explicitly reference the *U. S. Department of Education Peer Review of State Assessment Systems: Non-Regulatory Guidance for States* (2015), as well as the *Standards for Educational and Psychological Testing* (AERA, APA, & NCME, 2014). Delaware will work with the successful bidder to develop an understanding as to what evidence will be produced by the successful bidder, the State, or both. The table below shows the critical elements and indicates which elements the Delaware expects evidence produced by the successful bidder to meet, or partially meet with additional evidence produced by the state. In the table below “S” indicates that the state will produce the required evidence, “M” means that a mix of evidence from the state and successful bidder will be used, and “B” means that the evidence will come solely from the successful bidder and be produced as a result of the bidder meeting the requirements specified in this RFP.

Table 1. *Responsibilities for Evidence by Federal Peer Review Critical Elements.*

1.1 S	2.1 M	3.1 M	4.1 B	5.1 S	6.1 S
1.2 S	2.2 M	3.2 B	4.2 M	5.2 S	6.2 B
1.3 S	2.3 M	3.3 B	4.3 B	5.3 M	6.3 S
1.4 S	2.4 M	3.4 M	4.4 B	5.4 S	6.4 B
1.5 S	2.5 M		4.5 B		
	2.6 M		4.6 B		
			4.7 B		

Delaware expects all documentation produced by the successful bidder to reference a specific critical element or elements to facilitate the organization of evidence for Peer Review. This evidence will be made available in a print-ready format that is clearly aligned and identified (i.e., labeled) for each appropriate critical element. The evidence will be stored in a repository (e.g., online directory, shared secure website, etc.) that will be accessible to the state and any identified designees. Additionally, if the successful bidder does not have evidence supporting

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the technical quality of the assessment and assessment system as per peer review requirements, the bidder will provide a plan or schedule to develop and compile the necessary evidence to satisfy requirements.

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III Required Information

The following information shall be provided in each proposal in the order listed below. Failure to respond to any request for information within this proposal may result in rejection of the proposal at the sole discretion of the State.

A. Minimum Requirements

1. Provide Delaware license(s) and/or certification(s) necessary to perform services as identified in the scope of work.

Prior to the execution of an award document, the successful Vendor shall either furnish the Agency with proof of State of Delaware Business Licensure or initiate the process of application where required.

2. Vendor shall provide responses to the Request for Proposal (RFP) scope of work and clearly identify capabilities as presented in the General Evaluation Requirements below.
3. Complete all appropriate attachments and forms as identified within the RFP.
4. Proof of insurance and amount of insurance shall be furnished to the Agency prior to the start of the contract period and shall be no less than as identified in the bid solicitation, Section IV, subsection D, Item 5, sub e.
5. Provide response to Employing Delawareans Report (Attachment 8)
6. Identify all costs including expenses to be charged for performing the services necessary to accomplish the objectives of the contract. The bidder is to submit a fully detailed budget including staff costs, administrative costs, travel costs, and any other expenses necessary to accomplish the tasks and to produce the deliverables under the contract. Bidders should consider the following when preparing budget proposals:
 - a. It is encouraged that bidders prepare separate cost proposals for EoU and ITA production
 - b. Costs for subcontractors should be outlined separately from general contracted costs included in the proposal
 - c. Item sharing proposals should include cost savings options, but not be assumed as accepted practice, therefore should not be included as the intended budget proposal outline
 - d. The evaluation process is designed to award this contract to the bidding agency that most appropriately meets the requirements of the RFP. However, bidders are encouraged to submit proposals that are consistent with state government efforts to conserve resources.

B. General Evaluation Requirements

Project bids will be evaluated based upon required responses for:

1. End-of-Unit (EoU) Assessment Sections (2.1.A, 2.2.A, 2.2.B, 2.2.C, 2.2.D, 2.2.E, 2.2.F, 2.2.G)
2. Integrative Transfer Assessment (ITA) Sections (2.3.A, 2.3.B.I, 2.3.B.II, 2.3.C, 2.3.D, 2.3.E, 2.3.F, 2.3.G, 2.3.H)

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3. Operational Administration Sections (3.2.B, 3.4.B, 3.4.C, 3.4.E)
4. Technology Requirements (3.5.A, 3.5.B)
5. Project Cost/Budget Proposal

3 Professional Services RFP Administrative Information
A. RFP Issuance

1. Public Notice

Public notice has been provided in accordance with 29 *Del. C.* [§ 6981](#).

2. Obtaining Copies of the RFP

This RFP is available in electronic form through DDOE website at: <https://pubapps.doe.k12.de.us/rfplisting/> and the State of Delaware Procurement website at <http://bids.delaware.gov/> Paper copies of this RFP will not be available.

3. Assistance to Vendors with a Disability

Vendors with a disability may receive accommodation regarding the means of communicating this RFP or participating in the procurement process. For more information, contact the Designated Contact no later than ten days prior to the deadline for receipt of proposals.

4. RFP Designated Contact

All requests, questions, or other communications about this RFP shall be made in writing to DDOE. Address all communications to the person listed below; communications made to other DDOE personnel or attempting to ask questions by phone or in person will not be allowed or recognized as valid and may disqualify the vendor. Vendors should rely only on written statements issued by the RFP designated contact.

April McCrae
Delaware Department of Education
401 Federal Street, Suite #2
Dover, DE 19901-3639
April.mccrae@doe.k12.de.us

To ensure that written requests are received and answered in a timely manner, electronic mail (e-mail) correspondence is acceptable, but other forms of delivery, such as postal and courier services can also be used.

5. Consultants and Legal Counsel

DDOE may retain consultants or legal counsel to assist in the review and evaluation of this RFP and the vendors' responses. Bidders shall not contact the State's consultant or legal counsel on any matter related to the RFP.

6. Contact with State Employees

Direct contact with State of Delaware employees other than the DDOE Designated Contact regarding this RFP is expressly prohibited without prior consent. Vendors directly contacting DDOE employees risk elimination of their proposal from further consideration. Exceptions exist only for organizations currently doing business in the State who require contact in the normal course of doing that business.

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7. Organizations Ineligible to Bid

Any individual, business, organization, corporation, consortium, partnership, joint venture, or any other entity including subcontractors currently debarred or suspended is ineligible to bid. Any entity ineligible to conduct business in the State of Delaware for any reason is ineligible to respond to the RFP.

8. Exclusions

The Proposal Evaluation Team reserves the right to refuse to consider any proposal from a vendor who:

- a. Has been convicted for commission of a criminal offense as an incident to obtaining or attempting to obtain a public or private contract or subcontract, or in the performance of the contract or subcontract;
- b. Has been convicted under State or Federal statutes of embezzlement, theft, forgery, bribery, falsification or destruction of records, receiving stolen property, or other offense indicating a lack of business integrity or business honesty that currently and seriously affects responsibility as a State contractor;
- c. Has been convicted or has had a civil judgment entered for a violation under State or Federal antitrust statutes;
- d. Has violated contract provisions such as;
 - 1) Knowing failure without good cause to perform in accordance with the specifications or within the time limit provided in the contract; or
 - 2) Failure to perform or unsatisfactory performance in accordance with terms of one or more contracts;
- e. Has violated ethical standards set out in law or regulation; and
- f. Any other cause listed in regulations of the State of Delaware determined to be serious and compelling as to affect responsibility as a State contractor, including suspension or debarment by another governmental entity for a cause listed in the regulations.

B. RFP Submissions

1. Acknowledgement of Understanding of Terms

By submitting a bid, each vendor shall be deemed to acknowledge that it has carefully read all sections of this RFP, including all forms, schedules and exhibits hereto, and has fully informed itself as to all existing conditions and limitations.

2. Proposals

To be considered, all proposals must be submitted in writing and respond to the items outlined in this RFP. The State reserves the right to reject any non-responsive or non-conforming proposals. Each proposal must be submitted with 12 paper copies and two electronic copies on CD or DVD media disk, or USB memory drive. Please provide a separate electronic pricing file from the rest of the RFP proposal responses.

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Proposals submitted in response to this RFP should be prepared and submitted in accordance with the following guidelines:

- Narrative limited to 40 pages maximum;
- Typewritten;
- Line spacing of 1.5;
- Twelve-point font, using an easy-to-read font such as Arial, Times New Roman, etc.;
- Charts and graphs may be single spaced and use no smaller than 10-point type;
- One-inch (1”) side, top, and bottom margins;
- Footer on each page with page number and the vendor name;
- Do not attach additional pages or information not requested in the application;
- Stapled (do not use binders or folders when submitting application).

All properly sealed and marked proposals are to be sent to DDOE and received no later than **2:00 PM (Local Time) on July 20, 2017**. The Proposals may be delivered by Express Delivery (e.g., FedEx, UPS, etc.), US Mail, or by hand to:

**Meaghan Brennan
Finance Office
Delaware Department of Education
401 Federal Street, Suite #2
Dover, DE 19901-3639**

Vendors are directed to clearly print “BID ENCLOSED” and “RFP # DOE – 2017-16 – Next Generation Science Assessment System for Delaware Learners Phase II: Development and Implementation” on the outside of the bid submission package.

Any proposal submitted by US Mail shall be sent by either certified or registered mail. Proposals must be received at the above address no later than **2:00 PM (Local Time) on July 20, 2017**. Any proposal received after this date shall not be considered and shall be returned unopened. The proposing vendor bears the risk of delays in delivery. The contents of any proposal shall not be disclosed as to be made available to competing entities during the negotiation process.

Upon receipt of vendor proposals, each vendor shall be presumed to be thoroughly familiar with all specifications and requirements of this RFP. The failure or omission to examine any form, instrument or document shall in no way relieve vendors from any obligation in respect to this RFP.

3. Proposal Modifications

Any changes, amendments or modifications to a proposal must be made in writing, submitted in the same manner as the original response and conspicuously labeled as a change, amendment or modification to a previously submitted proposal. Changes, amendments or modifications to proposals shall not be accepted or considered after the hour and date specified as the deadline for submission of proposals.

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4. Proposal Costs and Expenses

The DDOE will not pay any costs incurred by any Vendor associated with any aspect of responding to this solicitation, including proposal preparation, printing or delivery, attendance at vendor's conference, system demonstrations or negotiation process.

5. Proposal Expiration Date

Prices quoted in the proposal shall remain fixed and binding on the bidder at least through **January 20, 2018**. The DDOE reserves the right to ask for an extension of time if needed.

6. Late Proposals

Proposals received after the specified date and time will not be accepted or considered. To guard against premature opening, sealed proposals shall be submitted, plainly marked with the proposal title, Vendor name, and time and date of the proposal opening. Evaluation of the proposals is expected to begin shortly after the proposal due date. To document compliance with the deadline, the proposal will be date and time stamped upon receipt.

7. Proposal Opening

The DDOE will receive proposals until the date and time shown in this RFP. Proposals will be opened only in the presence of the DDOE personnel. Any unopened proposals will be returned to the submitting Vendor.

There will be no public opening of proposals but a public log will be kept of the names of all Vendor organizations that submitted proposals. The contents of any proposal shall not be disclosed to competing Vendors prior to contract award.

8. Non-Conforming Proposals

Non-conforming proposals will not be considered. Non-conforming proposals are defined as those that do not meet the requirements of this RFP. The determination of whether an RFP requirement is substantive or a mere formality shall reside solely within the DDOE.

9. Concise Proposals

The DDOE discourages overly lengthy and costly proposals. It is the desire that proposals be prepared in a straightforward and concise manner. Unnecessarily elaborate brochures or other promotional materials beyond those sufficient to present a complete and effective proposal are not desired. The DDOE's interest is in the quality and responsiveness of the proposal.

10. Realistic Proposals

It is the expectation of the DDOE that vendors can fully satisfy the obligations of the proposal in the manner and timeframe defined within the proposal. Proposals must be realistic and must represent the best estimate of time, materials and other costs including the impact of inflation and any economic or other factors that are reasonably predictable.

The DDOE shall bear no responsibility or increase obligation for a vendor's failure to accurately estimate the costs or resources required to meet the obligations defined in the proposal.

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11. Confidentiality of Documents

All documents submitted as part of the vendor's proposal will be deemed confidential during the evaluation process. Vendor proposals will not be available for review by anyone other than the DDOE/Proposal Evaluation Team or its designated agents. There shall be no disclosure of any vendor's information to a competing vendor prior to award of the contract.

The DDOE is a public agency as defined by state law, and as such, it is subject to the Delaware Freedom of Information Act, [29 Del. C. Ch. 100](#). Under the law, all the DDOE's records are public records (unless otherwise declared by law to be confidential) and are subject to inspection and copying by any person. Vendor(s) are advised that once a proposal is received by the DDOE and a decision on contract award is made, its contents will become public record and nothing contained in the proposal will be deemed to be confidential except proprietary information.

Vendor(s) shall not include any information in their proposal that is proprietary in nature or that they would not want to be released to the public. Proposals must contain sufficient information to be evaluated and a contract written without reference to any proprietary information. If a vendor feels that they cannot submit their proposal without including proprietary information, they must adhere to the following procedure or their proposal may be deemed unresponsive and will not be recommended for selection. Vendor(s) must submit such information in a separate, sealed envelope labeled "Proprietary Information" with the RFP number. The envelope must contain a letter from the Vendor's legal counsel describing the documents in the envelope, representing in good faith that the information in each document is not "public record" as defined by [29 Del. C. § 10002\(d\)](#), and briefly stating the reasons that each document meets the said definitions.

Upon receipt of a proposal accompanied by such a separate, sealed envelope, the DDOE will open the envelope to determine whether the procedure described above has been followed.

12. Multi-Vendor Solutions (Joint Ventures)

Multi-vendor solutions (joint ventures) will be allowed only if one of the venture partners is designated as the "**prime contractor**". The "**prime contractor**" must be the joint venture's contact point for the DDOE and be responsible for the joint venture's performance under the contract, including all project management, legal and financial responsibility for the implementation of all vendor systems. If a joint venture is proposed, a copy of the joint venture agreement clearly describing the responsibilities of the partners must be submitted with the proposal. Services specified in the proposal shall not be subcontracted without prior written approval by the DDOE, and approval of a request to subcontract shall not in any way relieve Vendor of responsibility for the professional and technical accuracy and adequacy of the work. Further, vendor shall be and remain liable for all damages to the DDOE caused by negligent performance or non-performance of work by its subcontractor or its sub-subcontractor.

Multi-vendor proposals must be a consolidated response with all cost included in the cost summary. Where necessary, RFP response pages are to be duplicated for each vendor.

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a. Primary Vendor

The DDOE expects to negotiate and contract with only one “prime vendor”. The DDOE will not accept any proposals that reflect an equal teaming arrangement or from vendors who are co-bidding on this RFP. The prime vendor will be responsible for the management of all subcontractors.

Any contract that may result from this RFP shall specify that the prime vendor is solely responsible for fulfillment of any contract with the State as a result of this procurement. The State will make contract payments only to the awarded vendor. Payments to any-subcontractors are the sole responsibility of the prime vendor (awarded vendor).

Nothing in this section shall prohibit the DDOE from the full exercise of its options under Section IV.B.16 regarding multiple source contracting.

b. Sub-contracting

The vendor selected shall be solely responsible for contractual performance and management of all subcontract relationships. This contract allows subcontracting assignments; however, vendors assume all responsibility for work quality, delivery, installation, maintenance, and any supporting services required by a subcontractor.

Use of subcontractors must be clearly explained in the proposal, and major subcontractors must be identified by name. **The prime vendor shall be wholly responsible for the entire contract performance whether or not subcontractors are used.** Any sub-contractors must be approved by DDOE.

c. Multiple Proposals

A primary vendor may not participate in more than one proposal in any form. Sub-contracting vendors may participate in multiple joint venture proposals.

13. Sub-Contracting

The vendor selected shall be solely responsible for contractual performance and management of all subcontract relationships. This contract allows subcontracting assignments; however, vendors assume all responsibility for work quality, delivery, installation, maintenance, and any supporting services required by a subcontractor.

Use of subcontractors must be clearly explained in the proposal, and subcontractors must be identified by name. Any sub-contractors must be approved by DDOE.

14. Discrepancies and Omissions

Vendor is fully responsible for the completeness and accuracy of their proposal, and for examining this RFP and all addenda. Failure to do so will be at the sole risk of vendor. Should vendor find discrepancies, omissions, unclear or ambiguous intent or meaning, or should any questions arise concerning this RFP, vendor shall notify the DDOE’s Designated Contact, in writing, of such findings at least ten (10) days before the proposal opening. This will allow issuance of any necessary addenda. It will also help prevent the opening of a defective proposal and exposure of vendor’s proposal upon which award could not be made. All unresolved issues should be addressed in the proposal.

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Protests based on any omission or error, or on the content of the solicitation, will be disallowed if these faults have not been brought to the attention of the Designated Contact, in writing, at least ten (10) calendar days prior to the time set for opening of the proposals.

a. RFP Question and Answer Process

The DDOE will allow written requests for clarification of the RFP. All questions should be posted on DDOE's website at: <https://pubapps.doe.k12.de.us/rfp/submit/> by **June 30, 2017**. Vendor names will be removed from questions in the responses released. Questions should be submitted in the following format. Deviations from this format will not be accepted.

Section number

Paragraph number

Page number

Text of passage being questioned

Questions not submitted electronically shall be accompanied by a CD and questions shall be formatted in Microsoft Word. Questions must be filed no later than midnight on **June 30, 2017**. Questions received after that time will not be considered. A copy of the questions and answers will be posted on <http://bids.delaware.gov>.

15. State's Right to Reject Proposals

The DDOE reserves the right to accept or reject any or all proposals or any part of any proposal, to waive defects, technicalities or any specifications (whether they be in the DDOE's specifications or vendor's response), to sit and act as sole judge of the merit and qualifications of each product offered, or to solicit new proposals on the same project or on a modified project which may include portions of the originally proposed project as the DDOE may deem necessary in the best interest of the DDOE.

16. State's Right to Cancel Solicitation

The DDOE reserves the right to cancel this solicitation at any time during the procurement process, for any reason or for no reason. The DDOE makes no commitments expressed or implied, that this process will result in a business transaction with any vendor.

This RFP does not constitute an offer by the DDOE. Vendor's participation in this process may result in the DDOE selecting your organization to engage in further discussions and negotiations toward execution of a contract. The commencement of such negotiations does not, however, signify a commitment by the DDOE to execute a contract nor to continue negotiations. The DDOE may terminate negotiations at any time and for any reason, or for no reason.

17. State's Right to Award Multiple Source Contracting

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Pursuant to 29 *Del. C.* [§ 6986](#), the DDOE may award a contract for a particular professional service to two or more vendors if the agency head makes a determination that such an award is in the best interest of the DDOE.

18. Notification of Withdrawal of Proposal

Vendor may modify or withdraw its proposal by written request, provided that both proposal and request is received by the DDOE prior to the proposal due date. Proposals may be re-submitted in accordance with the proposal due date in order to be considered further.

Proposals become the property of the DDOE at the proposal submission deadline. All proposals received are considered firm offers at that time.

19. Revisions to the RFP

If it becomes necessary to revise any part of the RFP, an addendum will be posted on DDOE's website at:

<https://pubapps.doe.k12.de.us/rfplisting/>
and <http://bids.delaware.gov/>

DDOE is not bound by any statement related to this RFP made by any State of Delaware employee, contractor or its agents.

20. Exceptions to the RFP

Any exceptions to the RFP, or the DDOE's terms and conditions, must be recorded on Attachment 3. Acceptance of exceptions is within the sole discretion of the evaluation committee.

21. Award of Contract

The final award of a contract is subject to approval by the DDOE. The DDOE has the sole right to select the successful vendor(s) for award, to reject any proposal as unsatisfactory or non-responsive, to award a contract to other than the lowest priced proposal, to award multiple contracts, or not to award a contract, as a result of this RFP.

Notice in writing to a vendor of the acceptance of its proposal by the DDOE and the subsequent full execution of a written contract will constitute a contract, and no vendor will acquire any legal or equitable rights or privileges until the occurrence of both such events.

a. RFP Award Notifications

After reviews of the evaluation committee report and its recommendation, and once the contract terms and conditions have been finalized, the DDOE will award the contract.

The contract shall be awarded to the vendor whose proposal is most advantageous, taking into consideration the evaluation factors set forth in the RFP.

It should be explicitly noted that the DDOE is not obligated to award the contract to the vendor who submits the lowest bid or the vendor who receives the highest total point score; rather, the contract will be awarded to the vendor whose

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proposal is the most advantageous to the DDOE. The award is subject to the appropriate DDOE approvals.

After a final selection is made, the winning vendor will be invited to negotiate a contract with the DDOE; remaining vendors will be notified in writing of their selection status.

22. Cooperatives

Vendors, who have been awarded similar contracts through a competitive bidding process with a cooperative, are welcome to submit the cooperative pricing for this solicitation.

C. RFP Evaluation Process

An evaluation team composed of representatives of the DDOE will evaluate proposals on a variety of quantitative criteria. Neither the lowest price nor highest scoring proposal will necessarily be selected.

The DDOE reserves full discretion to determine the competence and responsibility, professionally and/or financially, of vendors. Vendors are to provide in a timely manner any and all information that the DDOE may deem necessary to make a decision.

1. Proposal Evaluation Team

The Proposal Evaluation Team shall be comprised of representatives of the DDOE. The Team shall determine which vendors meet the minimum requirements pursuant to selection criteria of the RFP and procedures established in 29 *Del. C.* §§ [6981](#) and [6982](#). The Team may negotiate with one or more vendors during the same period and may, at its discretion, terminate negotiations with any or all vendors. The Team shall make a recommendation regarding the award to the Delaware Secretary of Education, who shall have final authority, subject to the provisions of this RFP and 29 *Del. C.* § [6982](#), to award a contract to the successful vendor in the best interests of the DDOE.

2. Proposal Selection Criteria

The Proposal Evaluation Team shall assign up to the maximum number of points for each Evaluation Item to each of the proposing vendor's proposals. All assignments of points shall be at the sole discretion of the Proposal Evaluation Team.

The proposals shall contain the essential information on which the award decision shall be made. The information required to be submitted in response to this RFP has been determined by the DDOE to be essential for use by the Team in the bid evaluation and award process. Therefore, all instructions contained in this RFP shall be met in order to qualify as a responsive and responsible contractor and participate in the Proposal Evaluation Team's consideration for award. Proposals which do not meet or comply with the instructions of this RFP may be considered non-conforming and deemed non-responsive and subject to disqualification at the sole discretion of the Team.

The Team reserves the right to:

- Select for contract or for negotiations, a proposal other than that with lowest costs.

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- Reject any and all proposals or portions of proposals received in response to this RFP or to make no award or issue a new RFP.
- Waive or modify any information, irregularity, or inconsistency in proposals received.
- Request modification to proposals from any or all vendors during the contract review and negotiation.
- Negotiate any aspect of the proposal with any vendor and negotiate with more than one vendor at the same time.
- Select more than one vendor pursuant to 29 *Del. C.* §[6986](#).

Criteria Weight

All proposals shall be evaluated using the same criteria and scoring process. The following criteria shall be used by the Evaluation Team to evaluate proposals:

Criteria:	Weight
Proposals will be evaluated based upon provided responses to each of the following:	
End-of-Unit (EoU) Assessment Sections (2.1.A, 2.2.A, 2.2.B, 2.2.C, 2.2.D, 2.2.E, 2.2.F, 2.2.G)	20%
Integrative Transfer Assessment (ITA) Sections (2.3.A, 2.3.B.I, 2.3.B.II, 2.3.C, 2.3.D, 2.3.E, 2.3.F, 2.3.G, 2.3.H)	20%
Operational Administration Section(s) (3.2.B, 3.4.B, 3.4.C, 3.4.E)	20%
Technology Requirements (3.5.A, 3.5.B)	20%
Project Cost/Budget Proposal (Minimum Requirement #6)	20%
Total	100%

Vendors are encouraged to review the evaluation criteria and to provide a response that addresses each of the scored items. Evaluators will not be able to make assumptions about a vendor’s capabilities so the responding vendor should be detailed in their proposal responses.

3. Proposal Clarification

The Evaluation Team may contact any vendor in order to clarify uncertainties or eliminate confusion concerning the contents of a proposal. Proposals may not be modified as a result of any such clarification request.

4. References

The Evaluation Team may contact any customer of the vendor, whether or not included in the vendor’s reference list and use such information in the evaluation process. Additionally, the DDOE may choose to visit existing installations of comparable systems, which may or may not include vendor personnel. If the vendor is involved in such site visits, the DDOE will pay travel costs only for DDOE personnel for these visits.

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5. Oral Presentations

After initial scoring and a determination that vendor(s) are qualified to perform the required services, selected vendors may be invited to make oral presentations to the Evaluation Team. All vendor(s) selected will be given an opportunity to present to the Evaluation Team.

The selected vendors will have their presentations scored or ranked based on their ability to successfully meet the needs of the contract requirements, successfully demonstrate their product and/or service, and respond to questions about the solution capabilities.

The vendor representative(s) attending the oral presentation shall be technically qualified to respond to questions related to the proposed system and its components. All of the vendor's costs associated with participation in oral discussions and system demonstrations conducted for the DDOE are the vendor's responsibility.

D. Contract Terms and Conditions

1. Contract Use by Other Agencies

REF: Title 29, Chapter 6904(e) Delaware Code. If no state contract exists for a certain good or service, covered agencies may procure that certain good or service under another agency's contract so long as the arrangement is agreeable to all parties. Agencies, other than covered agencies, may also procure such goods or services under another agency's contract when the arrangement is agreeable to all parties.

2. General Information

- a. The term of the contract between the successful bidder and DDOE shall be for **five (5)** years with **three (3)** possible extensions for a period of **one (1) year** for each extension.
- b. The selected vendor will be required to enter into a written agreement with the DDOE. The DDOE reserves the right to incorporate standard State contractual provisions into any contract negotiated as a result of a proposal submitted in response to this RFP. Any proposed modifications to the terms and conditions of the standard contract are subject to review and approval by the DDOE. Vendors will be required to sign the contract for all services and may be required to sign additional agreements.
- c. The selected vendor or vendors will be expected to enter negotiations with the DDOE, which will result in a formal contract between parties. Procurement will be in accordance with subsequent contracted agreement. This RFP and the selected vendor's response to this RFP will be incorporated as part of any formal contract.
- d. The DDOE's standard contract (Attachment 10) will most likely be supplemented with the vendor's software license, support/maintenance, source code escrow agreements, and any other applicable agreements. The terms and conditions of these agreements will be negotiated with the finalist during actual contract negotiations.
- e. The successful vendor shall promptly execute a contract incorporating the terms of this RFP within twenty (20) days after award of the contract. No vendor is to begin any service prior to receipt of a DDOE purchase order signed by two

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authorized representatives of the agency requesting service and properly processed through the DDOE Accounting Office and the Department of Finance. The purchase order shall serve as the authorization to proceed in accordance with the bid specifications and the special instructions, once it is received by the successful vendor.

- f. If the vendor to whom the award is made fails to enter into the agreement as herein provided, the award will be annulled, and an award may be made to another vendor. Such vendor shall fulfill every stipulation embraced herein as if they were the party to whom the first award was made.

3. Collusion or Fraud

Any evidence of agreement or collusion among vendor(s) and prospective vendor(s) acting to illegally restrain freedom from competition by agreement to offer a fixed price, or otherwise, will render the offers of such vendor(s) void.

By responding, the vendor shall be deemed to have represented and warranted that its proposal is not made in connection with any competing vendor submitting a separate response to this RFP, and is in all respects fair and without collusion or fraud; that the vendor did not participate in the RFP development process and had no knowledge of the specific contents of the RFP prior to its issuance; and that no employee or official of the DDOE participated directly or indirectly in the vendor's proposal preparation.

Advance knowledge of information which gives any particular vendor advantages over any other interested vendor(s), in advance of the opening of proposals, whether in response to advertising or an employee or representative thereof, will potentially void that particular proposal.

4. Lobbying and Gratuities

Lobbying or providing gratuities shall be strictly prohibited. Vendors found to be lobbying, providing gratuities to, or in any way attempting to influence a DDOE employee or agent of the DDOE concerning this RFP or the award of a contract resulting from this RFP shall have their proposal immediately rejected and shall be barred from further participation in this RFP.

The selected vendor will warrant that no person or selling agency has been employed or retained to solicit or secure a contract resulting from this RFP upon agreement or understanding for a commission, a percentage, brokerage, or contingent fee. For breach or violation of this warranty, the DDOE shall have the right to annul any contract resulting from this RFP without liability or at its discretion deduct from the contract price or otherwise recover the full amount of such commission, percentage, brokerage, or contingent fee.

All contact with DDOE employees, contractors or agents of the DDOE concerning this RFP shall be conducted in strict accordance with the manner, form, and conditions set forth in this RFP.

5. Solicitation of State Employees

Until contract award, vendors shall not, directly or indirectly, solicit any employee of the DDOE to leave the DDOE's employ in order to accept employment with the vendor, its affiliates, actual or prospective contractors, or any person acting in

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concert with vendor, without prior written approval of the DDOE's contracting officer. Solicitation of DDOE employees by a vendor may result in rejection of the vendor's proposal.

This paragraph does not prevent the employment by a vendor of a DDOE employee who has initiated contact with the vendor. However, DDOE employees may be legally prohibited from accepting employment with the contractor or subcontractor under certain circumstances. Vendors may not knowingly employ a person who cannot legally accept employment under State or Federal law. If a vendor discovers that they have done so, they must terminate that employment immediately.

6. General Contract Terms

a. Independent Contractors

The parties to the contract shall be independent contractors to one another, and nothing herein shall be deemed to cause this agreement to create an agency, partnership, joint venture or employment relationship between parties. Each party shall be responsible for compliance with all applicable workers compensation, unemployment, disability insurance, social security withholding, and all other similar matters. Neither party shall be liable for any debts, accounts, obligations or other liability whatsoever of the other party, any other obligation of the other party to pay on the behalf of its employees or to withhold from any compensation paid to such employees any social benefits, workers compensation insurance premiums or any income or other similar taxes.

It may be at the DDOE's discretion as to the location of work for the contractual support personnel during the project period. The DDOE may provide working space and sufficient supplies and material to augment the Contractor's services.

b. Temporary Personnel are Not State Employees Unless and Until They are Hired

Vendor agrees that any individual or group of temporary staff person(s) provided to the State of Delaware pursuant to this Solicitation shall remain the employee(s) of Vendor for all purposes including any required compliance with the Affordable Care Act by the Vendor. Vendor agrees that it shall not allege, argue, or take any position that individual temporary staff person(s) provided to the State pursuant to this Solicitation must be provided any benefits, including any healthcare benefits by the State of Delaware and Vendor agrees to assume the total and complete responsibility for the provision of any healthcare benefits required by the Affordable Care Act to aforesaid individual temporary staff person(s). In the event that the Internal Revenue Service, or any other third party governmental entity determines that the State of Delaware is a dual employer or the sole employer of any individual temporary staff person(s) provided to the State of Delaware pursuant to this Solicitation, Vendor agrees to hold harmless, indemnify, and defend the State to the maximum extent of any liability to the State arising out of such determinations.

Notwithstanding the content of the preceding paragraph, should the State of Delaware subsequently directly hire any individual temporary staff employee(s) provided pursuant to this Solicitation, the aforementioned obligations to hold harmless, indemnify, and defend the State of Delaware shall cease and terminate for the period following the date of hire. Nothing herein shall be

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deemed to terminate the Vendor's obligation to hold harmless, indemnify, and defend the State of Delaware for any liability that arises out of compliance with the ACA prior to the date of hire by the State of Delaware. Vendor will waive any separation fee provided an employee works for both the vendor and hiring agency, continuously, for a three (3) month period and is provided thirty (30) days written notice of intent to hire from the agency. Notice can be issued at second month if it is the State's intention to hire.

c. ACA Safe Harbor

The State and its utilizing agencies are not the employer of temporary or contracted staff. However, the State is concerned that it could be determined to be a Common-law Employer as defined by the Affordable Care Act ("ACA"). Therefore, the State seeks to utilize the "Common-law Employer Safe Harbor Exception" under the ACA to transfer health benefit insurance requirements to the staffing company. The Common-law Employer Safe Harbor Exception can be attained when the State and/or its agencies are charged and pay for an "Additional Fee" with respect to the employees electing to obtain health coverage from the Vendor.

The Common-law Employer Safe Harbor Exception under the ACA requires that an Additional Fee must be charged to those employees who obtain health coverage from the Vendor, but does not state the required amount of the fee. The State requires that all Vendors shall identify the Additional Fee to obtain health coverage from the Vendor and delineate the Additional Fee from all other charges and fees. The Vendor shall identify both the Additional Fee to be charged and the basis of how the fee is applied (i.e. per employee, per invoice, etc.). The State will consider the Additional Fee and prior to award reserves the right to negotiate any fees offered by the Vendor. Further, the Additional Fee shall be separately scored in the proposal to ensure that neither prices charged nor the Additional Fee charged will have a detrimental effect when selecting vendor(s) for award.

d. Licenses and Permits

In performance of the contract, the vendor will be required to comply with all applicable Federal, State and local laws, ordinances, codes, and regulations. The cost of permits and other relevant costs required in the performance of the contract shall be borne by the successful vendor. The vendor shall be properly licensed and authorized to transact business in the State of Delaware as provided in 30 *Del. C.* § [2502](#).

Prior to receiving an award, the successful vendor shall either furnish the DDOE with proof of State of Delaware Business Licensure or initiate the process of application where required. An application may be requested in writing to: Division of Revenue, Carvel State Building, P.O. Box 8750, 820 N. French Street, Wilmington, DE 19899 or by telephone to one of the following numbers: (302) 577-8200—Public Service, (302) 577-8205—Licensing Department.

Information regarding the award of the contract will be given to the Division of Revenue. Failure to comply with the State of Delaware licensing requirements may subject vendor to applicable fines and/or interest penalties.

