



evolve



**a creative writing manual
for science teachers**

a teaching manual promoting creative
learning in science and the arts

True science investigates and brings to human perception such truths and such knowledge as the people of a given time and society consider most important. Art transmits these truths from the region of perception.

Leo Nikolaevich Tolstoy

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Aims

- To make the Science understandable on a personal level
- To Demystify Scientific Terminology and Vocabulary
- To Give students confidence in using scientific language and ideas
- To use different ways of learning, understanding and remembering
- To approach science in a variety of different ways
- To use science as the basis of creative writing activities

Methods

- Games
- Group writing activities
- Individual exercises
- Translating diagrams
- Re-linking science with imaginative activity
- Structured listening and discussion techniques
- Relating the science to personal experience
- Using other disciplines and media to stimulate scientific enquiry
- Demonstrating processes (both creative and scientific)

Applications and Practicalities

(How to use the handbook)

After working on the EVOLVE project for a year within primary and secondary schools, alongside teachers and student teachers we have been able to develop a set of tried and tested exercises that incorporate creative writing techniques as a means to engage and deliver key areas from the science curriculum. It is not suggested that these replace practical experiments and more traditional modes of delivery, but we have seen how they can complement the work of the teacher in the class room. They can be used to introduce a new subject and its vocabulary, to explore that main curriculum ideas and learning points especially helping students to relate learning to personal experience, and as a learning check or information retention activity that is more fun and therefore more effective.

The structure of a full session is usually arranged as follows. It is worth noting that many of the introductory activities and vocabulary generators can be opened up and explored as main exercises.

- A** Focusing Activity
- B** Introductory Activity / Vocabulary Generators
- C** Main Activity
- D** Closing / Learning Check

We suggest that the best way to familiarize yourself with this handbook is to look at the sample sessions first, then look at the detail of the different techniques and adapt them to your and your students' needs.

The activities include individual, small group and whole class exercises and many of them can be used as part of a more conventional lesson to illustrate certain points either prior to or following an experiment, or can be used to deliver a whole lesson employing creative writing within a science context.

The handbook is designed to be flexible and the exercises included are designed to engage students in creative learning in an attitude of creative play, which will stimulate discussion and response, assist in the memorising of unfamiliar language and ground abstract concepts into a frame of personal experience and imaginative practice. You may have encountered some activities before, but what we have tried to do is break them down into structured stages and expand them, so that the process of learning is clearer and the outcomes more effective. In order for them to work the rules of the games and instructions for the activities need to be followed closely and delivered dynamically.

As practitioners of creative writing for educational purposes we have learned from experience that the best way to encourage creative learning is to take the learners on a structured, stage by stage journey which includes models and paradigms, which are particularly important for more challenged students. Time limits on creative play and vocabulary generation are crucial to encourage spontaneous creative play.

Many of the activities involve 'automatic writing' – a term we use to designate continuous free writing on a specified theme. Many writers employ this technique to generate material and to tap into the subconscious. It is important to stress prior to these exercises that there are no right or wrong answers, and focusing on neatness, grammar, punctuation and even correct spelling are often a hindrance to capturing the free flow of thoughts and impressions. If you want to implement a cross curricula approach with literacy implications, correction and editing can be done in another session with a focus on the writing itself. We have found it very important to make sure that the key science points are brought back into focus through each stage of the lesson, though we encourage students to link science to their personal experience and to understand it through metaphor the only danger is that the free play of expression is allowed to overtake the key curriculum delivery. This can be prevented by making sure that you have regular learning checks.

Although we have focused here upon creative writing activities, writing is never most effective as a page-based activity alone, so we have included within our core techniques and in many of the exercises a strong emphasis upon performance of work. This is vital in helping the students to remain focused on the end product and gives them a sense of ownership and pride in their work. Although primarily writers, we often incorporate a broader creative approach also employing where appropriate drama, visual art etcetera. Writing is a particularly useful activity in integrating creative approaches and should be used as such.

Useful Websites

www.scitalk.org.uk
www.poetryandscience.co.uk
www.mcn.org/ed/cur/cw/Science_Poetry/Poetry.html
www.firstscience.com/site/poems.asp
www.poetrysociety.org.uk/npd/plablp.htm

Quotes from Teachers

"It was exciting for the children and exciting for us as well."

Tracy Watson – Overfields Primary School

"It helped the subject and the terminology stick in their minds."

Lee Tate – St Michael's Secondary School

"It made us more confident to use a whole curriculum approach and it inspired us to write poetry too, which was interesting because I hadn't written creatively like that for a long time."

Tracy Watson – Overfields Primary School

"It was positive to see, especially in the lessons afterwards, some of the students who usually wouldn't do as much as they could, doing more than they could have done. They felt more creative and confident to produce work that was more extended and more interesting."

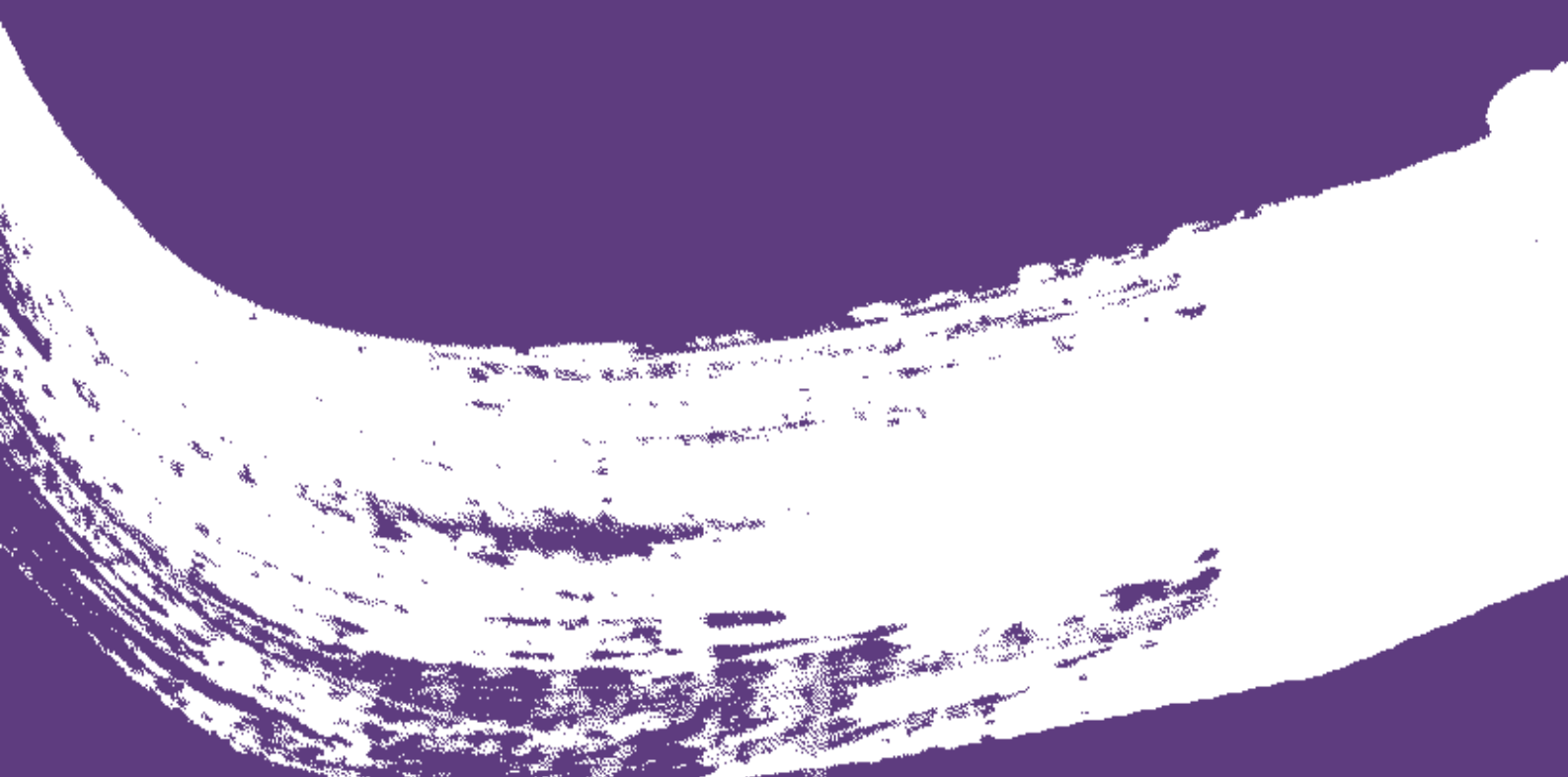
Lee Tate – St Michael's Secondary School

