PART A - About the School Where You Are Teaching
   a. In what type of school do you teach?
      • Middle School:
      • High School: High School 9-12
      • Other (please describe):
         • Urban:
         • Suburban: Suburban school setting
         • Rural:

   b. List any special features of your school or classroom setting (e.g., charter, co-teaching, themed magnet, remedial course, honors course) that will affect your teaching in this learning segment,
      There are no special features in the classroom setting that will affect my teaching.

   c. Describe any district, school, or cooperating teacher requirements or expectations that might affect your planning or delivery of instruction, such as required curricula, pacing plan, use of specific instructional strategies, or standardized tests.
      The students will be required to take the Ohio Graduation Test (OGT). This is a standardized test that all high school students must pass before graduating and a solid foundation in biological sciences is essential (in this class Mendelian genetics will be taught)

About the Class Featured in This Assessment
   a. What is the name of this course?
      Biology

   b. What is the length of this course?
      • One semester:
      • One year: This course is required for a one year term (10th grade, soph)
      • Other (please describe):

   c. What is the class schedule (e.g., 50 minutes every day, 90 minutes every other day)?
      50 minutes, 5 days a week

   d. Is there any ability grouping or tracking in science? If so, please describe how it affects your class.
      There is no ability grouping or tracking in this class.

   e. Identify any textbook or instructional program you primarily use for science instruction. If a textbook, please provide the title, publisher, and date of publication.
      Modern Biology, Holt Reinhart and Winston, 2002
f. List other resources (e.g., electronic whiteboard, graphing calculators, on-line resources) you use for science instruction in this class.
   Smartboard, Microsoft Power Point

About the Students in the Class Featured in This Assessment

a. Grade level composition (e.g., all seventh grade; 2 sophomores and 30 juniors)
   All sophomore students

b. Number of:
   - Students in the class – 24
   - Males – 12, Females – 12

c. Complete the chart below to summarize required or needed supports, accommodations or modifications for your students that will affect your instruction in this learning segment. As needed, consult with your cooperating teacher to complete the chart.

<table>
<thead>
<tr>
<th>Learning Needs Category</th>
<th>Number of Students</th>
<th>Supports, Accommodations, Modifications, and/or Pertinent IEP Goals</th>
</tr>
</thead>
<tbody>
<tr>
<td>Struggling Readers</td>
<td>5</td>
<td>Provide oral explanations for directions, simplified texts, graphic organizers</td>
</tr>
<tr>
<td>ELL</td>
<td>1</td>
<td>Tangible copies of notes, simplified texts, visual aids</td>
</tr>
</tbody>
</table>
PART B – Lesson Plans

TPAC Lesson Plan

Subject: Biology – Genetics/Inherited Traits
Grade Level: 9/10
Instructor: Patrick Hogan
Date: 14 March 2013

Ohio Academic Content Standards
1. Grade 9, Scientific Inquiry, indicator 6
   a. Draw logical conclusions based on scientific knowledge and evidence from investigations.
2. Grade 10, Life Sciences, Heredity indicator 6
   a. Explain that a unit of hereditary information is called a gene, and genes may occur in different forms called alleles (e.g., gene for pea plant height has two alleles, tall and short)
3. Grade 10, Life Sciences, Heredity indicator 8
   a. Use the concepts of Mendelian and non-Mendelian genetics (e.g., segregation, independent assortment, dominant and recessive traits, sex-linked traits and jumping genes) to explain inheritance.

Learning Objectives:
At the conclusion of this lesson, students will be able to:
   Explain and describe genetic inheritance through Mendelian genetics.
   Identify the key terms/concepts presented (genes, alleles, dominance/recessive, genotypes/phenotypes)
   Be able to construct and analyze punnett squares using information given.

Anticipatory Set:
At this point students should have a basic foundation in genetics including structure and function of DNA and the beginning of Mendelian genetics. The anticipatory set will assess where the students’ base knowledge is on the subject and allow the educator to clear up any misconceptions before building off their prior knowledge.

Instructional Strategies & Learning Tasks:
1. At the beginning of class, using powerpoint the instructor will have students identify if they possess some common inherited traits (rolling tongue, widow’s peak, chin dimple, etc). Getting them to see how inherited traits play a part in their lives, even in the simplest ways, should help engage them (creating an atmosphere for learning).
2. The instructor will then pass out the short pre-assessment to get a baseline of where the students’ knowledge is at on the subject matter. While passing out the pre-assessment the instructor will scroll to the agenda for the lesson.
3. Once pre-assessment is complete there will be a quick discussion over the information on there, see if there are any major points that need to be looked at in more depth.

