Supporting STAAR™ Achievement in Science

Biology

region 4®
Educated Solutions

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What is *Supporting STAAR™ Achievement in Science: Biology*?

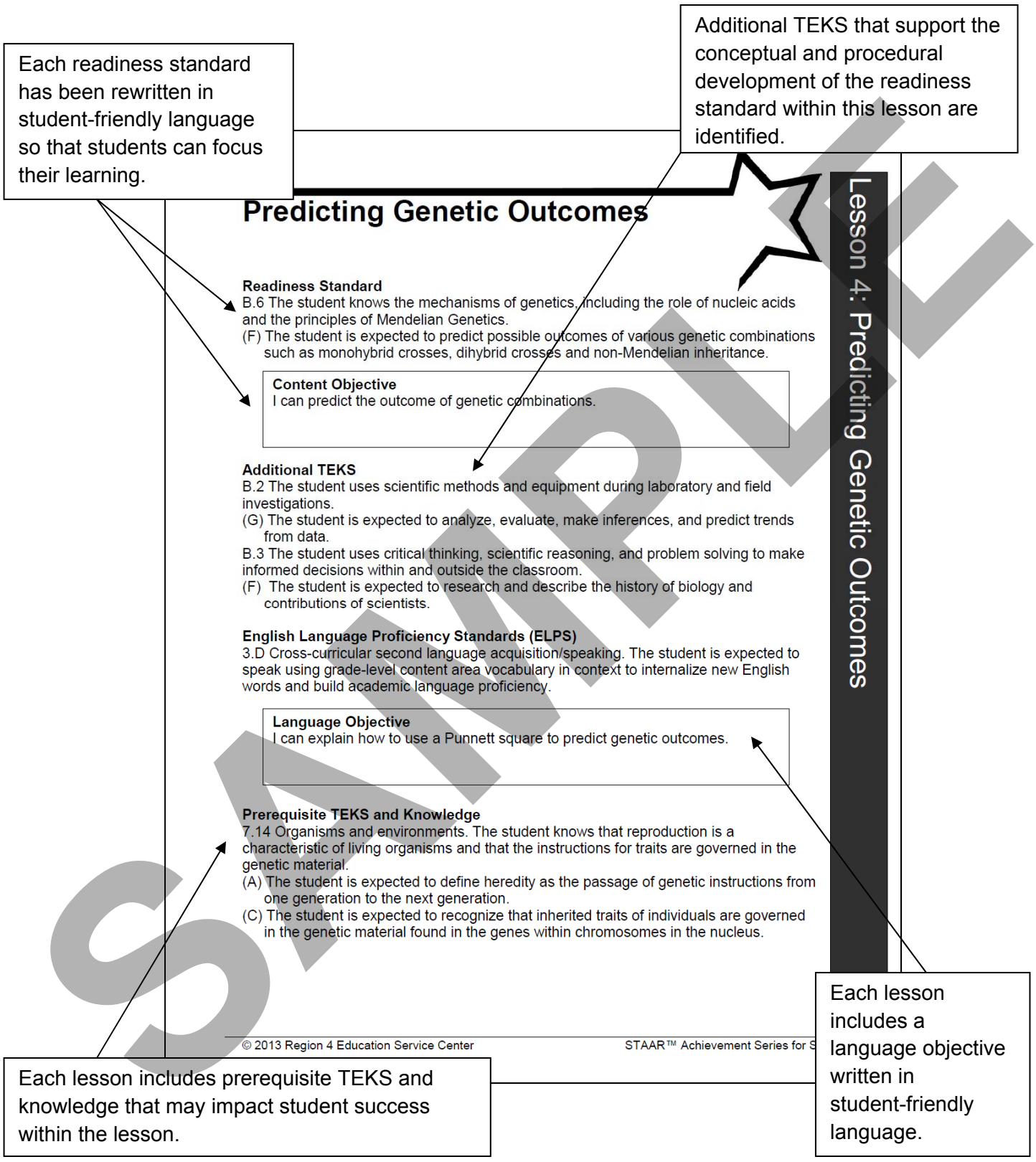
1 A resource that focuses on the Texas Essential Knowledge and Skills (TEKS) identified as readiness standards while integrating appropriate supporting standards and science processes and skills.