A – Focus Activities

The exercises in this session are intended to focus the class, bring them together and engage them in the session. They also get the group to concentrate, work together and get their energy going.

Activities

- 1 State & Event
- 2 Three Word Poems
- 3 Word Intensification
- 4 One Minute Of History
- 5 Graffiti Wall
- 6 Total Recall
- 7 Writing The Body
- 8 Transitional Objects
- 9 List poems
- 10 Word Association



activity 1 State & Event

...the activity can be used as a stimulus to explore chain reactions and depending upon the selected images various issues around gravity, weight, velocity.

General applications

Focus.

Sharing similarities and differences in perception.

Grounding the lesson in everyday life.

Collaborative working.

Increasing observational skills.

Exploring chain reactions and narrative structure of State – Expectation – Event.

Now ask the class to begin to consider the ‘invisibles’ – those elements that the still visual image cannot reveal e.g. sounds, temperature, texture, smells, tastes, why is this happening, and agree on one thing that is about to happen, and one thing that will be said (as a silent film caption) in this situation. The groups are given more time to write these answers up.

Automatic writing time: four minutes

Materials

Still photographs from movies.

(Suggestions – stills from silent films – see appendix A)

Pens and paper.

Now ask the groups to decide on and write down in one sentence what happens after and because of their projected event.

Each group then shows their image and reads their work out to rest of class / or talks through the process of state, event, comment and follow-up incident.

Instructions

Split the class into small groups of three to five people. Hand out one photo to each group and ask each group to make sure the other groups do not see the image. Each group selects a scribe.

Ask them to look at the image very carefully and collectively write a short description of the image (trying to be as objective as possible) and picking out details in foreground, middle ground, background and also to consider camera viewpoint, atmosphere and composition.

Automatic writing time: four minutes.

Discuss similarities and differences between the groups’ writings. Highlight the role of expectation ‘What happens next?’

Variations

This activity can be done with a selection of different images or with the same image, although the results will be better if the class are unaware in either case.

Science application

The activity can be used as a stimulus to explore chain reactions and depending upon the selected images various issues around gravity, weight, velocity etc.

activity 2 Three Word Poems

...the result is a chain poem and this can be typed up and displayed as shown in the example, or it can be recorded as an audio track and played back to the class.

➔ General applications

Focus.
Bonds group.
Quick Warm up.

➔ Materials

Pens and paper.
Strips of paper.

➔ Instructions

Hand out strips of paper. Tell the class they are all going to write a poem in three words on their strips. All of the poems will about the specified topic, e.g. Forces, Electricity, Magnetism. For this example we have chosen electricity. The only rule for the poem is that one of the three words has to be Electricity, but this can be the first, middle or the last word.

Give them two minutes to write their poem. Then go around the whole class with each student standing up and reading their three words out loud, then sitting down as the next stands up.

The result is a chain poem and this can be typed up and displayed as shown in the example, or it can be recorded as an audio track and played back to the class.

🎯 Example

electricity can kill
I use electricity
water conducts electricity
switch electricity on
pylons carry electricity
electricity in batteries
volts of electricity
does electricity run
electricity powers bulbs
nerves pulse electricity
resistors slow electricity
electricity seeks grounding
danger electricity overhead
ammeters measure electricity
electricity flow current
energy of electricity
switch electricity off
electricity recharged me
is electricity everywhere
electricity is expensive
bite electricity back
lightening is electricity
is electricity alive
can electricity die
electricity starts hearts
plastic insulates electricity
electricity in me
don't waste electricity
electricity is invisible
what is electricity

activity 3 **Word Intensification**

...a useful introduction to demonstrate the increased intensity of power produced through the number of coils within an electro-magnetic circuit.

General applications

Focus.
Small group teamwork.
Ice breaker.

Materials

Selection of pre-prepared cards. Each card contains one word of low intensity, e.g. 'nice', 'quiet', 'concerned', 'content', 'pretty', 'unsightly', 'afraid' etc.

Instructions

Separate class into groups of four to five.
Give each group one card. Ask them to spend five minutes coming up with a sequence of synonyms – words of the same register but with gradually increased intensity.

e.g. **CONTENT – GLAD – CHEERFUL – THRILLED – JOYOUS – ECSTATIC**

After five minutes ask each group to stand up in a line and perform the sequence in order of intensification.

Science application

A useful introduction to demonstrate the increased intensity of power produced through the number of coils within an electro-magnetic circuit.

activity 4 **One Minute Of History**

...it is a useful activity to do repeatedly with a group from time to time, as they become better at observing and capturing impressions in writing with more practice.

General applications

Focus.
Exploring perception.
Highlighting differences and similarities in shared experience.

Materials

Pens and paper.
Watch / clock with second hand.

Instructions

Prepare the class by explaining the activity.

Stage 1 – The whole class will sit quietly for one full minute. During this time they will not write anything, but should be conscious of what they look at, what they hear, feel, smell and taste during the minute, what feelings, emotions and thoughts they experience. ‘If you have a sore ankle from twisting it at football practice’ just make a mental note of it, if you think of what you are going to do after school, just remember it, try to remember the order in which you notice things during the minute.

Stage 2 – Mark one minute of history with the words, ‘Start’ and ‘Finish’.

Stage 3 – Tell the class to try to keep their minute clear in their minds and give them three to five minutes to write it up as accurately as possible. This is ‘automatic writing’ and can begin as a simple list, but pupils should try to develop sentences and keep writing for the full period given, remembering and recording the details. If they get stuck they can just write ‘stuck, stuck, stuck, stuck’ until they recall another detail.