4. The instructor will use powerpoint for a lecture covering Mendelian genetics, inheritance, and punnett squares. During this time the instructor will probe the students and use discussion to make sure the students understand the material.

5. At the end of the lecture slides students will have 2 word questions that will incorporate the use of punnett squares and an understanding of dominant/recessive genes.

6. Once the word problems have been solved and instructor asks for any further questions, the students will break into pairs to do a short/fun activity to wrap everything up. In this activity students will use pennies (heads/tails) to pass along a trait to their offspring. A pair of students will each flip a coin to see if they pass a dominant or recessive (tails dominant, heads recessive) gene onto the next generation. Once they have flipped / recorded 10 flips each they will use the key to draw their new offspring.

7. After the group activity students will complete a post assessment for the lesson.

Resources and Materials:
1. Computer/powerpoint
2. Writing material
3. White/chalk board
4. Pre/post assessments
5. 1 penny per student
6. Worksheets that go along with the activity

Accommodations for Special Learners:
1. Access to a tangible copy of the presentation material
2. Additional graphic organizers to help explain the material

Informal and Formal Assessment:
1. Informal Assessment: Because this can be a semi-lecture heavy topic, throughout class time instructor will engage students with questions and discussion. Using the class engagement the instructor can adjust to how the information is being retained. When in small groups instructor will listen in to make sure the major concepts have been identified.

2. Formal Assessment: Pre and post assessments will be completed by the students and collected by the instructor to gauge how effective the lesson was.
PART C – Instructional Materials

Who Can/Has ….
- … Roll their tongue
- … A chin dimple
- … Attached earlobes
- … A widow’s peak hairline
- … Mid-digit hair on fingers
- … Bent pinkie finger

Today’s Goals!
- Pretest
- Start to become familiar with some of the basic genetic terminology and processes.
- Practice punnett squares
- Collaborate in groups to see Genetic Inheritance at work.
- Posttest

Inherited Traits
- As we studied earlier, Gregor Mendel was able to use the simple pea plant to observe and experiment how certain traits were passed from parent generation (P generation) to the first filial generation (F1 generation).
- He was able to recognize that some of the traits from one parent plant were able to mask the traits from the second parent plant.
- i.e. When he crossed the purebred tall pea plant with the purebred short pea plant and all of the offspring in the F1 generation were tall.

However when he crossed 2 of the F1 generation, the new F2 generation had 3 tall plants and 1 short plant.

- How did the short plant pop up from 2 tall plants? …

Dominant and Recessive Traits
- A gene is a segment of DNA on a chromosome that is the basic unit of heredity.
  - In other words, genes translate from genetic code to physical appearance
  - Every pea plant has the gene for how tall it is going to grow …
- An allele is simply an alternate form of a gene (a variant).
  - … so the tall plants had alleles that code for growing tall while the short plants had alleles that code for being short.
- When Mendel crossed the purebred parent plants he observed that all the offspring were tall.
- Therefore the tall allele was the dominant allele because it masked the expression of the short allele (recessive allele)

- Every gene contains 2 alleles (one from mom and one from dad) that code for how the gene will be expressed (phenotype).
  - The gene can be described in 1 of 3 ways:
    - Homozygous Dominant
    - Homozygous Recessive
    - Heterozygous
- Using the letter “T” to signify an allele for the height of the pea plant lets describe their genetic makeup (genotype).
  - A capital letter is used to denote a dominant allele, while a lower case letter is used to denote a recessive allele.

Every organism’s traits/appearance don’t always reveal its genetic composition we must describe their genotype & phenotype:
- Genotype – is the genetic make up of an organism
- Phenotype – is the trait/appearance that it displays

What are the genotype/phenotypes of plants we just described

Because an organism’s traits/appearance don’t always reveal its genetic composition we must describe their genotype & phenotype:

- Homozygous dominant
- Heterozygous
- Homozygous recessive

Because an organism’s traits/appearance don’t always reveal its genetic composition we must describe their genotype & phenotype:

- Genotype – is the genetic make up of an organism
- Phenotype – is the trait/appearance that it displays

What are the genotype/phenotypes of plants we just described

- Homozygous dominant
- Heterozygous
- Homozygous recessive
**Punnett Squares**

- A punnett square is a diagram that allows us to predict the expected traits of random fertilization.

  - Let’s take for example Mendel’s crossing between the Parent generation and 2 F1 pea plants.