2 A resource that provides opportunities for rigorous science conversations while providing support for students at varying levels of preparedness.

3 A resource that provides support for English language learners and struggling students through Tier I differentiated activities; scaffolds for the activities, such as graphic organizers; and facilitation questions.

4 A resource that supports teachers through clear procedures and facilitation questions designed to assist students with processing science concepts. This resource also includes teacher notes to aid in clarifying misconceptions learners may have about a concept.

5 A resource of classroom-ready 5E lessons. Student-centered Engage bridges students' prior knowledge or encourages interest in deeper exploration of the concepts in the lesson. Explore is an opportunity to "do science," providing a common experience for all students to which they can tie concepts and vocabulary. In Explain, students formalize the scientific ideas from Explore with a focus on academic vocabulary as well as procedures related to the concepts. Elaborate allows students to apply or extend their understanding of the concepts in the lesson. In addition, an intervention strategy is suggested in each Elaborate. Evaluate consists of four selected-response items and one open-ended response question that can be used to assess student understanding.


Each readiness standard has been rewritten in student-friendly language so that students can focus their learning.
Additional TEKS that support the conceptual and procedural development of the readiness standard within this lesson are identified.
Predicting Genetic Outcomes
Lesson 4: Predicting Genetic Outcomes
Readiness Standard
B.6 The student knows the mechanisms of genetics, including the role of nucleic acids and the principles of Mendelian Genetics.
(F) The student is expected to predict possible outcomes of various genetic combinations such as monohybrid crosses, dihybrid crosses and non-Mendelian inheritance.
Content Objective
I can predict the outcome of genetic combinations.
Additional TEKS
B.2 The student uses scientific methods and equipment during laboratory and field investigations.