Automatic writing time – three to five minutes.

Stage 4 – Before asking for volunteers to read out their work in progress ask for reactions to the activity, how did they feel. There are usually two main reactions, a) students write a few lines and dry up, b) pupils write frantically and fail to get everything they noticed down on paper, and become aware that the minute seems to expand as they attempt to record it.

Stage 5 – Ask for four to five volunteers to read or talk through their notes. Respond between the readings on any similarities and differences in interpretation, some pupils tend to write objectively, others subjectively, some describe daydreams or memories, others focus on external stimuli.

Note: It is a useful activity to do repeatedly with a group from time to time, as they become better at observing and capturing impressions in writing with more practice.

Science application

Can be used following a specific experiment to record responses and observations, or by focusing their attention on a specific phenomenon.

activity 5 Graffiti Wall

...this is useful to do at the start of a new project, and repeated again at the end using the same roll of paper.

➔ General applications

Warm up.
Focus.
Establishing base line of knowledge.
Generating material for discussion.

⊖ Materials

Large roll of cartridge paper (at least one metre in width and three metres long).

Marker pens and felt tips.

⌚ Instructions

This is useful to do at the start of a new project, and repeated again at the end using the same roll of paper.

Roll out the paper on the floor in the class room.
Put felt tips and marker pens all around it.

Introduce the general subject and ask the class to think about everything they know about it, names, uses, origins, stories, songs that mention it. Anything at all that it triggers in their minds.

Tell them they are going to make a graffiti wall about the subject and will have five to ten minutes to fill the paper with information on it using big letters and doodles. That they can write over the top of other words and phrases.

Ask them to gather around the paper and find a space and a pen.

Say “Ready, steady, Go!”

After allotted time tell them to stop and stand up. Get the class to walk around the edge of the paper in one direction so they can see what everyone has done and pick out anything interesting, any repetitions, differences or anything unexpected.

Put the sheet up on a wall if possible or photograph it in sections and reduce in scale for display purposes.

Repeat the exercise at the end of the project, using the same sheet and ask them to build up the layers of words into a palimpsest, adding all the new things they have learnt.



activity 6 **Total Recall**

...ask the class to think about all of the different windows they have looked out of.

General applications

Focus.

Establishing the value of seemingly trivial detail.

Observational skills.

Thinking in images.

Mnemonic skills.

Materials

Pens and paper.

Instructions

Ask the class to think about all of the different windows they have looked out of and the views they can remember. Bedroom windows, school windows, the window at a grandparent's house, any window that they have stood or sat looking out of for any amount of time. Everyone should choose one that they can remember and visualise well, and feel comfortable exploring it. Ask the class to explore the view in their mind's eye, picking out details and fixing it in their memory.

Tell the class that you will ask a series of trigger questions and that they should write down a line or two in response to each question. Stress that it is about being accurate and faithful to their memory, the trick is to be as precise as possible rather than general.

- Write down the farthest thing you can see – what is in the distance?
- Look into the foreground, to the left, write down what is there and what colour it is. (Being precise means saying more than 'red' but what kind of red, as red as a?)
- Now note down two sounds.
- Pick out a movement and choose the most appropriate verb to describe the way that it moves, e.g. a bird does not just fly, but flaps, swoops, dives, soars, glides, circles etc.
- Say something about the weather, again describe it through an image rather than just saying 'its raining' for instance, 'rain runs down the window' or 'the puddles are puckered with raindrops'.
- Write something about the time, again think of an image that will show the reader e.g. a milkman drives past in his rattling milk float,

people are wandering back from the pub through puddles of lights from the streetlamps, or the sun is sinking into the west.

- Pick out an animal you can see or the sign of an animal, e.g. a cobweb on the garden gate, a nest in a tree.
- Write down something you know is there but can't actually see it, perhaps it is out of view around a corner, behind a wall, or perhaps it is invisible.
- Write down something that is going to happen and will change this view.
- Write down an emotion you connect with this memory.
- Write down a question a small child might ask about this view or something in this view.
- Write down a response to this question (not necessarily an answer).
- Repeat the response to the question.
- Bring your attention back to the interior of the room with the window. Write down something that is happening there or something that catches your attention there.

Ask the group to read through their notes and make any slight alterations. Ask for volunteers to read through this raw material just as it is. Discuss any points of interest and ask them how it felt writing in such close detail from a memory.

Development

This activity can provide much raw material for further development in narrative or poetry, both individually and collectively. For instance you may wish to collate all the responses to Question 12 and write them up as a list poem of 'Questions of Wonder', and see how many of them can be applied to science subjects, or just discuss how questioning appearances is the basis of all scientific enquiry. Obviously this activity is a useful tool for focusing students and developing their close observational skills, which are of course much needed in observing and recording experiments.

You may wish to follow the exercise with instructions for the class to do the exercise individually from a window of their choice and perhaps looking at a specific subject such as the night sky.

activity 7 **Writing The Body**

...for one minute ask the class to be conscious of their own bodies, and to think about the different parts of their bodies, their insides, their skin, their hair, their eyes.

General applications

Focus.

Warm up for any human biological lesson.

Highlights similarities and differences in perception.

Encourages close observation based on personal experience.

Personalizes the concepts to be explored.

Materials

Pens and paper.

Instructions

Stage 1 – For one minute ask the class to be conscious of their own bodies, and to think about the different parts of their bodies, their insides, their skin, their hair, their eyes. They can close their eyes to help them hear the sounds of their own bodies. Listen to your breathing, your pulse, your stomach etc.

Automatic writing time – three minutes.

Write continuously without taking pen off the paper what you noticed during the minute, what words / images came to mind as you focused on your body and the things it does.

Stage 2 – Split class into pairs. Each picks out a list of words in two columns, one for external body parts and the other internal body parts. Introduce clapping game using external and internal body part names.

a) For an external body part they clap own hands together, for an internal body part they clap each other's hands, speaking alternately until they have a basic clapping involving at least six parts. Get them to do it at alternative speeds. Which pair can do it fastest and slowest whilst keeping a steady rhythm.

b) (Optional) – add an extra element. For example soft internal body parts they clap each other's hands, but for hard internal body parts they slap their own knees.

For any external body part you have more than one of they do a high five slap with their partner, each high five in the sequence must be with alternate hands.

Other variations may occur to you.

Stage 3 – After whole class plays game at some frequency ask the class to sit silently for one minute, again being conscious of the sounds and feelings of their own body, as a repeat of Stage 1.

Automatic writing time – three minutes.

