Teacher packs in Experimental Science

Bio Pack 5

Examining flower structure

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Curriculum areas covered:

Year 1 Semester 1 Unit 4.2 of Diploma in Basic Education Biology Curriculum for designated Science and Mathematics Colleges of Education, Ghana.

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Title: Examining flower structure

Target group*:* Diploma Students

Also suitable for: Senior high school students

Learning outcomes:

These are the learning outcomes expected after students have gone through this Pack

1. Knowledge and understanding

   KN1 a flower has different parts

   KN2 different parts of flowers perform different functions

2. Cognitive skills

   CS1 identify and count the parts of a flower.

   CS2 identify types of floral symmetry and fusion of floral parts

   CS 3 write and interpret floral formulae

3. Key Skills

   KS1 observing

   KS2 drawing

4. Practical skills

   PS1draw and label an entire flower

   PS2 show the different parts in relation to one another

   PS3 dissect a flower and draw its internal structures

   PS4 separate the different parts and put similar parts together

   PS5 count the members of each part (whorl)

A. Teacher's Guide

- Ensure that there is a good collection of different flowers in class (*Crotalaria*, hibiscus, allamanda, pride of Barbados, flamboyant etc.)
- Put students in small groups to examine their collections of flowers
- Help students to recognize the following parts of the flower: Calyx, Corolla, stamen, and Pistil
- Provide hand lens to each student where available.
- Provide razor blades (preferably new ones).
- Ask students to remove separately for observation and study, the four parts mentioned and fill the table below.

Name of Plant	Sepals		Petals		Stamens		Pistil	
	Colour	No.	Colour	No.	Colour	No.	Colour	Shape of stigma

- Guide them to cut longitudinal sections of flowers.
- Demonstrate to students how a floral formula is constructed.
- Instruct the students to follow the experimental procedure strictly.

Produced by Biology Group, University of Cape Coast as part of a DelPHE funded project

Assessment Questions

- What are the functions of each part of the flower?
  (Answer: Calyx protects the flower at the bud stage and supports the inner whorls; Corolla when brightly coloured attracts animal pollinators. It also supports the inner whorls; Androecium is the male reproductive parts and produces pollen grains; Gynaecium is the female reproductive part where fertilization takes place.)
- What symmetry does each flower exhibit? (practical)
- Is there any fusion between floral leaves of different whorls? (practical)
- Compare the flowers. (practical)

B. STUDENTS' GUIDE

Background Information

A flower is the reproductive structure found in flowering plants (plants of the division Magnoliophyta, also called angiosperms). The biological function of a flower is to mediate the union of male sperm with female ovum in order to produce seeds. The process which begins with pollination is followed by fertilization, leading to the formation and dispersal of the seeds.

When one flower is produced, the stalk holding the flower is called a pedicel. If the stalk ends with groups of flowers, it is called a peduncle. The flower stalk forms a receptacle *or torus* at its distal end. The parts of a flower are arranged in whorls on the torus. The four main parts or whorls (starting from the base of the flower or lowest node and working upwards) are as follows:

- *Calyx*: the outer whorl of *sepals*; typically these are green, but are petal-like in some species.
- *Corolla*: the whorl of *petals*, which are usually thin, soft and coloured to attract insects that help the process of pollination.
- *Androecium*: one or two whorls of stamens, each with a filament topped by an anther where pollen is produced. Pollen contains the male gametes.
- *Gynoecium*: one or more pistils. The female reproductive organ is the carpel: this contains an ovary with ovules (which contain female gametes). A pistil may consist of a number of carpels merged together, in which case there is only one pistil to each flower, or of a single carpel (the flower is then described as *apocarpous*). The sticky tip of the pistil, the stigma, is the receptor of pollen. The supportive stalk, the style, becomes the pathway for pollen tubes to grow from pollen grains adhering to the stigma, to the ovules, carrying the reproductive material.

Floral symmetry

Symmetrical halves of many flowers can be produced if the perianth is bisected through the central axis from any point. Such flowers are called regular or actinomorphic, e.g. rose or

trillium. When symmetrical halves of a flower can be produced by cutting only along one line the flower is said to be irregular or zygomorphic, e.g. snap dragon or most orchids.