(G) The student is expected to analyze, evaluate, make inferences, and predict trends from data.
B.3 The student uses critical thinking, scientific reasoning, and problem solving to make informed decisions within and outside the classroom.
(F) The student is expected to research and describe the history of biology and contributions of scientists.
English Language Proficiency Standards (ELPS)
3.D Cross-curricular second language acquisition/speaking. The student is expected to speak using grade-level content area vocabulary in context to internalize new English words and build academic language proficiency.
Language Objective
I can explain how to use a Punnett square to predict genetic outcomes.
Prerequisite TEKS and Knowledge
7.14 Organisms and environments. The student knows that reproduction is a characteristic of living organisms and that the instructions for traits are governed in the genetic material.
(A) The student is expected to define heredity as the passage of genetic instructions from one generation to the next generation.
(C) The student is expected to recognize that inherited traits of individuals are governed in the genetic material found in the genes within chromosomes in the nucleus.
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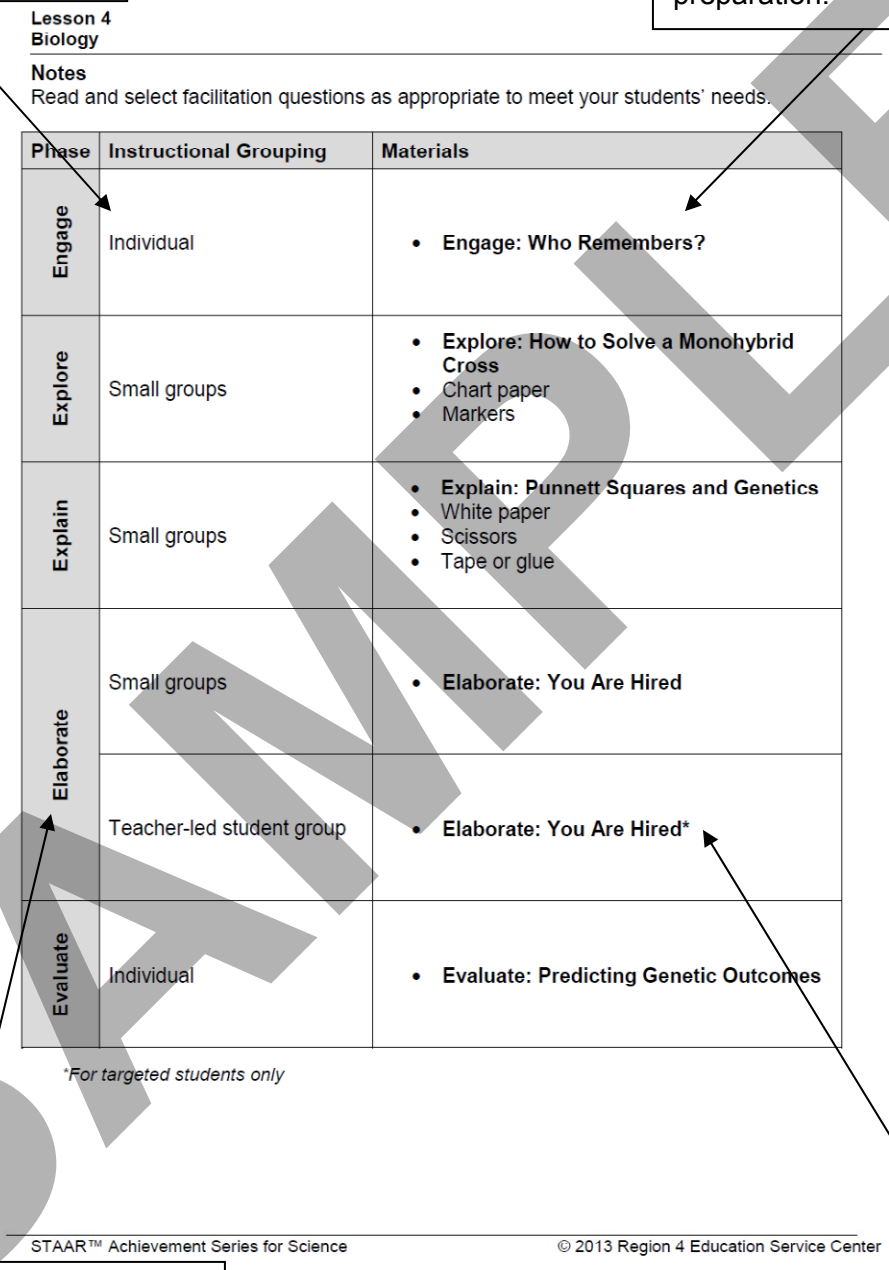
Each lesson includes prerequisite TEKS and knowledge that may impact student success within the lesson.
Each lesson includes a language objective written in student-friendly language.

What is *Supporting STAAR™ Achievement in Science: Biology*?

Grouping strategies for each activity are summarized to assist in the arrangement of the classroom.

Materials for each activity are summarized for ease in preparation.



Lesson 4
Biology

Notes
Read and select facilitation questions as appropriate to meet your students' needs.

Phase	Instructional Grouping	Materials
Engage	Individual	• **Engage: Who Remembers?**
Explore	Small groups	• **Explore: How to Solve a Monohybrid Cross** • Chart paper • Markers
Explain	Small groups	• **Explain: Punnett Squares and Genetics** • White paper • Scissors • Tape or glue
Elaborate	Small groups	• **Elaborate: You Are Hired**
	Teacher-led student group	• **Elaborate: You Are Hired***
Evaluate	Individual	• **Evaluate: Predicting Genetic Outcomes**