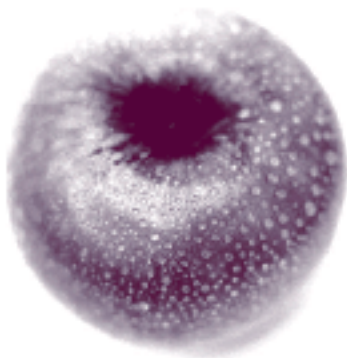
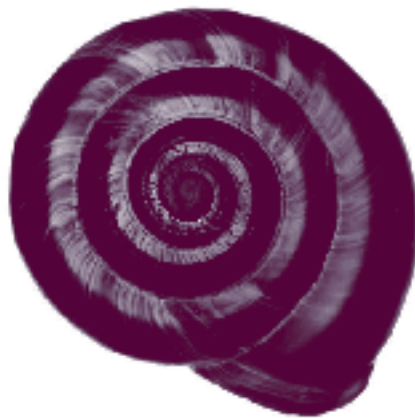
Again write continuously without taking pen off the paper what you noticed during the minute, what words / images came to mind as you focused on your body and the things it does, what has changed from the first stage. If this is a higher ability class you may ask them to incorporate metaphor and similes to describe the body parts, processes and how they feel about them.

Follow up

If this exercise is going to lead into a lesson about the cardiovascular system or the effects of exercise on the body ask them to list things they do in life that make them feel the same way as this exercise has.

focus activity 8

Transitional Objects



activity 8 Transitional Objects

...look at poems that explore objects in close detail i.e. Seamus Heaney's Grauballe Man and Bone Dreams.

➡ General applications

Focus.
Observational skills.
Translating objects into words.
Exploring relationships of objects.

➡ Materials

A collection of contrasting objects such as a comb, a shell, a fir cone, a fossil, a feather, a watch, a key, an ornament, a bone, a stone, a piece of drift wood, an apple, a cuddly toy.

Paper and pens.

➡ Instructions

Arrange the objects on a table as a still life. Ask the class to gather around with pens and paper. On the word 'Start' the class will begin 'automatic writing' while focusing on the arrangement of objects.

They can start anywhere and end anywhere, but will need to give descriptions of the objects as well as naming them, ask them to think about their origins, their uses, any connotations and personal associations they connect with the objects, and how they are affected by each other. Just as visual artists would sketch the still life into line, shade and form, the students will translate the arrangement into a flow of words. As always with automatic writing, it is important to give a time limit and reinforce the idea that it is a warm up to generate raw material and good or bad writing doesn't enter into it.

Automatic writing time: five minutes maximum.

Ask for volunteers to read out their writing and discuss similarities and differences of interpretation.

➡ Development

Look at poems that explore objects in close detail i.e. Seamus Heaney's Grauballe Man and Bone Dreams.

Ask everyone to select an object from the arrangement (in pairs or individually if enough objects).

Ask the class to write again for five minutes focusing only on the selected object.

You may wish to focus on the idea of change, or ask the class in small groups to list the objects into categories of commonality through discussion.



activity 9 **List Poems**

...discuss responses in terms of developing the statements into lines of other poems or developed into a piece of descriptive prose.

General applications

Focus attention on topic.
Establish a dialogue around the subject area.
Encourages group work.
Establishes a base line of knowledge.
Generates raw material for later development.

Materials

Pens and paper.

Strips of paper in envelope. On each strip is written a trigger statement, which depends on the subject being covered. As an example we are using Hedgerows and statements might be:

10 questions to ask a hedgerow.

10 things that hedgerows do.

10 predators that live in a hedgerow.

10 ways a hedgerow changes through the seasons.

10 places a hedgerow might lead you.

10 things to know about hedgerows.

10 homes you might find in a hedgerow.

10 parts to a hedgerow.

Instructions

Separate class into groups of five or six.

Ask each group to elect a scribe.

Allow each group to randomly pick a strip from envelope and show it to their group.

The statement on the strip should not be divulged to the other groups.

Ask each group to discuss the statement and come up with and agree a list of 10 statements in response to it.

Give groups five to seven minutes to compose their list.

Ask each group to read out their list to the rest of the class.

Ask the other groups if they can identify the statement on the strip from the response list.

Development

Discuss responses in terms of developing the statements into lines of other poems or developed into a piece of descriptive prose.

Repeat this exercise at end of project and compare the response lists to test retention of information and increased knowledge.

activity 10 **Word Association**

...the rest of the class will be watching and a couple of nominated students in the audience will write down all of the words the students say, in order.

General application

- To focus attention on the subject area
- To encourage spontaneity and responsiveness
- To generate basic vocabulary
- To establish a base line of existing knowledge

The rest of the class will be watching and a couple of nominated students in the audience will write down all of the words the students say, in order, and read it back when all of the groups have finished.

Each group begins by picking out a different word from the bag.

Materials

Pens and paper.

Cards in a bag. Each card has a term from the subject area on it.

Note: The words must not be returned to the bag once pulled out to ensure every group gets a different word. You can follow this up by asking which words logically follow the first word and which didn't, which words are adjectives, verbs, nouns related to weather itself. Then you are ready to start work on the water cycle or other aspects of weather systems.

Instructions

Introduce subject area, e.g. weather systems.

Divide class into groups of five or six.

Bring each group in turn to front of class and ask them to line up facing the class.

Get the person at left end of line to blindly choose a card from the bag. They read it out loud and then say a word / phrase they associate with it (this does not have to be logically linked, it is personal association). The next person in the line responds to the previous person's response with their association. Continue down the line until the end.

B – Introductory Activities

The exercises in this section are designed to introduce and familiarise the students with the language of science in fun and playful ways. These are intended as introductory activities that can be adapted across a range of scientific subject areas and are useful as introductions to a new area of learning or revision of previously visited ideas. Our examples of science applications are only suggestions, the point is that these activities can be repeated and adapted whenever a new set of science vocabulary needs to be learnt or revised.

By allowing students to make up their own vocabularies from existing phonemes they will be less intimidated by the actual correct vocabulary. It is also important to promote an element of decision making and classification between the play words and the actual terms as this will emphasise for the students the connections between scientific words and their meanings within scientific systems.

Activities

- 1 Jigsaw Words
- 2 Kennings
- 3 Riddles
- 4 Roots
- 5 Sonic Play
- 6 Liquid, Solid, Gas
- 7 Concrete Poems
- 8 Cautionary Tales
- 9 Describing the Suspect
- 10 Chain Poem Race



activity 1 Jigsaw words

...other possible uses of this exercise should work well with any scientific system or grouping of vocabulary, for example the process of photosynthesis.

Taking our example for the Digestive System this exercise could be adapted using any set of related scientific words.

General Application

Warm up.
Familiarise students with scientific words beyond their everyday lexis.
Collaborative work

Materials

Pens and paper.

Pre-prepared sets of jigsaw cards consisting of pieces from the scientific words from the lesson. In this case: MOLE, CAR, MO, PRO, BO, UTH, TINES, TUM, TTY, US, DRATE, ENZ, SOL, LE, CULE, YMES, INT, EST, INE, STA, DIG, LET, RCH, EST, GUL, ACH, FA, ION, UB, STOM, REC. (see example sheet in appendix B).

Instructions

Part 1 - Split class into small groups of three or four. Give each group a set of cards with the above syllables on.

Part 2 - Ask the groups to list as many words as they can make by combining the syllables in two, three, four, and five syllable words. These can be real and completely made up words as long as they sound scientific.

