High School Gardening Curriculum Outline:

**Part One: Preparing for a Garden**
**Lesson 1:** MyPlate and Plant Basics
**Lesson 2:** Where, What, and When of Planning a Garden

**Part Two: Making Your Garden a Reality**
**Lesson 3:** Planting a Garden for Healthy Snacking
**Lesson 4:** Physical Activity and Planting a Garden
**Lesson 5:** Maintaining Your Plants & enjoying Your Harvest

**Series Activity:** Have each student identify a food crop to research throughout this lesson series. They may research such things as where the crop is predominantly grown, the growing season and process for that crop, healthy snacks and foods it can be used for, etc. Perhaps the teacher could have a list available of plants (“Region 1 Map” in Lesson 2) that grow in that region which students could specialize in learning about.
Lesson 1: MyPlate and Plant Basics
Grades 9 – 12

I. Nutrition Education Objective:
   Goal 1: Students will comprehend concepts consistent with USDA guidance related to
eating and physical activity for good health.
   Objective: As a result of Pennsylvania’s SNAP-Ed plan, student will know,
understand, analyze and apply concepts, as developmentally appropriate, that are
consistent with USDA guidance about the benefits of:
   1. Eating a variety of whole grain products, fruits and vegetables,
      low fat milk, and calcium-rich foods for meals and/or snacks
   2. Eating from each food group every day

II. Pennsylvania Educational Standards:
   A. 10.1 Concepts of Health
   B. 11.3 Food Science and Nutrition

III. Content:
   A. Students will identify each food group in MyPlate.
   B. Students will identify which food groups are products of plants.
   C. Students will learn the importance of fruits and vegetables in the diet.
   D. Students will be able to describe the basics of plant functions and growth.

IV. Materials:
   A. USDA MyPlate Poster, mini poster and/or handouts.
   B. California Department of Education Fresh Fruit and Vegetable Photo Cards
   C. Understanding Plants Worksheet
   D. Edible Plant Parts Worksheet
   E. Photosynthesis Review Worksheet
   F. Models of plant part foods (or the real things)
   G. Plates, forks, napkins, gloves, bowl and tongs.
   H. Hand wipes
   I. Salad ingredients:
      i. Fresh lettuce, chopped
      ii. Sliced tomatoes or plum/cherry tomatoes
      iii. Grated or sliced carrots
      iv. Chopped celery
      v. Chopped broccoli
      vi. Ready-to-eat sunflower seeds
vii. Salad dressing, if desired
J. Reinforcement that conveys the appropriate nutrition message.

V. Procedure
A. Introductory:
   a. Ice Breaker
      i. Ask how many of the food groups in MyPlate are directly related to plants.
      ii. Ask students to name the parts of a plant and what the function of each is.
          Hand out the *Understanding Plants* worksheet. You may want to have students try it now, and fill out the rest as the lesson proceeds.
   b. Introduction
      i. Welcome to the *Name It Yourself* Gardening program. Have students create a name for this lesson series at this time or in advance of this lesson. How many of you have ever grown a plant in a garden?
      ii. Explain that gardening is a great way to get involved in basic food production and watch your work pay off in the form of tasty, nutritious garden treats.

B. Developmental:
   a. Plants in MyPlate
      i. Exhibit MyPlate and/or distribute MyPlate mini poster or handouts and have students name each food group
      ii. Explain which food groups are direct products of plants.
      iii. Fruits, Vegetables, and Grains are immediate plant products.
      iv. In the Protein group, beans are yielded from plants.
      v. Even oils are comprised largely of plants.
         1. Ask students to name common oils that are derived from plants (soybean oil, corn oil, peanut oil, canola oil, sunflower oil, sesame oil, etc.).
      vi. Describe how plants constitute a major portion of our diets and are important in providing us with essential nutrients.
      vii. Ask students to list what nutrients are obtained from consuming plants (energy, protein, fiber, vitamins, minerals, healthy fats).
   b. What Plants Need
      i. Ask how plants and animals are different. If it is not mentioned, state that plants are *producers*—they produce their own food.
      ii. What do plants need in order to grow?
         1. Soil: dark, rich soil with adequate water drainage is needed to supply plants with nutrients. Minerals present in the soil will be absorbed by the plant to sustain its growth and development.
         2. Water: plants need water to perform necessary functions, just as humans do.
         3. Sunlight: plants derive energy from sunlight to drive photosynthesis.
         4. Air (CO₂): just like people, plants need air for proper growth and development. The difference is that humans need oxygen
in the air and give off carbon dioxide as waste, while plants need carbon dioxide and release oxygen.