**For targeted students only*

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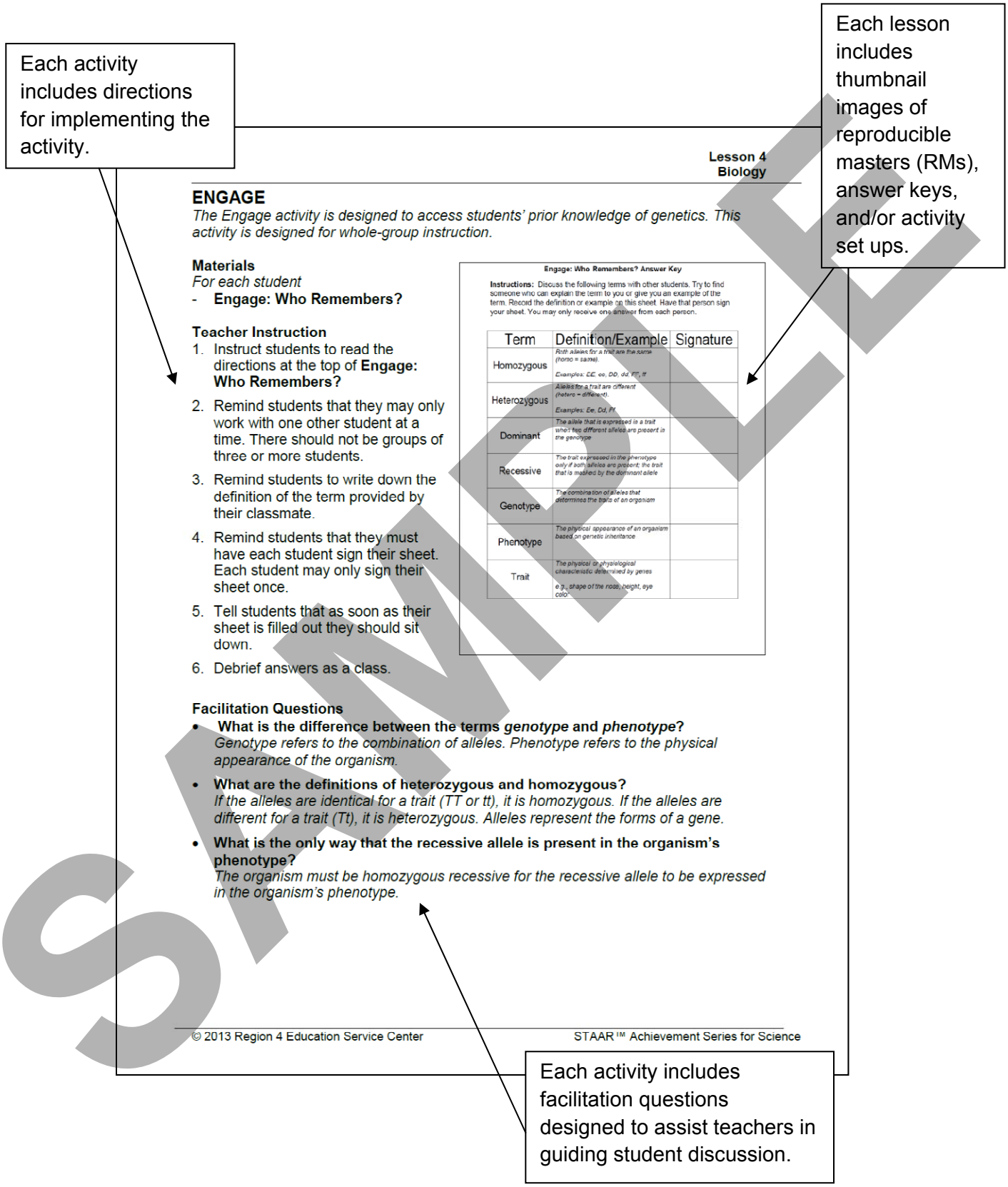
The Elaborate activity has two concurrent components: a student-facilitated activity and a teacher-facilitated activity that focuses on the needs of students who are struggling with the content.