Part 3 - A spokesperson from each group reads out five or six words from their list, some of which they think are true and some false. Teacher writes these on the board. When all groups have read out their selected lists the whole class votes on which are real and which are not.

Development

As a follow up you can then ask the groups to combine these compound words together in collocations that could make sense, also to group them into chains of words that can be chanted to explore the sound qualities as well as the potential meanings. At this stage you can ask them to add more words of their own choice, such as conjunctives and prepositions, which will help them build sentences from their compound words.

Other possible uses of this exercise should work well with any scientific system or grouping of vocabulary, for example the process of photosynthesis, the planetary system, the respiratory system etc.

activity 2 Kennings

...kenning refers to a form of riddling popular during the Anglo-Saxon and Viking periods.

General applications

Group writing.
Stimulates inventiveness.
Raises creative awareness of naming and names as a form of meaning.

Materials

Pens and paper.

A bag of small objects such as: a feather, an onion, a fossil, a key, a watch, a shell, a flower, a comb, a marble, a candle.

Instructions

It is useful to give a brief introduction on Kennings to contextualise the activity to follow.

Kenning refers to a form of riddling popular during the Anglo-Saxon and Viking periods and which feature in many poems from the 6th – 9th Century. The word Kenning means to know – to get at the meaning of and is still a term used in the North east of England and Scotland. In fact the Anglo Saxons used Kenning as a form of religious practice in order to defamiliarise or decentre themselves from their habitual ways of perceiving the world around them and stimulate fresh ways of seeing. Essentially it is a playful way of renaming things, usually in a double barrel form. For instance the sea was referred to as The Whale Road, the body was The Bone House, a warrior's sword was his Battle Friend, blood was Wolf's Wine.

Stage 1 - Split the class into groups of four or five. Give each group one or two objects from the bag. Let them choose which to focus on first as a group. Tell them to spend some time exploring the physical qualities of the object, its size, shape, colour, weight, temperature, the sounds it makes, what it reminds them of. Each member of the group should have the chance to hold and smell and look closely at the object. They can begin making notes about it. Then ask them to consider its origin, its properties, its uses and misuses, its potential symbolic meanings, what stories or songs include such objects. Again encourage them to make rough notes.

Stage 2 - Ask the groups to come up with a kenning poem that consists of a different double-barrel name from each member of the group, arranged with the same number of lines as there

are people in the group. Give them time to devise this, then a few more minutes to consider the best arrangement of the lines and make any changes.

Stage 3 - Ask each group to read out their Kenning poem. The other groups have to guess what the object is. Listen to the kenning poem again after the right answer and ask how the kenning makes you reconsider the object.

Note: Repeat the activity with the group's second object. You will see that the response to this activity gets better with practice so play at least two rounds of it before moving on. Sometimes it is useful to do a whole class kenning on a single object as an introduction before splitting the groups and giving them their secret objects.

Development

Spend time afterwards to discuss how kennings affect perception of an object and how names have evolved through language. Explain that scientific words may sound complicated, but they work on the same principle as kennings, only stemming primarily from Ancient Greek and Latin, scientific words often denote the properties of the object or process in question (for example – Photosynthesis).

Example

Kennings from workshop exploring habitats and lifecycles.

Crocodile

Green glider
Camouflage killer
Heavy hider
River lover
Flesh tearer
Long snapper

Grace Weatherall – Overfields Primary School

Dog

Tail wager
Carpet chewer
Fast runner
Loud barker
Bone cruncher
Nose licker
Meat eater
Garden lover

Daniel Marshall & Sharon Douglas – Overfields Primary School

activity 3 **Riddles**

...it is sometimes useful to give some example riddles to prime the class and ask if they can guess the subject of the riddle. There are excellent riddles found in the Riddles in the Dark chapter of J.R.R. Tolkien's 'The Hobbit'.

General applications

Exploring subject matter.
Stimulates inventiveness.
Produces material for class discussion.

Materials

Pens and paper.

Instructions

This activity follows on well and develops and incorporates the work begun with kennings. It can be used to explore a wide range of subject areas, but for our example we have chosen to focus upon organisms, their habitats and lifecycles.

It is sometimes useful to give some example riddles to prime the class and ask if they can guess the subject of the riddle. There are excellent riddles found in the Riddles in the Dark chapter of J.R.R. Tolkien's 'The Hobbit'.

Give the children a habitat to focus on. As a whole class, ask them to suggest organisms that you would find there, write these on the board. Ask them to order these plants and animals into a food chain or food web. Ask them to choose one of the animals from their list and write a riddle of at least six lines, which needs to include some physical description of the organism, how it moves, where it lives, what it eats, what preys upon it, and how it is suited to its habitat.

Give the class 15 minutes to write their riddle.

Ask for or nominate volunteers to come up and read out their riddle, students who think they know the answer put their hands up, then let the riddler choose students from the class to make a guess.

Example

Corvus Corone Corone

I'm a ragamuffin brawler and I yawp at passing cars
As I pick the flesh off varmint's bones by the road
I'm a feather ruffler with eyes as clear as dawn
To beat the beetle and the fox to the fallen corpse
I'm a chimney stack glider stealing your updraughts
In my gang of three drifting up and carefree
I'm a ragamuffin brawler and I yawp at passing cars
I clean up the countryside of every scrap of flesh
My beaks designed to drill in to the rotten and the fresh
At battlefields and hunts as centuries come and go
You can hear my cry see me flying low
I'm a shadow glider in the dying dusk light
As I head to my scruffbag nest for another night
I'm a ragamuffin brawler and I yawp at passing cars.

Andy Willoughby

Vulpes Vulpes

My coat is red as rust with snow white tips,
Cunning, I survive on the strength of my wits
I'm so sleek and so silent, I eat up the yards,
Running long distance on my four soft pads.
I hunt through darkness with bright yellow eyes
Searching the hedgerows for an edible prize;
Slugs, crunchy crickets or a plump field mouse,
I avoid clumsy hooves of lumbering cows.
Call me shadow-stalker, I'm a fierce chicken killer
Wind taster, ragged-roamer, dusty trail brusher.
I like to sleep away days in a safely hidden set,
Among the roots of a tree until squeaking bats flit.
My home, well I dug it with my powerful claws,
And bring prey to my cubs between bloodied jaws.
They say that I'm vermin, the jealous farmer's pest,
When hounds come to hunt, it's the ultimate test,
Then I'm forced to flee like a streak of wild fire
Over miles of woodland, through fields till they tire.
Once the barks, the baying and the horns recede,
I'll howl into dusk like a prisoner just freed.

Bob Beagrie

activity 4 **Roots**

...ask the groups to imagine they are Martians visiting earth and have come across this specimen, they don't have the exact English word for it.

Taking for our example the process and vocabulary around photosynthesis this exercise could be adapted using any set of related scientific words.

General applications

Introducing a subject area.
Demystifying vocabulary.
Group work.

Materials

Pre-prepared, dissected parts of plants:
leaf, petal, stem, root, stamen.

