

Creating Science – Dissecting Eyeballs

Intro #CreatingScienceDissectingEyeballs

DANGERS!

This section cannot explain every possible danger in this activity. Adult care and surveillance is required at all times. Please exercise all appropriate caution at all times.

1. *KNIVES, KNIVES, KNIVES, KNIVES, KNIVES. Need I say more? Knives can cut, slice, disembowel, disfigure, and countless other tragedies. Please exercise all adult caution and preparation and, if necessary, take the knives off the students after the experiments.*
 - a. *We are using EXTRA SHARP knives, called SCALPES. They are strong sharp enough to cut human flesh – it's what they're designed to do!*
 - b. *Always carry a knife safely, with the safety cap on and pointing toward yourself.*
2. *Dissection. We are cutting up the necrotic flesh of living creatures.*
 - a. *It will go stale in less than a day if you leave it out.*
 - b. *You MUST dispose of it properly according to all state and federal legislation.*
3. *Involuntary reactions. Student reactions will include, but are not limited to, vomiting, fainting, and autonomic system shock which includes trembling, sweating, turning pale, and in the rarest of occasions even seizures. Prepare properly.*
 - a. *Remind students that autonomic system shock is a natural response to such weird, gory, situations, and to be prepared.*
 - b. *Remind students that it is all right to not participate, to leave if the need to, and the location of the nearest vomit receptacle.*
 - c. *Inform students that it is all right, also, to enjoy this activity. Remember, we need some people in society to not be afraid, indeed, to find such gore even rivetingly fascinating, or there might be no surgeons, doctors, ambulance staff, or even vets. Understanding the biological machine is, indeed, a noble and noteworthy pursuit – even if it is at times, also, a very gory one.*

Suggested Outcomes

(NOTE: This is by no means an exhaustive list of possible outcomes, neither is it intended that ONLY these outcomes can or should be met. Science is a deeply interrelated activity, and you may find cross curriculum links you can and should use.)

Science understanding

- Biological Sciences 3: Living things can be grouped on the basis of observable features and can be distinguished from non-living things.
- Biological Sciences 5: Living things have structural features and adaptations that help them to survive in their environment.
- Biological Sciences 8: Multi-cellular organisms contain systems of organs that carry out specialised functions that enable them to survive and reproduce

Also

- Physical sciences 5: Light from a source forms shadows and can be absorbed, reflected and refracted.

Science inquiry skills

- Planning and conducting 3-4: Safely use appropriate materials, tools or equipment to make and record observations, using formal measurements and digital technologies as appropriate
- Planning and conducting 5-6: With guidance, select appropriate investigation methods to answer questions or solve problems

Science as a human endeavour

- Use and influence of science 5-6: Scientific understandings, discoveries and inventions are used to solve problems that directly affect peoples' lives

Science vocabulary words

Tier 1 (Everyday words) Eyes, eyeball, germs.

Tier 3 (Specialised vocabulary)

- Scalpel - a knife with a small, sharp, sometimes detachable blade, as used by a surgeon.
- Dissect - to carefully cut up (a body or plant) in order to study its internal parts.

See also the parts of the eye, such as - iris, cornea, fovea, lens, retina, optic nerve, myelin sheath, vitreous humor, and many more.

Preparation

- You will need to order some eyeballs. Sometimes you can get them from an abattoir or butcher, though Australia usually orders them through companies such as Dissection Connection, see <https://dissectionconnection.com.au/>
- You will need ground mats, or do the activity outdoors.
- Chuck buckets. Please assume someone will throw up.

- You will need somewhere to cut the eyeballs up. Strong, cardboard plates will do, or regular cutting boards. Official dissection tables are available online.
- Really, really sharp knives, called scalpels. Student friendly ones are available for around a dollar each online, but they are still just as dangerous as any knife.
- You will need to dispose of the meat and dissected materials properly, as it will become very rotten if left in a bin for a day. Usually you can place it in a freezer until rubbish removal day, but be sure to follow all local and state laws for removing dissected materials.

See you all Monday folks! For those who can, please remember the following;

- Science. If you can, tie long hair back and wear gloves and lab coats (we provide extras).
 - If you have a cut or sore on hands or arms, you MUST wear gloves!!!
- We are using super sharp knives called *scalpels*. We recommend covered shoes.
- One eyeball between two. We will have to team up for this!
- BYO device PLEASE!! Please print out, or even better, open in a new window on a portable device, the following dissection plan: https://www.exploratorium.edu/learning_studio/cow_eye/coweys.pdf
- Re: nausea. If this is an issue for you feel free to bring along pegs (or swimming plugs) for your nose, or dab a little vicks vapour rub to help overlay the smell a little. I can bring my aromatherapy vaporiser (lavender, peppermint), and you can try ginger tablets to help calm worried tummies.
- If you have something else biological, such as some chops, let me know and we'll see if we can dissect it as well on the day.
- Nothing herein is any more gross than cooking – it's just another piece of meat! Remember, it is all right to *enjoy* this activity. We need some people in society to not be afraid, indeed, to find gore even *rivetingly fascinating*, or there might be no surgeons, doctors, ambulance staff, or even vets. Understanding the biological machine is, indeed, a noble and noteworthy pursuit – even if it is at times, also, a very messy one.

Learning Intent (student friendly)

'We are learning to' (WALT) – appreciate biology and form, and safely perform a dissection.