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e. Notice

Any notice to the DDOE required under the contract shall be sent by registered mail to:

Theresa Bennett; Director of Assessment
Delaware Department of Education
John Collette Education Resource Center
35 Commerce Way; Suite 1
Dover, DE 19904

f. Indemnification

1. General Indemnification

By submitting a proposal, the proposing vendor agrees that in the event it is awarded a contract, it will indemnify and otherwise hold harmless the DDOE, its agents and employees from any and all liability, suits, actions, or claims, together with all costs, expenses for attorney's fees, arising out of the vendor's, its agents and employees' performance work or services in connection with the contract, regardless of whether such suits, actions, claims or liabilities are based upon acts or failures to act attributable, whole or part, to the State, its employees or agents.

2. Proprietary Rights Indemnification

Vendor shall warrant that all elements of its solution, including all equipment, software, documentation, services and deliverables, do not and will not infringe upon or violate any patent, copyright, trade secret or other proprietary rights of any third party. In the event of any claim, suit or action by any third party against the DDOE, the DDOE shall promptly notify the vendor in writing and vendor shall defend such claim, suit or action at vendor's expense, and vendor shall indemnify the DDOE against any loss, cost, damage, expense or liability arising out of such claim, suit or action (including, without limitation, litigation costs, lost employee time, and counsel fees) whether or not such claim, suit or action is successful.

If any equipment, software, services (including methods) products or other intellectual property used or furnished by the vendor (collectively "Products") is or in vendor's reasonable judgment is likely to be, held to constitute an infringing product, vendor shall at its expense and option either:

- a. Procure the right for the DDOE to continue using the Product(s);
- b. Replace the Product with a non-infringing equivalent that satisfies all the requirements of the contract; or
- c. Modify the Product(s) to make it or them non-infringing, provided that the modification does not materially alter the functionality or efficacy of the Product or cause the Product(s) or any part of the work to fail to conform to the requirements of the Contract, or only alters the Product(s) to a degree that the DDOE agrees to and accepts in writing.

g. Insurance

1. Vendor recognizes that it is operating as an independent contractor and that it is liable for any and all losses, penalties, damages, expenses, attorney's fees, judgments, and/or settlements incurred by reason of injury to or death of

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any and all persons, or injury to any and all property, of any nature, arising out of the vendor's negligent performance under this contract, and particularly without limiting the foregoing, caused by, resulting from, or arising out of any act of omission on the part of the vendor in their negligent performance under this contract.

2. The vendor shall maintain such insurance as will protect against claims under the Worker's Compensation Act and from any other claims for damages for personal injury, including death, which may arise from operations under this contract. The vendor is an independent contractor and is not an employee of the DDOE.
3. During the term of this contract, the vendor shall, at its own expense, also carry insurance minimum limits as follows:

a.	Commercial General Liability	\$1,000,000 per occurrence / \$3,000,000 aggregate
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And at least one of the following, as outlined below:

b.	Medical or Professional Liability	\$1,000,000 per occurrence / \$3,000,000 aggregate
c.	Misc. Errors and Omissions	\$1,000,000 per occurrence / \$3,000,000 aggregate
d.	Product Liability	\$1,000,000 per occurrence / \$3,000,000 aggregate

If the contractual service requires the transportation of departmental clients or staff, the vendor shall, in addition to the above coverage's, secure at its own expense the following coverage;

a.	Automotive Liability (Bodily Injury)	\$100,000/\$300,000
b.	Automotive Property Damage (to others)	\$ 25,000

4. The vendor shall provide a Certificate of Insurance (COI) as proof that the vendor has the required insurance. The COI shall be provided prior to agency contact prior to any work being completed by the awarded vendor(s).
5. The DDOE shall not be named as an additional insured.
6. Should any of the above described policies be cancelled before the expiration date thereof, notice will be delivered in accordance with the policy provisions.

h. Performance Requirements

The selected Vendor will warrant that it possesses, or has arranged through subcontractors, all capital and other equipment, labor, materials, and licenses necessary to carry out and complete the work hereunder in compliance with any and all Federal and State laws, and County and local ordinances, regulations and codes.

i. Vendor Emergency Response Point of Contact

The awarded vendor(s) shall provide the name(s), telephone, or cell phone number(s) of those individuals who can be contacted twenty four (24) hours a day, seven (7) days a week where there is a critical need for commodities or

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services when the Governor of the DDOE declares a state of emergency under the Delaware Emergency Operations Plan or in the event of a local emergency or disaster where a state governmental entity requires the services of the vendor. Failure to provide this information could render the proposal as non-responsive.

In the event of a serious emergency, pandemic or disaster outside the control of the State, the State may negotiate, as may be authorized by law, emergency performance from the Contractor to address the immediate needs of the State, even if not contemplated under the original Contract or procurement. Payments are subject to appropriation and other payment terms.

j. Warranty

The Vendor will provide a warranty that the deliverables provided pursuant to the contract will function as designed for a period of no less than one (1) year from the date of system acceptance. The warranty shall require the Vendor correct, at its own expense, the setup, configuration, customizations or modifications so that it functions according to the State's requirements.

k. Costs and Payment Schedules

All contract costs must be as detailed specifically in the Vendor's cost proposal. No charges other than as specified in the proposal shall be allowed without written consent of the DDOE. The proposal costs shall include full compensation for all taxes that the selected vendor is required to pay.

The DDOE will require a payment schedule based on defined and measurable milestones. Payments for services will not be made in advance of work performed. The DDOE may require holdback of contract monies until acceptable performance is demonstrated (as much as 25%).

l. Penalties

The DDOE may include in the final contract penalty provisions for non-performance, such as liquidated damages.

m. Termination of Contract

The contract resulting from this RFP may be terminated as follows by the DDOE.

- 1. Termination for Cause:** If, for any reasons, or through any cause, the Vendor fails to fulfill in timely and proper manner its obligations under this Contract, or if the Vendor violates any of the covenants, agreements, or stipulations of this Contract, the State shall thereupon have the right to terminate this contract by giving written notice to the Vendor of such termination and specifying the effective date thereof, at least twenty (20) days before the effective date of such termination. In that event, all finished or unfinished documents, data, studies, surveys, drawings, maps, models, photographs, and reports or other material prepared by the Vendor under this Contract shall, at the option of the State, become its property, and the Vendor shall be entitled to receive just and equitable compensation for any satisfactory work completed on such documents and other materials which is usable to the State.

On receipt of the contract cancellation notice from the State, the Vendor shall have no less than five (5) days to provide a written response and may identify a

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method(s) to resolve the violation(s). A vendor response shall not affect or prevent the contract cancellation unless the State provides a written acceptance of the vendor response. If the State does accept the Vendor's method and/or action plan to correct the identified deficiencies, the State will define the time by which the Vendor must fulfill its corrective obligations. Final retraction of the State's termination for cause will only occur after the Vendor successfully rectifies the original violation(s). At its discretion the State may reject in writing the Vendor's proposed action plan and proceed with the original contract cancellation timeline.

2. **Termination for Convenience:** The State may terminate this Contract at any time by giving written notice of such termination and specifying the effective date thereof, at least twenty (20) days before the effective date of such termination. In that event, all finished or unfinished documents, data, studies, surveys, drawings, models, photographs, reports, supplies, and other materials shall, at the option of the State, become its property and the Vendor shall be entitled to receive compensation for any satisfactory work completed on such documents and other materials which are usable to the State.
 3. **Termination for Non-Appropriations:** In the event the General Assembly fails to appropriate the specific funds necessary to enter into or continue the contractual agreement, in whole or part, the agreement shall be terminated as to any obligation of the State requiring the expenditure of money for which no specific appropriation is available at the end of the last fiscal year for which no appropriation is available or upon the exhaustion of funds. This is not a termination for convenience and will not be converted to such.
- n. Non-discrimination**
In performing the services subject to this RFP the vendor, as set forth in Title 19 Delaware Code Chapter 7 section [711](#), will agree that it will not discriminate against any employee or applicant with respect to compensation, terms, conditions or privileges of employment because of such individual's race, marital status, genetic information, color, age, religion, sex, sexual orientation, gender identity, or national origin. The successful vendor shall comply with all Federal and State laws, regulations and policies pertaining to the prevention of discriminatory employment practice. Failure to perform under this provision constitutes a material breach of contract.
- o. Covenant against Contingent Fees**
The successful vendor will warrant that no person or selling agency has been employed or retained to solicit or secure this contract upon an agreement of understanding for a commission or percentage, brokerage or contingent fee excepting bona-fide employees, bona-fide established commercial, or bona-fide selling agencies maintained by the Vendor for the purpose of securing business. For breach or violation of this warranty the DDOE shall have the right to annul the contract without liability or at its discretion to deduct from the contract price or otherwise recover the full amount of such commission, percentage, brokerage or contingent fee.
- p. Vendor Activity**

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No activity is to be executed in an off shore facility, either by a subcontracted firm or a foreign office or division of the vendor. The vendor must attest to the fact that no activity will take place outside of the United States in its transmittal letter. Failure to adhere to this requirement is cause for elimination from future consideration.

q. Vendor Responsibility

The State will enter into a contract with the successful Vendor(s). The successful Vendor(s) shall be responsible for all products and services as required by this ITB whether or not the Vendor or its subcontractor provided final fulfillment of the order. Subcontractors, if any, shall be clearly identified in the Vendor's proposal by completing Attachment 6, and are subject the approval and acceptance of the DDOE.

r. Personnel, Equipment and Services

1. The Vendor represents that it has, or will secure at its own expense, all personnel required to perform the services required under this contract.
2. All of the equipment and services required hereunder shall be provided by or performed by the Vendor or under its direct supervision, and all personnel, including subcontractors, engaged in the work shall be fully qualified and shall be authorized under State and local law to perform such services.
3. None of the equipment and/or services covered by this contract shall be subcontracted without the prior written approval of the State. Only those subcontractors identified in Attachment 6 are considered approved upon award. Changes to those subcontractor(s) listed in Attachment 6 must be approved in writing by the State.

s. Fair Background Check Practices

Pursuant to 29 Del. C. [§6909B](#) and effective November 4, 2014 the State does not consider the criminal record, criminal history, credit history or credit score of an applicant for state employment during the initial application process unless otherwise required by State and/or Federal law. Vendors doing business with the State are encouraged to adopt fair background check practices. Vendors can refer to 19 Del. C. [§711\(g\)](#) for applicable established provisions.

t. Work Product

All materials and products developed under the executed contract by the vendor are the sole and exclusive property of the State. The vendor will seek written permission to use any product created under the contract.

u. Contract Documents

The RFP, the purchase order, the executed contract (sample attached as Attachment 10) and any supplemental documents between the DDOE and the successful vendor shall constitute the contract between the DDOE and the vendor. In the event there is any discrepancy between any of these contract documents, the following order of documents governs so that the former prevails over the latter: contract, DDOE's RFP, Vendor's response to the RFP and purchase order. No other documents shall be considered. These documents will constitute the entire agreement between the DDOE and the vendor.

v. Applicable Law

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The laws of the State of Delaware shall apply, except where Federal Law has precedence. The successful vendor consents to jurisdiction and venue in the State of Delaware.

In submitting a proposal, Vendors certify that they comply with all Federal, State and local laws applicable to its activities and obligations including:

1. the laws of the State of Delaware;
2. the applicable portion of the Federal Civil Rights Act of 1964;
3. the Equal Employment Opportunity Act and the regulations issued there under by the federal government;
4. a condition that the proposal submitted was independently arrived at, without collusion, under penalty of perjury; and
5. that programs, services, and activities provided to the general public under resulting contract conform to the Americans with Disabilities Act of 1990, and the regulations issued there under by the federal government.

If any vendor fails to comply with (1) through (5) of this paragraph, the DDOE reserves the right to disregard the proposal, terminate the contract, or consider the vendor in default.

The selected vendor shall keep itself fully informed of and shall observe and comply with all applicable existing Federal and State laws, and County and local ordinances, regulations and codes, and those laws, ordinances, regulations, and codes adopted during its performance of the work.

w. Severability

If any term or provision of this Agreement is found by a court of competent jurisdiction to be invalid, illegal or otherwise unenforceable, the same shall not affect the other terms or provisions hereof or the whole of this Agreement, but such term or provision shall be deemed modified to the extent necessary in the court's opinion to render such term or provision enforceable, and the rights and obligations of the parties shall be construed and enforced accordingly, preserving to the fullest permissible extent the intent and agreements of the parties herein set forth.

x. Scope of Agreement

If the scope of any provision of the contract is determined to be too broad in any respect whatsoever to permit enforcement to its full extent, then such provision shall be enforced to the maximum extent permitted by law, and the parties hereto consent and agree that such scope may be judicially modified accordingly and that the whole of such provisions of the contract shall not thereby fail, but the scope of such provisions shall be curtailed only to the extent necessary to conform to the law.

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y. Affirmation

The Vendor must affirm that within the past five (5) years the firm or any officer, controlling stockholder, partner, principal, or other person substantially involved in the contracting activities of the business is not currently suspended or debarred and is not a successor, subsidiary, or affiliate of a suspended or debarred business.

z. Audit Access to Records

The Vendor shall maintain books, records, documents, and other evidence pertaining to this Contract to the extent and in such detail as shall adequately reflect performance hereunder. The Vendor agrees to preserve and make available to the State, upon request, such records for a period of five (5) years from the date services were rendered by the Vendor. Records involving matters in litigation shall be retained for one (1) year following the termination of such litigation. The Vendor agrees to make such records available for inspection, audit, or reproduction to any official State representative in the performance of their duties under the Contract. Upon notice given to the Vendor, representatives of the State or other duly authorized State or Federal agency may inspect, monitor, and/or evaluate the cost and billing records or other material relative to this Contract. The cost of any Contract audit disallowances resulting from the examination of the Vendor's financial records will be borne by the Vendor. Reimbursement to the State for disallowances shall be drawn from the Vendor's own resources and not charged to Contract cost or cost pools indirectly charging Contract costs.

aa. Other General Conditions

1. **Current Version** – “Packaged” application and system software shall be the most current version generally available as of the date of the physical installation of the software.
2. **Current Manufacture** – Equipment specified and/or furnished under this specification shall be standard products of manufacturers regularly engaged in the production of such equipment and shall be the manufacturer’s latest design. All material and equipment offered shall be new and unused.
3. **Volumes and Quantities** – Activity volume estimates and other quantities have been reviewed for accuracy; however, they may be subject to change prior or subsequent to award of the contract.
4. **Prior Use** – The DDOE reserves the right to use equipment and material furnished under this proposal prior to final acceptance. Such use shall not constitute acceptance of the work or any part thereof by the DDOE.
5. **Status Reporting** – The selected vendor will be required to lead and/or participate in status meetings and submit status reports covering such items as progress of work being performed, milestones attained, resources expended, problems encountered and corrective action taken, until final system acceptance.
6. **Regulations** – All equipment, software and services must meet all applicable local, State and Federal regulations in effect on the date of the contract.

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7. **Changes** – No alterations in any terms, conditions, delivery, price, quality, or specifications of items ordered will be effective without the written consent of the DDOE.
8. **Purchase Orders** – Agencies that are part of the First State Financial (FSF) system are required to identify the contract number on all Purchase Orders (P.O.) and shall complete the same when entering P.O. information in the State's financial reporting system.
9. **Additional Terms and Conditions** – The DDOE reserves the right to add terms and conditions during the contract negotiations.

bb. Assignment of Antitrust Claims

As consideration for the award and execution of this contract by the State, the Vendor hereby grants, conveys, sells, assigns, and transfers to the State of Delaware all of its right, title and interest in and to all known or unknown causes of action it presently has or may now or hereafter acquire under the antitrust laws of the United States and the State of Delaware, regarding the specific goods or services purchased or acquired for the State pursuant to this contract. Upon either the State's or the Vendor notice of the filing of or reasonable likelihood of filing of an action under the antitrust laws of the United States or the State of Delaware, the State and Vendor shall meet and confer about coordination of representation in such action.

cc. Technology Standards

The selected vendor shall be responsible for the professional quality, technical accuracy, timely completion, and coordination of all services furnished by it, its subcontractors and its and their principals, officers, employees and agents under this Agreement. Vendor shall provide system diagrams in accordance with State Architecture requirements at <http://state.extranet.dti.state.de.us/documents/SystemArchitectureStandard.pdf> . In performing the specified services, Vendor shall follow practices consistent with generally accepted professional and technical standards. Vendor shall be responsible for ensuring that all services, products and deliverables furnished pursuant to this Agreement comply with the standards promulgated by the Department of Technology and Information ("DTI") published at <http://dti.delaware.gov/information/standards-policies.shtml>, and as modified from time to time by DTI during the term of this Agreement. Vendor will integrate all delivered services and systems with the DDOE Identity Management System and Single-Sign On system. If any service, product or deliverable furnished pursuant to this Agreement does not conform to DTI standards, Vendor shall, at its expense and option either (1) replace it with a conforming equivalent or (2) modify it to conform to DTI standards. Vendor shall be and remain liable in accordance with the terms of this Agreement and applicable law for all damages to DDOE caused by Vendor's failure to ensure compliance with DTI standards.

E. RFP Miscellaneous Information

1. No Press Releases or Public Disclosure

The DDOE reserves the right to pre-approve any news or broadcast advertising releases concerning this solicitation, the resulting contract, the work performed, or any reference to the DDOE with regard to any project or contract performance. Any

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such news or advertising releases pertaining to this solicitation or resulting contract shall require the prior express written permission of the DDOE.

The State will not prohibit or otherwise prevent the awarded vendor(s) from direct marketing to the State of Delaware agencies, departments, municipalities, and/or any other political subdivisions; however, the Vendor shall not use the State's seal or imply preference for the solution or goods provided.

2. Definitions of Requirements

To prevent any confusion about identifying requirements in this RFP, the following definition is offered: The words *shall*, *will* and/or *must* are used to designate a mandatory requirement. Vendors must respond to all mandatory requirements presented in the RFP. Failure to respond to a mandatory requirement may cause the disqualification of your proposal.

3. Production Environment Requirements

The DDOE requires that all hardware, system software products, and application software products included in proposals be currently in use in a production environment by at least three other customers, have been in use for at least six months, and have been generally available from the manufacturers for a period of six months. Unreleased or beta test hardware, system software, or application software will not be acceptable.

F. Attachments

The following attachments and appendixes shall be considered part of the solicitation:

- Attachment 1 – No Proposal Reply Form
- Attachment 2 – Non-Collusion Statement
- Attachment 3 – Exceptions
- Attachment 4 – Confidentiality and Proprietary Information
- Attachment 5 – Business References
- Attachment 6 – Subcontractor Information Form
- Attachment 7 – Subcontracting (2nd Tier Spend) Report
- Attachment 8 – Employing Delawareans Report
- Attachment 9 – Office of Supplier Diversity Information
- Attachment 10 – DDOE's Standard Contract Template
- Appendix A – Minimum Mandatory Submission Requirements
- Appendix B – Topical Arrangement of the Standards
- Appendix C – Task Type Organizer (DRAFT)
- Appendix D – Cognitive Interview Summary (DRAFT)
- Appendix E – Integrated Item Cluster Exemplars (5, 8 and HS Biology) [DRAFTS]

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IMPORTANT – PLEASE NOTE

- **Attachments 2, 3, 4, 5 and 8 must be included in your proposal**
- Attachment 6 must be included in your proposal if subcontractors will be involved
- Attachment 7 represents required reporting on the part of awarded vendors. Those bidders receiving an award will be provided with an active spreadsheet for reporting.

REQUIRED REPORTING

One of the primary goals in administering this contract is to keep accurate records regarding its actual value/usage. This information is essential in order to update the contents of the contract and to establish proper bonding levels if they are required. The integrity of future contracts revolves around our ability to convey accurate and realistic information to all interested parties.

Accurate 2nd tier reports shall be submitted to the contracting Agency's Office of Supplier Diversity at vendorusage@state.de.us on the 15th (or next business day) of the month following each quarterly period. For consistency quarters shall be considered to end the last day of March, June, September and December of each calendar year. Contract spend during the covered periods shall result in a report even if the contract has expired by the report due date.

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Attachment 1

NO PROPOSAL REPLY FORM

Contract No. 2017-16

Contract Title: Next Generation Science
Assessment System for Delaware
Learners Phase II: Development and
Implementation

To assist us in obtaining good competition on our Request for Proposals, we ask that each firm that has received a proposal, but does not wish to bid, state their reason(s) below and return in a clearly marked envelope displaying the contract number. This information will not preclude receipt of future invitations unless you request removal from the Vendor's List by so indicating below, or do not return this form or bona fide proposal.

Unfortunately, we must offer a "No Proposal" at this time because:

- _____ 1. We do not wish to participate in the proposal process.

- _____ 2. We do not wish to bid under the terms and conditions of the Request for Proposal document. Our objections are:

- _____ 3. We do not feel we can be competitive.

- _____ 4. We cannot submit a Proposal because of the marketing or franchising policies of the manufacturing company.

- _____ 5. We do not wish to sell to the State. Our objections are:

- _____ 6. We do not sell the items/services on which Proposals are requested.

- _____ 7. Other: _____

FIRM NAME

SIGNATURE

_____ We wish to remain on the Vendor's List **for these goods or services.**

_____ We wish to be deleted from the Vendor's List **for these goods or services.**

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Attachment 2

CONTRACT NO.: 2017-16

CONTRACT TITLE: Next Generation Science Assessment System for Delaware Learners Phase II: Development and Implementation

OPENING DATE: July 20, 2017 at 2:00 PM (Local Time)

NON-COLLUSION STATEMENT

This is to certify that the undersigned Vendor has neither directly nor indirectly, entered into any agreement, participated in any collusion or otherwise taken any action in restraint of free competitive bidding in connection with this proposal, **and further certifies that it is not a sub-contractor to another Vendor who also submitted a proposal as a primary Vendor in response to this solicitation** submitted this date to the State of Delaware Department of Education

It is agreed by the undersigned Vendor that the signed delivery of this bid represents the Vendor's acceptance of the terms and conditions of this solicitation including all specifications and special provisions.

NOTE: Signature of the authorized representative **MUST** be of an individual who legally may enter his/her organization into a formal contract with the State of Delaware Department of Education.

COMPANY NAME _____ (Check one)

	Corporation
	Partnership
	Individual

NAME OF AUTHORIZED REPRESENTATIVE
(Please type or print) _____

SIGNATURE _____ TITLE _____

COMPANY ADDRESS _____

PHONE NUMBER _____ FAX NUMBER _____

EMAIL ADDRESS _____

FEDERAL E.I. NUMBER _____ STATE OF DELAWARE LICENSE NUMBER _____

COMPANY CLASSIFICATIONS: CERT. NO.:	Certification type(s)	Circle all that apply	
	Minority Business Enterprise (MBE)	Yes	No
Woman Business Enterprise (WBE)	Yes	No	
Disadvantaged Business Enterprise (DBE)	Yes	No	
Veteran Owned Business Enterprise (VOBE)	Yes	No	
Service Disabled Veteran Owned Business Enterprise (SDVOBE)	Yes	No	

[The above table is for informational and statistical use only.]

PURCHASE ORDERS SHOULD BE SENT TO:
(COMPANY NAME) _____

ADDRESS _____

CONTACT _____

PHONE NUMBER _____ FAX NUMBER _____

EMAIL ADDRESS _____

AFFIRMATION: Within the past five years, has your firm, any affiliate, any predecessor company or entity, owner, Director, officer, partner or proprietor been the subject of a Federal, State, Local government suspension or debarment?

YES _____ NO _____ if yes, please explain _____

THIS PAGE SHALL HAVE ORIGINAL SIGNATURE, BE NOTARIZED AND BE RETURNED WITH YOUR PROPOSAL

SWORN TO AND SUBSCRIBED BEFORE ME this _____ day of _____, 20 _____

Notary Public _____ My commission expires _____

City of _____ County of _____ State of _____

Contract No. 2017-16
Contract Title: Next Generation Science Assessment System for Delaware Learners Phase II: Development and Implementation

CONFIDENTIAL INFORMATION FORM

By checking this box, the Vendor acknowledges that they are not providing any information they declare to be confidential or proprietary for the purpose of production under 29 Del. C. ch. 100, Delaware Freedom of Information Act.

Confidentiality and Proprietary Information

Note: use additional pages as necessary.

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Attachment 5

Contract No. 2017-16

Contract Title: Next Generation Science Assessment System for Delaware Learners Phase II: Development and Implementation

BUSINESS REFERENCES

List a minimum of three business references, including the following information:

- Business name and mailing address
- Contact name and phone number
- Number of years doing business with
- Type of work performed

Please do not list any State Employee as a business reference. If you have held a State contract within the last 5 years, please provide a separate list of the contract(s).

1.	Contact Name & Title:	
	Business Name:	
	Address:	
	Email:	
	Phone # / Fax #:	
	Current Vendor (YES or NO):	
	Years Associated & Type of Work Performed:	

2.	Contact Name & Title:	
	Business Name:	
	Address:	
	Email:	
	Phone # / Fax #:	
	Current Vendor (YES or NO):	
	Years Associated & Type of Work Performed:	

3.	Contact Name & Title:	
	Business Name:	
	Address:	
	Email:	
	Phone # / Fax #:	
	Current Vendor (YES or NO):	
	Years Associated & Type of Work Performed:	

STATE OF DELAWARE PERSONNEL MAY NOT BE USED AS REFERENCES.

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Attachment 6

SUBCONTRACTOR INFORMATION FORM

PART I – STATEMENT BY PROPOSING VENDOR

1. CONTRACT NO. <u>2017-16</u>	2. Proposing Vendor Name:	3. Mailing Address
4. SUBCONTRACTOR		
a. NAME	4c. Company OSD Classification: Certification Number: _____	
b. Mailing Address:	4d. Women Business Enterprise <input type="checkbox"/> Yes <input type="checkbox"/> No 4e. Minority Business Enterprise <input type="checkbox"/> Yes <input type="checkbox"/> No 4f. Disadvantaged Business Enterprise <input type="checkbox"/> Yes <input type="checkbox"/> No 4g. Veteran Owned Business Enterprise <input type="checkbox"/> Yes <input type="checkbox"/> No 4h. Service Disabled Veteran Owned Business Enterprise <input type="checkbox"/> Yes <input type="checkbox"/> No	
5. DESCRIPTION OF WORK BY SUBCONTRACTOR		
6a. NAME OF PERSON SIGNING	7. BY (<i>Signature</i>)	8. DATE SIGNED
6b. TITLE OF PERSON SIGNING		
PART II – ACKNOWLEDGEMENT BY SUBCONTRACTOR		
9a. NAME OF PERSON SIGNING	10. BY (<i>Signature</i>)	11. DATE SIGNED
9b. TITLE OF PERSON SIGNING		

* Use a separate form for each subcontractor

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Attachment 7

SAMPLE REPORT - FOR ILLUSTRATION PURPOSES ONLY

State of Delaware																		
Subcontracting (2nd tier) Quarterly Report																		
Prime Name:							Report Start Date:											
Contract Name/Number							Report End Date:											
Contact Name:							Today's Date:											
Contact Phone:							*Minimum Required			Requested detail								
Vendor Name*	Vendor Tax ID*	Contract Name/Number*	Vendor Contract Name*	Vendor Contract Phone*	Report Start Date*	Report End Date*	Amount Paid to Subcontractor*	Work Performed by Subcontractor UNSPSC	M/WB E Certifying Agency	Veteran /Service Disabled Veteran Certifying Agency	2nd tier Supplier Name	2nd tier Supplier Address	2nd tier Supplier Phone Number	2nd tier Supplier email	Description of Work Performed	2nd tier Supplier Tax Id		

Note: A copy of the Subcontracting Quarterly Report will be sent by electronic mail to the Awarded Vendor.

Completed reports shall be saved in an Excel format, and submitted to the following email address: vendorusage@state.de.us

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Attachment 8

Contract No. **2017-16**
Contract Title: **Next Generation Science Assessment System for Delaware Learners**
Phase II: Development and Implementation

EMPLOYING DELAWAREANS REPORT

As required by House Bill # 410 (Bond Bill) of the 146th General Assembly and under Section 30, No bid for any public works or professional services contract shall be responsive unless the prospective bidder discloses its reasonable, good-faith determination of:

1. Number of employees reasonable anticipated to be employed on the project:

2. Number and percentage of such employees who are bona fide legal residents of Delaware: _____

Percentage of such employees who are bona fide legal residents of Delaware:

3. Total number of employees of the bidder: _____
4. Total percentage of employees who are bona fide residents of Delaware:

If subcontractors are to be used:

1. Number of employees who are residents of Delaware: _____
2. Percentage of employees who are residents of Delaware: _____

“Bona fide legal resident of this State” shall mean any resident who has established residence of at least 90 days in the State.

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Attachment 9

State of Delaware
Office of Supplier Diversity
Certification Application

The most recent application can be downloaded from the following site:
<http://gss.omb.delaware.gov/osd/certify.shtml>

Submission of a completed Office of Supplier Diversity (OSD) application is optional and does not influence the outcome of any award decision.

The minimum criteria for certification require the entity must be at least 51% owned and actively managed by a person or persons who are eligible: minorities, women, veterans, and/or service disabled veterans. Any one or all of these categories may apply to a 51% owner.



Complete application and mail, email or fax to:

Office of Supplier Diversity (OSD)
100 Enterprise Place, Suite 4
Dover, DE 19904-8202
Telephone: (302) 857-4554 Fax: (302) 677-7086
Email: osd@state.de.us
Web site: <http://gss.omb.delaware.gov/osd/index.shtml>

**THE OSD ADDRESS IS FOR OSD APPLICATIONS ONLY.
NO BID RESPONSE PACKAGES WILL BE ACCEPTED BY THE OSD.**

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Attachment 10-

DOE CONTRACT TEMPLATE
**Next Generation Science Assessment System for Delaware Learners Phase II:
Development and Implementation #2017-16**

This Agreement ("Agreement") is effective only upon the execution of a State of Delaware Purchase Order and will end on **insert end date**, 20__, by and between the State of Delaware, Department of Education, hereafter referred to as DDOE, and ***Vendor Name***, hereafter referred to as

WHEREAS, DDOE desires to obtain certain services to **insert description of services**; and

WHEREAS, VENDOR NAME desires to provide such services to DDOE on the terms set forth below;

WHEREAS, DDOE and VENDOR NAME represent and warrant that each party has full right, power and authority to enter into and perform under this Agreement;

FOR AND IN CONSIDERATION OF the premises and mutual agreements herein, DDOE and VENDOR NAME agree as follows:

1. Services.

1.1 VENDOR NAME shall perform for DDOE the services specified in the Appendices to this Agreement, attached hereto and made a part hereof.

1.2 Any conflict or inconsistency between the provisions of the following documents shall be resolved by giving precedence to such documents in the following order: (a) this Agreement (including any amendments or modifications thereto); (b) DDOE's request for proposals, attached hereto as Appendix___; and (c) VENDOR NAME's response to the request for proposals, attached hereto as Appendix _____. The aforementioned documents are specifically incorporated into this Agreement and made a part hereof.

1.3 DDOE may, at any time, by written order, make changes in the scope of this Agreement and in the services or work to be performed. No services for which additional compensation may be charged by VENDOR NAME shall be furnished without the written authorization of DDOE. When DDOE desires any addition or deletion to the deliverables or a change in the Services to be provided under this Agreement, it shall notify VENDOR NAME, who shall then submit to DDOE a "Change Order" for approval authorizing said change. The Change Order shall state whether the change shall cause an alteration in the price or the time required by VENDOR NAME for any aspect of its performance under this Agreement. Pricing of changes shall be consistent with those established within this Agreement.

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1.4 VENDOR NAME will not be required to make changes to its scope of work that result in VENDOR NAME's costs exceeding the current unencumbered budgeted appropriations for the services. Any claim of either party for an adjustment under Section 1 of this Agreement shall be asserted in the manner specified in the writing that authorizes the adjustment.

2. Payment for Services and Expenses.

2.1 The term of the initial contract shall be from the execution of this agreement and a State of Delaware Purchase Order through _____, 20__.

2.2 DDOE will pay VENDOR NAME for the performance of services described in Appendix A, Statement of Work. The fee will be paid in accordance with the payment schedule attached hereto as part of Appendix__.

2.3 DDOE's obligation to pay VENDOR NAME for the performance of services described in Appendix A, Statement of Work will not exceed the fixed fee amount of \$ _____. It is expressly understood that the work defined in the appendices to this Agreement must be completed by VENDOR NAME and it shall be VENDOR NAME's responsibility to ensure that hours and tasks are properly budgeted so that all services are completed for the agreed upon fixed fee. DDOE's total liability for all charges for services that may become due under this Agreement is limited to the total maximum expenditure(s) authorized in DDOE's purchase order(s) to VENDOR NAME.

2.4 VENDOR NAME shall submit monthly invoices to DDOE in sufficient detail to support the services provided during the previous month. DDOE agrees to pay those invoices within thirty (30) days of receipt. In the event DDOE disputes a portion of an invoice, DDOE agrees to pay the undisputed portion of the invoice within thirty (30) days of receipt and to provide VENDOR NAME a detailed statement of DDOE's position on the disputed portion of the invoice within thirty (30) days of receipt. DDOE's failure to pay any amount of an invoice that is not the subject of a good-faith dispute within thirty (30) days of receipt shall entitle VENDOR NAME to charge interest on the overdue portion at no more than 1.0% per month or 12% per annum. All payments should be sent to VENDOR NAME, VENDOR ADDRESS.

2.5 Unless provided otherwise in an Appendix, all expenses incurred in the performance of the services are to be paid by VENDOR NAME. If an Appendix specifically provides for expense reimbursement, VENDOR NAME shall be reimbursed only for reasonable expenses incurred by VENDOR NAME in the performance of the services, including, but not necessarily limited to, travel and lodging expenses, communications charges, and computer time and supplies.

2.6 DDOE is a sovereign entity, and shall not be liable for the payment of Federal, State and local sales, use and excise taxes, including any interest and

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penalties from any related deficiency, which may become due and payable as a consequence of this Agreement.

2.7 DDOE shall subtract from any payment made to VENDOR NAME all damages, costs and expenses caused by VENDOR NAME's negligence, resulting from or arising out of errors or omissions in VENDOR NAME's work products, which have not been previously paid to VENDOR NAME.