**Important terms/concepts from today**

- Gene
- Allele
- Dominant/Recessive
- P generation
- F generation
- Homozygous
- Heterozygous
- Genotype
- Phenotype
- Punnett Squares

**Tongue Rolling (r)**

- Dominant trait, your mother is homozygous recessive, your father is heterozygous... what are the odds you can roll your tongue?

**Smooth chin (s)**

- Recessive trait, what type of pairings could your parents be in order for you to have a smooth chin.

**A look ahead to future topics …**

- We will begin going into more in depth genetic concepts building off what we’ve learned already:
  - Other gene interactions
  - (co-dominance, polygenic traits, incomplete dominance)
  - Hereditary disorders
  - Mutations
  - Sex-linked traits

**We are going to put genetic inheritance to the test …**

- You will partner up with the person sitting closest to you, and you will each be using your penny to give alleles/trait to your offspring.
  - For this exercise we will assume that both of you are heterozygous in each of the category (either pass dominant or recessive traits)
  - A tails will indicate a dominate trait, and a heads will indicate a recessive trait.
  - Each flip a coin to see which trait you have passed along, and make note of it in the column.
  - Once all the categories have been flipped on, you will get to see what your offspring looks like by drawing him using the key provided.
  - Run through the activity twice to see any differences your offspring may have due to genetic inheritance.

**A look ahead to future topics …**

- We will begin going into more in depth genetic concepts building off what we’ve learned already:
### PART D – Assessments

**Biology – Heredity**  
**Pre-assessment**  

<table>
<thead>
<tr>
<th></th>
<th>Know</th>
<th>Not Sure</th>
<th>Total Guess</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gene</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Allele</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Genotype</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Phenotype</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Inherited Trait</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dominant/Recessive Genes</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Heterozygous</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Biology – Heredity

The ______________ is the genetic makeup of a trait.

The ______________ is the trait or appearance that the gene displays.

Tall is dominant to short pea plants: (hetero or homozygous / what characteristic do the display)

TT______________________
Tt_______________________
tt______________________

What is an allele?

Widow’s Peak (w)
Dominant trait, your mother is homozygous recessive, your father homozygous dominant. If you meet someone who is heterozygous what are the odds your offspring will have a widow’s peak?

PART E - Planning for Instruction and Assessment

1. Central Focus

   a. Describe the central focus and purpose for the content you will teach in this learning segment.

      The central focus of this learning segment is to introduce genetic inheritance and Mendelian genetics to the students. Genetic inheritance, genes passed from one generation to the next, is the backbone of natural selection and evolution. This is a major concept in biology and a solid foundation of this information will be crucial for key concepts later. The students will be introduced to new concepts and vocabulary throughout this learning segment and the lessons around it. The goal of this learning segment is for the students to be able to analyze the information given to them and be able to use that to construct punnett squares that will predict the offspring of a parent generation. In order for that to happen they must understand the terminology and processes that go into Mendelian genetics.

   b. Given the central focus, describe how the standards and learning objectives within your learning segment address the use of science concepts and the ability to apply scientific practices through inquiry to develop evidence-based explanations for a real-world phenomenon.

      The standards that this learning segment deals with primarily concern
handedness/inheritance, how genes are passed from one generation to the next (grade 10, heredity indicator 6,8). The students can use the information that is presented to them to see how one generation of an organism affects the next generation (why/how have organisms become the way they are). This learning segment allows students to evaluate the genetic make-up of a parent generation and predict how the next generation should turn out (Scientific inquiry, indicator 6). The learning objectives for this segment focus on the basics such as the terminology and fundamental concepts that will allow them to develop a better understanding of genetic inheritance (which will become very important in later areas such as selection and evolution). By learning the correct terminology/concepts they will be able to develop hypotheses, and analyze situations to determine how genes will be passed from one generation to the next.

c. **Explain how your plans build on each other to help students understand relationships between scientific concepts, scientific practices, and the phenomenon in the learning segment.**

During this 5 day unit, each lesson will be a bridge to the next (start of broad and become more detailed). The beginning of this unit will construct a solid foundation of the terminology and basic concepts needed to understand the later lessons. As the lessons move on students will use punnett squares to visualize/analyze how alleles are passed from parents to offspring. The concepts behind this learning segment (Mendel, genetic inheritance) allow for students to visualize the phenomenon as they are studying (how do two tall pea plants give rise to three tall plants and one short plant). Once the foundation of Mendelian genetics is laid, the topics become more advanced. Where they were first studying monohybrids/how traits are passed from the parents on a single gene (tall,short), the next step is to show them how it is affected when two sets of alleles are crossed (dihybrids). These crosses are similar to the original punnett squares, though they have more information for the students to analyze and interpret. Using their prior knowledge from the original punnett squares and how they worked the students will be able to evaluate more complex models. From there the lessons move onto the exceptions to Mendel’s laws of inheritance. As the information goes more in depth, visual aids/clear examples will be crucial for students to see how the concepts are related to the phenomenon.

