



Science Objectives

- Students will discover how traits can be passed on from parents to offspring.
- Students will predict the traits parents will pass on to their offspring and specify how parents need to combine in order to generate a specific trait in their offspring.

Vocabulary

- allele
- dominant
- genotype
- recessive
- phenotype
- heterozygous
- homozygous

About the Lesson

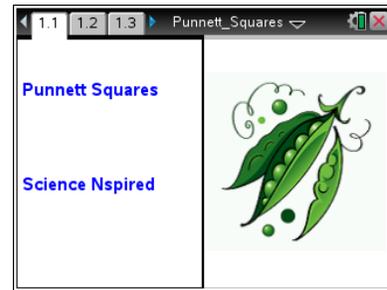
- This lesson is an interactive Punnett square. This provides an opportunity for students to gather data on traits expressed in offspring and to explore how allele combinations in parents produce phenotypic ratios in their offspring.
- As a result, students will:
 - Complete Punnett squares.
 - Collect data on phenotypic ratios.
 - Use collected data to spot a pattern in how dominant and recessive alleles are expressed.

TI-Nspire™ Navigator™

- Send out the *Punnett_Squares.tns* file.
- Monitor student progress using Screen Capture.
- Use Live Presenter to allow students to show how they manipulate variables that effect results.

Activity Materials

- TI-Nspire™ Technology



TI-Nspire™ Technology Skills:

- Open a document
- Drag and click the cursor to move objects

Lesson Materials:

Student Activity

- Punnett_Squares_Student.doc
- Punnett_Squares_Student.pdf
- Punnett_Squares.tns



Discussion Points and Possible Answers

Allow students time to read the background on their student activity sheet.

Move to pages 1.2 – 1.5.

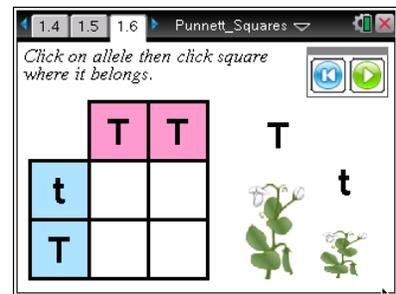
1. Allow students time to read the information on pages 1.2 and 1.3. Go over any information students do not understand. Then read the instructions on pages 1.4 and 1.5 for navigating the activity.

Part 1: Exploring Phenotypes

In this part of the lesson students explore alleles and phenotypic ratios.

Move to page 1.6.

2. Students will be dragging alleles, **T** or **t**, to the squares where they belong. Make sure students understand that they should drag a *pair* of alleles, or two alleles, to each square.



Make sure students click the green play button  to check the genotypes. If their genotypes are incorrect, they can click the blue reset button  to clear the squares and try again. Make sure they only record data for the trials in which their genotypes are correct. In filling in the Punnett squares on the activity sheet, remind them to also complete the phenotypic ratios for tall and short offspring.

TI-Nspire Navigator Opportunities

Allow students to volunteer to be the Live Presenter and demonstrate areas on the screen where the cursor changes.