2.8 Invoices shall be submitted to:

3. Responsibilities of VENDOR NAME.

3.1 VENDOR NAME shall be responsible for the professional quality, technical accuracy, timely completion, and coordination of all services furnished by VENDOR NAME, its subcontractors and its and their principals, officers, employees and agents under this Agreement. In performing the specified services, VENDOR NAME shall follow practices consistent with generally accepted professional and technical standards. VENDOR NAME shall be responsible for ensuring that all services, products and deliverables furnished pursuant to this Agreement comply with the standards promulgated by the Department of Technology and Information ("DTI") published at <http://dti.delaware.gov/> and as modified from time to time by DTI during the term of this Agreement. If any service, product or deliverable furnished pursuant to this Agreement does not conform with DTI standards, VENDOR NAME shall, at its expense and option either (1) replace it with a conforming equivalent or (2) modify it to conform with DTI standards. VENDOR NAME shall be and remain liable in accordance with the terms of this Agreement and applicable law for all damages to DDOE caused by VENDOR NAME's failure to ensure compliance with DTI standards.

3.2 It shall be the duty of the VENDOR NAME to assure that all products of its effort are technically sound and in conformance with all pertinent Federal, State and Local statutes, codes, ordinances, resolutions and other regulations. VENDOR NAME will not produce a work product that violates or infringes on any copyright or patent rights. VENDOR NAME shall, without additional compensation, correct or revise any errors or omissions in its work products.

3.3 Permitted or required approval by DDOE of any products or services furnished by VENDOR NAME shall not in any way relieve VENDOR NAME of responsibility for the professional and technical accuracy and adequacy of its work. DDOE's review, approval, acceptance, or payment for any of VENDOR NAME's services herein shall not be construed to operate as a waiver of any rights under this Agreement or of any cause of action arising out of the performance of this Agreement, and VENDOR NAME shall be and remain liable in accordance with the terms of this Agreement and applicable law for all damages to DDOE caused by VENDOR NAME's performance or failure to perform under this Agreement.

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3.4 VENDOR NAME shall appoint a Project Manager who will manage the performance of services. All of the services specified by this Agreement shall be performed by the Project Manager, or by VENDOR NAME's associates and employees under the personal supervision of the Project Manager. The positions anticipated include:

Project	Team	Title	% of Project Involvement
---------	------	-------	--------------------------

3.5 Designation of persons for each position is subject to review and approval by DDOE. Should the staff need to be diverted off the project for what are now unforeseeable circumstances, VENDOR NAME will notify DDOE immediately and work out a transition plan that is acceptable to both parties, as well as agree to an acceptable replacement plan to fill or complete the work assigned to this project staff position. Replacement staff persons are subject to review and approval by DDOE. If VENDOR NAME fails to make a required replacement within 30 days, DDOE may terminate this Agreement for default. Upon receipt of written notice from DDOE that an employee of VENDOR NAME is unsuitable to DDOE for good cause, VENDOR NAME shall remove such employee from the performance of services and substitute in his/her place a suitable employee.

3.6 VENDOR NAME shall furnish to DDOE's designated representative copies of all correspondence to regulatory agencies for review prior to mailing such correspondence.

3.7 VENDOR NAME agrees that its officers and employees will cooperate with DDOE in the performance of services under this Agreement and will be available for consultation with DDOE at such reasonable times with advance notice as to not conflict with their other responsibilities.

3.8 VENDOR NAME has or will retain such employees as it may need to perform the services required by this Agreement. Such employees shall not be employed by the State of Delaware or any other political subdivision of the State.

3.9 VENDOR NAME will not use DDOE's name, either express or implied, in any of its advertising or sales materials without DDOE's express written consent.

3.10 The rights and remedies of DDOE provided for in this Agreement are in addition to any other rights and remedies provided by law.

4. Time Schedule.

4.1 A project schedule is included in Appendix A.

4.2 Any delay of services or change in sequence of tasks must be approved in writing by DDOE.

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4.3 In the event that **VENDOR NAME** fails to complete the project or any phase thereof within the time specified in the Contract, or with such additional time as may be granted in writing by DDOE, or fails to prosecute the work, or any separable part thereof, with such diligence as will insure its completion within the time specified in this Agreement or any extensions thereof, DDOE shall suspend the payments scheduled as set forth in Appendix A.

5. State Responsibilities.

5.1 In connection with **VENDOR NAME**'s provision of the Services, DDOE shall perform those tasks and fulfill those responsibilities specified in the appropriate Appendices.

5.2 DDOE agrees that its officers and employees will cooperate with **VENDOR NAME** in the performance of services under this Agreement and will be available for consultation with **VENDOR NAME** at such reasonable times with advance notice as to not conflict with their other responsibilities.

5.3 The services performed by **VENDOR NAME** under this Agreement shall be subject to review for compliance with the terms of this Agreement by DDOE's designated representatives. DDOE representatives may delegate any or all responsibilities under the Agreement to appropriate staff members, and shall so inform **VENDOR NAME** by written notice before the effective date of each such delegation.

5.4 The review comments of DDOE's designated representatives may be reported in writing as needed to **VENDOR NAME**. It is understood that DDOE's representatives' review comments do not relieve **VENDOR NAME** from the responsibility for the professional and technical accuracy of all work delivered under this Agreement.

5.5 DDOE shall, without charge, furnish to or make available for examination or use by **VENDOR NAME** as it may request, any data which DDOE has available, including as examples only and not as a limitation:

- a. Copies of reports, surveys, records, and other pertinent documents;
- b. Copies of previously prepared reports, job specifications, surveys, records, ordinances, codes, regulations, other document, and information related to the services specified by this Agreement.

VENDOR NAME shall return any original data provided by DDOE.

5.6 DDOE shall assist **VENDOR NAME** in obtaining data on documents from public officers or agencies and from private citizens and business firms whenever such material is necessary for the completion of the services specified by this Agreement.

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5.7 VENDOR NAME will not be responsible for accuracy of information or data supplied by DDOE or other sources to the extent such information or data would be relied upon by a reasonably prudent contractor.

5.8 DDOE agrees not to use VENDOR NAME's name, either express or implied, in any of its advertising or sales materials. VENDOR NAME reserves the right to reuse the nonproprietary data and the analysis of industry-related information in its continuing analysis of the industries covered.

6. Work Product.

6.1 All materials, information, documents, and reports, whether finished, unfinished, or draft, developed, prepared, completed, or acquired by VENDOR NAME for DDOE relating to the services to be performed hereunder shall become the property of DDOE and shall be delivered to DDOE's designated representative upon completion or termination of this Agreement, whichever comes first. VENDOR NAME shall not be liable for damages, claims, and losses arising out of any reuse of any work products on any other project conducted by DDOE. DDOE shall have the right to reproduce all documentation supplied pursuant to this Agreement.

6.2 VENDOR NAME retains all title and interest to the data it furnished and/or generated pursuant to this Agreement. Retention of such title and interest does not conflict with DDOE's rights to the materials, information and documents developed in performing the project. Upon final payment, DDOE shall have a perpetual, nontransferable, non-exclusive paid-up right and license to use, copy, modify and prepare derivative works of all materials in which VENDOR NAME retains title, whether individually by VENDOR NAME or jointly with DDOE. Any and all source code developed in connection with the services provided will be provided to DDOE, and the aforementioned right and license shall apply to source code. The parties will cooperate with each other and execute such other documents as may be reasonably deemed necessary to achieve the objectives of this Section.

6.3 In no event shall VENDOR NAME be precluded from developing for itself, or for others, materials that are competitive with the Deliverables, irrespective of their similarity to the Deliverables. In addition, VENDOR NAME shall be free to use its general knowledge, skills and experience, and any ideas, concepts, know-how, and techniques within the scope of its consulting practice that are used in the course of providing the services.

6.4 Notwithstanding anything to the contrary contained herein or in any attachment hereto, any and all intellectual property or other proprietary data owned by VENDOR NAME prior to the effective date of this Agreement ("Preexisting Information") shall remain the exclusive property of VENDOR NAME even if such Preexisting Information is embedded or otherwise incorporated into materials or products first produced as a result of this Agreement or used to develop such materials or products. DDOE's rights under this section shall not apply to any Preexisting Information or any component thereof regardless of form or media.

7. Confidential Information.

To the extent permissible under 29 *Del. C.* § 10001, et seq., the parties to this Agreement shall preserve in strict confidence any information, reports or documents obtained, assembled or prepared in connection with the performance of this Agreement.

8. Warranty.

8.1 VENDOR NAME warrants that its services will be performed in a good and workmanlike manner. VENDOR NAME agrees to re-perform any work not in compliance with this warranty brought to its attention within a reasonable time after that work is performed.

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8.2 Third-party products within the scope of this Agreement are warranted solely under the terms and conditions of the licenses or other agreements by which such products are governed. With respect to all third-party products and services purchased by VENDOR NAME for DDOE in connection with the provision of the Services, VENDOR NAME shall pass through or assign to DDOE the rights VENDOR NAME obtains from the manufacturers and/or vendors of such products and services (including warranty and indemnification rights), all to the extent that such rights are assignable.

9. Indemnification; Limitation of Liability.

9.1 VENDOR NAME shall indemnify and hold harmless the State, its agents and employees, from any and all liability, suits, actions or claims, together with all reasonable costs and expenses (including attorneys' fees) directly arising out of (A) the negligence or other wrongful conduct of the VENDOR NAME, its agents or employees, or (B) VENDOR NAME's breach of any material provision of this Agreement not cured after due notice and opportunity to cure, provided as to (A) or (B) that (i) VENDOR NAME shall have been notified promptly in writing by DDOE of any notice of such claim; and (ii) VENDOR NAME shall have the sole control of the defense of any action on such claim and all negotiations for its settlement or compromise.

9.2 If DDOE promptly notifies VENDOR NAME in writing of a third party claim against DDOE that any Deliverable infringes a copyright or a trade secret of any third party, VENDOR NAME will defend such claim at its expense and will pay any costs or damages that may be finally awarded against DDOE. VENDOR NAME will not indemnify DDOE, however, if the claim of infringement is caused by (1) DDOE's misuse or modification of the Deliverable; (2) DDOE's failure to use corrections or enhancements made available by VENDOR NAME; (3) DDOE's use of the Deliverable in combination with any product or information not owned or developed by VENDOR NAME; (4) DDOE's distribution, marketing or use for the benefit of third parties of the Deliverable or (5) information, direction, specification or materials provided by Client or any third party. If any Deliverable is, or in VENDOR NAME's opinion is likely to be, held to be infringing, VENDOR NAME shall at its expense and option either (a) procure the right for DDOE to continue using it, (b) replace it with a noninfringing equivalent, (c) modify it to make it noninfringing. The foregoing remedies constitute DDOE's sole and exclusive remedies and VENDOR NAME's entire liability with respect to infringement.

9.3 DDOE agrees that VENDOR NAME' total liability to DDOE for any and all damages whatsoever arising out of or in any way related to this Agreement from any cause, including but not limited to contract liability or VENDOR NAME negligence, errors, omissions, strict liability, breach of contract or breach of warranty shall not, in the aggregate, exceed fees paid to VENDOR NAME.

In no event shall VENDOR NAME be liable for special, indirect, incidental, economic, consequential or punitive damages, including but not limited to lost revenue, lost profits, replacement goods, loss of technology rights or services, loss of data, or interruption or loss of use of software or any portion thereof regardless of the legal theory under which such damages are sought, and even if VENDOR NAME has been advised of the likelihood of such damages.

10. Employees.

10.1 VENDOR NAME has and shall retain the right to exercise full control over the employment, direction, compensation and discharge of all persons employed by VENDOR NAME in the performance of the services hereunder; provided, however, that it will, subject to scheduling and staffing considerations, attempt to honor DDOE's request for specific individuals.

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10.2 Except as the other party expressly authorizes in writing in advance, neither party shall solicit, offer work to, employ, or contract with, whether as a partner, employee or independent contractor, directly or indirectly, any of the other party's Personnel during their participation in the services or during the twelve (12) months thereafter. For purposes of this Section 10.2, "Personnel" includes any individual or company a party employs as a partner, employee or independent contractor and with which a party comes into direct contact in the course of the services.

10.3 Possession of a Security Clearance, as issued by the Delaware Department of Public Safety, may be required of any employee of VENDOR NAME who will be assigned to this project.

11. Independent Contractor.

11.1 It is understood that in the performance of the services herein provided for, VENDOR NAME shall be, and is, an independent contractor, and is not an agent or employee of DDOE and shall furnish such services in its own manner and method except as required by this Agreement. VENDOR NAME shall be solely responsible for, and shall indemnify, defend and save DDOE harmless from all matters relating to the payment of its employees, including compliance with social security, withholding and all other wages, salaries, benefits, taxes, exactions, and regulations of any nature whatsoever.

11.2 VENDOR NAME acknowledges that VENDOR NAME and any subcontractors, agents or employees employed by VENDOR NAME shall not, under any circumstances, be considered employees of DDOE, and that they shall not be entitled to any of the benefits or rights afforded employees of DDOE, including, but not limited to, sick leave, vacation leave, holiday pay, Public Employees Retirement System benefits, or health, life, dental, long-term disability or Workers' Compensation insurance benefits. DDOE will not provide or pay for any liability or medical insurance, retirement contributions or any other benefits for or on behalf of DDOE or any of its officers, employees or other agents.

11.3 VENDOR NAME shall be responsible for providing liability insurance for its personnel.

11.4 As an independent contractor, VENDOR NAME has no authority to bind or commit DDOE. Nothing herein shall be deemed or construed to create a joint venture, partnership, fiduciary or agency relationship between the parties for any purpose.

12. Suspension.

12.1 DDOE may suspend performance by VENDOR NAME under this Agreement for such period of time as DDOE, at its sole discretion, may prescribe by providing written notice to VENDOR NAME at least 30 working days prior to the date on which DDOE wishes to suspend. Upon such suspension, DDOE shall pay VENDOR NAME its compensation, based on the percentage of the project completed and earned until the effective date of suspension, less all previous payments. VENDOR NAME shall not perform further work under this Agreement after the effective date of suspension until receipt of written notice from DDOE to resume performance.

12.2 In the event DDOE suspends performance by VENDOR NAME for any cause other than the error or omission of the VENDOR NAME, for an aggregate period in excess of 30 days, VENDOR NAME shall be entitled to an equitable adjustment of the compensation payable to VENDOR NAME under this Agreement to reimburse VENDOR NAME for additional costs occasioned as a result of such suspension of performance by DDOE based on appropriated funds and approval by DDOE.

13. Termination.

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13.1 This Agreement may be terminated in whole or in part by either party in the event of substantial failure of the other party to fulfill its obligations under this Agreement through no fault of the terminating party; but only after the other party is given:

- a. Not less than 30 calendar days written notice of intent to terminate; and
- b. An opportunity for consultation with the terminating party prior to termination.

13.2 This Agreement may be terminated in whole or in part by DDOE for its convenience, but only after VENDOR NAME is given:

- a. Not less than 30 calendar days written notice of intent to terminate; and
- b. An opportunity for consultation with DDOE prior to termination.

13.3 If termination for default is effected by DDOE, DDOE will pay VENDOR NAME that portion of the compensation which has been earned as of the effective date of termination but:

- a. No amount shall be allowed for anticipated profit on performed or unperformed services or other work, and
- b. Any payment due to VENDOR NAME at the time of termination may be adjusted to the extent of any additional costs occasioned to DDOE by reason of VENDOR NAME's default.
- c. Upon termination for default, DDOE may take over the work and prosecute the same to completion by agreement with another party or otherwise. In the event VENDOR NAME shall cease conducting business, DDOE shall have the right to make an unsolicited offer of employment to any employees of VENDOR NAME assigned to the performance of the Agreement, notwithstanding the provisions of Section 10.2.

13.4 If after termination for failure of VENDOR NAME to fulfill contractual obligations it is determined that VENDOR NAME has not so failed, the termination shall be deemed to have been effected for the convenience of DDOE.

13.5 The rights and remedies of DDOE and VENDOR NAME provided in this section are in addition to any other rights and remedies provided by law or under this Agreement.

13.6 Gratuities.

13.6.1 DDOE may, by written notice to VENDOR NAME, terminate this Agreement if it is found after notice and hearing by DDOE that gratuities (in the form of entertainment, gifts, or otherwise) were offered or given by VENDOR NAME or any agent or representative of VENDOR NAME to any officer or employee of DDOE with a view toward securing a contract or securing favorable treatment with respect to the awarding or amending or making of any determinations with respect to the performance of this Agreement.

13.6.2 In the event this Agreement is terminated as provided in 13.6.1 hereof, DDOE shall be entitled to pursue the same remedies against VENDOR NAME it could pursue in the event of a breach of this Agreement by VENDOR NAME.

13.6.3 The rights and remedies of DDOE provided in Section 13.6 shall not be exclusive and are in addition to any other rights and remedies provided by law or under this Agreement.

14. Severability.

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If any term or provision of this Agreement is found by a court of competent jurisdiction to be invalid, illegal or otherwise unenforceable, the same shall not affect the other terms or provisions hereof or the whole of this Agreement, but such term or provision shall be deemed modified to the extent necessary in the court's opinion to render such term or provision enforceable, and the rights and obligations of the parties shall be construed and enforced accordingly, preserving to the fullest permissible extent the intent and agreements of the parties herein set forth.

15. Assignment; Subcontracts.

15.1 Any attempt by VENDOR NAME to assign or otherwise transfer any interest in this Agreement without the prior written consent of DDOE shall be void. Such consent shall not be unreasonably withheld.

15.2 Services specified by this Agreement shall not be subcontracted by VENDOR NAME, without prior written approval of DDOE.

15.3 Approval by DDOE of VENDOR NAME's request to subcontract or acceptance of or payment for subcontracted work by DDOE shall not in any way relieve VENDOR NAME of responsibility for the professional and technical accuracy and adequacy of the work. All subcontractors shall adhere to all applicable provisions of this Agreement.

15.4 VENDOR NAME shall be and remain liable for all damages to DDOE caused by negligent performance or non-performance of work under this Agreement by VENDOR NAME, its subcontractor or its sub-subcontractor.

15.5 The compensation due shall not be affected by DDOE's approval of the VENDOR NAME's request to subcontract.

16. Force Majeure.

Neither party shall be liable for any delays or failures in performance due to circumstances beyond its reasonable control.

17. Non-Appropriation of Funds.

17.1 Validity and enforcement of this Agreement is subject to appropriations by the General Assembly of the specific funds necessary for contract performance. Should such funds not be so appropriated DDOE may immediately terminate this Agreement, and absent such action this Agreement shall be terminated as to any obligation of the State requiring the expenditure of money for which no specific appropriation is available, at the end of the last fiscal year for which no appropriation is available or upon the exhaustion of funds.

17.2 Notwithstanding any other provisions of this Agreement, this Agreement shall terminate and DDOE's obligations under it shall be extinguished at the end of the fiscal year in which the State of Delaware fails to appropriate monies for the ensuing fiscal year sufficient for the payment of all amounts which will then become due.

18. State of Delaware Business License.

VENDOR NAME and all subcontractors represent that they are properly licensed and authorized to transact business in the State of Delaware as provided in 30 *Del. C.* § 2301.

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19. Complete Agreement.

19.1 This agreement and its Appendices shall constitute the entire agreement between DDOE and VENDOR NAME with respect to the subject matter of this Agreement and shall not be modified or changed without the express written consent of the parties. The provisions of this agreement supersede all prior oral and written quotations, communications, agreements and understandings of the parties with respect to the subject matter of this Agreement.

19.2 If the scope of any provision of this Agreement is too broad in any respect whatsoever to permit enforcement to its full extent, then such provision shall be enforced to the maximum extent permitted by law, and the parties hereto consent and agree that such scope may be judicially modified accordingly and that the whole of such provisions of the Agreement shall not thereby fail, but the scope of such provision shall be curtailed only to the extent necessary to conform to the law.

19.3 VENDOR NAME may not order any product requiring a purchase order prior to DDOE's issuance of such order. Each Appendix, except as its terms otherwise expressly provide, shall be a complete statement of its subject matter and shall supplement and modify the terms and conditions of this Agreement for the purposes of that engagement only. No other agreements, representations, warranties or other matters, whether oral or written, shall be deemed to bind the parties hereto with respect to the subject matter hereof.

20. Miscellaneous Provisions.

20.1 In performance of this Agreement, VENDOR NAME shall comply with all applicable Federal, State and Local laws, ordinances, codes and regulations. VENDOR NAME shall solely bear the costs of permits and other relevant costs required in the performance of this Agreement.

20.2 Neither this Agreement nor any appendix may be modified or amended except by the mutual written agreement of the parties. No waiver of any provision of this Agreement shall be effective unless it is in writing and signed by the party against which it is sought to be enforced.

20.3 The delay or failure by either party to exercise or enforce any of its rights under this Agreement shall not constitute or be deemed a waiver of that party's right thereafter to enforce those rights, nor shall any single or partial exercise of any such right preclude any other or further exercise thereof or the exercise of any other right.

20.4 VENDOR NAME covenants that it presently has no interest and that it will not acquire any interest, direct or indirect, which would conflict in any manner or degree with the performance of services required to be performed under this Agreement. VENDOR NAME further covenants, to its knowledge and ability, that in the performance of said services no person having any such interest shall be employed.

20.5 VENDOR NAME acknowledges that DDOE has an obligation to ensure that public funds are not used to subsidize private discrimination. VENDOR NAME recognizes that if they refuse to hire or do business with an individual or company due to reasons of race, color, gender, ethnicity, disability, national origin, age, or any other protected status, DDOE may declare VENDOR NAME in breach of the Agreement, terminate the Agreement, and designate VENDOR NAME as non-responsible.

20.6 VENDOR NAME warrants that no person or selling agency has been employed or retained to solicit or secure this Agreement upon an agreement or understanding for a commission, or a percentage, brokerage or contingent fee. For breach or violation of this warranty, DDOE shall have the right to annul this contract without liability or at its discretion deduct from the contract price or otherwise recover the full amount of such commission, percentage, brokerage or contingent fee.

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20.7 This Agreement was drafted with the joint participation of both parties and shall be construed neither against nor in favor of either, but rather in accordance with the fair meaning thereof.

20.8 **VENDOR NAME** shall maintain all public records, as defined by 29 *Del. C.* § 502(7), relating to this Agreement and its deliverables for the time and in the manner specified by the Delaware Division of Archives, pursuant to the Delaware Public Records Law, 29 *Del. C.* Ch. 5. During the term of this Agreement, authorized representatives of DDOE may inspect or audit **VENDOR NAME**'s performance and records pertaining to this Agreement at the **VENDOR NAME** business office during normal business hours.

21. Insurance.

21.1 **VENDOR NAME** shall maintain the following insurance during the term of this Agreement:

- A. Worker's Compensation and Employer's Liability Insurance in accordance with applicable law, **and**
- B. Comprehensive General Liability - \$1,000,000.00 per person/\$3,000,000 per occurrence, **and**
- C. Medical/Professional Liability - \$1,000,000.00 per person/\$3,000,000 per occurrence; or
- D. Miscellaneous Errors and Omissions - \$1,000,000.00 per person/\$3,000,000 per occurrence, or
- E. Automotive Liability Insurance covering all automotive units used in the work with limits of not less than \$100,000 each person and \$300,000 each accident as to bodily injury and \$25,000 as to property damage to others.

21.2 **VENDOR NAME** shall provide forty-five (45) days written notice of cancellation or material change of any policies.

21.3 Before any work is done pursuant to this Agreement, the Certificate of Insurance and/or copies of the insurance policies, referencing the contract number stated herein, shall be filed with the State.

The certificate holder is as follows:

Delaware Department of Education
401 Federal Street, Suite 2
Dover, DE 19901

21.4 In no event shall the State of Delaware be named as an additional insured on any policy required under this agreement.

22. Assignment of Antitrust Claims.

As consideration for the award and execution of this contract by the State, **VENDOR NAME** hereby grants, conveys, sells, assigns, and transfers to DDOE all of its right, title and interest in and to all known or unknown causes of action it presently has or may now or hereafter acquire under the antitrust laws of the United States and the State of Delaware, relating to the particular goods or services purchased or acquired by the State pursuant to this contract.

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23. Surviving Clauses.

The following clauses survive the termination of this Contract: Section 9.

24. Governing Law.

This Agreement shall be governed by and construed in accordance with the laws of the State of Delaware, except where Federal Law has precedence. VENDOR NAME consents to jurisdiction venue in the State of Delaware.

25. Notices.

Any and all notices required by the provisions of this Agreement shall be in writing and shall be mailed, certified or registered mail, return receipt requested. All notices shall be sent to the following addresses:

CONTRACTOR: (Contractor Name and Address)

DDOE: David Blowman, Associate Secretary
 Financial Management and Operations
 Delaware Department of Education
 John G. Townsend Building
 401 Federal Street, Suite 2
 Dover, DE 19901
 Phone No. (302) 735-4040
 Fax No. (302) 739-7768

DOE Certificated Staff coordinating activity:

Next Page for Signatures.

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IN WITNESS THEREOF, the Parties hereto have caused this Agreement to be duly executed as of the date and year first above written.

(Name of Contractor)

Delaware Department of Education

(Official of Contractor)
Project Manager

Associate Secretary, (or Designee) Date
Financial Management and Operations

Date

Initial Finance Director

(Official of Contractor)
Principal Investigator

Branch Associate Secretary Date

Date

Date _____
Initial Work Group
Director

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APPENDIX A
MINIMUM MANDATORY SUBMISSION REQUIREMENTS

Each vendor solicitation response should contain at a minimum the following information:

1. Transmittal Letter as specified on page 1 of the Request for Proposal including an Applicant's experience, if any, providing similar services.
2. The remaining vendor proposal package shall identify how the vendor proposes meeting the contract requirements and shall include pricing. Vendors are encouraged to review the Evaluation criteria identified to see how the proposals will be scored and verify that the response has sufficient documentation to support each criteria listed.
3. Pricing as identified in the solicitation
4. One (1) complete, signed and notarized copy of the non-collusion agreement (See Attachment 2). Bid marked "ORIGINAL", **MUST HAVE ORIGINAL SIGNATURES AND NOTARY MARK.** All other copies may have reproduced or copied signatures – Form must be included.
5. One (1) completed RFP Exception form (See Attachment 3) – please check box if no information – Form must be included.
6. One (1) completed Confidentiality Form (See Attachment 4) – please check if no information is deemed confidential – Form must be included.
7. One (1) completed Business Reference form (See Attachment 5) – please provide references other than State of Delaware contacts – Form must be included.
8. One (1) complete and signed copy of the Subcontractor Information Form (See Attachment 6) for each subcontractor – only provide if applicable.
9. One (1) complete Employing Delawareans Report (See Attachment 8)

The items listed above provide the basis for evaluating each vendor's proposal. **Failure to provide all appropriate information may deem the submitting vendor as "non-responsive" and exclude the vendor from further consideration.** If an item listed above is not applicable to your company or proposal, please make note in your submission package.

Vendors shall provide proposal packages in the following formats:

1. **Twelve (12)** paper copies of the vendor proposal paperwork. **One (1) paper copy must be an original copy, marked "ORIGINAL" on the cover, and contain original signatures.**
2. **Two (2)** electronic copies of the vendor proposal saved to CD or DVD media disk, or USB memory stick. Copy of electronic price file shall be a separate file from all other files on the electronic copy. (If Agency has requested multiple electronic copies, each electronic copy must be on a separate computer disk or media).

Appendix B – Topical Arrangement of the Standards

Delaware has adopted the Topical Arrangement of the Next Generation Science Standards. Curricular units taught during the year K-10 are taught in a topical manner.

Grade 3	
Forces and Interactions	
3-PS2-1.	Plan and conduct an investigation to provide evidence of the effects of balanced and unbalanced forces on the motion of an object. [Clarification Statement: Examples could include an unbalanced force on one side of a ball can make it start moving; and, balanced forces pushing on a box from both sides will not produce any motion at all.] [Assessment Boundary: Assessment is limited to one variable at a time: number, size, or direction of forces. Assessment does not include quantitative force size, only qualitative and relative. Assessment is limited to gravity being addressed as a force that pulls objects down.]
3-PS2-2.	Make observations and/or measurements of an object’s motion to provide evidence that a pattern can be used to predict future motion. [Clarification Statement: Examples of motion with a predictable pattern could include a child swinging in a swing, a ball rolling back and forth in a bowl, and two children on a see-saw.] [Assessment Boundary: Assessment does not include technical terms such as period and frequency.]
3-PS2-3.	Ask questions to determine cause and effect relationships of electric or magnetic interactions between two objects not in contact with each other. [Clarification Statement: Examples of an electric force could include the force on hair from an electrically charged balloon and the electrical forces between a charged rod and pieces of paper; examples of a magnetic force could include the force between two permanent magnets, the force between an electromagnet and steel paperclips, and the force exerted by one magnet versus the force exerted by two magnets. Examples of cause and effect relationships could include how the distance between objects affects strength of the force and how the orientation of magnets affects the direction of the magnetic force.] [Assessment Boundary: Assessment is limited to forces produced by objects that can be manipulated by students, and electrical interactions are limited to static electricity.]
3-PS2-4.	Define a simple design problem that can be solved by applying scientific ideas about magnets.* [Clarification Statement: Examples of problems could include constructing a latch to keep a door shut and creating a device to keep two moving objects from touching each other.]
Environmental Impacts on Organisms and Life Cycles and Traits	
3-LS2-1.	Construct an argument that some animals form groups that help members survive.
3-LS4-1.	Analyze and interpret data from fossils to provide evidence of the organisms and the environments in which they lived long ago. [Clarification Statement: Examples of data could include type, size, and distributions of fossil organisms. Examples of fossils and environments could include marine fossils found on dry land, tropical plant fossils found in Arctic areas, and fossils of extinct organisms.] [Assessment Boundary: Assessment does not include identification of specific fossils or present plants and animals. Assessment is limited to major fossil types and relative ages.]
3-LS4-3.	Construct an argument with evidence that in a particular habitat some organisms can survive well, some survive less well, and some cannot survive at all. [Clarification Statement: Examples of evidence could include needs and characteristics of the organisms and habitats involved. The organisms and their habitat make up a system in which the parts depend on each other.]
3-LS4-4.	Make a claim about the merit of a solution to a problem caused when the environment changes and the types of plants and animals that live there may change.* [Clarification Statement: Examples of environmental changes could include changes in land characteristics, water distribution, temperature, food, and other organisms.] [Assessment Boundary: Assessment is limited to a single environmental change. Assessment does not include the greenhouse effect or climate change.]
3-LS1-1.	Develop models to describe that organisms have unique and diverse life cycles but all have in common birth, growth, reproduction, and death. [Clarification Statement: Changes organisms go through during their life form a pattern.] [Assessment Boundary: Assessment of plant life cycles is limited to those of flowering plants. Assessment does not include details of human reproduction.]

Appendix B – Topical Arrangement of the Standards

3-LS3-1.	Analyze and interpret data to provide evidence that plants and animals have traits inherited from parents and that variation of these traits exists in a group of similar organisms. [Clarification Statement: Patterns are the similarities and differences in traits shared between offspring and their parents, or among siblings. Emphasis is on organisms other than humans.] [Assessment Boundary: Assessment does not include genetic mechanisms of inheritance and prediction of traits. Assessment is limited to non-human examples.]
3-LS3-2.	Use evidence to support the explanation that traits can be influenced by the environment. [Clarification Statement: Examples of the environment affecting a trait could include normally tall plants grown with insufficient water are stunted; and, a pet dog that is given too much food and little exercise may become overweight.]
3-LS4-2.	Use evidence to construct an explanation for how the variations in characteristics among individuals of the same species may provide advantages in surviving, finding mates, and reproducing. [Clarification Statement: Examples of cause and effect relationships could be plants that have larger thorns than other plants may be less likely to be eaten by predators; and, animals that have better camouflage coloration than other animals may be more likely to survive and therefore more likely to leave offspring.]

Weather and Climate

3-ESS2-1.	Represent data in tables and graphical displays to describe typical weather conditions expected during a particular season. [Clarification Statement: Examples of data could include average temperature, precipitation, and wind direction.] [Assessment Boundary: Assessment of graphical displays is limited to pictographs and bar graphs. Assessment does not include climate change.]
3-ESS2-2.	Obtain and combine information to describe climates in different regions of the world.
3-ESS3-1.	Make a claim about the merit of a design solution that reduces the impacts of a weather-related hazard.* [Clarification Statement: Examples of design solutions to weather-related hazards could include barriers to prevent flooding, wind resistant roofs, and lightning rods.]

Engineering Design--Bundled as Appropriate

3-5ETS1-2	Generate and compare multiple possible solutions to a problem based on how well each is likely to meet the criteria and constraints of the problem
3-5ETS1-3	Plan and carry out fair tests in which variables are controlled and failure points are considered to identify aspects of a model or prototype that can be improved.

3.

