

Me, myself and I – cloning in plants

KS3 RHS Wisley lesson plan

QCA 'Organisms, their behaviour and the environment' –selective breeding and cloning, introduction to inherited and environmental variation. **How science works'** - selecting equipment and methods, variables, recording, concluding and evaluating.

Every Child Matters: *Stay Safe* 2.3; 2.4 *Enjoy & achieve* 3:6 *Make a positive contribution* 4.2; 4.3; 4.4



<i>Learning Objectives</i>	<i>Structure</i>	<i>Plenary</i>
<p>Students should learn that:</p> <ul style="list-style-type: none"> that offspring are similar but not identical to their parents. that some characteristics are inherited. that these variations occur in plants. that plant breeders select healthy plants with particular characteristics to breed from. that fertilisation of an ovule by a pollen nucleus produces a seed to suggest how selective pollination could be brought about. 	<p>Introduction</p> <p>Demonstration of different varieties of African violet (<i>Saintpaulia ionantha</i>). Establish by means of questions that variation may be due to mutation, inheriting differing combinations of genes from parent plants or environmental conditions (not inherited).</p> <p>Using model of flower, recap structure of flower focussing on stamens and carpel, pollination, fertilisation and seed formation.</p> <p>Discuss how a plant breeder uses selective breeding to produce plants with desired characteristics. (PowerPoint)</p> <p>Demonstrate a grafted plant. Explain briefly about the advantages of grafting.</p> <p>Discuss briefly the difference between cloning and selective breeding.</p> <p>Discuss cuttings and tissue culture.</p> <p>Activities:</p> <ol style="list-style-type: none"> Depending on the season, walk up to the trials field. Students become 'trials judges'. Decide what criteria they will use to judge one plant 'better' than another. Think about scientific method. Which variables can be controlled to make the trial a 'fair test?' Walk to the fruit demonstration area, look at the varieties of fruits grown on dwarfing rootstocks. Discuss the advantages for gardeners who have limited space. Discuss the difference between pruning and genetic differences to produce different sizes/shapes of plants. 	<p>Show pupils sets of varieties of food crops, e.g. plum, beefsteak and cherry tomatoes; curly, cos and iceberg lettuces and strawberries.</p> <p>Demonstrate strawberry runners.</p> <p>Ask about desirable characteristics for these food plants. Are the different examples genetically identical? What are the advantages of using strawberries from strawberry runners? Eat the strawberries!</p>

<ul style="list-style-type: none"> that, in cloning, all genetic information comes from one parent. describe how asexual reproduction has been used to produce new plants. consider control of variables for testing suitability of plants grown by selective breeding. <p>Assessment questions:</p> <p>What is the difference between selective breeding and cloning of plants?</p> <p>How can farmers produce different varieties of tomatoes?</p> <p>How would farmers grow lots of the same variety of strawberries?</p>	<p>3. In growing laboratory, discuss cloning. Emphasise that daughter plants are genetically identical. Discuss advantages and disadvantages of cloning plants. Demonstrate examples of 'natural' cloning e.g. or runners from <i>Chlorophytum</i>. Students make stem tip, leaf blade and leaf petiole cuttings. Students can take these cuttings home.</p> <p>Alternative activity</p> <p>Go to glasshouse to see varieties of plants produced by selective breeding e.g. orchids. Discuss plants that can only be produced vegetatively e.g. banana.</p> <div data-bbox="649 721 1610 946"> <p>Key vocabulary:</p> <p>Stamens, pollen, carpel, ovary, seed, pollination, fertilisation</p> <p>Characteristics variation, inheritance, genes,</p> <p>Selective breeding, clones, tissue culture, tip cutting, leaf cutting.</p> <p>Sexual and asexual reproduction.</p> </div>	<p>Resources:</p> <p>Range of varieties Saintpaulia plants</p> <p>Model flower</p> <p>Demo of grafted plant</p> <p>Worksheet 'Trials Judge'</p> <p>Sheets explaining aftercare of cuttings</p> <p>Plants for cuttings - <i>Streptocarpus</i>, <i>Saintpaulia</i>, <i>Aeschynanthus</i></p> <p>Pots, potting compost, scissors, pencils, labels</p> <p>Different varieties of tomatoes and lettuces from veg garden or bought in.</p> <p><i>Chlorophytum</i> with runners. Strawberry plant with runners</p>
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Differentiation:

All students using appropriate terminology describe simply how plant breeders carry out selective breeding to improve varieties of plants. Describe cloning by the use of cuttings. Have some understanding that using seeds results in a variation in the seedlings and using cuttings results in plants which are exactly the same. From the field trials make observations and measurements which are recorded in tables. Describe the variables that can be controlled in the field trials. (Level 4)

Most students can explain why offspring are similar but not identical to their parents. Explain how plant breeders carry out selective breeding to improve varieties e.g. lettuce. Explain how use of cuttings produces clones and how this can be an advantage to plant breeders and gardeners - implications and applications of science. For the field trials, identify an appropriate approach, select and use methods adequate to the task. Identify the variable which can be controlled and suggest variables which cannot be controlled. Identify need for repeat experiments and make suggestions how the methods can be improved. (Level 6)

Some students can explain sexual reproduction in plants and how this gives rise to genetic variation. Understand and be able to explain in detail how plant breeders carry out selective breeding to produce improved varieties of plants. Explain fully how taking cuttings