2. **Knowledge of Students to Inform Teaching**

   a. **Prior learning, prerequisite skills, and understanding of the nature of science related to the central focus – What do students know, what can they do, and what are they learning to do?**

During this learning segment the students will be learning how to construct/analyze punnett squares and interpret the results. Students will be working on expanding their ability to analyze a question, remove the pertinent data/information, use that to construct a prediction of what will happen, and then use that information/data to prove it. This skill set is very important for students to have because in order to get a correct answer you
must first understand what the question is asking you. The students will also be working on their ability to use the information from one situation and apply that knowledge to a similar situation to reach a correct conclusion (e.g., using their knowledge of monohybrid crosses and applying that to dihybrid crosses). From past classes together and through day to day interactions with one another, the students have a very good rapport with one another which makes their collaboration skills very proficient (extremely important in science). Students have a solid foundation with their ability to use resources (texts, internet, notes) to research questions in order for them to formulate answers. The students have a basic understanding of what a gene is and does from prior units.

b. **Personal/cultural/community assets related to the central focus – What do you know about your students’ everyday experiences, cultural backgrounds and practices, and interests?**

It is extremely vital to have a solid relationship with all the students in the classroom. When students can see that the educator cares about them/their education they become much more intrinsically motivated to learn. Therefore, knowing the circumstances surrounding the students becomes very important because relating the information to their everyday lives, their interests, and their background allows them to see how the information is relevant to them. This school is in a rural/suburban, predominantly Christian, middle-class district. There is not much ethnic diversity among the student population at this high school (mostly Caucasian), but there is a larger socioeconomic discrepancy. Most families have a strong conviction for education in this area, so for the most part the students come well prepared for school. In this class, as indicated earlier, there is one ELL student and 5 struggling readers. Because all students process information differently, this learning segment tried to encompass different learning modalities (auditory, visual, and kinesthetic).

### 3. Supporting Students’ Science Learning

**a. Explain how your understanding of your students’ prior learning and personal/cultural/community assets (from prompts 2a-b above) guided your choice or adaptation of learning tasks and materials.**

For the most part the students in this class are always up on the material and ready to learn. With minor accommodations the ELL and struggling reading students are also able to stay on top of the information. Therefore, the learning objectives for this segment were a little more on the advanced side. The ELL and struggling readers were given tangible copies of the notes that they could write extra on as the class progressed (allowing them to better keep up with the pace). During this learning segment there was a lot of open ended questioning and class participation, which allowed the educator to make sure the students were grasping the material correctly as the class progressed. Allowing students to think about the material and voice their opinions about what is going on (not just writing notes) gives them a better opportunity to retain the information
because they are actively participating in the education process.

b. Describe and justify why your instructional strategies and planned supports are appropriate for the whole class and students with similar or specific learning needs. My instructional strategies were to make sure that all students during this learning segment were able to walk away with the important information. During this learning segment the educator used visual aids (powerpoint/board work) to help the more visual learners, oral presentation to help auditory learners, and an activity at the end to help drive home the information for the kinesthetic learners. A tangible copy of the presentation material was available for the struggling readers and ELL student. Having those in front of them from the start allowed them to concentrate more on the material rather than trying to keep up (they were still encouraged to take notes on the side of the slides to help them remember the material when reviewing it).

c. Describe common preconceptions (based on prior learning and experiences) within your content focus and how you will identify and address them. During this part of genetics, many students have the common misconception that all characteristic traits that the majority of people show are due to dominant traits overshadowing recessive. It is important that the students know that this is not true. Many of the characteristics that they show will be due to a homozygous recessive gene (straight hairline, smooth chin, etc). Seeing the word dominant compared to recessive automatically makes the students believe that all traits are dictated because of the dominant alleles. To address this during the learning segment I had them look around at some of the different characteristics that their fellow classmates showed (hairline, tongue rolling, smooth chin) and explained to them that we all inherited those characteristics from our parents, explaining the genetics behind it.