Appendix B – Topical Arrangement of the Standards

Grade 4	
Energy and Waves	
4-PS3-1.	Use evidence to construct an explanation relating the speed of an object to the energy of that object. [Assessment Boundary: Assessment does not include quantitative measures of changes in the speed of an object or on any precise or quantitative definition of energy]
4-PS3-2.	Make observations to provide evidence that energy can be transferred from place to place by sound, light, heat, and electric currents. [Assessment Boundary: Assessment does not include quantitative measurements of energy.]
4-PS3-3.	Ask questions and predict outcomes about the changes in energy that occur when objects collide. [Clarification Statement: Emphasis is on the change in the energy due to the change in speed, not on the forces, as objects interact.] [Assessment Boundary: Assessment does not include quantitative measurements of energy.]
4-PS3-4.	Apply scientific ideas to design, test, and refine a device that converts energy from one form to another.* [Clarification Statement: Examples of devices could include electric circuits that convert electrical energy into motion energy of a vehicle, light, or sound; and, a passive solar heater that converts light into heat. Examples of constraints could include the materials, cost, or time to design the device.] [Assessment Boundary: Devices should be limited to those that convert motion energy to electric energy or use stored energy to cause motion or produce light or sound.]
4-ESS3-1.	Obtain and combine information to describe that energy and fuels are derived from natural resources and their uses affect the environment. [Clarification Statement: Examples of renewable energy resources could include wind energy, water behind dams, and sunlight; non-renewable energy resources are fossil fuels and fissile materials. Examples of environmental effects could include loss of habitat due to dams, loss of habitat due to surface mining, and air pollution from burning of fossil fuels.]
4-PS4-1.	Develop a model of waves to describe patterns in terms of amplitude and wavelength and that waves can cause objects to move. [Clarification Statement: Examples of models could include diagrams, analogies, and physical models using wire to illustrate wavelength and amplitude of waves.] [Assessment Boundary: Assessment does not include interference effects, electromagnetic waves, non-periodic waves, or quantitative models of amplitude and wavelength.]
4-PS4-3.	Generate and compare multiple solutions that use patterns to transfer information.* [Clarification Statement: Examples of solutions could include drums sending coded information through sound waves, using a grid of 1's and 0's representing black and white to send information about a picture, and using Morse code to send text.]
Structure/Function and Information Processing	
4-PS4-2.	Develop a model to describe that light reflecting from objects and entering the eye allows objects to be seen. [Assessment Boundary: Assessment does not include knowledge of specific colors reflected and seen, the cellular mechanisms of vision, or how the retina works.]
4-LS1-1.	Construct an argument that plants and animals have internal and external structures that function to support survival, growth, behavior, and reproduction. [Clarification Statement: Examples of structures could include thorns, stems, roots, colored petals, heart, stomach, lung, brain, and skin.] [Assessment Boundary: Assessment is limited to macroscopic structures within plant and animal systems.]
4-LS1-2.	Use a model to describe that animals receive different types of information through their senses, process the information in their brain, and respond to the information in different ways. [Clarification Statement: Emphasis is on systems of information transfer.] [Assessment Boundary: Assessment does not include the mechanisms by which the brain stores and recalls information or the mechanisms of how sensory receptors function.]
Processes that Shape the Earth	
4-ESS1-1	Identify evidence from patterns in rock formations and fossils in rock layers to support an explanation for changes in a landscape over time. [Clarification Statement: Examples of evidence from patterns could include rock layers with marine shell fossils above rock layers with plant fossils and no shells, indicating a change from land to water over time; and, a canyon with different rock layers in the walls and a river in the bottom, indicating that over time a river cut through the rock.] [Assessment Boundary: Assessment does not include specific knowledge of the mechanism of rock formation or memorization of specific rock formations and layers. Assessment is limited to relative time.]

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4-ESS2-1	Make observations and/or measurements to provide evidence of the effects of weathering or the rate of erosion by water, ice, wind, or vegetation. [Clarification Statement: Examples of variables to test could include angle of slope in the downhill movement of water, amount of vegetation, speed of wind, relative rate of deposition, cycles of freezing and thawing of water, cycles of heating and cooling, and volume of water flow.] [Assessment Boundary: Assessment is limited to a single form of weathering or erosion.]
4-ESS2-2	Analyze and interpret data from maps to describe patterns of Earth’s features. [Clarification Statement: Maps can include topographic maps of Earth’s land and ocean floor, as well as maps of the locations of mountains, continental boundaries, volcanoes, and earthquakes.]
4-ESS3-2	Generate and compare multiple solutions to reduce the impacts of natural Earth processes on humans.* [Clarification Statement: Examples of solutions could include designing an earthquake resistant building and improving monitoring of volcanic activity.] [Assessment Boundary: Assessment is limited to earthquakes, floods, tsunamis, and volcanic eruptions.]

Engineering Design--Bundled as Appropriate

3-5ETS1-2	Generate and compare multiple possible solutions to a problem based on how well each is likely to meet the criteria and constraints of the problem
3-5ETS1-3	Plan and carry out fair tests in which variables are controlled and failure points are considered to identify aspects of a model or prototype that can be improved.

5.

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Grade 5

Structure and Properties of Matter

5-PS1-1.	Develop a model to describe that matter is made of particles too small to be seen. [Clarification Statement: Examples of evidence supporting a model could include adding air to expand a basketball, compressing air in a syringe, dissolving sugar in water, and evaporating salt water.] [Assessment Boundary: Assessment does not include the atomic-scale mechanism of evaporation and condensation or defining the unseen particles.]
5-PS1-2.	Measure and graph quantities to provide evidence that regardless of the type of change that occurs when heating, cooling, or mixing substances, the total weight of matter is conserved. [Clarification Statement: Examples of reactions or changes could include phase changes, dissolving, and mixing that form new substances.] [Assessment Boundary: Assessment does not include distinguishing mass and weight.]
5-PS1-3.	Make observations and measurements to identify materials based on their properties. [Clarification Statement: Examples of materials to be identified could include baking soda and other powders, metals, minerals, and liquids. Examples of properties could include color, hardness, reflectivity, electrical conductivity, thermal conductivity, response to magnetic forces, and solubility; density is not intended as an identifiable property.] [Assessment Boundary: Assessment does not include density or distinguishing mass and weight.]
5-PS1-4.	Conduct an investigation to determine whether the mixing of two or more substances results in new substances.

Ecosystems and Earth Systems

5-PS3-1.	Use models to describe that energy in animals' food (used for body repair, growth, motion, and to maintain body warmth) was once energy from the sun. [Clarification Statement: Examples of models could include diagrams, and flow charts.]
5-LS1-1.	Support an argument that plants get the materials they need for growth chiefly from air and water. [Clarification Statement: Emphasis is on the idea that plant matter comes mostly from air and water, not from the soil.]
5-LS2-1.	Develop a model to describe the movement of matter among plants, animals, decomposers, and the environment. [Clarification Statement: Emphasis is on the idea that matter that is not food (air, water, decomposed materials in soil) is changed by plants into matter that is food. Examples of systems could include organisms, ecosystems, and the Earth.] [Assessment Boundary: Assessment does not include molecular explanations.]
5-ESS2-1.	Develop a model using an example to describe ways the geosphere, biosphere, hydrosphere, and/or atmosphere interact. [Clarification Statement: Examples could include the influence of the ocean on ecosystems, landform shape, and climate; the influence of the atmosphere on landforms and ecosystems through weather and climate; and the influence of mountain ranges on winds and clouds in the atmosphere. The geosphere, hydrosphere, atmosphere, and biosphere are each a system.] [Assessment Boundary: Assessment is limited to the interactions of two systems at a time.]
5-ESS2-2.	Describe and graph the amounts and percentages of water and fresh water in various reservoirs to provide evidence about the distribution of water on Earth. [Assessment Boundary: Assessment is limited to oceans, lakes, rivers, glaciers, ground water, and polar ice caps, and does not include the atmosphere.]
5-ESS3-1.	Obtain and combine information about ways individual communities use science ideas to protect the Earth's resources and environment.

Stars and the Solar System

5-PS2-1	Support an argument that the gravitational force exerted by Earth on objects is directed down. [Clarification Statement: "Down" is a local description of the direction that points toward the center of the spherical Earth.] [Assessment Boundary: Assessment does not include mathematical representation of gravitational force.]
5-ESS1-1	Support an argument that differences in the apparent brightness of the sun compared to other stars is due to their relative distances from the Earth. [Assessment Boundary: Assessment is limited to relative distances, not sizes, of stars. Assessment does not include other factors that affect apparent brightness (such as stellar masses, age, stage).]
5-ESS1-2	Represent data in graphical displays to reveal patterns of daily changes in length and direction of shadows, day and night, and the seasonal appearance of some stars in the night sky. [Clarification Statement: Examples of

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patterns could include the position and motion of Earth with respect to the sun and selected stars that are visible only in particular months.] [Assessment Boundary: Assessment does not include causes of seasons.]

Engineering Design--Bundled as Appropriate

3-5ETS1-2	Generate and compare multiple possible solutions to a problem based on how well each is likely to meet the criteria and constraints of the problem
3-5ETS1-3	Plan and carry out fair tests in which variables are controlled and failure points are considered to identify aspects of a model or prototype that can be improved.

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Grade 6	
Earth History	
MS ESS1-4	<p>Construct a scientific explanation based on evidence from rock strata for how the geologic time scale is used to organize Earth's 4.6-billion-year-old history. [Clarification Statement: Emphasis is on how analyses of rock formations and the fossils they contain are used to establish relative ages of major events in Earth's history. Examples of Earth's major events could range from being very recent (such as the last Ice Age or the earliest fossils of homo sapiens) to very old (such as the formation of Earth or the earliest evidence of life). Examples can include the formation of mountain chains and ocean basins, the evolution or extinction of particular living organisms, or significant volcanic eruptions.] [Assessment Boundary: Assessment does not include recalling the names of specific periods or epochs and events within them.]</p>
MS LS4-1	<p>Analyze and interpret data for patterns in the fossil record that document the existence, diversity, extinction, and change of life forms throughout the history of life on Earth under the assumption that natural laws operate today as in the past. [Clarification Statement: Emphasis is on finding patterns of changes in the level of complexity of anatomical structures in organisms and the chronological order of fossil appearance in the rock layers.] [Assessment Boundary: Assessment does not include the names of individual species or geological eras in the fossil record.]</p>
MS ESS2-1	<p>Develop a model to describe the cycling of Earth's materials and the flow of energy that drives this process. [Clarification Statement: Emphasis is on the processes of melting, crystallization, weathering, deformation, and sedimentation, which act together to form minerals and rocks through the cycling of Earth's materials.] [Assessment Boundary: Assessment does not include the identification and naming of minerals.]</p>
MS ESS3-1	<p>Construct a scientific explanation based on evidence for how the uneven distributions of Earth's mineral, energy, and groundwater resources are the result of past and current geoscience processes. [Clarification Statement: Emphasis is on how these resources are limited and typically non-renewable, and how their distributions are significantly changing as a result of removal by humans. Examples of uneven distributions of resources as a result of past processes include but are not limited to petroleum (locations of the burial of organic marine sediments and subsequent geologic traps), metal ores (locations of past volcanic and hydrothermal activity associated with subduction zones), and soil (locations of active weathering and/or deposition of rock).]</p>
MS ESS3-2	<p>Analyze and interpret data on natural hazards to forecast future catastrophic events and inform the development of technologies to mitigate their effects. [Clarification Statement: Emphasis is on how some natural hazards, such as volcanic eruptions and severe weather, are preceded by phenomena that allow for reliable predictions, but others, such as earthquakes, occur suddenly and with no notice, and thus are not yet predictable. Examples of natural hazards can be taken from interior processes (such as earthquakes and volcanic eruptions), surface processes (such as mass wasting and tsunamis), or severe weather events (such as hurricanes, tornadoes, and floods). Examples of data can include the locations, magnitudes, and frequencies of the natural hazards. Examples of technologies can be global (such as satellite systems to monitor hurricanes or forest fires) or local (such as building basements in tornado-prone regions or reservoirs to mitigate droughts).]</p>
MS ESS2-2	<p>Construct an explanation based on evidence for how geoscience processes have changed Earth's surface at varying time and spatial scales. [Clarification Statement: Emphasis is on how processes change Earth's surface at time and spatial scales that can be large (such as slow plate motions or the uplift of large mountain ranges) or small (such as rapid landslides or microscopic geochemical reactions), and how many geoscience processes (such as earthquakes, volcanoes, and meteor impacts) usually behave gradually but are punctuated by catastrophic events. Examples of geoscience processes include surface weathering and deposition by the movements of water, ice, and wind. Emphasis is on geoscience processes that shape local geographic features, where appropriate.]</p>
MS ESS2-3	<p>Analyze and interpret data on the distribution of fossils and rocks, continental shapes, and seafloor structures to provide evidence of the past plate motions. [Clarification Statement: Examples of data include similarities of rock and fossil types on different continents, the shapes of the continents (including continental shelves), and the locations of ocean structures (such as ridges, fracture zones, and trenches).] [Assessment Boundary: Paleomagnetic anomalies in oceanic and continental crust are not assessed.]</p>
Solar System	
MS ESS 1-1	<p>Develop and use a model of the Earth-sun-moon system to describe the cyclic patterns of lunar phases, eclipses of the sun and moon, and seasons. [Clarification Statement: Examples of models can be physical, graphical, or conceptual.]</p>

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MS ESS 1-2	<p>Develop and use a model to describe the role of gravity in the motions within galaxies and the solar system. [Clarification Statement: Emphasis for the model is on gravity as the force that holds together the solar system and Milky Way galaxy and controls orbital motions within them. Examples of models can be physical (such as the analogy of distance along a football field or computer visualizations of elliptical orbits) or conceptual (such as mathematical proportions relative to the size of familiar objects such as students' school or state).] [Assessment Boundary: Assessment does not include Kepler's Laws of orbital motion or the apparent retrograde motion of the planets as viewed from Earth.]</p>
MS ESS 1-3	<p>Analyze and interpret data to determine scale properties of objects in the solar system. [Clarification Statement: Emphasis is on the analysis of data from Earth-based instruments, space-based telescopes, and spacecraft to determine similarities and differences among solar system objects. Examples of scale properties include the sizes of an object's layers (such as crust and atmosphere), surface features (such as volcanoes), and orbital radius. Examples of data include statistical information, drawings and photographs, and models.] [Assessment Boundary: Assessment does not include recalling facts about properties of the planets and other solar system bodies.]</p>
Force and Motion	
MS PS 2-1	<p>Apply Newton's Third Law to design a solution to a problem involving the motion of two colliding objects.* [Clarification Statement: Examples of practical problems could include the impact of collisions between two cars, between a car and stationary objects, and between a meteor and a space vehicle.] [Assessment Boundary: Assessment is limited to vertical or horizontal interactions in one dimension.]</p>
MS PS 2-2	<p>Plan an investigation to provide evidence that the change in an object's motion depends on the sum of the forces on the object and the mass of the object. [Clarification Statement: Emphasis is on balanced (Newton's First Law) and unbalanced forces in a system, qualitative comparisons of forces, mass and changes in motion (Newton's Second Law), frame of reference, and specification of units.] [Assessment Boundary: Assessment is limited to forces and changes in motion in one-dimension in an inertial reference frame and to change in one variable at a time. Assessment does not include the use of trigonometry.]</p>
MS PS 2-3	<p>Ask questions about data to determine the factors that affect the strength of electric and magnetic forces. [Clarification Statement: Examples of devices that use electric and magnetic forces could include electromagnets, electric motors, or generators. Examples of data could include the effect of the number of turns of wire on the strength of an electromagnet, or the effect of increasing the number or strength of magnets on the speed of an electric motor.] [Assessment Boundary: Assessment about questions that require quantitative answers is limited to proportional reasoning and algebraic thinking.]</p>
MS PS 2-4	<p>Construct and present arguments using evidence to support the claim that gravitational interactions are attractive and depend on the masses of interacting objects. [Clarification Statement: Examples of evidence for arguments could include data generated from simulations or digital tools; and charts displaying mass, strength of interaction, distance from the Sun, and orbital periods of objects within the solar system.] [Assessment Boundary: Assessment does not include Newton's Law of Gravitation or Kepler's Laws.]</p>
MS PS 2-5	<p>Conduct an investigation and evaluate the experimental design to provide evidence that fields exist between objects exerting forces on each other even though the objects are not in contact. [Clarification Statement: Examples of this phenomenon could include the interactions of magnets, electrically-charged strips of tape, and electrically-charged pith balls. Examples of investigations could include first-hand experiences or simulations.] [Assessment Boundary: Assessment is limited to electric and magnetic fields, and limited to qualitative evidence for the existence of fields.]</p>
Structure/Function (Body systems)	
MS LS 1-3	<p>Use argument supported by evidence for how the body is a system of interacting subsystems composed of groups of cells. [Clarification Statement: Emphasis is on the conceptual understanding that cells form tissues and tissues form organs specialized for particular body functions. Examples could include the interaction of subsystems within a system and the normal functioning of those systems.] [Assessment Boundary: Assessment does not include the mechanism of one body system independent of others. Assessment is limited to the circulatory, excretory, digestive, respiratory, muscular, and nervous systems.] <i>{For this grade level coverage extends only to Evidence Statements-2aii, 2aiii, 2aiv, 4ai (not cells), 4aii (not cells), 4aiii }</i></p>
MS LS 1-8	<p>Gather and synthesize information that sensory receptors respond to stimuli by sending messages to the brain for immediate behavior or storage as memories. [Assessment Boundary: Assessment does not include mechanisms for the transmission of this information.]</p>

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Engineering Design--Bundled as Appropriate	
MS-ETS1-1	Define the criteria and constraints of a design problem with sufficient precision to ensure a successful solution, taking into account relevant scientific principles and potential impacts on people and the natural environment that may limit possible solutions.
MS-ETS1-2	Evaluate competing design solutions using a systematic process to determine how well they meet the criteria and constraints of the problem.
MS-ETS1-4	Develop a model to generate data for iterative testing and modification of a proposed object, tool, or process such that an optimal design can be achieved.

8.

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Grade 7	
Diversity of Life/Cell Structure/Function	
MS LS1-1:	Conduct an investigation to provide evidence that living things are made of cells; either one cell or many different numbers and types of cells. [Clarification Statement: Emphasis is on developing evidence that living things are made of cells, distinguishing between living and non-living things, and understanding that living things may be made of one cell or many and varied cells.]
MS LS1-2:	Develop and use a model to describe the function of a cell as a whole and ways parts of cells contribute to the function. [Clarification Statement: Emphasis is on the cell functioning as a whole system and the primary role of identified parts of the cell, specifically the nucleus, chloroplasts, mitochondria, cell membrane, and cell wall.] [Assessment Boundary: Assessment of organelle structure/function relationships is limited to the cell wall and cell membrane. Assessment of the function of the other organelles is limited to their relationship to the whole cell. Assessment does not include the biochemical function of cells or cell parts.]
MS LS1-3:	Use argument supported by evidence for how the body is a system of interacting subsystems composed of groups of cells. [Clarification Statement: Emphasis is on the conceptual understanding that cells form tissues and tissues form organs specialized for particular body functions. Examples could include the interaction of subsystems within a system and the normal functioning of those systems.] [Assessment Boundary: Assessment does not include the mechanism of one body system independent of others. Assessment is limited to the circulatory, excretory, digestive, respiratory, muscular, and nervous systems.]
MS LS1-4:	Use argument based on empirical evidence and scientific reasoning to support an explanation for how characteristic animal behaviors and specialized plant structures affect the probability of successful reproduction of animals and plants respectively. [Clarification Statement: Examples of behaviors that affect the probability of animal reproduction could include nest building to protect young from cold, herding of animals to protect young from predators, and vocalization of animals and colorful plumage to attract mates for breeding. Examples of animal behaviors that affect the probability of plant reproduction could include transferring pollen or seeds, and creating conditions for seed germination and growth. Examples of plant structures could include bright flowers attracting butterflies that transfer pollen, flower nectar and odors that attract insects that transfer pollen, and hard shells on nuts that squirrels bury.]
MS LS1-5:	Construct a scientific explanation based on evidence for how environmental and genetic factors influence the growth of organisms. [Clarification Statement: Examples of local environmental conditions could include availability of food, light, space, and water. Examples of genetic factors could include large breed cattle and species of grass affecting growth of organisms. Examples of evidence could include drought decreasing plant growth, fertilizer increasing plant growth, different varieties of plant seeds growing at different rates in different conditions, and fish growing larger in large ponds than they do in small ponds.] [Assessment Boundary: Assessment does not include genetic mechanisms, gene regulation, or biochemical processes.]
MS LS3-1:	Develop and use a model to describe why structural changes to genes (mutations) located on chromosomes may affect proteins and may result in harmful, beneficial, or neutral effects to the structure and function of the organism. [Clarification Statement: Emphasis is on conceptual understanding that changes in genetic material may result in making different proteins.] [Assessment Boundary: Assessment does not include specific changes at the molecular level, mechanisms for protein synthesis, or specific types of mutations.]
MS LS3-2:	Develop and use a model to describe why asexual reproduction results in offspring with identical genetic information and sexual reproduction results in offspring with genetic variation. [Clarification Statement: Emphasis is on using models such as Punnett squares, diagrams, and simulations to describe the cause and effect relationship of gene transmission from parent(s) to offspring and resulting genetic variation.]
Our Genes Ourselves/Genetics-Natural Selection	
MS LS4-1:	Analyze and interpret data for patterns in the fossil record that document the existence, diversity, extinction, and change of life forms throughout the history of life on Earth under the assumption that natural laws operate today as in the past. [Clarification Statement: Emphasis is on finding patterns of

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	changes in the level of complexity of anatomical structures in organisms and the chronological order of fossil appearance in the rock layers.] [Assessment Boundary: Assessment does not include the names of individual species or geological eras in the fossil record.]
MS LS4-2:	Apply scientific ideas to construct an explanation for the anatomical similarities and differences among modern organisms and between modern and fossil organisms to infer evolutionary relationships. [Clarification Statement: Emphasis is on explanations of the evolutionary relationships among organisms in terms of similarity or differences of the gross appearance of anatomical structures.]
MS LS4-3:	Analyze displays of pictorial data to compare patterns of similarities in the embryological development across multiple species to identify relationships not evident in the fully formed anatomy. [Clarification Statement: Emphasis is on inferring general patterns of relatedness among embryos of different organisms by comparing the macroscopic appearance of diagrams or pictures.] [Assessment Boundary: Assessment of comparisons is limited to gross appearance of anatomical structures in embryological development.]
MS LS4-4:	Construct an explanation based on evidence that describes how genetic variations of traits in a population increase some individuals' probability of surviving and reproducing in a specific environment. [Clarification Statement: Emphasis is on using simple probability statements and proportional reasoning to construct explanations.]
MS LS4-5:	Gather and synthesize information about the technologies that have changed the way humans influence the inheritance of desired traits in organisms. [Clarification Statement: Emphasis is on synthesizing information from reliable sources about the influence of humans on genetic outcomes in artificial selection (such as genetic modification, animal husbandry, gene therapy); and, on the impacts these technologies have on society as well as the technologies leading to these scientific discoveries.]
MS LS4-6: (i, ii, iii)*	Use mathematical representations to support explanations of how natural selection may lead to increases and decreases of specific traits in populations over time. [Clarification Statement: Emphasis is on using mathematical models, probability statements, and proportional reasoning to support explanations of trends in changes to populations over time.] [Assessment Boundary: Assessment does not include Hardy Weinberg calculations.]
Properties of Matter	
MS PS1-1:	Develop models to describe the atomic composition of simple molecules and extended structures. [Clarification Statement: Emphasis is on developing models of molecules that vary in complexity. Examples of simple molecules could include ammonia and methanol. Examples of extended structures could include sodium chloride or diamonds. Examples of molecular-level models could include drawings, 3D ball and stick structures, or computer representations showing different molecules with different types of atoms.] [Assessment Boundary: Assessment does not include valence electrons and bonding energy, discussing the ionic nature of subunits of complex structures, or a complete description of all individual atoms in a complex molecule or extended structure is not required.]
MS PS1-2:	Analyze and interpret data on the properties of substances before and after the substances interact to determine if a chemical reaction has occurred. [Clarification Statement: Examples of reactions could include burning sugar or steel wool, fat reacting with sodium hydroxide, and mixing zinc with hydrogen chloride.] [Assessment boundary: Assessment is limited to analysis of the following properties: density, melting point, boiling point, solubility, flammability, and odor.]
MS PS1-3:	Gather and make sense of information to describe that synthetic materials come from natural resources and impact society. [Clarification Statement: Emphasis is on natural resources that undergo a chemical process to form the synthetic material. Examples of new materials could include new medicine, foods, and alternative fuels.] [Assessment Boundary: Assessment is limited to qualitative information.]
MS PS1-4:	Develop a model that predicts and describes changes in particle motion, temperature, and state of a pure substance when thermal energy is added or removed. [Clarification Statement: Emphasis is on qualitative molecular-level models of solids, liquids, and gases to show that adding or removing thermal energy increases or decreases kinetic energy of the particles until a change of state occurs. Examples of models could include drawing and diagrams. Examples of particles could include molecules or inert atoms. Examples of pure substances could include water, carbon dioxide, and helium.]
MS PS1-5:	Develop and use a model to describe how the total number of atoms does not change in a chemical reaction and thus mass is conserved. [Clarification Statement: Emphasis is on law of conservation of matter and on physical models or drawings, including digital forms, that represent atoms.] [Assessment Boundary:

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	Assessment does not include the use of atomic masses, balancing symbolic equations, or intermolecular forces.]
MS PS1-6:	Undertake a design project to construct, test, and modify a device that either releases or absorbs thermal energy by chemical processes.* [Clarification Statement: Emphasis is on the design, controlling the transfer of energy to the environment, and modification of a device using factors such as type and concentration of a substance. Examples of designs could involve chemical reactions such as dissolving ammonium chloride or calcium chloride.] [Assessment Boundary: Assessment is limited to the criteria of amount, time, and temperature of substance in testing the device.]
Engineering Design--Bundled as Appropriate	
MS-ETS1-1	Define the criteria and constraints of a design problem with sufficient precision to ensure a successful solution, taking into account relevant scientific principles and potential impacts on people and the natural environment that may limit possible solutions.
MS-ETS1-2	Evaluate competing design solutions using a systematic process to determine how well they meet the criteria and constraints of the problem.
MS-ETS1-4	Develop a model to generate data for iterative testing and modification of a proposed object, tool, or process such that an optimal design can be achieved.

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Grade 8	
Transformation of Energy	
MS PS3-1	Construct and interpret graphical displays of data to describe the relationships of kinetic energy to the mass of an object and to the speed of an object. [Clarification Statement: Emphasis is on descriptive relationships between kinetic energy and mass separately from kinetic energy and speed. Examples could include riding a bicycle at different speeds, rolling different sizes of rocks downhill, and getting hit by a whiffle ball versus a tennis ball.]
MS PS3-2	Develop a model to describe that when the arrangement of objects interacting at a distance changes, different amounts of potential energy are stored in the system. [Clarification Statement: Emphasis is on relative amounts of potential energy, not on calculations of potential energy. Examples of objects within systems interacting at varying distances could include: the Earth and either a roller coaster cart at varying positions on a hill or objects at varying heights on shelves, changing the direction/orientation of a magnet, and a balloon with static electrical charge being brought closer to a classmate’s hair. Examples of models could include representations, diagrams, pictures, and written descriptions of systems.] [Assessment Boundary: Assessment is limited to two objects and electric, magnetic, and gravitational interactions.]
MS PS3-5	Construct, use, and present arguments to support the claim that when the kinetic energy of an object changes, energy is transferred to or from the object. [Clarification Statement: Examples of empirical evidence used in arguments could include an inventory or other representation of the energy before and after the transfer in the form of temperature changes or motion of object.] [Assessment Boundary: Assessment does not include calculations of energy.]
MS PS4-1	Use mathematical representations to describe a simple model for waves that includes how the amplitude of a wave is related to the energy in a wave. [Clarification Statement: Emphasis is on describing waves with both qualitative and quantitative thinking.] [Assessment Boundary: Assessment does not include electromagnetic waves and is limited to standard repeating waves.]
MS PS4-2	Develop and use a model to describe that waves are reflected, absorbed, or transmitted through various materials. [Clarification Statement: Emphasis is on both light and mechanical waves. Examples of models could include drawings, simulations, and written descriptions.] [Assessment Boundary: Assessment is limited to qualitative applications pertaining to light and mechanical waves.]
Weather and Climate	
MS PS3-3	Apply scientific principles to design, construct, and test a device that either minimizes or maximizes thermal energy transfer. (apply to weather and ecosystems unit) [Clarification Statement: Examples of devices could include an insulated box, a solar cooker, and a Styrofoam cup.] [Assessment Boundary: Assessment does not include calculating the total amount of thermal energy transferred.]
MS PS3-4	Plan an investigation to determine the relations among the energy transferred, the type of matter, the mass, and the change in the average kinetic energy of the particles as measured by the temperature of the sample. (apply to weather and ecosystems unit) [Clarification Statement: Examples of experiments could include comparing final water temperatures after different masses of ice melted in the same volume of water with the same initial temperature, the temperature change of samples of different materials with the same mass as they cool or heat in the environment, or the same material with different masses when a specific amount of energy is added.] [Assessment Boundary: Assessment does not include calculating the total amount of thermal energy transferred.]
MS ESS2-5	Collect data to provide evidence for how the motions and complex interactions of air masses results in changes in weather conditions. [Clarification Statement: Emphasis is on how air masses flow from regions of high pressure to low pressure, causing weather (defined by temperature, pressure, humidity, precipitation, and wind) at a fixed location to change over time, and how sudden changes in weather can result when different air masses collide. Emphasis is on how weather can be predicted within probabilistic ranges. Examples of data can be provided to students (such as weather maps, diagrams, and visualizations) or obtained through laboratory experiments (such as with condensation).] [Assessment Boundary: Assessment does not include recalling the names of cloud types or weather symbols used on weather maps or the reported diagrams from weather stations.]
MS ESS2-6	Develop and use a model to describe how unequal heating and rotation of the Earth cause patterns of atmospheric and oceanic circulation that determine regional climates. [Clarification Statement: Emphasis is on how patterns vary by latitude, altitude, and geographic land distribution. Emphasis of atmospheric circulation is on

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	the sunlight-driven latitudinal banding, the Coriolis effect, and resulting prevailing winds; emphasis of ocean circulation is on the transfer of heat by the global ocean convection cycle, which is constrained by the Coriolis effect and the outlines of continents. Examples of models can be diagrams, maps and globes, or digital representations.] [Assessment Boundary: Assessment does not include the dynamics of the Coriolis effect.]
MS ESS3-5	Ask questions to clarify evidence of the factors that have caused the rise in global temperatures over the past century. [Clarification Statement: Examples of factors include human activities (such as fossil fuel combustion, cement production, and agricultural activity) and natural processes (such as changes in incoming solar radiation or volcanic activity). Examples of evidence can include tables, graphs, and maps of global and regional temperatures, atmospheric levels of gases such as carbon dioxide and methane, and the rates of human activities. Emphasis is on the major role that human activities play in causing the rise in global temperatures.]
MS ESS2-1	Develop a model to describe the cycling of Earth's materials and the flow of energy that drives this process. [Clarification Statement: Emphasis is on the processes of melting, crystallization, weathering, deformation, and sedimentation, which act together to form minerals and rocks through the cycling of Earth's materials.] [Assessment Boundary: Assessment does not include the identification and naming of minerals.]
MS ESS2-4	Develop a model to describe the cycling of water through Earth's systems driven by energy from the sun and the force of gravity. [Clarification Statement: Emphasis is on the ways water changes its state as it moves through the multiple pathways of the hydrologic cycle. Examples of models can be conceptual or physical.] [Assessment Boundary: A quantitative understanding of the latent heats of vaporization and fusion is not assessed.]
MS ESS3-2	Analyze and interpret data on natural hazards to forecast future catastrophic events and inform the development of technologies to mitigate their effects. (related to severe weather events) [Clarification Statement: Emphasis is on how some natural hazards, such as volcanic eruptions and severe weather, are preceded by phenomena that allow for reliable predictions, but others, such as earthquakes, occur suddenly and with no notice, and thus are not yet predictable. Examples of natural hazards can be taken from interior processes (such as earthquakes and volcanic eruptions), surface processes (such as mass wasting and tsunamis), or severe weather events (such as hurricanes, tornadoes, and floods). Examples of data can include the locations, magnitudes, and frequencies of the natural hazards. Examples of technologies can be global (such as satellite systems to monitor hurricanes or forest fires) or local (such as building basements in tornado-prone regions or reservoirs to mitigate droughts).]
MS ESS3-3	Apply scientific principles to design a method for monitoring and minimizing a human impact on the environment.* [Clarification Statement: Examples of the design process include examining human environmental impacts, assessing the kinds of solutions that are feasible, and designing and evaluating solutions that could reduce that impact. Examples of human impacts can include water usage (such as the withdrawal of water from streams and aquifers or the construction of dams and levees), land usage (such as urban development, agriculture, or the removal of wetlands), and pollution (such as of the air, water, or land).]
MS ESS3-4	Construct an argument supported by evidence for how increases in human population and per-capita consumption of natural resources impact Earth's systems. [Clarification Statement: Examples of evidence include grade-appropriate databases on human populations and the rates of consumption of food and natural resources (such as freshwater, mineral, and energy). Examples of impacts can include changes to the appearance, composition, and structure of Earth's systems as well as the rates at which they change. The consequences of increases in human populations and consumption of natural resources are described by science, but science does not make the decisions for the actions society takes.]
Ecosystems	
MS LS1-6	Construct a scientific explanation based on evidence for the role of photosynthesis in the cycling of matter and flow of energy into and out of organisms. [Clarification Statement: Emphasis is on tracing movement of matter and flow of energy.] [Assessment Boundary: Assessment does not include the biochemical mechanisms of photosynthesis.]
MS LS2-1	Analyze and interpret data to provide evidence for the effects of resource availability on organisms and populations of organisms in an ecosystem. [Clarification Statement: Emphasis is on cause and effect relationships between resources and growth of individual organisms and the numbers of organisms in ecosystems during periods of abundant and scarce resources.]
MS LS2-4	Construct an argument supported by empirical evidence that changes to physical or biological components of an ecosystem affect populations. [Clarification Statement: Emphasis is on recognizing patterns in data and making warranted inferences about changes in populations, and on evaluating empirical evidence supporting arguments about changes to ecosystems.]