Materials that are provided to support students in need of additional help are labeled with an asterisk.

Each activity includes directions for implementing the activity.

Each lesson includes thumbnail images of reproducible masters (RMs), answer keys, and/or activity set ups.



ENGAGE

The Engage activity is designed to access students' prior knowledge of genetics. This activity is designed for whole-group instruction.

Materials

For each student

- **Engage: Who Remembers?**

Teacher Instruction

1. Instruct students to read the directions at the top of **Engage: Who Remembers?**
2. Remind students that they may only work with one other student at a time. There should not be groups of three or more students.
3. Remind students to write down the definition of the term provided by their classmate.
4. Remind students that they must have each student sign their sheet. Each student may only sign their sheet once.
5. Tell students that as soon as their sheet is filled out they should sit down.
6. Debrief answers as a class.

Engage: Who Remembers? Answer Key

Instructions: Discuss the following terms with other students. Try to find someone who can explain the term to you or give you an example of the term. Record the definition or example on this sheet. Have that person sign your sheet. You may only receive one answer from each person.

Term	Definition/Example	Signature
Homozygous	*Both alleles for a trait are the same (homo = same).* *Examples: EE, ee, DD, dd, FF, ff*	
Heterozygous	*Alleles for a trait are different (hetero = different).* *Examples: Ee, Dd, Ff*	
Dominant	*The allele that is expressed in a trait when two different alleles are present in the genotype*	
Recessive	*The trait expressed in the phenotype only if both alleles are present; the trait that is masked by the dominant allele*	
Genotype	*The combination of alleles that determines the traits of an organism*	
Phenotype	*The physical appearance of an organism based on genetic inheritance*	
Trait	*The physical or physiological characteristic determined by genes* *e.g., shape of the nose, height, eye color*	

Facilitation Questions

- **What is the difference between the terms *genotype* and *phenotype*?**
  Genotype refers to the combination of alleles. Phenotype refers to the physical appearance of the organism.
- **What are the definitions of heterozygous and homozygous?**
  If the alleles are identical for a trait (TT or tt), it is homozygous. If the alleles are different for a trait (Tt), it is heterozygous. Alleles represent the forms of a gene.
- **What is the only way that the recessive allele is present in the organism's phenotype?**
  The organism must be homozygous recessive for the recessive allele to be expressed in the organism's phenotype.

Each activity includes facilitation questions designed to assist teachers in guiding student discussion.

The titles of activity masters and student pages are printed in bold for ease of reference.

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ELABORATE

The Elaborate activity affords students the opportunity to extend or solidify their knowledge of the mechanisms of genetics. This activity is designed for small-group instruction.

Materials
For each student
- **Elaborate: You Are Hired**

Intervention Materials
For each student
- **Elaborate: You Are Hired***

Teacher Instruction
1. Instruct students to read the scenario on **Elaborate: You Are Hired** and follow the instructions.
2. Explain to students that they will work as a team to help Mr. and Mrs. Williams find their biological son using genetic probabilities.
3. Monitor students.
4. Conduct a whole-group discussion.

Intervention
1. Invite struggling students to join a small group.
2. Distribute **Elaborate: You are Hired*** to each student. The intervention worksheet contains a reduced reading passage and the addition of blank Punnett squares. The blank Punnett squares are intended to provide students with a place to start.
3. Assist students as they work together to complete the activity. Students may require assistance with assigning the alleles.
4. Watch for students who are slow to start and help them think through the process of where to start.

Facilitation Questions
- **Who is their biological son?**
  Baby 2 is their biological son. He is the only individual with genotypes that could result from the parents.
- **Why do scientists perform monohybrid and dihybrid crosses?**
  To predict possible outcomes of genetic combinations
- **What is probability?**
  In this instance, probability is the chance that a genetic outcome will occur.