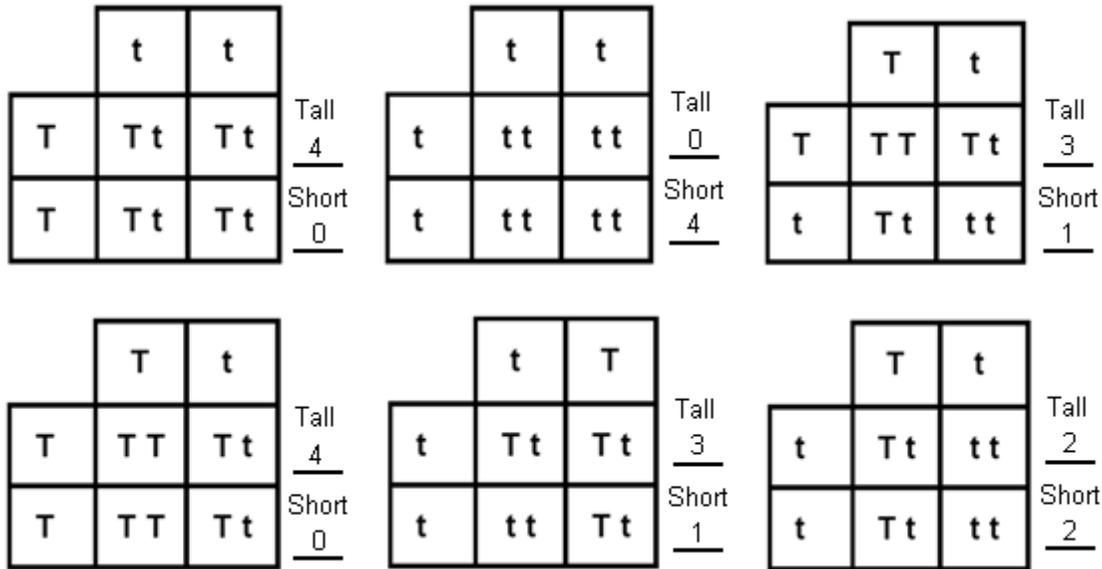
- Q1. Fill in the Punnett squares below with the results of the trials in which your genotypes are correct.

Sample answer:

	T	T	
T	TT	TT	Tall <u>4</u>
T	TT	TT	Short <u>0</u>

	t	T	
T	Tt	TT	Tall <u>4</u>
T	Tt	TT	Short <u>0</u>

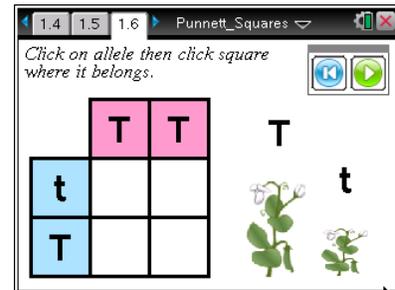
	T	T	
t	Tt	Tt	Tall <u>4</u>
t	Tt	Tt	Short <u>0</u>



Part 2: Analyzing Phenotypes

3. Students will review the data from their Punnett squares, and based on the phenotypic ratios they collected from each trial of the simulation, circle the pairs of alleles in each square where they think the offspring expresses the tall trait.

Allow students time to analyze the data in their Punnett squares.



Make sure they understand that the number of allele pairs they circle in each Punnett square should be the same as the number of tall offspring they recorded in the phenotypic ratio for each square.

Q2. Which allele appears in all of your circled pairs, T or t?

Answer: T

Q3. Based on your data and observations, which allele is dominant?

Answer: tall (T)

Q4. Based on your data and observations, which allele is recessive?

Answer: short (t)



Part 3: Predicting Phenotypes

From parts 1 and 2, students should now have a formal understanding of **dominant** and **recessive** alleles. Go over the definitions of **heterozygous** and **homozygous** as addressed in the student activity sheet. Provide additional examples using the tall and short alleles if students do not understand.

Q5. If a pea plant is heterozygous, will it always be tall or short?

Answer: If a pea plant is heterozygous, it will always be tall.

Q6. If a pea plant is homozygous with the short allele, will it always be tall or short?

Answer: If a pea plant is homozygous with the short allele, it will always be short.

Q7. If a pea plant is homozygous with the tall allele, will it always be tall or short?

Answer: If a pea plant is homozygous with the tall allele, it will always be tall.

Q8. One parent is homozygous tall. To produce tall offspring, what must the other parent be?

Answer: D. It doesn't matter.

TI-Nspire Navigator Opportunities

Use Quick Poll to check for understanding during the course of the activity.

Wrap Up

When students are finished with the activity, pull back the .tns file using TI-Nspire Navigator. Save grades to Portfolio. Discuss activity questions using Slide Show.

Assessment

- Analysis questions are written into the student worksheet.