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MS LS1-7	Develop a model to describe how food is rearranged through chemical reactions forming new molecules that support growth and/or release energy as this matter moves through an organism. [Clarification Statement: Emphasis is on describing that molecules are broken apart and put back together and that in this process, energy is released.] [Assessment Boundary: Assessment does not include details of the chemical reactions for photosynthesis or respiration.]
MS LS2-3	Develop a model to describe the cycling of matter and flow of energy among living and nonliving parts of an ecosystem. [Clarification Statement: Emphasis is on describing the conservation of matter and flow of energy into and out of various ecosystems, and on defining the boundaries of the system.] [Assessment Boundary: Assessment does not include the use of chemical reactions to describe the processes.]
MS PS3-3	Apply scientific principles to design, construct, and test a device that either minimizes or maximizes thermal energy transfer. (apply to weather and ecosystems unit) [Clarification Statement: Examples of devices could include an insulated box, a solar cooker, and a Styrofoam cup.] [Assessment Boundary: Assessment does not include calculating the total amount of thermal energy transferred.]
MS PS3-4	Plan an investigation to determine the relations among the energy transferred, the type of matter, the mass, and the change in the average kinetic energy of the particles as measured by the temperature of the sample. (apply to weather and ecosystems unit) [Clarification Statement: Examples of experiments could include comparing final water temperatures after different masses of ice melted in the same volume of water with the same initial temperature, the temperature change of samples of different materials with the same mass as they cool or heat in the environment, or the same material with different masses when a specific amount of energy is added.] [Assessment Boundary: Assessment does not include calculating the total amount of thermal energy transferred.]
Engineering Design--Bundled as Appropriate	
MS-ETS1-1	Define the criteria and constraints of a design problem with sufficient precision to ensure a successful solution, taking into account relevant scientific principles and potential impacts on people and the natural environment that may limit possible solutions.
MS-ETS1-2	Evaluate competing design solutions using a systematic process to determine how well they meet the criteria and constraints of the problem.
MS-ETS1-4	Develop a model to generate data for iterative testing and modification of a proposed object, tool, or process such that an optimal design can be achieved.

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Grade 9 (Or Integrated Physical/Earth Science)

Foundational Chemistry--Structure and Properties of Matter and Chemical Reactions	
HS-PS1-1:	Use the periodic table as a model to predict the relative properties of elements based on the patterns of electrons in the outermost energy level of atoms. [Clarification Statement: Examples of properties that could be predicted from patterns could include reactivity of metals, types of bonds formed, numbers of bonds formed, and reactions with oxygen.] [Assessment Boundary: Assessment is limited to main group elements. Assessment does not include quantitative understanding of ionization energy beyond relative trends.]
HS-PS1-2 grade 9 responsible for evidence statements 1Ai, ii, iii:	Construct and revise an explanation for the outcome of a simple chemical reaction based on the outermost electron states of atoms, trends in the periodic table, and knowledge of the patterns of chemical properties. [Clarification Statement: Examples of chemical reactions could include the reaction of sodium and chlorine, of carbon and oxygen, or of carbon and hydrogen.] [Assessment Boundary: Assessment is limited to chemical reactions involving main group elements and combustion reactions.]
HS-PS1-5 grade 9 responsible for evidence statements 1a:	Apply scientific principles and evidence to provide an explanation about the effects of changing the temperature or concentration of the reacting particles on the rate at which a reaction occurs. [Clarification Statement: Emphasis is on student reasoning that focuses on the number and energy of collisions between molecules.] [Assessment Boundary: Assessment is limited to simple reactions in which there are only two reactants; evidence from temperature, concentration, and rate data; and qualitative relationships between rate and temperature.]
HS-PS1-7 grade 9 responsible for evidence statements 1Aiii, iv-conceptual:	Use mathematical representations to support the claim that atoms, and therefore mass, are conserved during a chemical reaction. [Clarification Statement: Emphasis is on using mathematical ideas to communicate the proportional relationships between masses of atoms in the reactants and the products, and the translation of these relationships to the macroscopic scale using the mole as the conversion from the atomic to the macroscopic scale. Emphasis is on assessing students' use of mathematical thinking and not on memorization and rote application of problem-solving techniques.] [Assessment Boundary: Assessment does not include complex chemical reactions.]
Forces and Interactions/Energy Transfer and Conservation	
HS-PS2-3:	Apply scientific and engineering ideas to design, evaluate, and refine a device that minimizes the force on a macroscopic object during a collision.* [Clarification Statement: Examples of evaluation and refinement could include determining the success of the device at protecting an object from damage and modifying the design to improve it. Examples of a device could include a football helmet or a parachute.] [Assessment Boundary: Assessment is limited to qualitative evaluations and/or algebraic manipulations.]
HS-PS2-4 grade 9 responsible for evidence statements 1A&B conceptual:	Use mathematical representations of Newton's Law of Gravitation and Coulomb's Law to describe and predict the gravitational and electrostatic forces between objects. [Clarification Statement: Emphasis is on both quantitative and conceptual descriptions of gravitational and electric fields.] [Assessment Boundary: Assessment is limited to systems with two objects.]
HS-PS2-5:	Plan and conduct an investigation to provide evidence that an electric current can produce a magnetic field and that a changing magnetic field can produce an electric current. [Assessment Boundary: Assessment is limited to designing and conducting investigations with provided materials and tools.]
HS-PS3-1 grade 9 responsible for evidence statements Ai, ii, iii, iv:	Create a computational model to calculate the change in the energy of one component in a system when the change in energy of the other component(s) and energy flows in and out of the system are known. [Clarification Statement: Emphasis is on explaining the meaning of mathematical expressions used in the model.] [Assessment Boundary: Assessment is limited to basic algebraic expressions or computations; to systems of two or three components; and to thermal energy, kinetic energy, and/or the energies in gravitational, magnetic, or electric fields.]
HS-PS3-2:	Develop and use models to illustrate that energy at the macroscopic scale can be accounted for as a combination of energy associated with the motions of particles (objects) and energy associated with the relative positions of particles (objects). [Clarification Statement: Examples of phenomena at the macroscopic scale could include the conversion of kinetic energy to thermal energy, the energy stored due to position of

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	an object above the earth, and the energy stored between two electrically-charged plates. Examples of models could include diagrams, drawings, descriptions, and computer simulations.]
HS-PS3-3:	Design, build, and refine a device that works within given constraints to convert one form of energy into another form of energy.* [Clarification Statement: Emphasis is on both qualitative and quantitative evaluations of devices. Examples of devices could include Rube Goldberg devices, wind turbines, solar cells, solar ovens, and generators. Examples of constraints could include use of renewable energy forms and efficiency.] [Assessment Boundary: Assessment for quantitative evaluations is limited to total output for a given input. Assessment is limited to devices constructed with materials provided to students.]
HS-PS3-4:	Plan and conduct an investigation to provide evidence that the transfer of thermal energy when two components of different temperature are combined within a closed system results in a more uniform energy distribution among the components in the system (second law of thermodynamics). [Clarification Statement: Emphasis is on analyzing data from student investigations and using mathematical thinking to describe the energy changes both quantitatively and conceptually. Examples of investigations could include mixing liquids at different initial temperatures or adding objects at different temperatures to water.] [Assessment Boundary: Assessment is limited to investigations based on materials and tools provided to students.]
HS-PS3-5:	Develop and use a model of two objects interacting through electric or magnetic fields to illustrate the forces between objects and the changes in energy of the objects due to the interaction. [Clarification Statement: Examples of models could include drawings, diagrams, and texts, such as drawings of what happens when two charges of opposite polarity are near each other.] [Assessment Boundary: Assessment is limited to systems containing two objects.]
HS-PS4-1:	Use mathematical representations to support a claim regarding relationships among the frequency, wavelength, and speed of waves traveling in various media. [Clarification Statement: Examples of data could include electromagnetic radiation traveling in a vacuum and glass, sound waves traveling through air and water, and seismic waves traveling through the Earth.] [Assessment Boundary: Assessment is limited to algebraic relationships and describing those relationships qualitatively.]
HS-PS3-2:	Develop and use models to illustrate that energy at the macroscopic scale can be accounted for as a combination of energy associated with the motions of particles (objects) and energy associated with the relative positions of particles (objects). [Clarification Statement: Examples of phenomena at the macroscopic scale could include the conversion of kinetic energy to thermal energy, the energy stored due to position of an object above the earth, and the energy stored between two electrically-charged plates. Examples of models could include diagrams, drawings, descriptions, and computer simulations.]
Earth Systems	
HS-ESS1-2:	Construct an explanation of the Big Bang theory based on astronomical evidence of light spectra, motion of distant galaxies, and composition of matter in the universe. [Clarification Statement: Emphasis is on the astronomical evidence of the red shift of light from galaxies as an indication that the universe is currently expanding, the cosmic microwave background as the remnant radiation from the Big Bang, and the observed composition of ordinary matter of the universe, primarily found in stars and interstellar gases (from the spectra of electromagnetic radiation from stars), which matches that predicted by the Big Bang theory (3/4 hydrogen and 1/4 helium).]
HS-ESS1-3:	Communicate scientific ideas about the way stars, over their life cycle, produce elements. [Clarification Statement: Emphasis is on the way nucleosynthesis, and therefore the different elements created, varies as a function of the mass of a star and the stage of its lifetime.] [Assessment Boundary: Details of the many different nucleosynthesis pathways for stars of differing masses are not assessed.]
HS-ESS1-5:	Evaluate evidence of the past and current movements of continental and oceanic crust and the theory of plate tectonics to explain the ages of crustal rocks. [Clarification Statement: Emphasis is on the ability of plate tectonics to explain the ages of crustal rocks. Examples include evidence of the ages oceanic crust increasing with distance from mid-ocean ridges (a result of plate spreading) and the ages of North American continental crust decreasing with distance away from a central ancient core of the continental plate (a result of past plate interactions).]
HS-ESS1-6:	Apply scientific reasoning and evidence from ancient Earth materials, meteorites, and other planetary surfaces to construct an account of Earth’s formation and early history. [Clarification Statement: Emphasis is on using available evidence within the solar system to reconstruct the early history of Earth, which formed along with the rest of the solar system 4.6 billion years ago. Examples of evidence include the absolute ages of

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	ancient materials (obtained by radiometric dating of meteorites, moon rocks, and Earth’s oldest minerals), the sizes and compositions of solar system objects, and the impact cratering record of planetary surfaces.]
HS-ESS2-1:	Develop a model to illustrate how Earth’s internal and surface processes operate at different spatial and temporal scales to form continental and ocean-floor features. [Clarification Statement: Emphasis is on how the appearance of land features (such as mountains, valleys, and plateaus) and sea-floor features (such as trenches, ridges, and seamounts) are a result of both constructive forces (such as volcanism, tectonic uplift, and orogeny) and destructive mechanisms (such as weathering, mass wasting, and coastal erosion).] [Assessment Boundary: Assessment does not include memorization of the details of the formation of specific geographic features of Earth’s surface.]
HS-ESS2-2:	Analyze geoscience data to make the claim that one change to Earth’s surface can create feedbacks that cause changes to other Earth systems. [Clarification Statement: Examples should include climate feedbacks, such as how an increase in greenhouse gases causes a rise in global temperatures that melts glacial ice, which reduces the amount of sunlight reflected from Earth’s surface, increasing surface temperatures and further reducing the amount of ice. Examples could also be taken from other system interactions, such as how the loss of ground vegetation causes an increase in water runoff and soil erosion; how dammed rivers increase groundwater recharge, decrease sediment transport, and increase coastal erosion; or how the loss of wetlands causes a decrease in local humidity that further reduces the wetland extent.]
HS-ESS2-3:	Develop a model based on evidence of Earth’s interior to describe the cycling of matter by thermal convection. [Clarification Statement: Emphasis is on both a one-dimensional model of Earth, with radial layers determined by density, and a three-dimensional model, which is controlled by mantle convection and the resulting plate tectonics. Examples of evidence include maps of Earth’s three-dimensional structure obtained from seismic waves, records of the rate of change of Earth’s magnetic field (as constraints on convection in the outer core), and identification of the composition of Earth’s layers from high-pressure laboratory experiments.]
HS-ESS2-4:	Use a model to describe how variations in the flow of energy into and out of Earth’s systems result in changes in climate. [Clarification Statement: Examples of the causes of climate change differ by timescale, over 1-10 years: large volcanic eruption, ocean circulation; 10-100s of years: changes in human activity, ocean circulation, solar output; 10-100s of thousands of years: changes to Earth’s orbit and the orientation of its axis; and 10-100s of millions of years: long-term changes in atmospheric composition.] [Assessment Boundary: Assessment of the results of changes in climate is limited to changes in surface temperatures, precipitation patterns, glacial ice volumes, sea levels, and biosphere distribution.]
HS-ESS2-5:	Plan and conduct an investigation of the properties of water and its effects on Earth materials and surface processes. [Clarification Statement: Emphasis is on mechanical and chemical investigations with water and a variety of solid materials to provide the evidence for connections between the hydrologic cycle and system interactions commonly known as the rock cycle. Examples of mechanical investigations include stream transportation and deposition using a stream table, erosion using variations in soil moisture content, or frost wedging by the expansion of water as it freezes. Examples of chemical investigations include chemical weathering and recrystallization (by testing the solubility of different materials) or melt generation (by examining how water lowers the melting temperature of most solids).]
HS-ESS2-6:	Develop a quantitative model to describe the cycling of carbon among the hydrosphere, atmosphere, geosphere, and biosphere. [Clarification Statement: Emphasis is on modeling biogeochemical cycles that include the cycling of carbon through the ocean, atmosphere, soil, and biosphere (including humans), providing the foundation for living organisms.]
HS-ESS3-5:	Analyze geoscience data and the results from global climate models to make an evidence-based forecast of the current rate of global or regional climate change and associated future impacts to Earth systems. [Clarification Statement: Examples of evidence, for both data and climate model outputs, are for climate changes (such as precipitation and temperature) and their associated impacts (such as on sea level, glacial ice volumes, or atmosphere and ocean composition).] [Assessment Boundary: Assessment is limited to one example of a climate change and its associated impacts.]
Engineering Design--Bundled as Appropriate	
HS-ETS1-1	Analyze a major global challenge to specify qualitative and quantitative criteria and constraints for solutions that account for societal needs and wants.
HS-ETS1-2	Design a solution to a complex real-world problem by breaking it down into smaller, more manageable problems that can be solved through engineering.

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HS-ETS1-3

Evaluate a solution to a complex real-world problem based on prioritized criteria and tradeoffs that account for a range of constraints, including cost, safety, reliability, and aesthetics, as well as possible social, cultural, and environmental impacts.

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Grade 10 (Or Standards Based Biology)	
Cellular Foundation of Life/Structure and Function	
HS LS1-1	Construct an explanation based on evidence for how the structure of DNA determines the structure of proteins which carry out the essential functions of life through systems of specialized cells. [Assessment Boundary: Assessment does not include identification of specific cell or tissue types, whole body systems, specific protein structures and functions, or the biochemistry of protein synthesis.]
HS LS1-2	Develop and use a model to illustrate the hierarchical organization of interacting systems that provide specific functions within multicellular organisms. [Clarification Statement: Emphasis is on functions at the organism system level such as nutrient uptake, water delivery, and organism movement in response to neural stimuli. An example of an interacting system could be an artery depending on the proper function of elastic tissue and smooth muscle to regulate and deliver the proper amount of blood within the circulatory system.] [Assessment Boundary: Assessment does not include interactions and functions at the molecular or chemical reaction level.]
HS LS1-3	Plan and conduct an investigation to provide evidence that feedback mechanisms maintain homeostasis. [Clarification Statement: Examples of investigations could include heart rate response to exercise, stomate response to moisture and temperature, and root development in response to water levels.] [Assessment Boundary: Assessment does not include the cellular processes involved in the feedback mechanism.]
HS LS1-4	Use a model to illustrate the role of cellular division (mitosis) and differentiation in producing and maintaining complex organisms. [Assessment Boundary: Assessment does not include specific gene control mechanisms or rote memorization of the steps of mitosis.]
Matter and Energy and Interdependent Relationships in Ecosystems	
HS LS1-5	Use a model to illustrate how photosynthesis transforms light energy into stored chemical energy. [Clarification Statement: Emphasis is on illustrating inputs and outputs of matter and the transfer and transformation of energy in photosynthesis by plants and other photosynthesizing organisms. Examples of models could include diagrams, chemical equations, and conceptual models.] [Assessment Boundary: Assessment does not include specific biochemical steps.]
HS LS1-6	Construct and revise an explanation based on evidence for how carbon, hydrogen, and oxygen from sugar molecules may combine with other elements to form amino acids and/or other large carbon-based molecules. [Clarification Statement: Emphasis is on using evidence from models and simulations to support explanations.] [Assessment Boundary: Assessment does not include the details of the specific chemical reactions or identification of macromolecules.]
HS LS1-7	Use a model to illustrate that cellular respiration is a chemical process whereby the bonds of food molecules and oxygen molecules are broken and the bonds in new compounds are formed resulting in a net transfer of energy. [Clarification Statement: Emphasis is on the conceptual understanding of the inputs and outputs of the process of cellular respiration.] [Assessment Boundary: Assessment should not include identification of the steps or specific processes involved in cellular respiration.]
HS LS2-3	Construct and revise an explanation based on evidence for the cycling of matter and flow of energy in aerobic and anaerobic conditions. [Clarification Statement: Emphasis is on conceptual understanding of the role of aerobic and anaerobic respiration in different environments.] [Assessment Boundary: Assessment does not include the specific chemical processes of either aerobic or anaerobic respiration.]
HS LS2-4	Use mathematical representations to support claims for the cycling of matter and flow of energy among organisms in an ecosystem. [Clarification Statement: Emphasis is on using a mathematical model of stored energy in biomass to describe the transfer of energy from one trophic level to another and that matter and energy are conserved as matter cycles and energy flows through ecosystems. Emphasis is on atoms and molecules such as carbon, oxygen, hydrogen and nitrogen being conserved as they move through an ecosystem.] [Assessment Boundary: Assessment is limited to proportional reasoning to describe the cycling of matter and flow of energy.]
HS LS2-5	Develop a model to illustrate the role of photosynthesis and cellular respiration in the cycling of carbon among the biosphere, atmosphere, hydrosphere, and geosphere. [Clarification Statement: Examples of models could include simulations and mathematical models.] [Assessment Boundary: Assessment does not include the specific chemical steps of photosynthesis and respiration.]

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HS ESS2-6	Develop a quantitative model to describe the cycling of carbon among the hydrosphere, atmosphere, geosphere, and biosphere. [Clarification Statement: Emphasis is on modeling biogeochemical cycles that include the cycling of carbon through the ocean, atmosphere, soil, and biosphere (including humans), providing the foundation for living organisms.]
HS ESS2-7	Construct an argument based on evidence about the simultaneous coevolution of Earth’s systems and life on Earth. [Clarification Statement: Emphasis is on the dynamic causes, effects, and feedbacks between the biosphere and Earth’s other systems, whereby geoscience factors control the evolution of life, which in turn continuously alters Earth’s surface. Examples of include how photosynthetic life altered the atmosphere through the production of oxygen, which in turn increased weathering rates and allowed for the evolution of animal life; how microbial life on land increased the formation of soil, which in turn allowed for the evolution of land plants; or how the evolution of corals created reefs that altered patterns of erosion and deposition along coastlines and provided habitats for the evolution of new life forms.] [Assessment Boundary: Assessment does not include a comprehensive understanding of the mechanisms of how the biosphere interacts with all of Earth’s other systems.]
HS LS2-1	Use mathematical and/or computational representations to support explanations of factors that affect carrying capacity of ecosystems at different scales. [Clarification Statement: Emphasis is on quantitative analysis and comparison of the relationships among interdependent factors including boundaries, resources, climate, and competition. Examples of mathematical comparisons could include graphs, charts, histograms, and population changes gathered from simulations or historical data sets.] [Assessment Boundary: Assessment does not include deriving mathematical equations to make comparisons.]
HS LS2-2	Use mathematical representations to support and revise explanations based on evidence about factors affecting biodiversity and populations in ecosystems of different scales. [Clarification Statement: Examples of mathematical representations include finding the average, determining trends, and using graphical comparisons of multiple sets of data.] [Assessment Boundary: Assessment is limited to provided data.]
HS LS2-6	Evaluate the claims, evidence, and reasoning that the complex interactions in ecosystems maintain relatively consistent numbers and types of organisms in stable conditions, but changing conditions may result in a new ecosystem. [Clarification Statement: Examples of changes in ecosystem conditions could include modest biological or physical changes, such as moderate hunting or a seasonal flood; and extreme changes, such as volcanic eruption or sea level rise.]
HS LS2-7	Design, evaluate, and refine a solution for reducing the impacts of human activities on the environment and biodiversity.* [Clarification Statement: Examples of human activities can include urbanization, building dams, and dissemination of invasive species.]
HS LS2-8	Evaluate the evidence for the role of group behavior on individual and species’ chances to survive and reproduce. [Clarification Statement: Emphasis is on: (1) distinguishing between group and individual behavior, (2) identifying evidence supporting the outcomes of group behavior, and (3) developing logical and reasonable arguments based on evidence. Examples of group behaviors could include flocking, schooling, herding, and cooperative behaviors such as hunting, migrating, and swarming.]
HS PS1-4	Develop a model to illustrate that the release or absorption of energy from a chemical reaction system depends upon the changes in total bond energy. [Clarification Statement: Emphasis is on the idea that a chemical reaction is a system that affects the energy change. Examples of models could include molecular-level drawings and diagrams of reactions, graphs showing the relative energies of reactants and products, and representations showing energy is conserved.] [Assessment Boundary: Assessment does not include calculating the total bond energy changes during a chemical reaction from the bond energies of reactants and products.]
HS PS1-7	Use mathematical representations to support the claim that atoms, and therefore mass, are conserved during a chemical reaction. [Clarification Statement: Emphasis is on using mathematical ideas to communicate the proportional relationships between masses of atoms in the reactants and the products, and the translation of these relationships to the macroscopic scale using the mole as the conversion from the atomic to the macroscopic scale. Emphasis is on assessing students’ use of mathematical thinking and not on memorization and rote application of problem-solving techniques.] [Assessment Boundary: Assessment does not include complex chemical reactions.]
HS PS3-1	Create a computational model to calculate the change in the energy of one component in a system when the change in energy of the other component(s) and energy flows in and out of the system are known. [Clarification Statement: Emphasis is on explaining the meaning of mathematical expressions used in the model.] [Assessment Boundary: Assessment is limited to basic algebraic expressions or computations; to systems of two or three components; and to thermal energy, kinetic energy, and/or the energies in gravitational, magnetic, or electric fields.]
Inheritance and Variation of Traits and Natural Selection and Evolution	

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HS LS3-1	Ask questions to clarify relationships about the role of DNA and chromosomes in coding the instructions for characteristic traits passed from parents to offspring. [Assessment Boundary: Assessment does not include the phases of meiosis or the biochemical mechanism of specific steps in the process.]
HS LS3-2	Make and defend a claim based on evidence that inheritable genetic variations may result from: (1) new genetic combinations through meiosis, (2) viable errors occurring during replication, and/or (3) mutations caused by environmental factors. [Clarification Statement: Emphasis is on using data to support arguments for the way variation occurs.] [Assessment Boundary: Assessment does not include the phases of meiosis or the biochemical mechanism of specific steps in the process.]
HS LS3-3	Apply concepts of statistics and probability to explain the variation and distribution of expressed traits in a population. [Clarification Statement: Emphasis is on the use of mathematics to describe the probability of traits as it relates to genetic and environmental factors in the expression of traits.] [Assessment Boundary: Assessment does not include Hardy-Weinberg calculations.]
HS LS4-1	Communicate scientific information that common ancestry and biological evolution are supported by multiple lines of empirical evidence. [Clarification Statement: Emphasis is on a conceptual understanding of the role each line of evidence has relating to common ancestry and biological evolution. Examples of evidence could include similarities in DNA sequences, anatomical structures, and order of appearance of structures in embryological development.]
HS LS4-2	Construct an explanation based on evidence that the process of evolution primarily results from four factors: (1) the potential for a species to increase in number, (2) the heritable genetic variation of individuals in a species due to mutation and sexual reproduction, (3) competition for limited resources, and (4) the proliferation of those organisms that are better able to survive and reproduce in the environment. [Clarification Statement: Emphasis is on using evidence to explain the influence each of the four factors has on number of organisms, behaviors, morphology, or physiology in terms of ability to compete for limited resources and subsequent survival of individuals and adaptation of species. Examples of evidence could include mathematical models such as simple distribution graphs and proportional reasoning.] [Assessment Boundary: Assessment does not include other mechanisms of evolution, such as genetic drift, gene flow through migration, and co-evolution.]
HS LS4-3	Apply concepts of statistics and probability to support explanations that organisms with an advantageous heritable trait tend to increase in proportion to organisms lacking this trait. [Clarification Statement: Emphasis is on analyzing shifts in numerical distribution of traits and using these shifts as evidence to support explanations.] [Assessment Boundary: Assessment is limited to basic statistical and graphical analysis. Assessment does not include allele frequency calculations.]
HS LS4-4	Construct an explanation based on evidence for how natural selection leads to adaptation of populations. [Clarification Statement: Emphasis is on using data to provide evidence for how specific biotic and abiotic differences in ecosystems (such as ranges of seasonal temperature, long-term climate change, acidity, light, geographic barriers, or evolution of other organisms) contribute to a change in gene frequency over time, leading to adaptation of populations.]
HS LS4-5	Evaluate the evidence supporting claims that changes in environmental conditions may result in: (1) increases in the number of individuals of some species, (2) the emergence of new species over time, and (3) the extinction of other species. [Clarification Statement: Emphasis is on determining cause and effect relationships for how changes to the environment such as deforestation, fishing, application of fertilizers, drought, flood, and the rate of change of the environment affect distribution or disappearance of traits in species.]
HS LS4-6	Create or revise a simulation to test a solution to mitigate adverse impacts of human activity on biodiversity.* [Clarification Statement: Emphasis is on designing solutions for a proposed problem related to threatened or endangered species, or to genetic variation of organisms for multiple species.]
Engineering Design--Bundled as Appropriate	
HS-ETS1-1	Analyze a major global challenge to specify qualitative and quantitative criteria and constraints for solutions that account for societal needs and wants.
HS-ETS1-2	Design a solution to a complex real-world problem by breaking it down into smaller, more manageable problems that can be solved through engineering.
HS-ETS1-3	Evaluate a solution to a complex real-world problem based on prioritized criteria and tradeoffs that account for a range of constraints, including cost, safety, reliability, and aesthetics, as well as possible social, cultural, and environmental impacts.

Appendix C – Task Types Organizer (DRAFT)

Assessment Component	Intended High-level Claim(s)/ Assessment Focus	Type of Reporting/Intended Score Use	Evidence to be Elicited	Proposed Task Type Descriptions
End-of-Unit Assessment	<p>Students can apply the NGSS science knowledge and skills taught within a given unit to contexts similar to those encountered in instruction.</p> <p>Specific to proficiency related to the PEs for the specific grade and the established combinations of dimensions for the targeted PEs. Phenomena defined in relation to these targeted PEs.</p> <p>Mastery of knowledge and skills relative to the established NGSS PEs.</p> <p>Proximal transfer of science knowledge and skills</p>	<p>Proficiency on the standards instructed in each unit (See Appendix QQQ for the groupings of standards by units).</p> <p>Subscores may include generalized dimensional scores such as:</p> <ul style="list-style-type: none"> • Gathering data and information practices score • Reasoning with evidence practices score • Constructing explanations practices score • Core idea/Content scoring <ul style="list-style-type: none"> • Instruction (formative) • Grading <ul style="list-style-type: none"> ○ School (evaluative) ○ Teacher (formative) <p>Interest in reporting EoU scores for grade 5 with grade 5 ITA, grade 8 EoU scores with grade 8 ITA and Biology EoU scores with Biology ITA. Scores will not be combined but provided on same report to provide through year performance and overall science proficiency in one complete parental report.</p>	<p>Application of the SEP in context of the DCI</p> <p>Understanding of the CCC with respect to the given DCI and context</p> <p>Integration of all three dimensions (i.e., text of the PE, clarification statements, and assessment boundaries)</p>	<ul style="list-style-type: none"> • Stand-alone items and Regular Item Clusters¹, which include the following item types: <ul style="list-style-type: none"> ○ Selected Response ○ Evidence-Based Selected Response ○ Constructed Response ○ Technology Enhanced Items • Integrated Item Clusters¹, including: <ul style="list-style-type: none"> ○ Performance Tasks (wet or dry) ○ Classroom Kit Assessments
Integrative Transfer Assessment	<p>Students can integrate, transfer, and apply the NGSS science knowledge and skills taught during the year to contexts that span those encountered in instruction to relatively novel contexts.</p> <p>Unique contexts, phenomena, and (potentially) combinations of unique dimensions for PEs (i.e., apply a “unique” SEP, that is a SEP not present in the grade-level PEs while demonstrating understanding of a DCI and a CCC present in the grade-level standards).</p> <p>Mastery of knowledge and skills relative to the K-12 Framework and NGSS progressions.</p>	<p>Overall science proficiency at student, school, district and state level (to meet federal requirements).</p> <p>Subscores may include generalized dimensional scores such as:</p> <ul style="list-style-type: none"> • Gathering data and information practices score • Reasoning with evidence practices score • Constructing explanations practices score • Core idea/Content scoring 	<p>PE Bundled across DCI Domains</p> <p>Application of a unique SEP in context of the PE’s DCI(s)</p> <p>Understanding of the CCC with respect to the given DCI and context (or crossover to a unique CCC)</p> <p>Integration of three dimensions in a unique context, and potentially, a unique combination of dimensions</p>	<ul style="list-style-type: none"> • Stand-alone items and Regular Item Clusters, which include the following item types: <ul style="list-style-type: none"> ○ Selected Response ○ Evidence-Based Selected Response ○ Constructed Response ○ Technology Enhanced Items • Integrated Item Clusters¹, including: <ul style="list-style-type: none"> ○ Performance Tasks (dry only) ○ Simulation-Based Tasks

Appendix C – Task Types Organizer (DRAFT)

	Distal transfer of science knowledge and skills.			
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¹Briefly, an integrated item cluster requires extended amounts of time and is akin to tasks found on performance assessments, whereas a regular item cluster is more limited.

Assessment Component	Applicable Standards & Design Guidelines	Development & Delivery Specifications	Applicable grades	Test Build Expectations
End-of-Unit Assessment	<ul style="list-style-type: none"> • Individual items or item clusters that are aligned to PEs or PE Bundles, as well as the PE specific SEPs, CCCs, and DCIs. Additional SEPs and CCCs can be incorporated into the tasks, with alignment specified, but the PE specific SEPs and CCCs must be addressed and central to the task. • Subsets of the grade-level PEs, grouped by instructional units • Length of any one task (as part of the overall assessment) is XXXXX 	<ul style="list-style-type: none"> • Delivered via paper & pencil only, computers cannot be used to deliver any test content. • All scoring and data entry will be done by local educators. Data will be entered into Delaware’s content management system, Performance Plus. • Security: non-secure, released to teachers on a limited, as needed basis. • Each EoU assessment will have a single form, which will be held static across multiple years. 	<ul style="list-style-type: none"> • Grades 3-8 and HS. • 3-4 EoU Assessments per grade (21 to 28 assessments total) 	<ul style="list-style-type: none"> • Maximum testing time <ul style="list-style-type: none"> ○ Grades 3 to 5: 45 mins ○ Grades 6 to 8 & HS: 90 mins • Development & Maintenance: developed once and then released to teachers on an ongoing basis. That is, no continuous cycles of development (i.e., assessments will be produced once and then available to teachers in an ongoing basis).
Integrative Transfer Assessment	<ul style="list-style-type: none"> • Individual items or item clusters that are aligned to PEs or PE Bundles, as well as the PE specific SEPs, CCCs, and DCIs. Additional SEPs and CCCs can be incorporated into the tasks, with alignment specified, but the PE specific SEPs and CCCs must be addressed and central to the task. • All PEs in the grade level (i.e., grade 5, 8 , and Biology) • PEs may be Bundled across DCI Domains (Earth/Physical/Life) • Length of any one task (as part of the overall assessment) is XXXX 	<ul style="list-style-type: none"> • Computer delivered. • Anticipate that non-science teachers will be delivering/proctoring the assessment. • All activities associated with tasks must be able to be completed in a computer lab setting. • All items, including those requiring scoring by trained raters, will be scored by the vendor. • Security: assessments are secure with annual release of XXXX item clusters and XXXX stand-alone items. • Each ITA assessment will have one or more forms within each year. Forms will need to be equated across years to produce comparable scores. 	<ul style="list-style-type: none"> • Grade 5, Grade 8, and HS. • 1 ITA per grade (3 in total) 	<ul style="list-style-type: none"> • Maximum testing time <ul style="list-style-type: none"> ○ Grade 5: 90 mins ○ Grade 8 & HS: 120 mins • Development & Maintenance: maintained year-to-year, with continuous cycles of development and appropriate supports (e.g., year-to-year equating).

Appendix C – Task Types Organizer (DRAFT)

Task Types: Nature of stimuli to define many of the task types, acknowledging that the basic nature of items to elicit student response remains fairly constant.

1. Stand-alone/Traditional/Discrete Items (included, but external of the tasks/item clusters) (EOU and ITA)
 - a. These items may have short stimuli information available
 - b. Items should average no more than 2 min. for students to complete.
 - c. Items may be one or two-part items.
 - d. Item can be selected response, multiple selected response, evidence-based selected response, constructed response, and technology enhanced items
 - e. Items are to be aligned to one PE, and at least 2 dimensions within that PE
2. Integrated Item Clusters
 - a. General Description
 - i. 4-6 single or multi-part items, each cluster aligned to a 2-3 PE bundle; all items are supported by a common stimulus; can be a mix of MCs, MSs, EBSRs, CRs, and TEIs
 - ii. A minimum of 8 points should be achieved per Task.
 - iii. Items in Integrative Item Cluster should be closely linked to each as well as to the stimulus
 - iv. Stimuli can be present at multiple places within an Integrative Item Cluster and can adjust/change as the cluster advances.
 - b. Stimuli types
 - i. Static (most similar to an SAIC Item Cluster) (EOU and ITA)
 1. Stimulus is non-interactive, but provides context for student. Stimulus is a mix of graphics and text.
 - ii. Performance task wet lab: Lab setting collection/processing of information (EoU only)
 1. A classroom kit (materials provided or easily available in classroom) and detailed proctor instructions for leading a highly reproducible and straightforward activity or investigation where students will make observations and collect data; associated assessment where students will apply their observations and data.
 - iii. Performance task dry lab: Dry lab collection/processing of information, something that can be done in a computer lab, (EOU and ITA)

Appendix C – Task Types Organizer (DRAFT)

Use of Constructed Response items.