c. **Plant Biology**
   i. Ask students: How many main parts does a plant have? (6). Then ask them to name and describe the purpose of each one.
   ii. **Roots:** anchor the plant in the ground and absorb minerals and water for the plant. Some are also used for storing energy and minerals. Root hairs protrude from roots to aid in absorption.
      1. Two types of roots
         a. Fibrous root system—mat-like structure that generally grows close to the soil surface.
         b. Taproot system—one main root that extends far into the ground (i.e. carrots, turnips, beets).
      2. Ask “What types of foods are roots?” Edible roots include carrots, beets, cassava, parsnips, rutabagas, turnips, and sweet potatoes.
   iii. **Stems:** connect the roots to the leaves of the plant. Stems act as a conduit for nutrients and water to pass through to reach all parts of the plant.
      1. Inside stems are vein-like transport tissues, called xylem and phloem.
         a. Xylem (zahy-lem)—transports water and mineral nutrients from the roots to other plant parts.
         b. Phloem (floh-em)—transports organic nutrients made during photosynthesis from the leaves to the rest of the plant.
      2. Stems can be herbaceous (like supple dandelion stems) or woody (like a tree trunk).
      3. Ask “What types of foods are plant stems?” Edible stems include asparagus, garlic, ginger, and white potatoes. Celery is not actually a stem, but a “petiole” (pronounced pet-ee-ohl), or leaf stalk. The petiole is a smaller stalk that connects the leaf to the stem.
   iv. **Leaves:** absorb sunlight and convert this energy and carbon dioxide and water to create sugars for food, a process called photosynthesis.
      1. Ask “What types of foods are leaves?” Edible leaves include lettuce, cabbage, Brussels sprouts, spinach, parsley, and mustard greens.
   v. **Flowers:** responsible for reproduction of the plant. Flowers contain pollen and egg cells called ovules, which when combined through pollination develop into seeds.
      1. Ask “What types of foods are flowers?” Edible flowers include broccoli, cauliflower, chive blossoms, and squash blossoms.
   vi. **Fruits:** protective covering for seeds. Flowers become fruits after they are pollinated.
      1. This covering may be a soft flesh (like a tomato or apple) or a hard shell (like nuts).
2. What is the difference between a fruit and a vegetable? Many foods that we call vegetables are actually fruits by the scientific definition. In botany, the fruit is the ripened ovary of the plant, so anything with seeds is a fruit. Vegetables are a broad classification which includes any portion of an herbaceous plant which is eaten. So fruits are products of the reproductive portion of a plant, while vegetables are the vegetative portion. However, some fruits (like cucumbers and tomatoes) are considered vegetables in nutrition because their nutrient contents and flavors are more characteristic of vegetables.

3. Ask “What types of foods are fruits?” By the scientific definition, edible fruits include apples, tomatoes, grapes, cucumbers, pumpkins, peaches, pears, oranges, etc.

vii. **Seeds:** part of a plant capable of growing into a new plant. Like animal eggs, seeds are packed with the nutrients needed for their next step of growth, in this case germination. They contain everything needed for a new plant to start growing. After germination, however, the young seedling needs a steady supply of nutrients from the soil.

1. Three basic parts:
   a. Embryo—innermost portion that develops into a new plant.
   b. Endosperm—stored food that provides nutrition to the embryo as it begins to grow.
   c. Seed coat—outer layer that protects the embryo until conditions are met for the seed to grow.

2. Ask “What types of foods are seeds?” Edible seeds include peas, pumpkin seeds, sunflower seeds, and the edible portion of nuts such as almonds and cashews.

viii. Give students the *Plant Parts Identification* worksheet
ix. Play the *Plant Parts Game*

1. Split students into teams and have them correctly identify each food product as a stem, leaf, root, flower, etc. (Use the California Department of Education 2007 Fresh Fruit and Vegetable Photo Cards. Pick some tricky ones!) The team that correctly identifies the most foods wins.

d. **Photosynthesis**
   i. Hand out the *Photosynthesis Review* sheet for students to work on.
   ii. Ask if someone can explain what photosynthesis is and why this process is important.
   iii. Photosynthesis is the process of converting CO₂ to organic compounds (sugars) for energy. This is how plants produce their own food. The scientific definition of “food” is a source of energy and building blocks needed for organisms to live and grow.
   iv. Plants need chlorophyll, light, CO₂, water, and nutrients in order to perform photosynthesis.