Sets of cards containing:
PHOTO, SYNTHESIS, CHLOROPHYL, OXYGEN,
CARBON, DIOXIDE, WATER.

Martian poem by Craig Raine, (see appendix C).

Instructions

Stage 1 - Split class into small groups of four or five. Give each group a tissue paper on which lies the dissected part of the plant. You may allow them to examine this through microscopes. (Optional).

Stage 2 - Ask the groups to imagine they are Martians visiting earth and have come across this specimen, they don't have the exact English word for it. They have to write a short description of what it is / what it might be, what it reminds them of, what it might do or be used for. You can read out Craig Raine's Martian poem as an example to stimulate their use of imagery and vocabulary. The key is to encourage them to engage with the question 'What If...'

Stage 3 - Read out the group's Martian reports and discuss results.

Stage 4 - Collect the parts of the plant and arrange them together to show the whole plant. Explain that this is how scientific words also work – in composite parts that have different names for different jobs.

Stage 5 - Hand out the sets of word cards to the groups. Ask them to choose two cards and write a short statement of what they think it might mean on the back no matter how bizarre.

Stage 6 - Read out result and discuss.

Stage 7 - Ask each group to look up one of the compound words in the Oxford English Dictionary and find out the etymological root.

Stage 8 - Write the key parts of the etymologies on the board and ask if this makes the process of photosynthesis easier to remember?

activity 5 **Sonic Play**

...discuss the use of nonsense words, spacing and layout to convey the sense of an alien song or poem.

Taking for our example the digestive system and related body parts, this exercise could be adapted to any set of parts within a system. However, this exercise should be used as a vocabulary generator to lead onto some exercises outlined in the Main Activities section.

General applications

Warm up and introduction.
Ice breaker.
Confidence builder.
Example poem (see Appendix D).

Materials

An example of concrete poetry (where the visual layout of the poem makes a picture of the thing described) such as The Loch Ness Monster's Song by Edwin Morgan (see appendix D).

A3 size blank paper.

A4 size blank paper.

Pens and pencils.

Instructions

Stage 1 - Split the class into small groups of four or five. Designate each group a part of the digestive system: Mouth, gullet, stomach, small intestine, large intestine, rectum, anus.

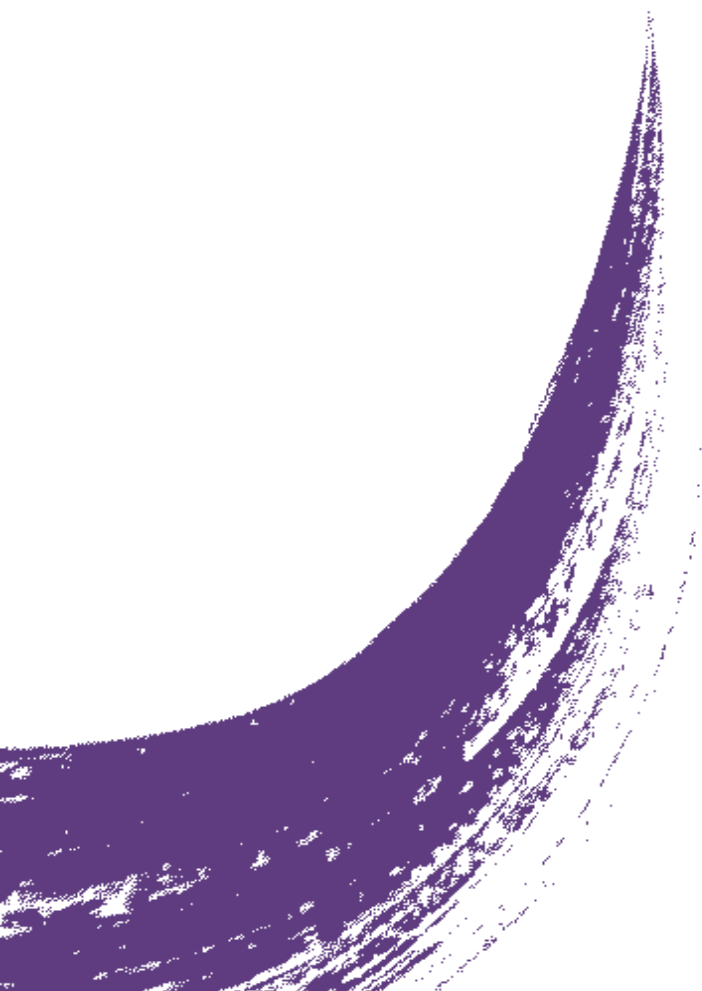
Stage 2 - Plop, Gurgle, Thpff, Glug – Ask the group to brainstorm all of the sounds and onomatopoeic words that relate to that body part.

Stage 3 - Look at Edwin Morgan's poem and discuss the use of nonsense words, spacing and layout to convey the sense of an alien song or poem. Ask for volunteers to attempt to read the poem out loud. Other examples of concrete and kinetic poetry may be useful.

Stage 4 - Ask each group to compose a sound-based poem using their notes drawn from the sounds and words connected to the body part. Ensure that they pay attention to space, layout and line length.

Stage 5 - Give time for each group to turn their sound poem into a performance piece using multiple voices.

Stage 6 - Perform the sound poems in the order of their position in the digestive system, with a title and obvious beginning and end. This can lead to a labelling of the digestive system onto a blank diagram.



activity 6 **Liquid, Solid, Gas**

...this could be a group versus group activity with the card holder from two groups exchanging places and each rival group racing to find the correct answer in the least number of questions.

General applications

To encourage students to think about categorising through physical properties and function.

Learning to formulate questions.

Materials

Board and marker.

Pens and paper.

Cards with either words or pictures, e.g. a river, a bar of gold, clouds.

Instructions

Tell the class you are thinking of something in one of the above categories. They must find out what it is. The whole class have only 20 questions. You can only answer yes or no. Mark off their questions on the board so they know how many they have left.

When the class have guessed or ran out of questions you can then work through with them what kinds of useful questions they could have asked to help them guess, and introduce more scientific vocabulary as needed relating to properties, chemical composition etc.

Split class into groups of five or six. Get each group to agree five good general questions that would be useful in guessing / categorising the answer whatever it is. Give one person in each group a card, the others take turns in asking questions and recording answers. Try to get them to discuss before they submit the question to the card holder, who also counts off the questions.

After 20 they must take a final guess.

Variation

This could be a group versus group activity with the card holder from two groups exchanging places and each rival group racing to find the correct answer in the least number of questions.

Follow up

Categorisation activity, adapted to level. For example, listing as many gasses as possible or devising a properties table to identify the exact nature of a gas. Write a series of similes describing when they felt like the substance, i.e. I felt like boiling magma when my bike was stolen, etc.

activity 7 Concrete Poems

...if you were doing the circulatory system, you could show them a real heart or picture of a real heart and ask them to write a poem to fit the shape

➡ General applications

To encourage creative thinking and visual recognition of various subjects.
To teach positions and visualisation of systems.
To introduce a subject area.
To encourage thoughts about things and their functions.