Only one extended response item (2-4 paragraphs) should be used in an assessment (ITA or EoU)

No more than 2 CRs (no more than one paragraph) should be included in any one Integrative Item Cluster

Task and Assessment Specifications

End of Unit

2-3 PEs in a bundle, drives the minimum number of tasks per assessment

Grade	3	4	5	6	7	8	HS
# of assessments for one school year	3	3	3	3	3	3	3
Total # of PEs (i.e., standards) at Grade	15	15	15	25	25	25	25
# of PEs (i.e., Standards) per assessment	5	5	5	8	8	8	8
Reporting categories	<ul style="list-style-type: none"> Overall (domain – LS, ESS, PS) by default of the nature of the unit) Proficient or Not proficient (NOT 4 levels) SEP CCC <p>Min. of 4 items/7points per reporting category</p>	<ul style="list-style-type: none"> Overall (domain – LS, ESS, PS) by default of the nature of the unit) Proficient or Not proficient (NOT 4 levels) SEP CCC <p>Min. of 4 items/7points per reporting category</p>	<ul style="list-style-type: none"> Overall (domain – LS, ESS, PS) by default of the nature of the unit) Proficient or Not proficient (NOT 4 levels) SEP CCC <p>Min. of 4 items/7points per reporting category</p>	<ul style="list-style-type: none"> Overall (domain – LS, ESS, PS) by default of the nature of the unit) SEPA SEPB SEPC CCC <p>Min. of 4 items/7points</p>	<ul style="list-style-type: none"> Overall (domain – LS, ESS, PS) by default of the nature of the unit) SEPA SEPB SEPC CCC <p>Min. of 4 items/7points</p>	<ul style="list-style-type: none"> Overall (domain – LS, ESS, PS) by default of the nature of the unit) SEPA SEPB SEPC CCC <p>Min. of 4 items/7points</p>	<ul style="list-style-type: none"> Overall (domain – LS, ESS, PS) by default of the nature of the unit) SEPA SEPB SEPC CCC <p>Min. of 4 items/7points</p>
Maximum Assessment time (min)	45	45	45	90	90	90	90
Basic Assessment structure	<ul style="list-style-type: none"> Task 1 (8-10 pts. max) Task 2 Task 3 (Discrete items) <p>(link across grades and to same scale as ITA)</p>	<ul style="list-style-type: none"> Task 1 (8-10 pts. max) Task 2 Task 3 (Discrete items) <p>(link across grades and to same scale as ITA)</p>	<ul style="list-style-type: none"> Task 1 (8-10 pts. max) Task 2 Task 3 (Discrete items) <p>(link across grades and to same scale as ITA)</p>	<ul style="list-style-type: none"> Task 1 Task 2 Task 3 (Discrete items) 	<ul style="list-style-type: none"> Task 1 Task 2 Task 3 (Discrete items) 	<ul style="list-style-type: none"> Task 1 Task 2 Task 3 (Discrete items) 	<ul style="list-style-type: none"> Task 1 Task 2 Task 3 (Discrete items)

Appendix C – Task Types Organizer (DRAFT)

Time per task (min)	15	15	15	22	22	22	22
# of standards per task	2-3	2-3	2-3	2-3	2-3	2-3	2-3

Integrative Transfer Assessment

Grade	5	8	HS
# of assessments for one school year	1	1	1
Total # of PEs (i.e., standards) at Grade	15	25	25
# of Standards per assessment	15	25	25
Maximum Assessment time (min)	90	120	120
Basic Assessment structure	<ul style="list-style-type: none"> • Task 1 • Task 2 • Task 3 • Task 4 • Traditional Item set (TIS)?? 	<ul style="list-style-type: none"> • Task 1 • Task 2 • Task 3 • Task 4 • Traditional Item set (TIS)?? 	<ul style="list-style-type: none"> • Task 1 • Task 2 • Task 3 • Task 4 • Traditional Item set (TIS)??
Time per task (mins)	25 (13 for TIS)	26 (13 for TIS)	26 (13 for TIS)
# of standards per task	2-3	2-3	2-3

Define a traditional item set as “half of an Interactive Item Cluster task for ITA” in terms of time (and therefore # of items).

A task can bundle 2-3 PEs (i.e., standards)

Defining coverage and sampling of standards across an ITA assessment.

APPENDIX D
Cognitive Interview Summary (DRAFT)

Delaware Science
Cognitive Interview Summary
Spring 2017

Grade 5

Simulation (SIM)—ITA task	Page 2
Classroom Kit Assessment (CKA)—ITA task	Page 3

Grade 8

Performance Task (PT)—EoU task	Page 4
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High School

Open-Ended Constructed Response (OECR)—ITA task	Page 6
Classroom Kit Assessment (CKA)—ITA task	Page 7
Performance Task (PT)—EoU task	Page 8

APPENDIX D
Cognitive Interview Summary (DRAFT)

TASK: Grade 5 SIM

DESCRIPTION OF THE TASK: This task engaged students in demonstrating understanding of energy and matter flows in ecosystems, developing models that describe these flows, and interpreting data to explain the behavior of organisms related to the flow of energy and matter.

VALIDITY EVIDENCE: In two rounds of cognitive interviews, this task and a predecessor version elicited varying levels of evidence that students use and apply their understanding of the performance expectation 5-PS3-1; the crosscutting concept *Energy and Matter: Flows, Cycles, and Conservation*; the practices of *Developing and Using Models*, *Analyzing and Interpreting Data*, and *Constructing Explanations and Designing Solutions*; and the disciplinary core ideas PS3.D and LS1.C. The main difference between the current and predecessor versions of the task was the addition of the first screen, which is intended to serve as an easier entry point into the task and as an introduction to two interactions central to the ecosystem: the feeding relationships between right whales, zooplankton (fish larvae), and phytoplankton (algae). With the addition of this screen, students were generally more successful on the entire task than on the predecessor version, although this comparison is based on observations of two small groups of students at different schools and at different times in the school year. Evidence from both sets of observations suggest that the difficulty of the later screens is on the upper end of the range of what is expected for grade-5 students. Several students showed little to no understanding of the dimensions targeted by the task. For others, evidence from the cognitive interviews indicated some content knowledge and partial understanding of the crosscutting concept, but difficulty in applying these concepts to the models in the task. Some students were able to develop and use the models of energy and matter flows; fewer students were able to demonstrate these understandings when constructing explanations in the constructed response item.

USABILITY DATA: There were only minor usability issues in the first round of cognitive interviews, observed in students' interactions with the display of algae concentrations, due to some ambiguity in the exact timing of the peak of algae growth and misunderstanding of the color scale. In the second round of cognitive interviews, the first issue was addressed while the second was left as is; no usability issues were observed in this second round.

TIME DATA: Students typically needed about 20 minutes to complete the task, although the purpose of the cognitive interviews was not to collect timing data, as thinking aloud while responding tends to increase the time required.

APPENDIX D
Cognitive Interview Summary (DRAFT)

TASK: Grade 5 CKA

DESCRIPTION OF THE TASK: This task engaged students in an investigation of the properties of materials and in analyzing the data collected to evaluate claims and construct explanations.

VALIDITY EVIDENCE: The task elicited partial evidence of the performance expectations 5-PS1-2 and 5-PS1-3. In particular, evidence of students' understanding of matter conservation was not observed. For example, even in the item specifically about this concept, one student responded to a question about "missing" mass by adding the masses together, rather than finding their difference, and explaining, "I think what happened to the missing mass that more water was added to it because of the object." The task did not elicit evidence of the crosscutting concept *Scale, Proportion, and Quantity*.

The task elicited evidence of practices *Planning and Carrying out Investigations, Analyzing and Interpreting Data, Mathematical and Computational Thinking, and Constructing Explanations*. Students carried out the investigations, generate data, and reasoned about the underlying science content. However, data were often collected inaccurately, due to usability issues described below, and not used in the ways intended. For example, students did not always make a clear connection between mass and gas.

USABILITY DATA: Students were able to complete most of the tasks, although some students had difficulty using plastic wrap to collect gas above the beaker. The plastic wrap was trick for students and the rubber bands were not tight enough to contain the gas – leading to inaccurate results.

Some instructions were unclear; additional pictures and additional to written instructions would help improve the clarity of the task for students at this grade level, such as showing how to touch cylinders and how much is "one inch" of water in a cup.

TIME DATA: Some students were able to complete the task in one hour; others took over an hour. However, the purpose of the cognitive interviews was not to collect timing data, as thinking aloud while responding tends to increase the time required. In addition, teachers would likely need at least 30 minutes to prepare materials in advance of the assessment – some preparation cannot be done more than 10-15 minutes in advance (ice water, warm water). The task brought together two investigations through the context of the "spy;" in fact these two investigations could each be done separately, providing more flexibility for including either in an operational assessment.

APPENDIX D
Cognitive Interview Summary (DRAFT)

TASK: Grade 8 PT

DESCRIPTION OF THE TASK: This task engaged students in an investigation of heat transfer and the effect of mass on temperature changes, data analysis, and items related to this context.

VALIDITY EVIDENCE: In the cognitive interviews, this task elicited evidence of the performance expectations MS-PS3-3, MS-PS3-4, and MS-PS3-5 in some cases, but only partial evidence in others, due to the difficulty of the task and the time needed to complete it. Students who were not successful in the initial experiment demonstrated less of the intended assessment targets throughout the task. In the feasibility study, students focused on completing the hands-on portion of the task, but left the Student Manual incomplete, providing answers to only a few of the items. These data contrast with the round one findings, which included strong evidence of MS-PS3-3 and MS-PS3-4, with a longer version of the task and more time to complete it.

The task required the use of crosscutting concepts *Energy and Matter* as well as *Scale, Proportion, and Quantity* to help explain and make sense of the transfer of heat within a system and how the ratio of materials affects the transfer of heat. The task also requires use of the practices of *Planning and Conducting an Investigation* during the initial phase of the assessment. Student had to determine steps to test in an investigation and then follow those steps to determine rates of heat transfer into different volumes of water. Students demonstrated the practice of *Developing and Using Models* to explain the transfer of heat within a system. The practice of *Analyzing and Interpreting Data* was applied later as information was provided and claims presented to students. The practice of *Mathematical and Computational Thinking* is used when analyzing graphs. The practice *Construction Explanations* was used as students answered questions to make sense of the phenomenon. Finally, the practice of *Engaging in Argument from Evidence* was used to select claims that supported or refuted statements was used.

USABILITY DATA: The primary usability issue observed was also one of this tasks strengths: the open ended nature of the initial experimental design. Most students made no attempt or were unable to design an experiment given the directions and materials provided. At best, students provided a short description that included the volumes of water and the independent and dependent variables. In two cases, students tried to answer the question to be investigated directly and, in one case, wrote a prediction. Another usability issue was the relatively small effect of the hot pack on different volumes of water. If not conducted properly, even a well-designed experiment could generate confounding data. This issue was anticipated, and subsequent items that rely on the experimental data are intended to be scored such that correct answers are possible even with less than ideal results. For example, one student who did not generate accurate data was able to evaluate his prediction and determine that his prediction was wrong. However, another student used erroneous results to justify responses later in the task, for example, misinterpreting the correct data provided for another item. This student reasoned that more materials such as sand or water will lead larger changes in temperature. A minor usability issue with the Student Manual was the need to flip between pages to review data or to view all parts of an item with several graphics; this issue could be addressed by reorganizing the manual, allowing students to remove and replace the page with the data table, or providing some graphics on a separate handout. Usability issues with language and the clarity of the directions were observed for some students; these were minor issues for most students that could be addressed by simplifying the text, but were barriers to completion for some ELLs, to the point where one student did not make any progress on the task before declining to continue participating.

APPENDIX D

Cognitive Interview Summary (DRAFT)

TIME DATA: In cognitive interviews, individual students typically did not complete the task in the 55-minutes provided within a 60-minute class period (at least 5 minutes were set aside for follow-up questions). In cognitive interviews with longer class periods, students needed between 60 and 90 minutes to complete the task. However, in a 25-student⁶ feasibility study during a 1-hour class period, no students were able to complete the task as designed, despite shortening the task from the prior CKA version used in round 1 cognitive interviews. [look at feasibility time data and break down the hour; esp. look at time for students to get the investigation underway <recommendation that students not set up and then take apart apparatus—rely on diagram instead, which could be a separate handout> and the 10 minute wait, which some students used to complete items and others did not] Approximately 15 minutes of additional time were needed to distribute well-organized materials prior to the class period, and approximately 30 minutes of additional time were needed to clean up the materials after the class period. If teachers were required to organize the materials, an additional hour would likely be required for setup, and an additional 30 minutes would be needed to reset and refresh used materials.

⁶ Of these 25 students, 8 were reported as having an IEP.

APPENDIX D
Cognitive Interview Summary (DRAFT)

TASK: HS OECR

DESCRIPTION OF THE TASK: This task engaged students in constructing explanations based on information provided and analyses of data that show how the Chesapeake Bay has changed over time.

VALIDITY EVIDENCE: Although it was only partly completed in this round of cognitive interviews, the task elicited the targeted PEs HS-LS2-2 and HS-LS2-4, and the additional practices included for assessment: *Analyzing and Interpreting Data*, *Constructing Explanations and Designing Solutions*, and *Obtaining, Evaluating, and Communicating Information*. Observations and comments from students in follow-up interviews indicate that the set of items are all on the upper end of the difficulty scale. For example, one student meaningfully compared curves in a graph to understand a relationship among variables although she did not do it correctly (“The concentrations of DO and O2 are never the same. There is either more or less oxygen.”) The student did not understand what dissolved oxygen actually is or where it comes from. Another student interpreted the term “carrying capacity” as the upper limit of the amount of change to the ecosystem.

USABILITY DATA: Some technical, usability, and conceptual issues arose due to the quantity of information presented, complexity of the presentation (multiple sections with tabs, and tables and data spread across multiple tabs), and some vocabulary. There were many instances when students were observed scrolling up and down and clicking on different tabs to review items, sections, and information that could help answer the question. Specifically, students complained about the challenge of locating text they had read only moments’ prior. Many students expressed a need for a “highlighting tool” to help index important information in the text. One student expressed a desire to not have to “hunt” for information already read. This student suggested incorporating a tool similar to a highlighting tool, one that could help to gather and organize ideas before being asked to write about them.

TIME DATA: Round two cognitive interviews were limited to approximately 60 minutes; two students completed the first two sections before running out of time and one student completed the first section only. A fourth student had only 30 minutes to complete the cognitive interview and completed just the first section. In round one, up to 90 minutes were needed to complete the predecessor version of the task.

APPENDIX D
Cognitive Interview Summary (DRAFT)

TASK: HS CKA

DESCRIPTION OF THE TASK: The HS CKA included two main parts, 1) a paper-based Student Manual with directions for a hands-on activity using manipulatives, prompts to take notes and to make a prediction, and a description of an investigation, and 2) a computer-based assessment with an introduction to the phenomenon, static and interactive stimuli, and nine items of a variety of item types, including multiple choice, short answer, constructed response, and technology-enhanced items.

VALIDITY EVIDENCE: Overall, the task provided sufficient evidence of the performance expectations HS-LS1-5, HS-LS1-7, and HS-LS2-5, including evidence of the practices *Developing and Using Models*, *Planning and Carrying Out Investigations*, *Analyzing and Interpreting Data*, *Mathematical and Computational Thinking*, and *Constructing Explanations and Designing Solutions*, as well as the crosscutting concepts *Energy and Matter: Flows, Cycles, and Conservation*, and *Systems and System Models*. However, the quality of evidence across the dimensions varied within the task; evidence from some items was limited to a single dimension. For example, item 1b elicited evidence of the practice, but not the core idea or crosscutting concept; item 1d elicited only evidence of the core idea. In section 2, students typically did not use the crosscutting concepts, although this may be due to the difficulty of the items and the abilities of individual students. Some evidence of the crosscutting concepts was observed in the notes and prediction in the Student Manual, which were not intended to be scored. Typed responses gathered from the log files in the feasibility study mostly provide evidence knowledge of the core ideas, the practice *Analyzing and Interpreting Data*, partial evidence of using and making explicit models of systems within the practice and crosscutting concept, along with evidence that some students are using the crosscutting concept *Energy and Matter: Flows, Cycles, and Conservation*.

USABILITY DATA: For most students, the combination of a simple, hands-on task using the transparencies, and a computer-based task with interactive stimuli and items worked well. There were some minor usability issues for some students, due to lack of familiarity with a transparency overlay or with the functionality of some computer interfaces.

TIME DATA: In a 19-student feasibility study, most students were able to complete the task, with times to complete ranging from 25 to 70 minutes. A few students who arrived late were not able to complete the task during the class period. In the cognitive interviews, students were typically able to complete the task within an hour.

APPENDIX D
Cognitive Interview Summary (DRAFT)

TASK: HS PT

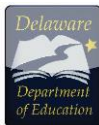
DESCRIPTION OF THE TASK: This task engaged students in developing a model to show the process of gene expression, from DNA to protein, and to use the model to explain the variation of traits.

VALIDITY EVIDENCE: The task elicited evidence of the performance expectations HS-LS1-1 and HS-LS1-2, including evidence of students' knowledge of the core idea LS1.A. However, the task provided information to students that a protein is made up of a string of amino acids, so the task did not assess this part of the DCI, only whether students were able to use a DNA template to produce mRNA (recognize and identify the nucleotide base pairs) and use a codon chart to identify amino acids. The task also elicited the practices of *Developing and Using Models* and *Constructing Explanations*, and application of the crosscutting concepts of *Structure and Function* and *Systems and Systems Models*. However, without the physical model used in round one cognitive interviews, students in round two did not see the connection to the modeling practice. For example, students did not identify the nucleotide bases as a model of the mRNA strand, but rather that they had produced the mRNA strand. Evidence of the crosscutting concepts was strongest in the short-answer responses toward the end of the task.

USABILITY DATA: The placement of the codon chart within the task and the layout of the task on paper were problematic. Students had to flip back and forth among pages. Offering the codon chart as a laminated or paper hand-out separate from the task would have solved the awkward page layout issue. In round one cognitive interviews, the kit included both the table format and the circle format of codon charts. Students in this second round of interviews were only presented with the table format; students indicated they typically use the circle format in class. Including the codon chart as a hand out would have allowed both formats to be presented to students and they could use which ever was most familiar. Photos throughout the Student Manuals were presented in black and white, but images were originally intended to be in color. Again, a separate hand out in color would resolve this issue. Students also had difficulty with transcribing DNA to mRNA due to placement of information and answer box. The nucleotides should be placed directly above the corresponding location for the answer.

TIME DATA: In the round two cognitive interviews, students needed between 20 and 40 minutes to complete the task, all well within the 60-minute class period.

Appendix E
Grade 5 Integrated Item Cluster (Simulation) Exemplar
(DRAFT)



**Delaware Science Assessment Prototype:
Grade 5 Simulation Assessment**

Status: RFP Inclusion

Description: Students will observe simulations of phenomena, develop and use models of ecosystem interactions that include energy and matter flows, and construct an explanation of energy and matter flows, using evidence in a simulation.

Grade: 5	Focus: Right whale migration
Testing Target: ITA	Task Format: online
Item Cluster Format: Simulation	Dimensions: SEP: MOD E/S; DCI: PS3.D, LS1.C; CCC: E/M
Task Phenomenon: Microscopic animals eat algae, which get energy from the Sun. The amounts of algae change in different parts of the world at different times of year. Right whales migrate north in the spring to where algae are increasing.	

Item Cluster PE Bundle:
5-PS3-1: Use models to describe that energy in animals' food (used for body repair, growth, motion, and to maintain body warmth) was once energy from the sun.

CCCs	SEPs
<input type="checkbox"/> PAT – Patterns	<input type="checkbox"/> Q/P – Asking Questions and Defining Problems
<input type="checkbox"/> C/E – Cause and Effect	<input checked="" type="checkbox"/> MOD – Developing and Using Models
<input type="checkbox"/> SPQ – Scale, Proportion, and Quantity	<input type="checkbox"/> INV – Planning and Carrying Out Investigations
<input type="checkbox"/> SYS – Systems and System Models	<input type="checkbox"/> DATA – Analyzing and Interpreting Data
<input checked="" type="checkbox"/> E/M – Energy and Matter	<input type="checkbox"/> MCT – Using Mathematics and Computational Thinking
<input type="checkbox"/> S/F – Structure and Function	<input checked="" type="checkbox"/> E/S – Constructing Explanations and Designing Solutions
<input type="checkbox"/> S/C – Stability and Change	<input type="checkbox"/> ARG – Engaging in Argument from Evidence
	<input type="checkbox"/> INFO – Obtaining, Evaluating, and Communicating Information

Format	Type	Documents
<input type="checkbox"/> Paper/pencil	<input type="checkbox"/> EoU	<input checked="" type="checkbox"/> Task content
<input type="checkbox"/> Lab/manipulatives	<input checked="" type="checkbox"/> ITA	<input type="checkbox"/> Student instructions
<input checked="" type="checkbox"/> Online		<input type="checkbox"/> Proctor instructions
		<input type="checkbox"/> Materials list


Grade: 5	Focus: Right whale migration
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Testing Target: ITA	Task Format: online
Item Cluster Format: Simulation	Item Cluster PE Bundle: 5-PS3-1
Task Phenomenon: Microscopic animals eat algae, which get energy from the Sun. The amounts of algae change in different parts of the world at different times of year. Right whales migrate north in the spring to where algae are increasing.	

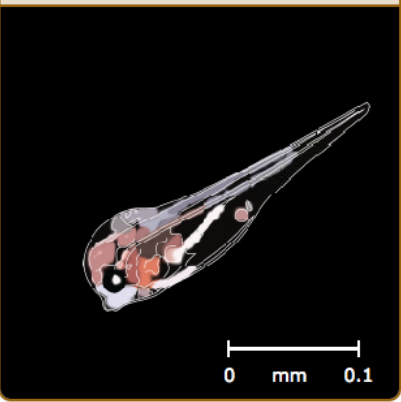
Item: 1	Item Format: Multiple select
Target PE: 5-PS3-1	CCC target(s): E/M
DCI: LS1.C (Organization for Matter and Energy Flow in Organisms) Food provides animals with the materials they need for body repair and growth and the energy they need to maintain body warmth and for motion.	SEP target(s): N/A

Correct responses: A, B, E

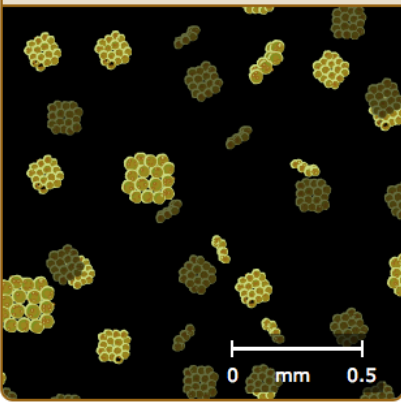
Right Whales



Fish Larva



Algae



A group of scientists is studying an ocean ecosystem. They show you pictures of three organisms they observe:

- Right whales
- A fish larva
- Algae

They plan to study the right whales eating fish larvae. They also plan to study a fish larva eating algae.

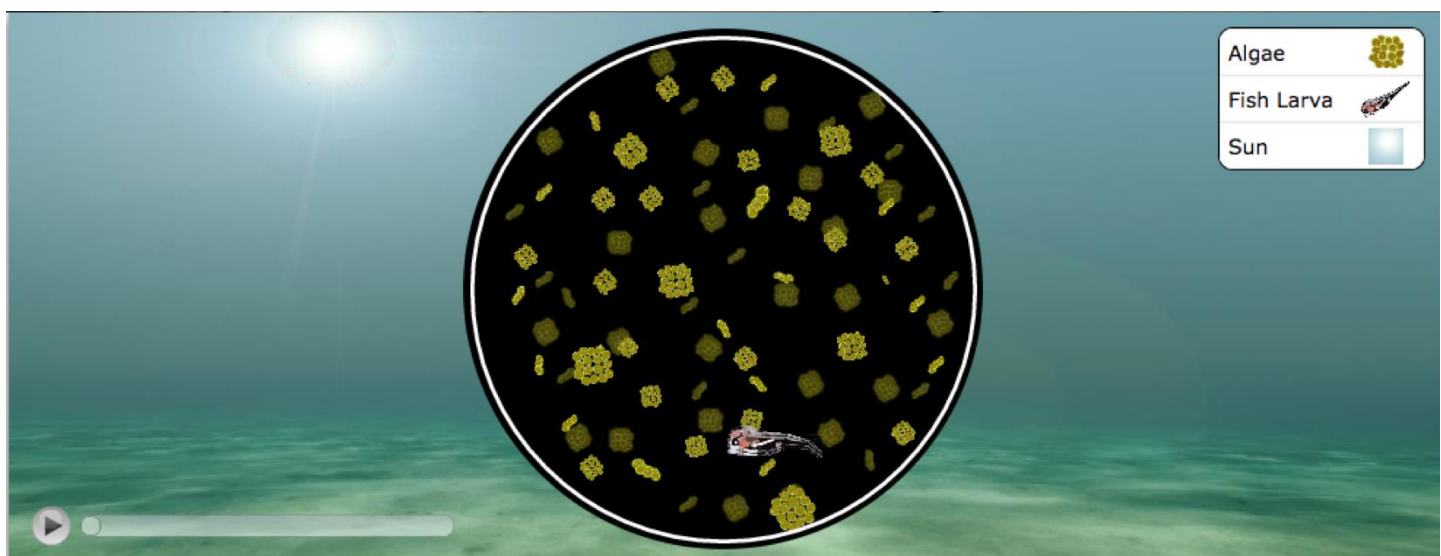
Which three statements explain why right whales eat fish larvae?

- Whales need matter to grow.
- Whales need energy to swim.
- Eating transfers energy from the whales to the fish larvae.
- Eating transfers matter from the water to the whales and fish larvae.
- Eating transfers energy and matter from the fish larvae to the whales.

1 of 9
NEXT

Grade: 5	Focus: Right whale migration
Testing Target: ITA	Task Format: online
Item Cluster Format: Simulation	Item Cluster PE Bundle: 5-PS3-1
Task Phenomenon: Microscopic animals eat algae, which get energy from the Sun. The amounts of algae change in different parts of the world at different times of year. Right whales migrate north in the spring to where algae are increasing.	

Item: 2	Item Format: Stimulus	
Target PE: 5-PS3-1	CCC target(s): N/A	
DCI: N/A	SEP target(s): N/A	



The scientists are studying the ocean ecosystem with a new underwater camera. The camera shows microscopic algae and a fish larva eating the algae.

You will be helping the scientists investigate the ecosystem. Your first job is to show how energy and matter flow through the parts of the ecosystem.

Click play (▶) to observe the ecosystem in action.

Grade: 5	Focus: Right whale migration
Testing Target: ITA	Task Format: online
Item Cluster Format: Simulation	Item Cluster PE Bundle: 5-PS3-1
Task Phenomenon: Microscopic animals eat algae, which get energy from the Sun. The amounts of algae change in different parts of the world at different times of year. Right whales migrate north in the spring to where algae are increasing.	

Item: 3	Item Format: TEI
Target PE: 5-PS3-1	CCC target(s): E/M
DCI: PS3.D: (Energy in Chemical Processes and Everyday Life) The energy released [from] food was once energy from the sun that was captured by plants in the chemical process that forms plant matter (from air and water).	SEP target(s): MOD

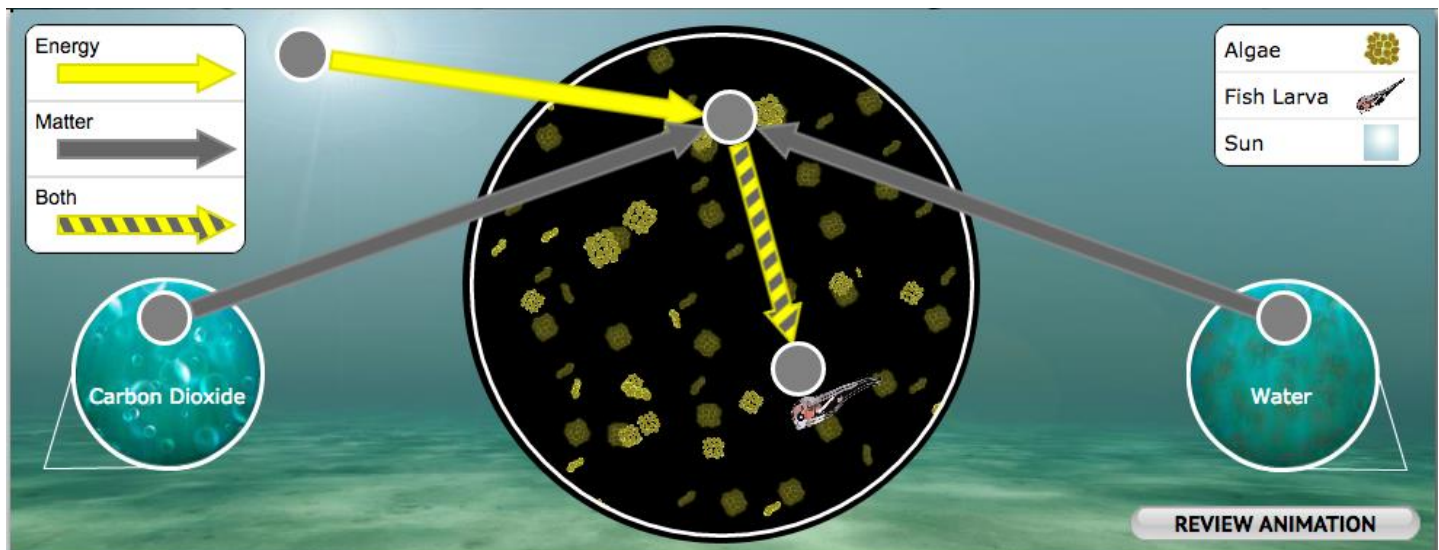
You observed the ecosystem in action. Now show how energy flows through the ecosystem.

The diagram above shows sunlight, algae, and a fish larva. **Complete the diagram by drawing arrows to show the flow of energy.**

- To draw an arrow, click and drag from one dot to another dot.
- To delete an arrow, double click on it.
- You can click REVIEW ANIMATION to observe the ecosystem again.

Grade: 5	Focus: Right whale migration
Testing Target: ITA	Task Format: online
Item Cluster Format: Simulation	Item Cluster PE Bundle: 5-PS3-1
Task Phenomenon: Microscopic animals eat algae, which get energy from the Sun. The amounts of algae change in different parts of the world at different times of year. Right whales migrate north in the spring to where algae are increasing.	

Item: 4	Item Format: TEI	
Target PE: 5-PS3-1	CCC target(s): E/M	
DCI: PS3.D: (Energy in Chemical Processes and Everyday Life) The energy released [from] food was once energy from the sun that was captured by plants in the chemical process that forms plant matter (from air and water).	SEP target(s): MOD	



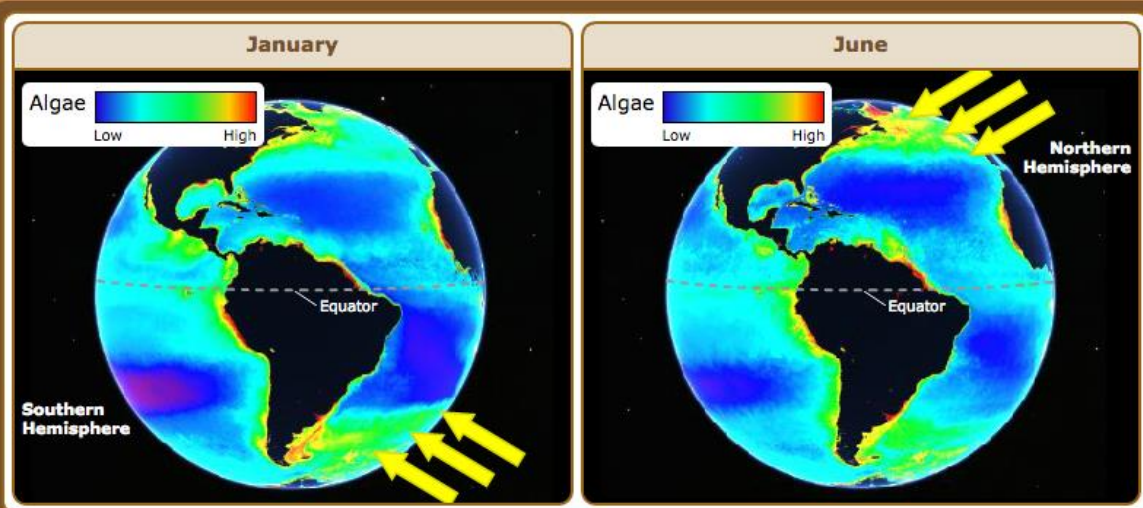
One of the scientists drew the diagram above. She added carbon dioxide and water to the diagram. She wants you to complete the diagram by coloring the arrows to show how energy and matter transfer in the ecosystem.

Show the flow of energy and matter by choosing a type for each arrow: energy, matter, or both.

- Click each arrow one or more times to change its color.
- You can change the type of arrow by clicking on the arrow again.
- You can click REVIEW ANIMATION to observe the ecosystem again.

Grade: 5	Focus: Right whale migration
Testing Target: ITA	Task Format: online
Item Cluster Format: Simulation	Item Cluster PE Bundle: 5-PS3-1
Task Phenomenon: Microscopic animals eat algae, which get energy from the Sun. The amounts of algae change in different parts of the world at different times of year. Right whales migrate north in the spring to where algae are increasing.	