4. Supporting Science Development through Language

a. Language Demand: Language Function. From the list below, choose one language function essential for student learning within your central focus:

<table>
<thead>
<tr>
<th>Analyze</th>
<th>Explain</th>
<th>Interpret</th>
<th>Justify with Evidence</th>
</tr>
</thead>
</table>

Analyze

b. Identify a key learning task from your plans that provides students with opportunities to practice using the language function. In which lesson does the learning task occur? (Give the lesson day and number)

Lesson 2, Tuesday

During this learning segment the students were given two word problems that required them to decipher the important information, pull it out, and use it to complete punnett
squares. In these questions the students had to analyze what the question was asking for, first and foremost. Then they had to be able to decide what to do with the information (how can they use it to answer the question).

c. **Additional Language Demands.** Given the language function and task identified above, describe the following associated language demands (written or oral) students need to understand and/or use.

- **Vocabulary and/or symbols**
  In biology the vocabulary/terminology can be one of the steepest learning curves for students to overcome. There are many new, very large words that students struggle to understand at first. In order for the students to be able to complete the learning task above the must understand the basic vocabulary of this lesson: genes, alleles, dominant, recessive, heterozygous, homozygous, inherited trait. It is crucial for the students to know the differences between these vocabulary words in order for them to pull out the correct information from the word problems and to be able to answer the questions correctly.

- **Plus at least one of the following:**
  i. **Syntex**
  ii. **Discourse**

  This refers to the ability of an individual to speak, converse, or write using the correct terminology, as an expert in the field might. In science it is ever so important to have the ability to speak to and understand peers in your field. Science is a language of its own and any miscommunication could lead to a plethora of mishaps. Collaboration is an extremely important skill for students to work on because it will play a critical role in their development for the rest of their lives (not just in the science realm). While the students worked through the problems I made sure to listen for the correct terminology (correcting any misconception). The students were able to explain the answers using the good discourse for the most part.

d. **Language Supports.** Refer to your lesson plans and instructional materials as needed in your response to this prompt.

- **Describe the instructional supports (during and/or prior to the learning task) that help students understand and successfully use the language function and additional language identified in prompts 4a-c.**

  The pre-assessment had a list of important terms, some that had been covered previously and others that would come up in this learning segment (allowed me to see which students had misconceptions, those were right on task, and those that had a higher level background on this topic). Throughout this lesson it was
clear that student questions were encouraged (positive responses and clarification allowed students to feel comfortable asking questions). Also, in order to make sure the students were grasping the material during the lecture open questions were posed to keep the students thinking (e.g., why would a pea plant be good specimen for Mendel to study?). Allowing students to work through examples of punnett squares out loud during the lecture (slides 7, 8, 9), during which I made sure that when they were explaining their thoughts that they were using the correct vocabulary (hetero-homozygous, recessive, dominant, allele, etc). On the powerpoint slides the important vocabulary was bolded or italicized to make sure the students recognized the important terms (also at the end of class the important terms/concepts were shown to make sure students knew what they were, slide 12).

5. Monitoring Student Learning – refer to the assessments you will submit as part of the materials for Task 1

a. Describe how your planned formal and informal assessments will provide direct evidence of students’ understanding of science concepts and the phenomenon, nature of science, and use of scientific practices throughout the learning segment. During this learning segment the students were encouraged to voice their thoughts and think out loud what was going on. This part of the informal assessment allowed the educator to make sure all students understood the information. Listening for the key vocabulary and concepts when the students answered questions gave me a good idea of what the students were grasping and what was being misconceived. When the students broke into small groups it allowed me to go around to each group to make sure the concept of genetic inheritance was being understood. The formal part of my assessment included the pre/post test along with the work in small groups. The pre-assessment allowed me to see how much of a base knowledge the students had on this topic. It included vocabulary from previous lessons along with vocabulary that they would see later in this learning segment, which allowed me to find out who was ahead and who had preconceptions that were not entirely accurate. The post assessment which included several fill in blanks and a word problem allowed me to make sure that the major concepts of genetic inheritance had been grasped.

b. Explain how the design or adaptation of your planned assessments allows students with specific needs to demonstrate their learning. The students with specific needs would be given extra time to finish the post-assessment, along with extra examples of some word problems to allow them to see examples of how to analyze the problem. For the pre-assessment they would be given a definition bank to try and match up the correct terms with their definition. During the lecture they will be encouraged to ask questions and answer the prompts, allowing me to make sure they do not develop misconceptions about the material.