➡ Materials

Examples of concrete / kinetic and shape poems.

Paper, pencils and pens.

Visual diagrams / pictures of the subjects to be covered.

➡ Instructions

A concrete / kinetic poem is a poem that creates a visual picture on the page from the use of typography and layout. The picture is of the subject of the poem.

🎯 Example

Guess what?
The heart is not to be
confused with love itself –
it is the bump and beat of blood
pumped through throbbing muscle
fast when the brain senses danger
or the promise of passionate love
or lust that speeds the oxygen
along the arteries of organs
primed for impending
flight -, fight -, love –
 action
 !

Obviously we have used the clichéd symbol of the heart. If you were doing the circulatory system, you could show them a real heart or picture of a real heart and ask them to write a poem to fit the shape about the things that make their heart's beat faster. You could then extend this to the whole of the circulatory system, by producing a chain of concrete poems to make a diagram, with parts set out in the correct positions. This activity can be adapted to suit other organs, organisms, systems i.e. not just biological ones – this could work with electric circuits or the water cycle, anything where visual realisation and recall are desirable.



His hair was
shocked, his nose
was smoking.
A silly little
fied got a folk
and started
peking!

activity 8 **Cautionary Tales**

...record the children reading their cautionary tales out as a group on audio or video equipment. Display the cards on the wall and built them up until you have the full alphabetical range.

General applications

To stimulate ideas around specific area of subject.
To encourage free play with information.

Materials

Pre-prepared cards (see appendix i).

Pens, pencils, felt tips / coloured pencils.

Examples of cautionary tales.

Suggested examples: Hilaire Belloc's Cautionary Tales poems, selected pages of something like Tim Burton's 'The Melancholy Death of Oyster Boy', Edward Gorey's 'The Gashlycrumb Tinies', Heinrich Hoffman's 'Cautionary Tales'. (This choice is age specific).

Instructions

This activity works well with issues around safety. It can be applied to a variety of science areas where safety is an issue. For this example we are using safety around electricity.

Introduce the area of enquiry and ask the class to verbally give examples of how people are harmed by electricity through not being careful with it. Collate responses on the board, e.g. flying a kite in a lightening storm, sticking metal forks in sockets, touching electrical equipment with wet hands, cutting through live electrical wires, mis-fitting an electrical plug, catching a fishing line in an overhead pylon while casting, watering a Christmas tree while the fairy lights are switched on, generate as many as possible.

Hand out examples of cautionary tale poems and cartoon drawings. Read them out and discuss the way the image and text tell the story together. Make a note of any patterning or rhyming scheme.

Ask the class to choose one of the dangers from the board or come up with a new one.

Hand out rough paper to develop their own ideas and drawings.

Ask them to decide on a character and give the character a first name.

Give the class six minutes to sketch their character in a situation of electrical danger, either just before, during or following the incident.

Give the class six minutes to write a short poem in the style of a cautionary tale to accompany their drawing.

Example

lines from one workshop were:

**B is for Bob who cut a live wire
and ended up frying in front of the fire**

**D is for Deb who burnt off her hair with a pair
of faulty straighteners**

**Desperate for a solution she phoned the painters
and decorators**

**E is for Eric who died wearing nylon
Just for a laugh he climbed up a pylon**

**F is for Fred who stuck a fork in a socket
He'll never again put his hands in his pockets**

**J is for James who licked a wall socket
He's learnt his lesson, so maybe he'll stop it.**

Hand out the pre-prepared cards.

Give them 10 minutes to redraw their picture in the space on the card and rewrite their poem in the space below.

Arrange the class into alphabetical order of their chosen character names.

Get them to show their picture and read out their verse in alphabetical order.

Follow up

Record the children reading their cautionary tales out as a group on audio or video equipment. Display the cards on the wall and built them up until you have the full alphabetical range.

activity 9 Describing The Subject

...this is a useful and fun activity to lead into a lesson on physical reversible changes as opposed to chemical and irreversible changes.

➔ General applications

Focus
Observational Skills
Exploring metaphor and simile

➔ Materials

Pens and paper.

➔ Instructions

Intro (optional). Enter classroom with something small different about your appearance, e.g. a badge, a piece of jewellery, tell the class to look at you then leave for ten seconds and remove it. Ask how many of them can tell you what's changed about your appearance.

Split class into groups. Each group selects a person to send to the other group, they then must change their appearance temporarily, for example changing their hair, lending them a pair of glasses, a watch, different item of clothing, ring etc. Then each group sends their "suspect" to another group, the other group are told to look at them and mentally record everything they can about their appearance (writing nothing down yet). The "suspects" then return to their own group and go back to their original appearance.

The group then try to write down everything they remember about their visitor. Encourage them to use concrete details and comparisons, similes where appropriate. When this is done the "suspects" from each group line up at the front of the class. The groups then have to note all that's changed about them according to their original description. What's different and what has changed.

Read out the two descriptions.

Which group has the best description of their suspect?

➔ Science application

This is a useful and fun activity to lead into a lesson on physical reversible changes as opposed to chemical and irreversible changes.



activity 10 Chain Poem Race

...this can be used with a wide range of subject areas, e.g. habitats, food chains, digestive system, In this example we are focusing on the weather system.

➡ General applications

Introducing vocabulary.
Eliciting personal response.
Group dynamics.

➡ Materials

Paper and pens.
Stimulus (image or object).

➡ Instructions

This can be used with a wide range of subject areas, e.g. habitats, food chains, digestive system. In this example we are focusing on the weather system.

Divide the class into teams, set out in rows.

Ask the class to give words describing weather conditions. Write these on the board.

Choose one and give them an example of a simile, e.g. 'I feel stormy on a Monday morning when no one has remembered to bring in their homework.'

Now choose a different word from the board for each team.

Tell them, when you say go, the first person in the row must write a simile using that word and their personal experience, then pass it on to the person behind them to add their own simile.

Note: each personal experience must be different, no repetition allowed.

It is a race and the first team to have a complete row of similes is the winner, but all rows must finish.

When all teams have finished, nominate one student from each team to read out the whole list.

Which chain poem was best?

Note: This activity can be done without the race aspect if you don't wish to have a competitive element or are concerned about the abilities of some students in the teams.

C – Development Through Core Techniques

The activities in this section are designed to explore areas of science in more detail by applying a number of core techniques from creative writing, some of which have already been explored to some extent in previous sections.

The core techniques that underpin much of the work we have carried out in schools can be divided into four interrelated categories, which together often provide a structure for a session.

- Vocabulary Generators / Collecting Words
- Word Play / Text Manipulation
- Set Forms / Paradigms
- Words into Performance

Each of these categories allows for creative play and imaginative learning that should make the material easier to understand and easier to remember. They can be used alongside or to lead into scientific experiments or exercise bookwork or as alternative workshops to augment more traditional lessons.