Item: 5	Item Format: Multiple Choice	
Target PE: 5-PS3-1	CCC target(s): E/M	
DCI: PS3.D: (Energy in Chemical Processes and Everyday Life) The energy released [from] food was once energy from the sun that was captured by plants in the chemical process that forms plant matter (from air and water).	SEP target(s): MOD	



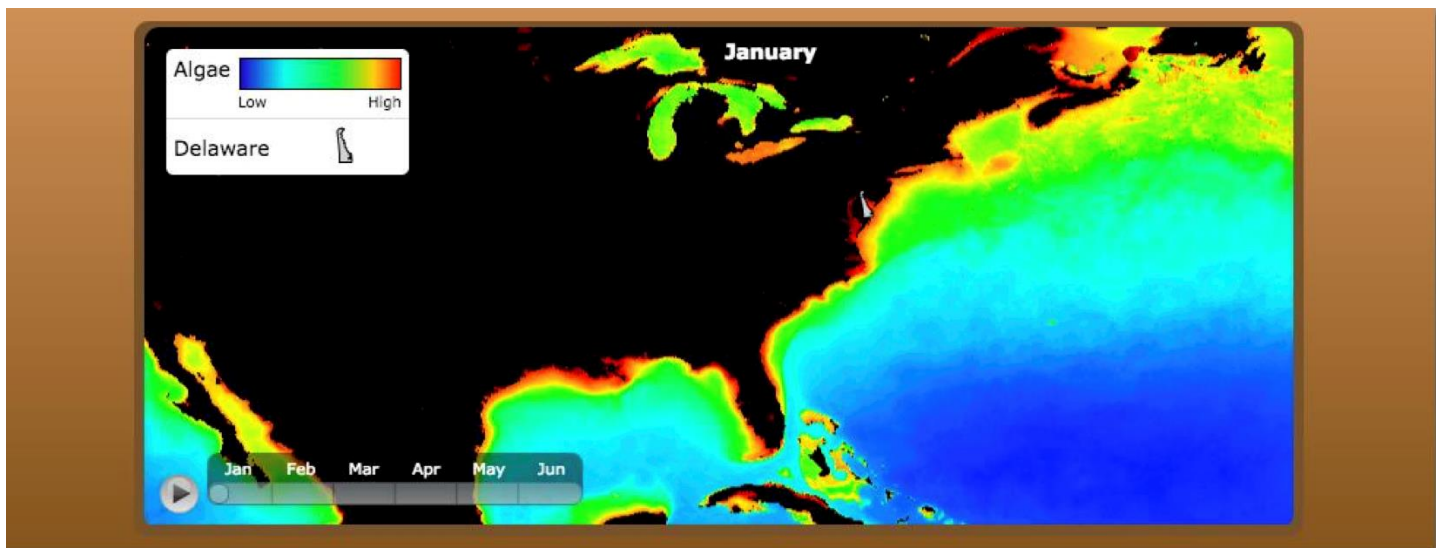
The maps show how the amount of algae in the ocean changes from January to June. The arrows show the hemisphere in which the sunlight is more direct in each season. In January, the sunlight is more direct in the Southern Hemisphere. In June, the sunlight is more direct in the Northern Hemisphere.

Which statement explains what the maps show about algae?

- Algae move toward the Northern Hemisphere throughout the year.
- Algae move away from places where there is too much energy from Sun.
- Algae grow in both hemispheres at the same rate throughout the year.
- Algae grow better in places where they have more energy from the Sun.

Grade: 5	Focus: Right whale migration
Testing Target: ITA	Task Format: online
Item Cluster Format: Simulation	Item Cluster PE Bundle: 5-PS3-1
Task Phenomenon: Microscopic animals eat algae, which get energy from the Sun. The amounts of algae change in different parts of the world at different times of year. Right whales migrate north in the spring to where algae are increasing.	

Item: 6	Item Format: Stimulus	
Target PE: 5-PS3-1	CCC target(s): N/A	
DCI: N/A	SEP target(s): N/A	



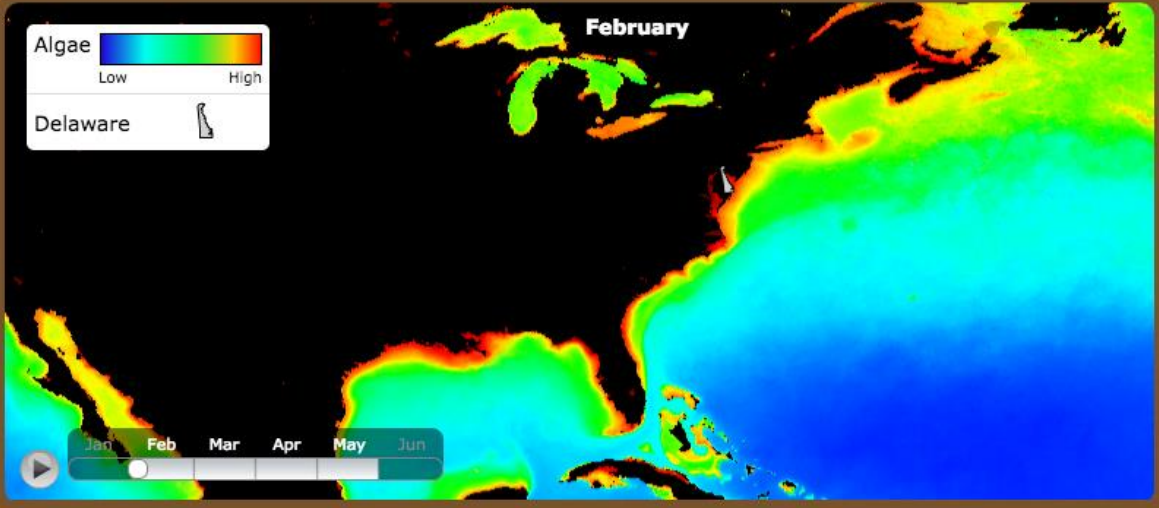
The simulation above shows changes in the amount of algae from January to June. The location of Delaware is shown in light gray.

Click play to observe the simulation in action.

You can drag the circle in the progress bar to observe the amount of algae each month.

Grade: 5	Focus: Right whale migration
Testing Target: ITA	Task Format: online
Item Cluster Format: Simulation	Item Cluster PE Bundle: 5-PS3-1
Task Phenomenon: Microscopic animals eat algae, which get energy from the Sun. The amounts of algae change in different parts of the world at different times of year. Right whales migrate north in the spring to where algae are increasing.	

Item: 7	Item Format: EBSR	
Target PE: 5-PS3-1	CCC target(s): E/M	
DCI: PS3.D: (Energy in Chemical Processes and Everyday Life) The energy released [from] food was once energy from the sun that was captured by plants in the chemical process that forms plant matter (from air and water).	SEP target(s): MOD	



Algae are food for the fish larvae and other tiny organisms that whales eat. The scientists are planning to study the whales as they migrate past Delaware. The scientists ask you to help, using information from the simulation.

In which month will the scientists most likely find whales near Delaware?

February
 March
 April
 May

Which three statements explain why scientists are more likely to find whales near Delaware in the month you selected?

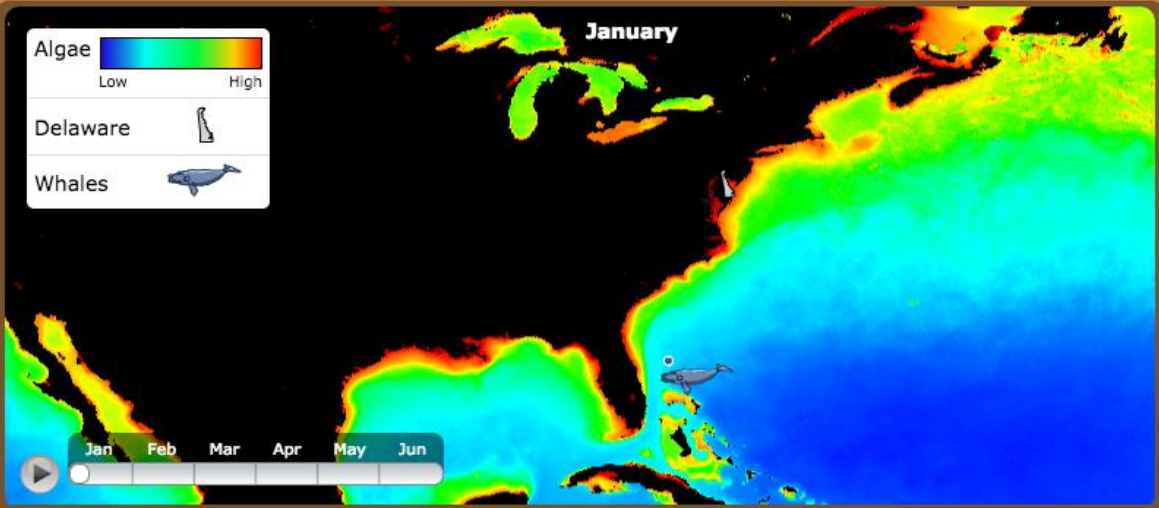
- More matter is available for whales in that month.
- More energy is available for algae in that month.
- Less sunlight is available in that month.
- Algae store more matter in that month.
- Algae store less energy in that month.

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NEXT

Grade: 5	Focus: Right whale migration
Testing Target: ITA	Task Format: online
Item Cluster Format: Simulation	Item Cluster PE Bundle: 5-PS3-1
Task Phenomenon: Microscopic animals eat algae, which get energy from the Sun. The amounts of algae change in different parts of the world at different times of year. Right whales migrate north in the spring to where algae are increasing.	

Item: 7	Item Format: CR	
Target PE: 5-PS3-1	CCC target(s): E/M	
DCI: LS1.C (Organization for Matter and Energy Flow in Organisms) Food provides animals with the materials they need for body repair and growth and the energy they need to maintain body warmth and for motion.	SEP target(s): MOD	



The simulation shows that whales migrate north in the spring. After feeding all summer long, the whales will migrate south during the fall months. The whales will not eat as they migrate south in the fall.

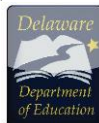
Construct an explanation supported by evidence from the simulation for how whales can migrate south during the fall months without eating.

The whales can migrate south during the fall months without eating because they eat and store energy in the summer. My evidence is the whale moving through the places where there is more algae in the summer.

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NEXT

Appendix E
Grade 8 Integrated Item Cluster (Performance Task) Exemplar
(DRAFT)



Delaware Science Assessment Prototype: Grade 8 Performance Task Assessment

Status: RFP Inclusion

Description: How does the mass or type of material affect temperature changes when heated?
How does the ratio of salt to water affect how well a hot pack works?

Grade: 8	Focus: Temperature and Kinetic Energy
Testing Target: EoU	Task Format: paper-pencil and hands-on
Item Cluster Format: Performance Task	Dimensions: SEP: MOD, INV, DATA, MCT, E/S, ARG; DCI: PS3.A, PS3.B; CCC: SPQ, E/M
Task Phenomenon: Hot packs affect the temperature of their surroundings.	

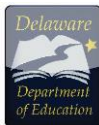
PE/PE Bundle: MS-PS3-3, MS-PS3-4, MS-PS3-5
 MS-PS3-3: Apply scientific principles to design, construct, and test a device that either minimizes or maximizes thermal energy transfer.
 MS-PS3-4: Plan an investigation to determine the relationships among the energy transferred, the type of matter, the mass, and the change in the average kinetic energy of the particles as measured by the temperature of the sample.
 MS-PS3-5: Construct, use, and present arguments to support the claim that when the kinetic energy of an object changes, energy is transferred to or from the object.

CCCs	SEPs
<input type="checkbox"/> PAT – Patterns	<input type="checkbox"/> Q/P – Asking Questions and Defining Problems
<input type="checkbox"/> C/E – Cause and Effect	<input checked="" type="checkbox"/> MOD – Developing and Using Models
<input checked="" type="checkbox"/> SPQ – Scale, Proportion, and Quantity	<input checked="" type="checkbox"/> INV – Planning and Carrying Out Investigations
<input type="checkbox"/> SYS – Systems and System Models	<input checked="" type="checkbox"/> DATA – Analyzing and Interpreting Data
<input checked="" type="checkbox"/> E/M – Energy and Matter	<input checked="" type="checkbox"/> MCT – Using Mathematics and Computational Thinking
<input type="checkbox"/> S/F – Structure and Function	<input checked="" type="checkbox"/> E/S – Constructing Explanations and Designing Solutions
<input type="checkbox"/> S/C – Stability and Change	<input checked="" type="checkbox"/> ARG – Engaging in Argument from Evidence
	<input type="checkbox"/> INFO – Obtaining, Evaluating, and Communicating Information

Format	Type	Documents
<input checked="" type="checkbox"/> Paper/pencil	<input checked="" type="checkbox"/> EoU	<input checked="" type="checkbox"/> Task content
<input checked="" type="checkbox"/> Lab/manipulatives	<input type="checkbox"/> ITA	<input checked="" type="checkbox"/> Student instructions
<input type="checkbox"/> Online		<input checked="" type="checkbox"/> Proctor instructions
		<input checked="" type="checkbox"/> Materials list

Introduction

Appendix E
Grade 8 Integrated Item Cluster (Performance Task) Exemplar
(DRAFT)



Instant hot packs have many different uses, from loosening stiff muscles to warming up cold hands on a chilly day. There are many types of instant hot packs available, but all involve a process that results in a transfer of heat energy.

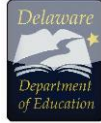
In one type of instant hot pack, a sealed outer bag contains a type of salt and another, smaller sealed bag of water. You activate the hot pack when you break the inner bag of water, mixing the salt and the water. The solution that is formed changes temperature.

Using the materials in this kit, you will plan and carry out an investigation of the transfer of heat energy between an instant hot pack and different volumes of water.

Materials

- Four 177-ml (6-oz) plastic jars with lids [*number the jars in each set 1–4*]
- One 6-inch instant hot pack
- Aluminum foil
- Tap water
- Digital instant-read thermometer
- 100-mL graduated cylinder
- Timer
- Goggles
- One cardboard box with cardboard dividers for holding hot pack and jars

Appendix E
Grade 8 Integrated Item Cluster (Performance Task) Exemplar
(DRAFT)



Section 1: Hands-On Activity (20–30 minutes)

Instructions: You will first assemble a testing apparatus, or device, in step 1.1. In steps 1.2–1.3, you will design an experiment to test how the volume of water affects temperature change using the apparatus you assembled. Beginning in step 1.4, you will conduct the experiment you designed.

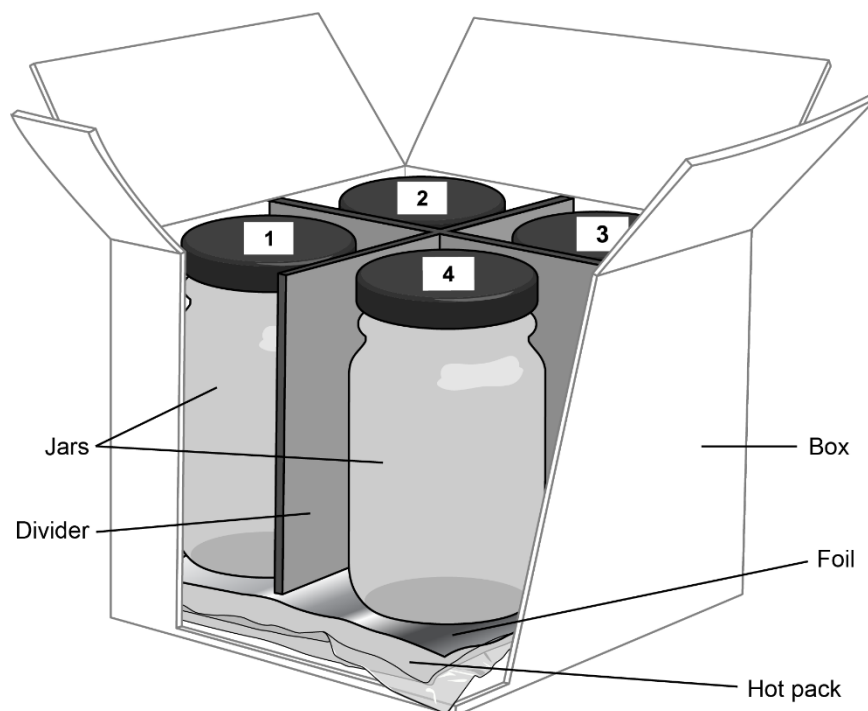
Put on your goggles before you begin. Read through the directions in steps 1.1–1.3 first, and then follow steps 1.4–1.13 to complete the investigation.

1.1. Follow steps a–e to assemble the testing apparatus.

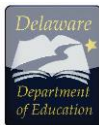
Important: Do NOT activate the hot pack yet.

- a. Locate the cardboard box. If the divider is in the box, remove it.
- b. Place the **inactive** hot pack into the bottom of the box.
- c. Place a sheet of aluminum foil directly on top of the hot pack.
- d. Place the divider on top of the hot pack to produce four sections.
- e. Place one jar in each of the sections.

The diagram below shows what your testing apparatus should look like when assembled.



Appendix E
Grade 8 Integrated Item Cluster (Performance Task) Exemplar
(DRAFT)

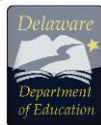


Your testing apparatus is now assembled. You will now design an experiment using this apparatus and additional materials from your kit.

1.2. Locate the following materials:

- Tap water
- One instant-read thermometer (digital)
- One 100-mL graduated cylinder
- One digital timer
- One pair of goggles

Appendix E
Grade 8 Integrated Item Cluster (Performance Task) Exemplar
(DRAFT)



Grade: 8	Focus: Temperature and Kinetic Energy
Testing Target: EoU	Task Format: paper-pencil and hands-on
Item Cluster Format: Performance Task	Item Cluster PE Bundle: MS-PS3-3, MS-PS3-4, MS-PS3-5
Task Phenomenon: Hot packs affect the temperature of their surroundings.	

Item: A (parts a–c)	Item Format: Constructed Response, Table Input
Total Points: 3	Key(s): Rubric
Target PE: MS-PS3-4	CCC target(s): N/A
DCI: N/A	SEP target(s): DATA, INV Analyzing and Interpreting Data Planning and Carrying Out Investigations

1.3. Design an investigation to answer this scientific question:

Does changing the volume of water in a closed system affect the total amount of temperature change in that system after 10 minutes?

Use the apparatus you’ve assembled to develop your investigation. Remember to describe:

- the volume of water you will use in each jar
- the independent and dependent variables
- the variables you will control
- ways to get more reliable data

You can use models and writing to communicate the design of your investigation in the space provided on the next page.

Note: When deciding how much water to use, keep in mind that each jar must be at least half full for the thermometer to read accurately.

You will now carry out the experiment you designed.

- 1.4. Remove each of the jars (labeled 1–4) from the apparatus.
- 1.5. Measure and add the volume of water you identified in your design to each of the four plastic jars.
- 1.6. Record the volume of water that you added to each jar in the row “Volume (in mL)” in Table 1 below.

Appendix E
Grade 8 Integrated Item Cluster (Performance Task) Exemplar
(DRAFT)

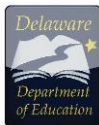


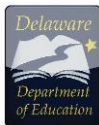
Table 1. Volume and Temperature Data

	Jar 1	Jar 2	Jar 3	Jar 4
Volume (in mL)				
Starting Temp. (in °C)				
Ending Temp. (in °C)				
Temp. Change (in °C)				

- 1.7. Use the thermometer to record the starting temperature of the water in each jar in the row “Starting Temp. (in °C)” in Table 1 above. Then close each jar with a lid.
- 1.8. Follow steps a–d below to begin your experiment:
 - a. Carefully remove the divider, aluminum foil, and hot pack from the apparatus.
 - b. Follow the directions on the hot pack to activate it. **Activate it now** (your teacher can help you with this step).
 - c. Carefully replace the hot pack, aluminum foil, and divider to reassemble the apparatus. Place one plastic jar into each of the spaces created by the divider. Each jar must be sitting directly on top of the aluminum foil.
 - d. Close the top of the box by pushing each flap inward.
- 1.9. The jars need to sit in the apparatus for approximately 10 minutes. Set the digital timer for 10 minutes and complete step 1.10 while the timer is going.
- 1.10. In the space below, make predictions to answer the following scientific questions:

How is thermal energy transferred between the instant hot pack and the water?
How will the temperature of the water in each jar change over the course of the experiment?

Appendix E
Grade 8 Integrated Item Cluster (Performance Task) Exemplar
(DRAFT)



It is NOT important for your prediction to be correct. Later, you will describe whether your data support your prediction.

Prediction

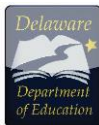
I predict that, over time:

- 1.11. Use the thermometer to measure the ending temperature of the water in each jar. Record the temperature in the row “Ending Temp. (in °C)” in Table 1 above.
- 1.12. Calculate the temperature change in each jar using the following equation:

$$\textit{ending temperature} - \textit{starting temperature} = \textit{temperature change}$$

- 1.13. Record the temperature change for each jar in the row “Temp. Change (in °C)” in Table 1.

Appendix E
Grade 8 Integrated Item Cluster (Performance Task) Exemplar
(DRAFT)



Grade: 8	Focus: Temperature and Kinetic Energy
Testing Target: EoU	Task Format: paper-pencil and hands-on
Item Cluster Format: Performance Task	Item Cluster PE Bundle: MS-PS3-3, MS-PS3-4, MS-PS3-5
Task Phenomenon: Hot packs affect the temperature of their surroundings.	

Item: 1	Item Format: Graphing
Total Points: 1	Key(s): Rubric
Target PE: MS-PS3-4	CCC target(s): N/A
DCI: N/A	SEP target(s): DATA, INV Analyzing and Interpreting Data Planning and Carrying Out Investigations

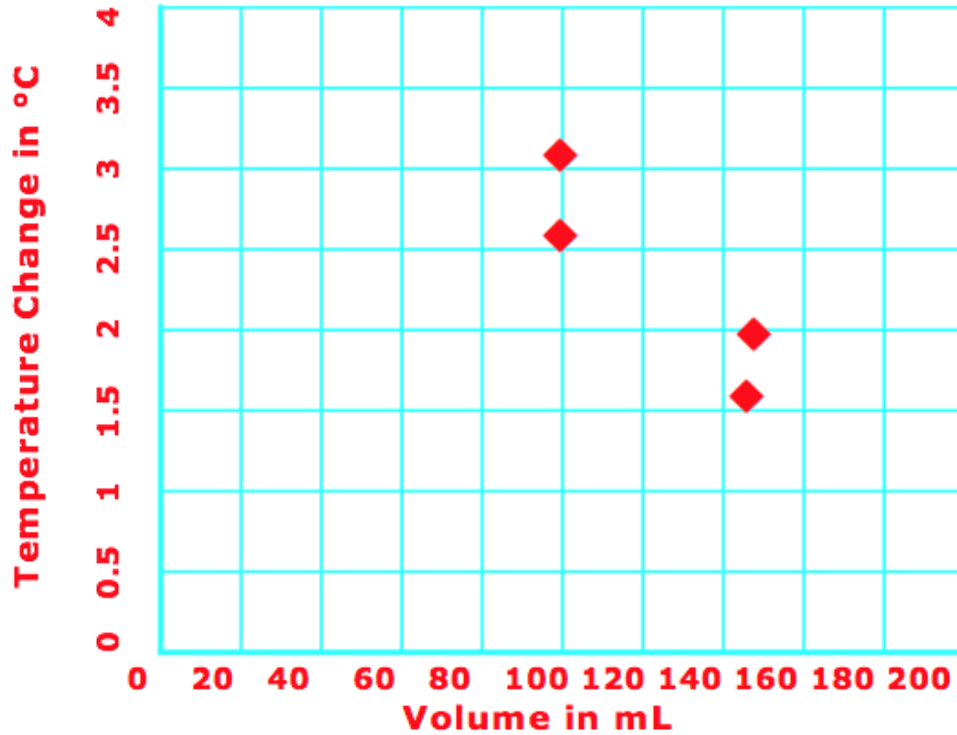
Question 1. Use the data that you entered in Table 1 to construct a graph. Your graph should show how the volume of water in each jar affected the temperature change. To construct your graph:

- Label the *x*-axis and the *y*-axis on the long lines. Be sure to include the appropriate units.
- On the small lines, indicate an appropriate scale for each axis.
- Draw points on the graph to show the results of your experiment.

Appendix E
Grade 8 Integrated Item Cluster (Performance Task) Exemplar
(DRAFT)



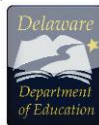
**Hot Pack and Jars with
Different Amounts of Water**



Rubric:

Response should include four data points representing the change in temperature for each volume of water. *y*-axis label: Temperature change in degrees C. *y*-axis scale: range of numbers should be appropriate for the data collected. *x*-axis label: Volume in mL. *x*-axis scale: 0–200.

Appendix E
Grade 8 Integrated Item Cluster (Performance Task) Exemplar
(DRAFT)



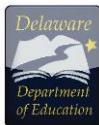
Grade: 8	Focus: Temperature and Kinetic Energy
Testing Target: EoU	Task Format: paper-pencil and hands-on
Item Cluster Format: Performance Task	Item Cluster PE Bundle: MS-PS3-3, MS-PS3-4, MS-PS3-5
Task Phenomenon: Hot packs affect the temperature of their surroundings.	

Item: 2	Item Format: Constructed Response
Total Points: 1	Key(s): Rubric
Target PE: MS-PS3-4	CCC target(s): N/A
DCI: N/A	SEP target(s): DATA, INV Analyzing and Interpreting Data Planning and Carrying Out Investigations

Question 2. Does the data in the graph support the prediction you made in step 1.10?
Explain your answer.

Response should include accurate comparisons of the data in the graph to the two parts of the prediction: whether or not the graph shows evidence of the direction of heat transfer in the prediction AND whether or not the graph shows the change in temperature described in the prediction. The response should include an explanation for the comparison, using the data in the graph as evidence.

Appendix E
Grade 8 Integrated Item Cluster (Performance Task) Exemplar
(DRAFT)



Grade: 8	Focus: Temperature and Kinetic Energy
Testing Target: EoU	Task Format: paper-pencil and hands-on
Item Cluster Format: Performance Task	Item Cluster PE Bundle: MS-PS3-3, MS-PS3-4, MS-PS3-5
Task Phenomenon: Hot packs affect the temperature of their surroundings.	

Item: 3	Item Format: Multiple Select
Total Points: 1	Key(s): A, D
Target PE: MS-PS3-4	CCC target(s): E/M Energy and Matter
DCI: N/A	SEP target(s): ARG Engaging in Argument from Evidence

Question 3. Coach Smith helped a student loosen a stiff arm muscle with an instant hot pack. Later, the student collected data on mass and temperature before and after using the instant hot pack. The student showed the data below to Coach Smith.

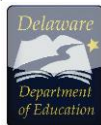
Instant Hot Pack Data

	Before Using	After Using
Mass of Instant Hot Pack	300 g	300 g
Temperature of Instant Hot Pack	45°C	15°C
Temperature of Arm	30°C	35°C
Temperature of Room	20°C	20°C

Coach Smith claims that even though the temperature of the instant hot pack changed, matter and energy were conserved. Select the **two** statements that support Coach Smith's claim.

- A. The mass of the instant hot pack did not change because the same amount of matter was present.*
- B. The mass of the instant hot pack did not change because the total amount of energy was conserved.
- C. Matter was conserved because it flowed from the hot pack to the arm, as shown by the temperature data.

Appendix E
Grade 8 Integrated Item Cluster (Performance Task) Exemplar
(DRAFT)



- D. Energy was conserved because it flowed from the instant hot pack into the arm causing the arm to warm, as shown by the temperature data.*
- E. The instant hot pack transferred energy as cold flowed from the arm into the hot pack and changed the temperature of the arm, until both were at the same temperature.

Grade: 8	Focus: Temperature and Kinetic Energy
Testing Target: EoU	Task Format: paper-pencil and hands-on
Item Cluster Format: Performance Task	Item Cluster PE Bundle: MS-PS3-3, MS-PS3-4, MS-PS3-5
Task Phenomenon: Hot packs affect the temperature of their surroundings.	

Item: 4	Item Format: Constructed Response
Total Points: 2 (one point per part)	Key(s): Rubric
Target PE: MS-PS3-4	CCC target(s): SPQ Scale, Proportion, and Quantity
DCI: N/A	SEP target(s): INV Planning and Carrying Out Investigations

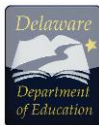
Question 4. The following question has two parts. First, answer Part A. Then, answer Part B.

A student wants to test how the ratio between the mass of a hot pack and the mass of a water sample relates to temperature change. The student's procedure is shown below.

Student's Procedure

1. Place a beaker of 50 mL of room-temperature water on top of a 300-g hot pack. The hot pack contains 250 mL of water and 50 g of salt.
2. Record the temperature of the water in the beaker every minute for 15 minutes.
3. Repeat steps 1 and 2 with a new hot pack and another 50 mL of room-temperature water.
4. Place a beaker of 100 mL of room-temperature water on top of a 600-g hot pack underneath. The hot pack contains 500 mL of water and 100 g of salt.
5. Record the temperature of the water in the beaker every minute for 15 minutes.
6. Repeat steps 4 and 5 with a new hot pack and 100 mL of room-temperature water.

Appendix E
Grade 8 Integrated Item Cluster (Performance Task) Exemplar
(DRAFT)



Part A

Explain why the student's procedure does **not** test how the ratio between the mass of a hot pack and the mass of a water sample relates to temperature change. Use what you know about proportion and quantity to support your explanation.

The student's procedure will not work because the student does not keep the mass of the hot pack the same. The only variable that should change is the volume of the sample (or mass of the hot pack). When the sizes of the hot pack and the water are increased by the same amount, the ratio stays the same.

Part B

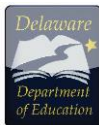
Describe how the student could change the procedure to correctly test how the ratio between the mass of a hot pack and the mass of a water sample relates to temperature change. In your answer, use what you know about scale and proportion to explain the reasoning for your changes.

In step 4, the student should use a 300-g hot pack with 100 mL of water, rather than a 600-g hot pack, to change the ratio of mass to volume. With this change, there is double the amount of water with the same-size hot pack. Thus, I can compare how increasing the volume of the water sample will affect the temperature change.

OR

In step 4, the student should use a 600-g hot pack with 50 mL of water, rather than 100 mL of water, to change the ratio of mass to volume. With this change, the mass of the hot pack doubles with the same-size water sample. Thus, I can compare how increasing the mass of a hot pack will affect the temperature change.

Appendix E
Grade 8 Integrated Item Cluster (Performance Task) Exemplar
(DRAFT)

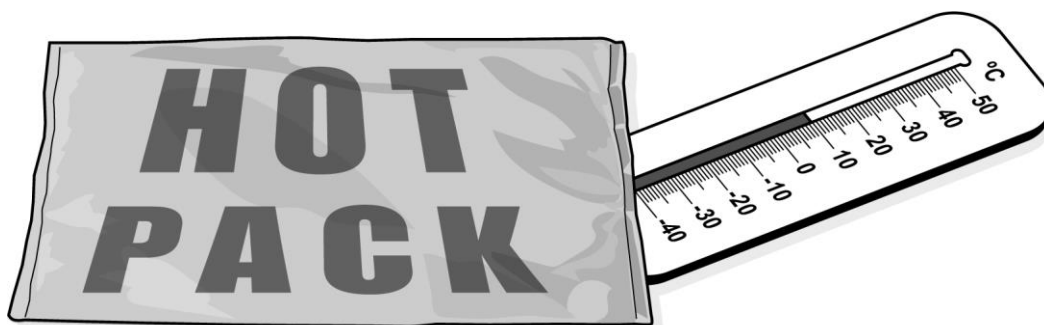


Grade: 8	Focus: Temperature and Kinetic Energy
Testing Target: EoU	Task Format: paper-pencil and hands-on
Item Cluster Format: Performance Task	Item Cluster PE Bundle: MS-PS3-3, MS-PS3-4, MS-PS3-5
Task Phenomenon: Hot packs affect the temperature of their surroundings.	

Item: 5	Item Format: EBSR
Total Points: 2	Key(s): D; A, B
Target PE: MS-PS3-3, MS-PS3-5	CCC target(s): E/M Energy and Matter
DCI: PS3.B (Conservation of Energy and Energy Transfer) <ul style="list-style-type: none"> When the motion energy of an object changes, there is inevitably some other change in energy at the same time. Energy is spontaneously transferred out of hotter regions or objects and into colder ones. 	SEP target(s): ARG, DATA Engaging in Argument from Evidence Analyzing and Interpreting Data

Question 5. The following question has two parts. First, answer Part A. Then, answer Part B.

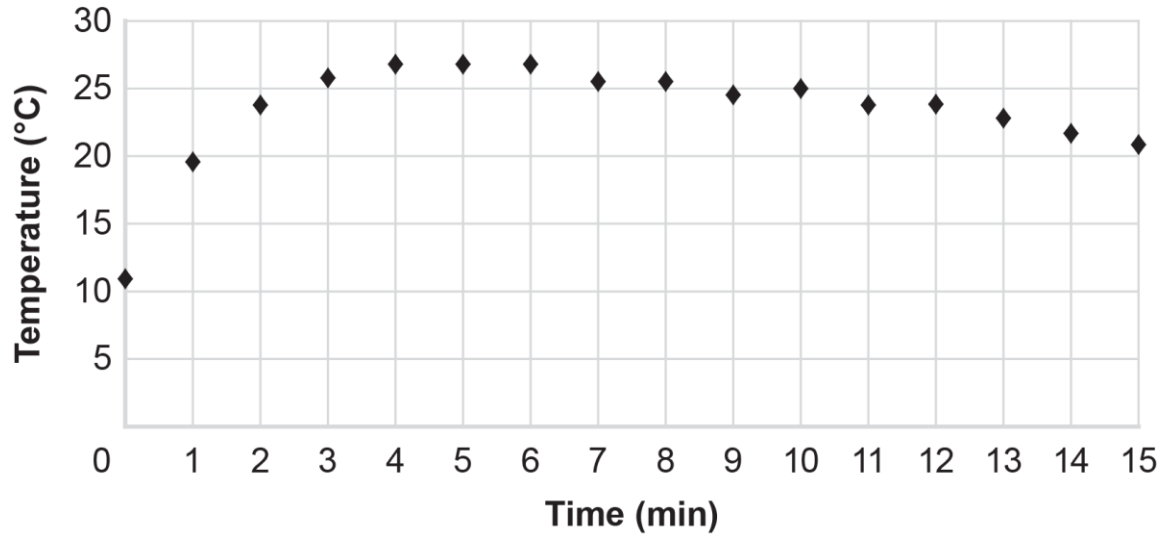
Suzy’s class recorded the temperatures of hot packs outside on a cool (10°C) day. They recorded the temperatures before activating the hot packs. After activating the hot packs, they recorded the temperatures of the hot packs every minute for 15 minutes. A setup and the average temperature data are shown below.