Elaborate: You Are Hired Answer Key

Background information:
December 23, 1972, was the first day of work for a young nurse. It was an unusually busy night at the hospital and four beautiful babies were born. Five years later, Mr. and Mrs. Williams were involved in a car accident. Their son, John, was injured but later made a full recovery. The night of the accident, Mr. and Mrs. Williams both volunteered to donate blood. The news they received was devastating. Neither of them was a match and they could not donate blood. This meant John was not their biological son. You have been hired by the Williams' to locate their biological son.

In an interview with Mr. and Mrs. Williams, you ask several important questions and make a few key observations. Through research, you learn that hair texture is controlled by incomplete dominance. Individuals who are homozygous dominant for hair texture have curly hair (CC). Individuals who are homozygous recessive have straight hair (cc). Individuals who are heterozygous have wavy hair (Cc). After reviewing your notes, you decide to concentrate on two key pieces of information:

Mr. Williams is heterozygous for Type B blood and has wavy hair.
Mrs. Williams is homozygous for Type A blood and has straight hair.

	B	O
A	AB	AO
A	AB	AO

50% Type AB, 50% Type AO
50% Type AB, 50% Type A

	C	c
C	Cc	cc
c	Cc	cc

50% Cc, 50% cc
50% wavy, 50% straight

The hospital records contain important information about the other children who were born in the hospital that day:

Baby 1 is heterozygous Type B blood and has wavy hair. *There is a 0% chance that the Williams' could produce a child with Type BO blood. Although they could produce a child with wavy hair, Baby 1 cannot be their son.*

Baby 2 has Type AB blood and has straight hair. *There is a 50% chance that the Williams' could produce a child with Type AB blood. There is a 50% chance of producing a child with straight hair. Baby 2 could be their son.*

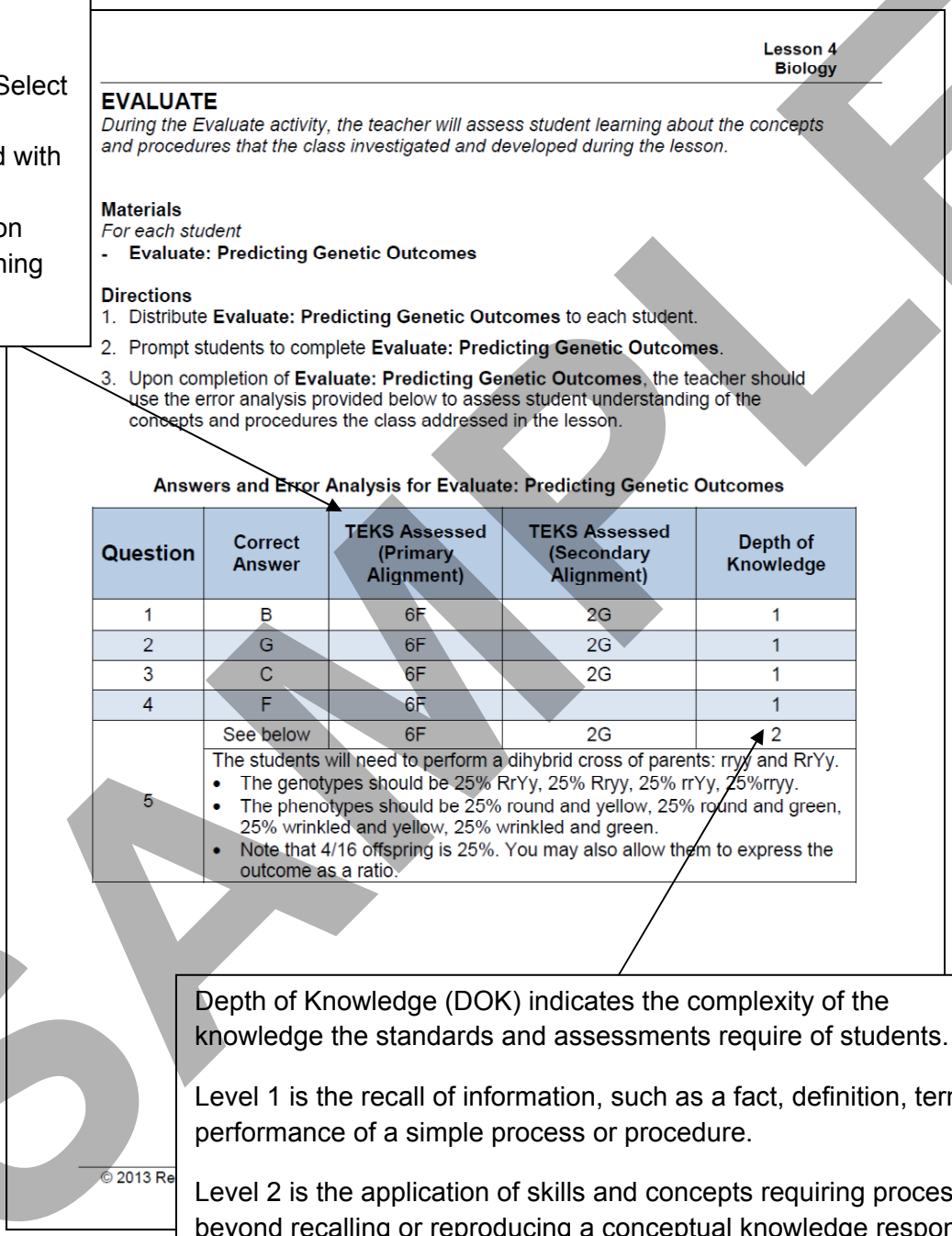
Baby 3 is heterozygous for Type A blood and has curly hair. *There is a 50% chance that the Williams' could produce a child with Type AO blood, and a 0% chance of producing a child with curly hair. Baby 3 could not be their son.*