1. Ask “How does the plant obtain each of these?”
2. Chlorophyll is a green pigment found in plants that absorbs light and is essential to photosynthesis.

3. Light energy from the sun is converted to chemical energy, which is stored in plants in the form of sugars.

4. Carbon dioxide from the air and water from the soil are converted to sugars; oxygen is given off as waste.

5. Chloroplasts are organelles found in plant cells and are the site of photosynthesis.

C. Concluding:
   a. Plants need water and nutrients from the soil to grow. When we eat the plants, we absorb these nutrients and water for our own growth and development.
   b. Challenge the students to grow all the components of a salad in their school garden.

D. Taste Testing:
   a. Distribute hand wipes to students.
   b. Distribute plates and forks.
   c. Samples of a fresh garden salad.
Understanding Plants
Use the terms in the word bank below to label the parts of this plant. Then match each corresponding number with the main function of that plant part.

<table>
<thead>
<tr>
<th>Flower</th>
<th>Stem</th>
<th>Fruit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Leaf</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Matching:

________ Absorbs sunlight to perform photosynthesis
________ Absorbs minerals and water from the soil
________ Reproductive portion of the plant
________ Part of plant protected by fruit
________ Protective covering for seeds
________ Connects the roots to the leaves

1
2
3
4
5
6

After pollination, this part becomes:

Inside this part you will find:

Drexel University, Gardening HS, Lesson 1, rev 7/14
Understanding Plants – Answer Key

Use the terms in the word bank below to label the parts of this plant. Then match each corresponding number with the main function of that plant part.

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<th>Fruit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Leaf</td>
<td>Roots</td>
<td>Seeds</td>
</tr>
</tbody>
</table>

Matching:

1. Leaf – Absorbs sunlight to perform photosynthesis
2. Flower – Absorbs minerals and water from the soil
3. Fruit – Reproductive portion of the plant
4. Seeds – Part of plant protected by fruit
5. Stem – Protective covering for seeds
6. Roots – Connects the roots to the leaves

After pollination, this part becomes:

3. Fruit

Inside this part you will find:

4. Seeds
## Plant Parts Identification

*Think of the last meal you ate. Then classify each component of that meal by the plant part it comes from by writing it in the table below. For example, if you ate a peanut butter jelly sandwich, list peanuts under seeds, jelly under fruit, and bread under seeds (grains).*

<table>
<thead>
<tr>
<th>Roots</th>
<th>Stems</th>
<th>Flowers</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
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<td></td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Fruit</th>
<th>Leaves</th>
<th>Seeds</th>
</tr>
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</table>

*Write any non-plant foods from your last meal below. Did your last meal have more plant food components or non-plant foods? Write what Food Group each food belongs to.*
Photosynthesis Review

1. Plants use _______________ from the _______________,
   _______________ from the _______________, and
   _______________ from the _______________ in the process called
   photosynthesis.

2. Plants make their own _______________ through photosynthesis.

3. The scientific meaning of the word “food” is: a source of _______________
   and _______________ that organisms need to live and grow.

4. During photosynthesis, _______________ energy from the sun is changed
   into _______________ energy that is stored inside sugar.

5. During photosynthesis, carbon dioxide and water are changed to
   _______________. _______________ is given off as waste.

6. Photosynthesis takes place inside the cells that have _________________.

7. _______________ is a green pigment that gives plants their green color.

8. When animals, including humans, eat plants, they are using the food the plants
   made. This gives their body a source of _______________ and the
   _______________ they need to live and grow.

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Answers for Photosynthesis Review

1. Plants use (Energy) from the (Sun), (Carbon Dioxide) from the (Air), and (Water) from the (Soil) in the process called photosynthesis.

2. Plants make their own (Food) through photosynthesis.

3. The scientific meaning of the work “food” is: a source of (Energy) and (Building Blocks) that organisms need to live and grow.

4. During photosynthesis, (Light) energy from the sun is changed into (Chemical) energy that is stored inside sugar.

5. During photosynthesis, carbon dioxide and water are changed to (Sugar): (Oxygen) is given off as waste.

6. Photosynthesis takes place inside the cells that have (Chloroplasts).

7. (Chlorophyll) is a green pigment that gives plants their green color.

8. When animals, including humans, eat plants, they are using the food the plants made. This gives their body a source of (Energy) and the (Building Blocks) they need to live and grow.