Appendix E
Grade 8 Integrated Item Cluster (Performance Task) Exemplar
(DRAFT)



Average Hot Pack Temperature



Appendix E
Grade 8 Integrated Item Cluster (Performance Task) Exemplar
(DRAFT)



Part A

Which of the following explanations is **best** supported by the data in the graph?

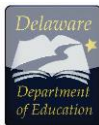
- A. Energy transfers at a constant rate between the hot pack system and the surrounding system that includes the thermometer.
- B. Energy transfers at a constant rate between the system of the hot pack, the thermometer, and the room.
- C. Energy transfers from the system of the hot pack to the thermometer, but the rate changes over time.
- D. Energy transfers between the system of the hot pack and the systems of the thermometer and air, but the rate changes over time.*

Part B

Which statements are the **best** arguments for evidence that supports the explanation you chose in Part A? Select the **two** correct answers.

- A. The temperature increase shown on the graph is evidence of energy flow into the thermometer. Because energy flows from warmer objects to colder objects, energy must flow from the hot pack to the thermometer.*
- B. The temperature decrease shown on the graph is evidence of energy flow out of the thermometer. Because energy flows from warmer objects to colder objects, energy must start flowing from the thermometer to the air once the thermometer is warmer than the air.*
- C. The temperature increase shown on the graph is evidence of energy flow into the hot pack. Because the temperature of an object increases when energy flows into it, energy must flow from the thermometer to the hot pack.
- D. The temperature decrease shown on the graph is evidence of energy flow into the hot pack. Because the temperature of an object decreases when energy flows out of it, energy must flow from the hot pack into the air once the hot pack is warmer than the air.
- E. The temperature changes shown on the graph are evidence that energy is gained and lost. Because the temperatures of the objects are changing, some energy is created and some energy is destroyed.

Appendix E
Grade 8 Integrated Item Cluster (Performance Task) Exemplar
(DRAFT)



Grade: 8	Focus: Temperature and Kinetic Energy
Testing Target: EoU	Task Format: paper-pencil and hands-on
Item Cluster Format: Performance Task	Item Cluster PE Bundle: MS-PS3-3, MS-PS3-4, MS-PS3-5
Task Phenomenon: Hot packs affect the temperature of their surroundings.	

Item: 6	Item Format: Multiple Choice, Multiple Select
Total Points: 2	Key(s): C; B, E
Target PE: MS-PS3-4	CCC target(s): SPQ Scale, Proportion, and Quantity
DCI: N/A	SEP target(s): DATA, MCT Analyzing and Interpreting Data Using Mathematics and Computational Thinking

Question 6. The following question has two parts. First, answer Part A. Then, answer Part B.

Another class tested different brands of hot packs to see how the ratio of salt to water in an instant hot pack relates to the temperature of the hot pack over time. The average data from the class are shown in the table and graph below.

Hot Pack Brands Data

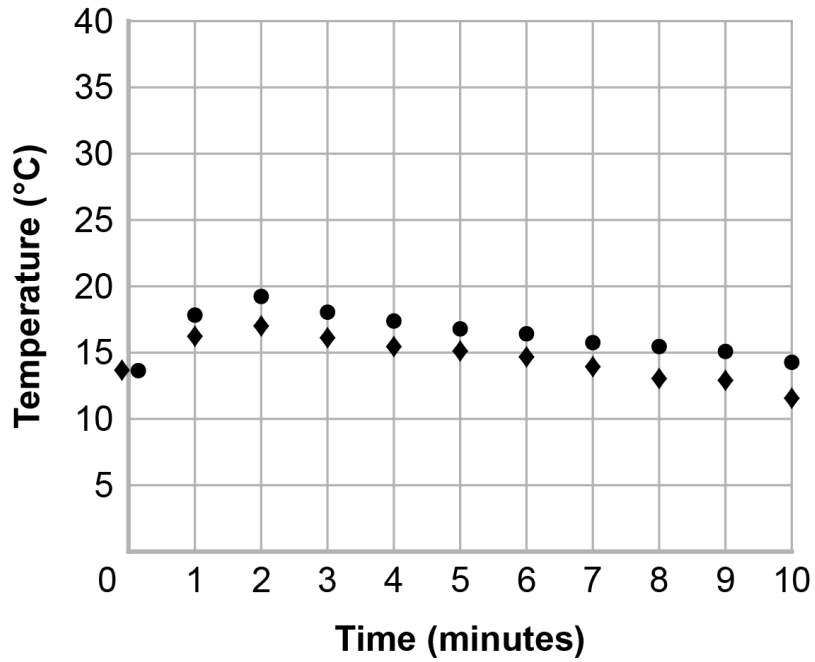
Hot Pack Brand	Mass of Salt (in g)	Volume of Water (in mL)
A	75.0	300
B	100.0	300

Appendix E
Grade 8 Integrated Item Cluster (Performance Task) Exemplar
(DRAFT)



Temperature Over Time

◆ Brand A
● Brand B



Part A

Which claim is **best** supported by the data from the class?

- A. A salt solution with more mass will have a higher temperature than a salt solution with less mass.
- B. A salt solution with more water than salt will have a higher temperature than a salt solution with more salt than water.
- C. A salt solution with a higher ratio of salt to water will have a higher temperature than a salt solution with a lower ratio of salt to water.*
- D. A salt solution with a greater total volume of salt and water will have a higher temperature than a salt solution with a smaller total volume of salt and water.

Part B

Based on the data from the class, which **two** combinations of salt and water will likely reach a higher temperature than either Brand A or Brand B? Select the **two** correct answers.

- A. 75.0 g of salt and 250 mL of water
- B. 100.0 g of salt and 250 mL of water*
- C. 100.0 g of salt and 400 mL of water
- D. 125.0 g of salt and 400 mL of water
- E. 150.0 g of salt and 400 mL of water*

Grade: 8	Focus: Temperature and Kinetic Energy
Testing Target: EoU	Task Format: paper-pencil and hands-on
Item Cluster Format: Performance Task	Item Cluster PE Bundle: MS-PS3-3, MS-PS3-4, MS-PS3-5
Task Phenomenon: Hot packs affect the temperature of their surroundings.	

Item: 7	Item Format: Constructed Response
Total Points: 2 (one point per part)	Key(s): Rubric
Target PE: MS-PS3-4	CCC target(s): E/M Energy and Matter
<p>DCI: PS3.A: Definitions of Energy</p> <ul style="list-style-type: none"> Temperature is a measure of the average kinetic energy of particles of matter. The relationship between the temperature and the total energy of a system depends on the types, states, and amounts of matter present. <p>PS3.B: Conservation of Energy and Energy Transfer</p> <ul style="list-style-type: none"> The amount of energy transfer needed to change the temperature of a matter sample by a given amount depends on the nature of the matter, the size of the sample, and the environment. 	<p>SEP target(s): ARG Engaging in Argument from Evidence</p>

Question 7. The following question has two parts. First, answer Part A. Then, answer Part B.

Part A

Two students are planning to eat lunch outside in winter. The students have identical containers of soup, but have different masses of soup in the containers. They ask for your advice about how to insulate the containers. Write a claim about how the masses of their soup and their choices of insulating materials, such as paper or foam, will affect the energy transfer between the soup and the surrounding system.

The soup with less mass will need the better foam insulation. This will reduce the energy transfer so that the soup's temperature will not change as quickly.

Part B

Describe the evidence you could collect to support your claim.

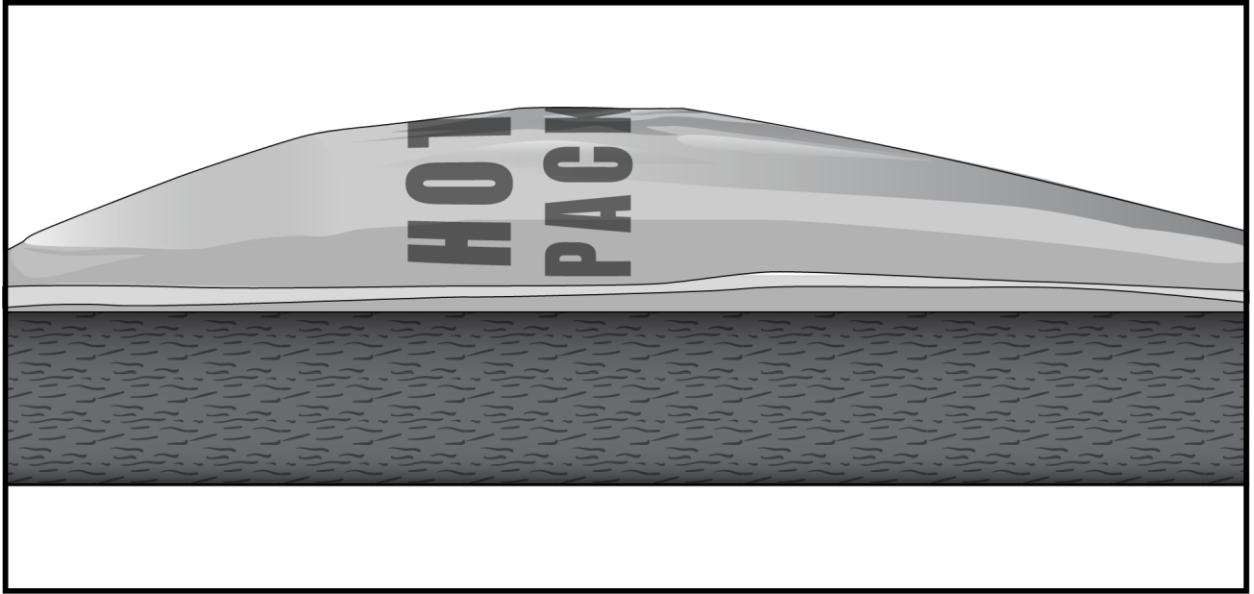
I would need evidence comparing soup with the same mass and different types of insulation, and evidence comparing soup with different masses and the same temperature. I would need to record the insulating materials used, and measure the masses, outdoor temperatures, and changes in the soups' temperatures over time.

Grade: 8	Focus: Temperature and Kinetic Energy
Testing Target: EoU	Task Format: paper-pencil and hands-on
Item Cluster Format: Performance Task	Item Cluster PE Bundle: MS-PS3-3, MS-PS3-4, MS-PS3-5
Task Phenomenon: Hot packs affect the temperature of their surroundings.	

Item: 8	Item Format: Model drawing, Short answer
Target PE: MS-PS3-4; MS-PS3-5	CCC target(s): E/M Energy and Matter
<p>DCI: PS3.A: Definitions of Energy</p> <ul style="list-style-type: none"> Temperature is a measure of the average kinetic energy of particles of matter. The relationship between the temperature and the total energy of a system depends on the types, states, and amounts of matter present. <p>PS3.B: Conservation of Energy and Energy Transfer</p> <ul style="list-style-type: none"> When the motion energy of an object changes, there is inevitably some other change in energy at the same time. 	<p>SEP target(s): MOD, E/S Developing and Using Models Constructing Explanations and Designing Solutions</p>

Question 8. The following question has two parts. First, answer Part A. Then, answer Part B.

The picture below shows a system that contains an instant hot pack placed on a cool bench.

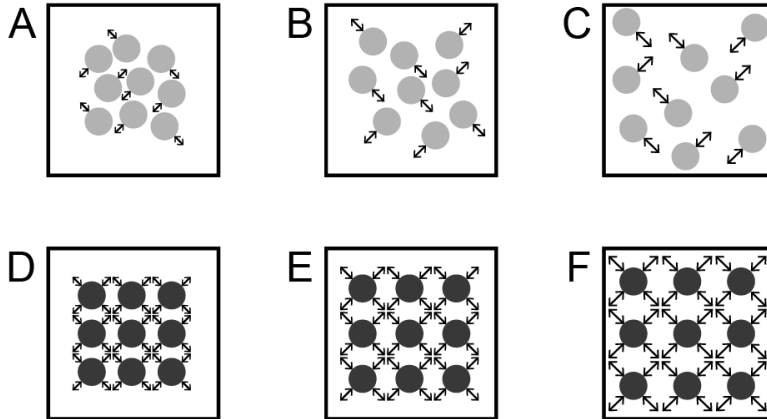


Part A

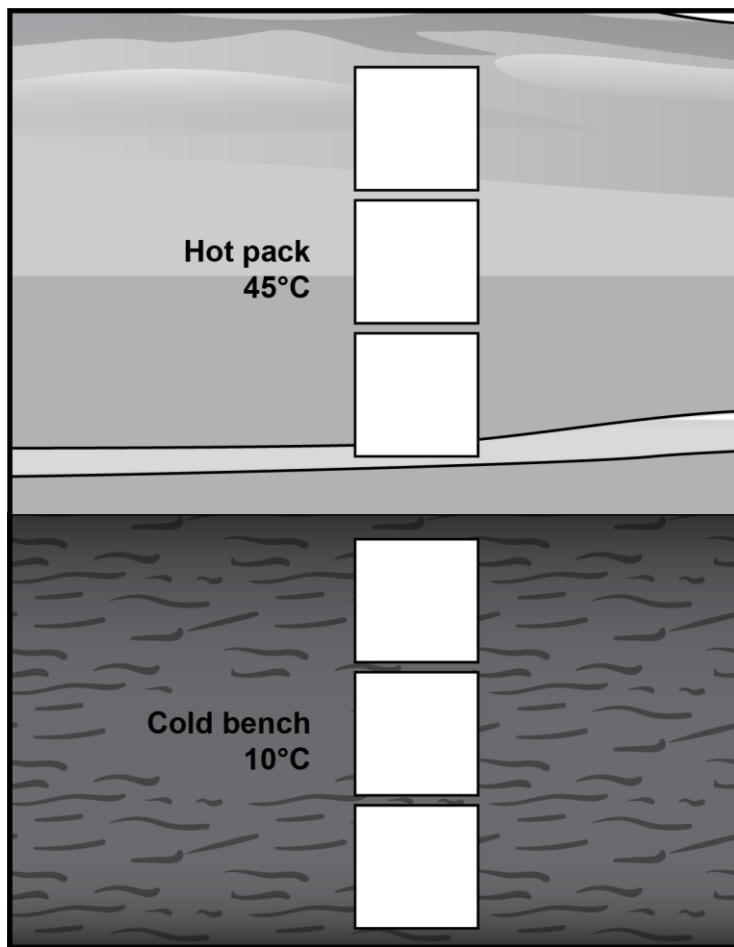
Complete the diagram below to model how heat is transferred in this system.

Step 1: In the white boxes, write the letters of the particle model pictures (A–F) needed to model the average kinetic energy of the particles in the hot pack and in the bench.

Particle model pictures:



Step 2: Draw an arrow on the diagram to show the direction in which energy is transferred in this system.



The boxes on the diagram are labeled, in downward order on the diagram: C, B, A, F, E, D. Energy arrow points from hot pack to cold bench.

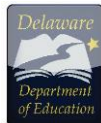
Part B

Explain how the kinetic energy of the molecules in the instant hot pack and in the cool bench will change as a result of the heat transfer you modeled in Part A.

[Sample full-credit response] Energy transfers from the hot pack to the bench because the hot pack is warmer than the cold bench. This causes the kinetic energy of the particles in the hot pack to decrease and the kinetic energy of the particles in the cold bench to increase.

Appendix E

High School Integrated Item Cluster (Performance Task) Exemplar (DRAFT)



Delaware Science Assessment Prototype: High School Performance Task

Status: RFP Inclusion

Description: Students develop a model showing information flow from DNA through proteins, and use a model to explain a phenomenon.

Grade: HS	Focus: Students develop a model showing information flow from DNA through proteins, and use a model to explain a phenomenon.
Testing Target: EoU	Task Format: paper-pencil
Item Cluster Format: Performance Task	Dimensions: SEP: E/S, MOD; CCC: S/F, SYS; DCI: LS1.A
Task Phenomenon: Occasionally, a healthy lobster will have an all-blue-colored shell, whereas most lobsters have a shell with a mix of black, blue, red, and orange colors.	

Item Cluster PE Bundle:

HS-LS1-1: Construct an explanation based on evidence for how the structure of DNA determines the structure of proteins which carry out the essential functions of life through systems of specialized cells.

HS-LS1-2: Develop and use a model to illustrate the hierarchical organization of interacting systems that provide specific functions within multicellular organisms.

CCCs	SEPs
<input type="checkbox"/> PAT – Patterns	<input type="checkbox"/> Q/P – Asking Questions and Defining Problems
<input type="checkbox"/> C/E – Cause and Effect	<input checked="" type="checkbox"/> MOD – Developing and Using Models
<input type="checkbox"/> SPQ – Scale, Proportion, and Quantity	<input type="checkbox"/> INV – Planning and Carrying Out Investigations
<input checked="" type="checkbox"/> SYS – Systems and System Models	<input type="checkbox"/> DATA – Analyzing and Interpreting Data
<input type="checkbox"/> E/M – Energy and Matter	<input type="checkbox"/> MCT – Using Mathematics and Computational Thinking
<input checked="" type="checkbox"/> S/F – Structure and Function	<input checked="" type="checkbox"/> E/S – Constructing Explanations and Designing Solutions
<input type="checkbox"/> S/C – Stability and Change	<input type="checkbox"/> ARG – Engaging in Argument from Evidence
	<input type="checkbox"/> INFO – Obtaining, Evaluating, and Communicating Information

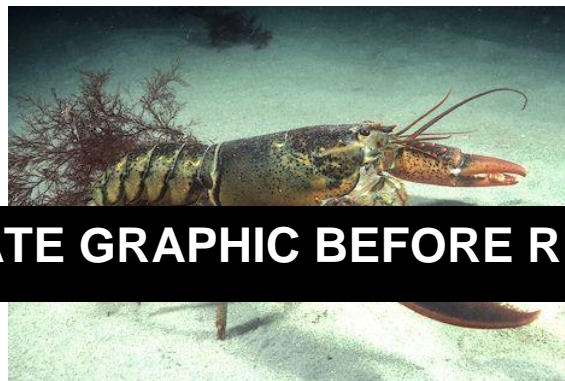
Format	Type	Documents
<input checked="" type="checkbox"/> Paper/pencil	<input checked="" type="checkbox"/> EoU	<input checked="" type="checkbox"/> Task content
<input type="checkbox"/> Lab/manipulatives	<input type="checkbox"/> ITA	<input checked="" type="checkbox"/> Student instructions
<input type="checkbox"/> Online		<input type="checkbox"/> Proctor instructions
		<input type="checkbox"/> Materials list

Overview

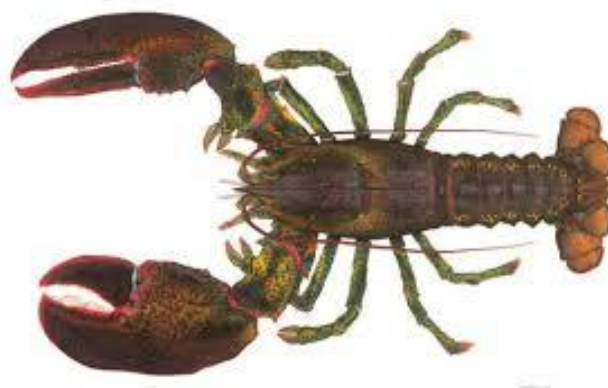
In this performance task, you will investigate some of the factors that affect a lobster's shell color. First, you will develop a model of processes that occur within the lobster's body and that affect shell color. Next, you will use the model to explain why there are differences in shell color within a lobster population. Finally, you will explain how different systems within the lobster's body interact to affect shell color.

Introduction

American lobsters are crustaceans, with hard outer shells, that live on the ocean floor. Most living lobsters have shells that are blue-black, mixed with red and orange, as shown in the pictures below.

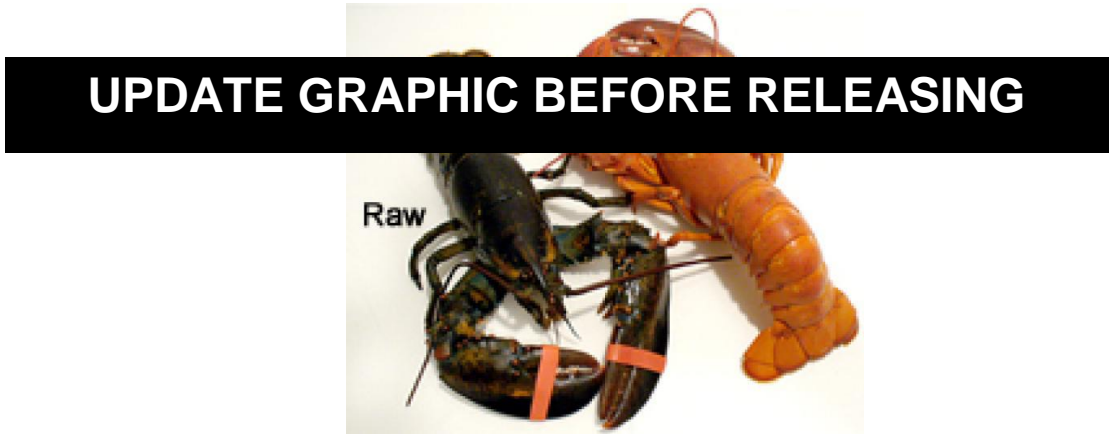


UPDATE GRAPHIC BEFORE RELEASING



A lobster's shell color is determined both by genetics and by the foods it eats. In the wild, lobsters eat foods that contain a natural red pigment (*pigment A*). This pigment turns lobster shells red-orange in color, but most living lobsters are not red-orange in color. This is because a lobster's cells naturally produce a protein (*protein C*) that binds to *pigment A*,

changing the shape of the *pigment A* molecule. When a lobster is cooked, *protein C* breaks down, and *pigment A* returns to its normal shape. The result is an entire shell that is bright red-orange in color, as shown in the picture below.



About one in two million lobsters has an entirely blue shell, as shown below. Blue lobsters in the wild also eat a diet that is rich in *pigment A*. The blue shell is caused by the lobster producing an overabundance of *protein C*. Interestingly, when a blue lobster is cooked, its shell turns the same red-orange as normal-colored lobster shells do when they are cooked.



Grade: HS	Focus: Students develop a model showing information flow from DNA through proteins, and use a model to explain a phenomenon.
Testing Target: EoU	Task Format: paper-pencil
Item Cluster Format: Performance Task	Dimensions: SEP: E/S, MOD; CCC: S/F, SYS; DCI: LS1.A
Task Phenomenon: Occasionally, a healthy lobster will have an all-blue-colored shell, whereas most lobsters have a shell with a mix of black, blue, red, and orange colors.	

Item: 1	Item Format: Fill-in	
Target PE: HS-LS1-1	CCC target(s): SYS Systems and System Models	
DCI: LS1.A (Structure and Function) All cells contain genetic information in the form of DNA molecules. Genes are regions in the DNA that contain the instructions that code for the formation of proteins, which carry out most of the work of cells.		SEP target(s): MOD Developing and Using Models

Section 1: From DNA to Proteins

Scientists investigating blue lobsters have confirmed that the overproduction of *protein C* has a genetic basis. One of the first steps in studying proteins is to determine the amino acid sequence that makes up the protein. Below is an initial sequence of nucleotides from a lobster gene. It is the complementary strand (or template strand) to a coding strand of DNA.

Complementary DNA strand: **T-A-C-T-A-T-C-T-C-A-C-A-T-C-T-C-A-C**

Question 1

Write out the sequence of nucleotide bases for the corresponding strand of lobster mRNA.

Nucleotide base sequence for mRNA: **A-U-G-A-U-A-G-A-G-U-G-U-A-G-A-G-**

The next step in determining the amino acid sequence can be completed using the genetic codon chart shown below.

Codon Chart

Second Position

		U	C	A	G	
First Position (5')	U	Phenylalanine	Serine	Tyrosine	Cysteine	U
		Phenylalanine	Serine	Tyrosine	Cysteine	C
		Leucine	Serine	Stop	Stop	A
		Leucine	Serine	Stop	Tryptophan	G
	C	Leucine	Proline	Histidine	Arginine	U
		Leucine	Proline	Histidine	Arginine	C
		Leucine	Proline	Glutamine	Arginine	A
		Leucine	Proline	Glutamine	Arginine	G
	A	Isoleucine	Threonine	Asparagine	Serine	U
		Isoleucine	Threonine	Asparagine	Serine	C
		Isoleucine	Threonine	Lysine	Arginine	A
		Methionine	Threonine	Lysine	Arginine	G
	G	Valine	Alanine	Aspartic acid	Glycine	U
		Valine	Alanine	Aspartic acid	Glycine	C
		Valine	Alanine	Glutamic acid	Glycine	A
		Valine	Alanine	Glutamic acid	Glycine	G

Third Position (3')

Grade: HS	Focus: Students develop a model showing information flow from DNA through proteins, and use a model to explain a phenomenon.
Testing Target: EoU	Task Format: paper-pencil
Item Cluster Format: Performance Task	Dimensions: SEP: E/S, MOD; CCC: S/F, SYS; DCI: LS1.A
Task Phenomenon: Occasionally, a healthy lobster will have an all-blue-colored shell, whereas most lobsters have a shell with a mix of black, blue, red, and orange colors.	

Item: 2	Item Format: Table fill-in; constructed response	
Target PE: HS-LS1-1	CCC target(s): SYS Systems and System Models	
DCI: LS1.A (Structure and Function) All cells contain genetic information in the form of DNA molecules. Genes are regions in the DNA that contain the instructions that code for the formation of proteins, which carry out most of the work of cells.		SEP target(s): MOD, E/S Developing and Using Models; Constructing Explanations and Designing Solutions

Question 2

This question has two parts. First, answer Part A. Then, answer Part B.

Part A

Using the Codon Chart, write the name of each amino acid encoded in the mRNA strand.



Rubric: Met - Ile - Glu - Cys - Arg - Val

Part B

Describe how the chain of amino acids relates to the formation and function of *protein C* in a lobster.

Rubric

[Sample Student Response]

The chain of amino acids is part of the sequence of amino acids in protein C. The complete sequence of amino acids in protein C affects how the protein will fold. The shape and structure of the folded protein will determine its function (binding pigment A).

Grade: HS	Focus: Students develop a model showing information flow from DNA through proteins, and use a model to explain a phenomenon.
Testing Target: EoU	Task Format: paper-pencil
Item Cluster Format: Performance Task	Dimensions: SEP: E/S, MOD; CCC: S/F, SYS; DCI: LS1.A
Task Phenomenon: Occasionally, a healthy lobster will have an all-blue-colored shell, whereas most lobsters have a shell with a mix of black, blue, red, and orange colors.	

Item: 3	Item Format: Multiple Choice	
Target PE: HS-LS1-1	CCC target(s): SYS Systems and System Models	
DCI: LS1.A (Structure and Function) All cells contain genetic information in the form of DNA molecules. Genes are regions in the DNA that contain the instructions that code for the formation of proteins, which carry out most of the work of cells.		SEP target(s): E/S Constructing Explanations and Designing Solutions

The diagram below shows parts of the amino acid and mRNA sequences for *protein C* in a normal-colored lobster and a blue-colored lobster. The letters in the protein row represent the amino acids coded for by the mRNA nucleotides in the nucleotide row.

Normal Color

Protein:	M	Y	N	A	M	E	I	S	G	E	N	E	*																							
Nucleotide:	A	T	G	T	A	C	A	C	G	C	A	A	T	G	G	A	A	T	A	T	C	A	G	G	T	G	A	A	A	C	G	A	A	T	G	A

Blue Color

Protein:	M	Y	N	A	M	E	I	S	G	E	<u>K</u>	E	*																							
Nucleotide:	A	T	G	T	A	C	A	C	G	C	A	A	T	G	G	A	A	T	A	T	C	A	G	G	T	G	A	A	A	<u>G</u>	G	A	A	T	G	A

Question 3

Based on the diagram, which of the following **most likely** causes a lobster to produce an overabundance of *protein C*?

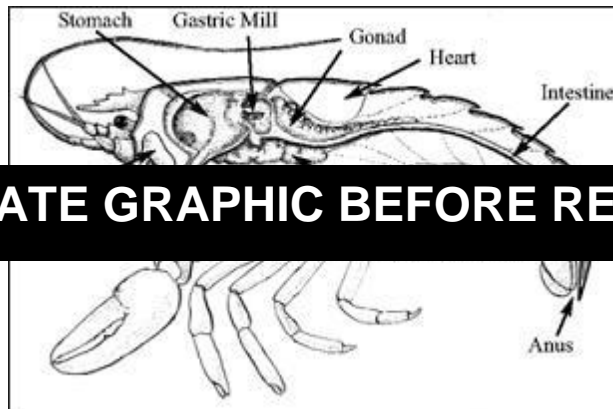
- The lobster is missing the genetic information that results in the production of *protein C*.

- The lobster has a genetic mutation that results in a change to the code that regulates the production of *protein C*.*
- The lobster has a genetic mutation that affects the ability of hydrogen bonds to form between nucleotide base pairs in *pigment A*.
- The lobster is missing the genetic information that allows the lobster to digest and release *pigment A* from the foods that it consumes.

You will now complete Section 2 and answer Questions 4 and 5.

Section 2: Pigment A

The interactions of a lobster's internal systems contribute to the red-orange color seen in a living lobster. Some of these internal systems are shown in the figure below.



Think about the roles of interacting cells, organs, and systems that contribute to the buildup of *pigment A* in a lobster's shell.

Grade: HS	Focus: Students develop a model showing information flow from DNA through proteins, and use a model to explain a phenomenon.
Testing Target: EoU	Task Format: paper-pencil
Item Cluster Format: Performance Task	Dimensions: SEP: E/S, MOD; CCC: S/F, SYS; DCI: LS1.A
Task Phenomenon: Occasionally, a healthy lobster will have an all-blue-colored shell, whereas most lobsters have a shell with a mix of black, blue, red, and orange colors.	

Item: 4	Item Format: Table fill-in	
Target PE: HS-LS1-2	CCC target(s): N/A	
DCI: LS1.A (Structure and Function) All cells contain genetic information in the form of DNA molecules. Genes are regions in the DNA that contain the instructions that code for the formation of proteins, which carry out most of the work of cells.		SEP target(s): MOD Developing and Using Models

Question 4

Five of the main steps that occur in the creation of a lobster's shell are listed in the table below. The steps are **not** shown in the correct order.

Order the steps in the table by writing the number 1, 2, 3, 4, or 5 in the column labeled "Step" to model the correct sequence of events that occur in the creation of a lobster's shell.

Step	Structure(s) Involved	Role of Structure(s)	System(s) Involved
	Heart/Blood vessels	Move substances throughout the body	Circulatory
	Stomach/Intestines	Release acids to break down foods	Digestive
	Claws/Mouth	Contract and release to provide movement of body parts	Skeletal/muscular
	Tissue in shell	Protects body parts and provides camouflage	Skeletal/muscular
	Cells in shell	Produce and combine proteins and other substances	Skeletal/muscular

Rubric:

Step	Structure(s) Involved	Role of Structure(s)	System(s) Involved
3	Heart/Blood vessels	Move substances throughout the body	Circulatory
2	Stomach/Intestines	Release acids to break down foods	Digestive
1	Claws/Mouth	Contract and release to provide movement of body parts	Skeletal/muscular
5	Tissue in shell	Protects body parts and provides camouflage	Skeletal/muscular
4	Cells in shell	Produce and combine proteins and other substances	Skeletal/muscular

Grade: HS	Focus: Students develop a model showing information flow from DNA through proteins, and use a model to explain a phenomenon.
Testing Target: EoU	Task Format: paper-pencil
Item Cluster Format: Performance Task	Dimensions: SEP: E/S, MOD; CCC: S/F, SYS; DCI: LS1.A
Task Phenomenon: Occasionally, a healthy lobster will have an all-blue-colored shell, whereas most lobsters have a shell with a mix of black, blue, red, and orange colors.	

Item: 5	Item Format: Constructed response	
Target PE: HS-LS1-1, HS-LS1-2	CCC target(s): S/F Structure and Function	
DCI: LS1.A (Structure and Function) Multicellular organisms have a hierarchical structural organization, in which any one system is made up of numerous parts and is itself a component of the next level. [HS-LS1-2] Systems of specialized cells within organisms help them perform the essential functions of life. [HS-LS1-1] All cells contain genetic information in the form of DNA molecules. Genes are regions in the DNA that contain the instructions that code for the formation of proteins, which carry out most of the work of cells. [HS-LS1-1]		SEP target(s): MOD, E/S Developing and Using Models; Constructing Explanations and Designing Solutions

Question 5

This question has two parts. First, answer Part A. Then, answer Part B.

Part A

For most living lobsters, shell color results from the interaction of both *protein C* and *pigment A*. Both *protein C* and *pigment A* build up in a lobster's shell as a result of the interactions at different levels of organization within a lobster's body.

Explain how the organs, specialized cells, and systems in a lobster's body interact in a hierarchical organization to result in the buildup of *pigment A* and *protein C* in a lobster's shell.

Rubric:

[Sample Student Response]

The secretions and muscular contractions of cells in the mouth, stomach, and intestines in the digestive system must work together to break down food and release pigment A, which

provides the red color. Pigment A is then transported from the digestive system to the shell by the cells of the circulatory system (heart and other parts). Cells in the shell tissue produce protein C by protein synthesis. Protein C binds to pigment A to produce the coloration of the lobster's shell.

Part B

Even rarer than a living lobster with an entirely blue shell is a living lobster with an entirely red shell. Only about one in ten million lobsters has this color characteristic.

Explain one change that you could make to the sequences that you developed in Section 1 and that represents a real-world change that could result in a lobster having an entirely red shell. Use what you know about structure and function to support your answer.

Rubric:

[Sample Student Response]

A lobster that has a red shell does not produce enough of, or any, protein C, and thus, its color is dominated by pigment A. I could change the nucleotide base pairs in the model to show how a genetic mutation (insertion, deletion, mix-up) could result in a nonfunctioning protein C. Changing the sequence of nucleotides in the region of DNA that codes for protein C would affect the sequence of amino acids and the overall structure of protein C. Since the shape of the protein determines its function, a change in the structure could affect its ability to function and, thus, could affect the color of the lobster.