Success criteria

'What I'm looking for' (WILF) – a correctly labelled diagram, and photographs of all the main sections.

Student learning goals

Help students make a self-monitored learning goal for this lesson.

Evidence of learning

How will you know when the learning goal is achieved? What EVIDENCE do you have that your students have met or exceeded the learning expectations?

Suggestions for other year levels

As always, more material is presented here than can be used by the average class during the average lesson time. However, since the students questions can and should guide student learning, more material is presented for you convenience. Remember, it is not uncommon for students to only remember those points which answered their personal questions.

Younger:

Be very careful. Aside from minimal manual dexterity, young children can sometimes have very minimal understanding of risk and danger. Supervise carefully at all times.

Children at this age can have difficulty with focus. Avoid tangents into interesting side tracts if you're attempting to make a key point.

Middle:

Be very careful. Aside from occasionally poor manual dexterity, children can sometimes have very minimal understanding of risk and danger. Supervise carefully at all times.

Teen:

This activity is well suited to this age group. However, Be very careful. Aside from moderate manual dexterity, even teens can sometimes have very minimal understanding of risk and danger. Supervise carefully at all times.

Engage

- ⇒ Note the Learning Intention of this lesson for students.
- ⇒ Make sure all students write down any questions they may have generated during this phase regarding the topic for today.

Engage: show how ineffective it is to cut a piece of paper with a normal kitchen knife, and then how dangerous it is to use a scalpel. Discuss knife safety.

Discuss: other health and safety issues, such as disposal of offal, and dealing with cuts and injuries. Make sure students are prepared with adequate safety precautions.

Explore

- ⇒ Encourage and validate student explanations of this phenomenon. You may like to ask students to write or draw their explanation personally to avoid embarrassment to students unfamiliar with this material. Remember, 'I don't know' is a valid explanation in science - it is the beginning of learning new things!

Experiment: Do the dissecting an eyeball activity at the end of this document. Have students document their dissection by taking pictures at every stage.

Explain

Demonstrate how lenses in the eyeball work.

Elaborate

- ⇒ Ask students if they can design new ways to test this explanation, is it really sufficient? Can they think of further or better explanations, and the experiments needed to test them?

Help students discuss and research further activities, for instance;

1. Eye problems such as cataracts, myopia, and hyperopia.
2. Further dissections, including photo evidence, including tails, lungs, tongues, etc.
3. Find out about taking small sections of tissue for student under a microscope.

Back-to-front and upside-down

Using a spherical orb filled with water – usually a flower pot or fish tank will do, demonstrate how everything at the back of the eye is back-to-front and upside-down. As infants we learn to right the image in our brains.

The lens

Using the lens acquired in this activity, show how light can be concentrated into a single point.

Discuss how as people age, the lenses in their own eyes gradually become less flexible, making it harder and harder to focus the image on our retina correctly. This is one of the main reasons why people tend to need glasses as they get older.

Evaluate

- ⇒ Review with students what they felt they learnt from this lesson. Did they have any questions at the start that they feel were answered?

Success criteria

- ⇒ Review the Learning Intentions of this lesson with students. Was it met?

At the end of each class, review the learning objective and see how we did. Ask:

- ⇒ Did you achieve your learning goal?
- ⇒ What did You learn?
- ⇒ What worked to help you achieve it?
- ⇒ What might you do better next time?
- ⇒ (If needed) where can you go for extra help or information?

Assessment

Prior learning:

Focus on the outcomes – how can we create the BEST scientific knowledge?

- Draw an image of the eye from memory.
- After providing a picture, have students try to draw how they think the light behaves inside an eyeball.
- Discuss knife safety and safe handling of the super-sharp scalpels!

Be sure to watch out for the following common alternative conceptions:

- Light curves only inside the lens – it actually bends as soon as it hits the cornea.
- The optical nerve is the focal point – it is actually the blind spot!

Formative:

As students are learning, help them self-monitor their own learning and achievements.

Summative:

Help students consider ways they can communicate their new understanding to others, just as scientists need to do.

- Fill in the image of the eye, below
- Do a slide presentation of their dissection, just like real surgeons do when teaching surgery to new students.

So what?

- Scalpels are sharp, be careful
- Some people really like cutting up living things, other people can't stand it.

Creating science

Science understanding

In dissecting an eyeball, we can see that;

- Biological Sciences 3: Living things can be grouped on the basis of observable features and can be distinguished from non-living things.
- Biological Sciences 5: Living things have structural features and adaptations that help them to survive in their environment.
- Biological Sciences 8: Multi-cellular organisms contain systems of organs that carry out specialised functions that enable them to survive and reproduce

Also

In investigating how light moves through orbs such as the eye, reflects off the tapetum, refracts in the lens and cornea, we learn that;

- Physical sciences 5: Light from a source forms shadows and can be absorbed, reflected and refracted.

Science inquiry skills

In safely dissecting an eye and using a scalpel you may;

- Planning and conducting 3-4: Safely use appropriate materials, tools or equipment to make and record observations, using formal measurements and digital technologies as appropriate
- Planning and conducting 5-6: With guidance, select appropriate investigation methods to answer questions or solve problems

Science as a human endeavour

As we learn about eye health, we understand that;

- Use and influence of science 5-6: Scientific understandings, discoveries and inventions are used to solve problems that directly affect peoples' lives

Tips from the Masters to make it work:

Label the following. Or, even better, take picture of each of the following eye parts!