Floral formula

A *floral formula* is a way to represent the structure of a flower using specific letters, numbers and symbols. Typically, a general formula will be used to represent the flower structure of a plant family rather than a particular species. The following representations are used:

Ca = calyx (sepal whorl; e.g. Ca5 = 5 sepals)

Co = corolla (petal whorl; e.g., Co3(x) = petals some multiple of three)

Z = add if *zygomorphic* (e.g., CoZ6 = zygomorphic with 6 petals)

A = *androecium* (whorl of stamens; e.g., A∞ = many stamens)

G = *gynoecium* (carpel or carpels; e.g., G1 = monocarpous)

$\bar{\mathbf{G}}$ = ovary inferior to insertion point of the other whorls. The floral whorls are epigynous to the gynoecium.

$\underline{G}$ = ovary superior to insertion point of other floral whorls. The floral whorls are hypogenous to the gynoecium.

X: to represent a "variable number"

∞: to represent "many"

A floral formula would appear something like this:

Ca5Co5A10 - ∞ G1

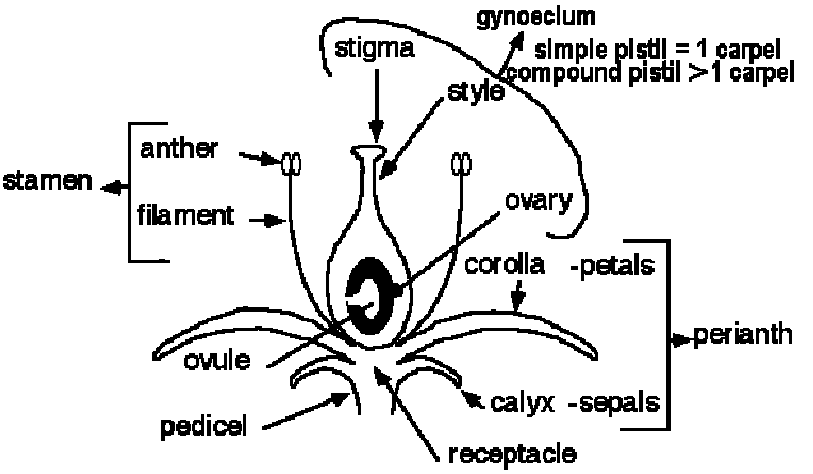

Fig 1. A labeled diagram showing flower parts

Equipment/ Materials

- Blade
- guide pins
- Flowers from: *Tecoma sp, Delonix sp (flamboyant), Caesalpinia sp (Pride of Barbados), Crotalaria sp (Devil bean) and Hibiscus sp*
- Hand lens (optional)
- Dissecting microscope (optional)

Other requirements

A sketch book, Notebook, Pens and pencils for drawing and note-taking, Eraser.

Experimental Procedure

- Get your collection of different flowers (*Crotalaria*, *Hibiscus*, *Allamanda*, pride of Barbados, flamboyant etc).
- Work in pairs to examine your collection of flowers

- Identify the following parts of each flower: calyx, corolla, stamen, and pistil and complete the table below.
- For any cutting you intend to do, use your razor blades (preferably new ones)
- Remove separately for observation and study, the four parts identified and fill the table below.

Name of plant	Sepals		Petals		Stamens		Pistil	
	Colour	No.	Colour	No.	Colour	No.	Colour	Shape of stigma

- Cut longitudinal section of each flower.
- Write the floral formula for each species examined.

Reflection on the experiment

Take some time to reflect on the activity carried out. Ensure that you have understood the procedure followed. If clarification is needed, discuss it with your teacher or colleagues.

Do you think this activity could be done in a different way? Give reasons for your answer.

What other things can you do with the flower to enhance your knowledge on floral structure? Discuss with your group.

C. Assessment – Student's sheet

On completion of the experiment, you should answer the following questions:

1. What are the functions of each part of the flower? (KN2)

2. What symmetry does each flower exhibit? (CS2)

3. Is there any fusion between floral leaves of different whorls? (CS2)

4. Compare the flower parts of all the flowers used in this experiment.

D. Extensions to experiment

E. Useful links

http://employees.csbsju.edu/SSAUPE/biol308/Lecture/floral_form.htm (accessed July 18, 2010)

Bio Packs 3 & 6

Nyavor, C.B. and Seddoh, S. (2006). *Biology for senior secondary schools.* Accra: Unimax Macmillan Publishers Ltd.

F. Health and Safety

You are responsible for your immediate working area!

At the end of activity, ensure that your bench space is clean and free of plant material.

Be careful when handling razor blades to avoid cuts

Wash hands after experiment.

G. Evaluation

What do you not like about the pack?