Baby 2 is the Williams' biological son.

The Tier I intervention provides instructions on how to make the science content more explicit for students struggling with the concepts addressed within the lesson. The intervention activity is at the same rigor as the activity being completed by the students in a self-directed environment.

What is *Supporting STAAR™ Achievement in Science: Biology*?

Each item assesses a STAAR™ readiness standard. Select items are dual-coded with scientific investigation and reasoning TEKS.



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EVALUATE

During the Evaluate activity, the teacher will assess student learning about the concepts and procedures that the class investigated and developed during the lesson.

Materials

For each student

- **Evaluate: Predicting Genetic Outcomes**

Directions

1. Distribute **Evaluate: Predicting Genetic Outcomes** to each student.
2. Prompt students to complete **Evaluate: Predicting Genetic Outcomes**.
3. Upon completion of **Evaluate: Predicting Genetic Outcomes**, the teacher should use the error analysis provided below to assess student understanding of the concepts and procedures the class addressed in the lesson.

Answers and Error Analysis for Evaluate: Predicting Genetic Outcomes

Question	Correct Answer	TEKS Assessed (Primary Alignment)	TEKS Assessed (Secondary Alignment)	Depth of Knowledge
1	B	6F	2G	1
2	G	6F	2G	1
3	C	6F	2G	1
4	F	6F		1
5	See below	6F	2G	2
	The students will need to perform a dihybrid cross of parents: rryy and RrYy. • The genotypes should be 25% RrYy, 25% Rryy, 25% rrYy, 25%rryy. • The phenotypes should be 25% round and yellow, 25% round and green, 25% wrinkled and yellow, 25% wrinkled and green. • Note that 4/16 offspring is 25%. You may also allow them to express the outcome as a ratio.			

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Depth of Knowledge (DOK) indicates the complexity of the knowledge the standards and assessments require of students.

Level 1 is the recall of information, such as a fact, definition, term, or performance of a simple process or procedure.

Level 2 is the application of skills and concepts requiring processing beyond recalling or reproducing a conceptual knowledge response.

Level 3 is strategic thinking requiring a deep understanding and cognitive reasoning. These standards and assessments may be complex and abstract.