Whenever soliciting new writing from either children or adults, it is often necessary first to provide them with the language, terminology and phraseology with which to do so, through a collective word hoard, Q & A, thesaurus search or other means, to prevent them from drying up during the compositional stages of their writing. Many activities in the Focus and the Introductory sections are geared towards this. However, they can be expanded and repeated to suit the class needs. Once the class has a vocabulary at their disposal they need to become familiar with it, uninhibited by it and able to use it comfortably. This can be achieved quickly and effectively through word games and fun writing activities that lead to a vocal presentation or performance of the work produced. To do this comfortably and to gain confidence it is vital that examples of stimulating writing and set forms / paradigms are regularly used to provide a context and potential structures for their experiments with the vocabulary and phraseology. The activities provided here all focus of developing raw material, word hoards and rough notes into more structured and considered pieces of creative work that connect with various aspects of the science curriculum.

Personification has proved to be a valuable tool in grounding abstract

ideas into in the realm of concrete experience, which helps the students relate learning to their own experience of the world, and enjoy the process of metaphorical expression. Similarly, set poetic forms provide a framework and structure for articulating ideas and experience, but the limitations of forms also require any original notes to be altered to fit the prescribed structure and this produces some startling and unexpected results, which can stimulate discussion and debate about the representation of scientific ideas.

The performance element isn't always desirable, but we have seen that it helps motivate and creates a focus for the students, and helps the sessions end in a climactic and fun way, that also provides a learning check for the teacher. We found that by introducing a competitive group element via a poetry slam or contest was a good way of finishing a set of sessions around a topic.

Oral based activity is very useful in involving those students who may be struggling with literacy or learning difficulties. It is a powerful form of engagement. Many famous performance poets have struggled with dyslexia and other literacy problems, and it should be remembered that the oral poetry and storytelling traditions have been used for millennia as ways of transferring knowledge.

Activities

- 1 Raps: Braggin', Dissin' and Praisin'
- 2 Odes In Praise Of...
- 3 The Dating Agency (The Lonely Planets Club)
- 4 Personal Metaphors
- 5 Superheroes and Supervillains
- 6 Like A Fish Out of Water
- 7 Spells
- 8 Ceridwen's Cauldron
- 9 Fantasy Newspapers
- 10 Diary Entries
- 11 Set Poetic Forms – (Haiku, Renga, Tanka, Sijo)

activity 1 Raps: Braggin', Dissin' and Praisin'

...the winners from each group compete against each other in The Grand Showdown Slam.

➡ General applications

Introduction of system vocabulary.
Creates visualisation of physical processes.
Aid to retention of learning.
Can be used for biological, astronomical, physical, chemical processes. (In this example we are using the digestive system).
Optional – examples from rap CDs or extract from the film 8 Mile.

⊖ Materials

A4 Paper and pens.

Jigsaw cards (as in Jigsaw words exercise).

One very large sheet of card or paper.

Diagrams of digestive system with label words removed.

⊖ Instructions

If you haven't already introduced the vocabulary of the digestive system you could use all or part of the Jigsaw Words exercise in section 2.

Stage 1 – Split class into groups of seven. Each group gets a set of seven cards, which they spread face down on the table and choose one of each. They then look to see which body part in the system they are going to be. The cards can contain information about the function of each part or you may ask them to use study books to find that information and add it to the cards themselves. Alternatively, they may have to surmise or remember in the case of revision sessions all of the functions of that body part themselves (dependent on level of ability).

Stage 2 – Ask them to arrange themselves around the table in order of the parts in the system.

Stage 3 – Tell them they are going to be the body part – come to life as a rapper. They are going to write a rap for a showdown slam against the other parts to decide who is the top dog of the D.G. System. Each rap should contain three verses and a repeated refrain. The refrain should be about naming themselves and their function or position. The first verse should be about describing their function in more detail in an exciting way, the second verse should denigrate (dis) at least two of the other body parts, the third verse should all about why they are the greatest.

Stage 4 – Mini Slam – Each person reads out their rap to the group. Each group votes on who produced the best rap in their group. They will go forward to the next stage which is optional according to time and the group, but would be great fun!

Stage 5 – The winners from each group compete against each other in The Grand Showdown Slam.

Note: They may all be the same body part, but it doesn't matter.

The judging must be on

- a) written style
- b) delivery and
- c) correct use of science.

The pupils remaining in the groups award points out of five (written on big cards) for each of the categories. The rapper with the greatest points total is given the Big Respect Prize (whatever you want it to be!)

Stage 6 – Each group makes a big poster of the digestive system with the parts labelled and the raps stuck on beside them.

⊕ Variations

The body part cards can be given to pairs or small groups depending on class size or class dynamics.



activity 2 Odes In Praise Of...

...this can be used using examples from any system. We are using an Enzyme from the digestive system. We could have used any of the body parts, planets, or organs in other systems.

General applications

Manipulating information in creative ways to create mnemonics.
Creates visualisation of physical processes.
Learning through metaphoric association.

Materials

Pens and paper.

Example Odes e.g. Ode on a Grecian Urn by John Keats.

Ode To A Nightingale by John Keats.

Instructions

This can be a complete session, a revision exercise or a follow up to previous activity. This can be used using examples from any system. We are using an Enzyme from the digestive system. We could have used any of the body parts, planets, or organs in other systems etc.

Stage 1 – Ask the class to remember good and cheesy lines from love songs and collate them on the board. You can hold a vote for good or cheesy categories.

Stage 2 – Introduce the idea of Odes – praising poems. Hand out an example, Q & A on which categories of praise the Ode covers: spiritual, physical, aesthetic, prowess etc.

Stage 3 – Write 'Amylase' on the board. Ask the class to think about what the word conjures up in their minds, say it out loud and explore its sound. Ask them to imagine it as a character.

Stage 4 – Explain that Amylase is an enzyme in saliva that breaks down starch into smaller sugar molecules that can pass through the small intestinal wall into the blood stream. Show diagram of digestive process and list some starch and sugar foods on the board.

Stage 5 – Ask them to write an Ode to Amylase of Saliva, which praises her and describes her transformation of food from starch to sugar, i.e. She takes strings of spaghetti and makes drops of honey.

Stage 6 – Ask for examples to be read out loud from each group.

Stage 7 – (Optional). Write Ode for any other part of digestive system they choose.

Follow up

Write scientific description for the function of Amylase in the digestive system.

activity 3 The Dating Agency (Lonely Planets Club)

...write a personal advert from the planet's viewpoint. Ask if it is male or female, what kind of character would it have?

General applications

Aid to retention of learning.
Creative Visualisation of the planets
and their properties.
Collaborative work.

Materials

Cards and marker pens.

Pens and paper.

Examples of personal ads.

Instructions

Stage 1 - List all the planets on cards. Ask for nine volunteers to come on down! Give them each a card.

Stage 2 - Line ups.

a) Ask the group to line up in order of their position from the sun. The rest of the class can call instructions.

Once lined up correctly the rest of class write Positions as title then the first letters of each planet in a column below it.

b) Ask the group to line up in order of mass, rest of the class can call instructions.

Once lined up correctly the rest of class write Mass as title then the first letters of each planet in a column below it.

c) Ask the group to line up in order of period of one orbit around the sun, rest of the class can call instructions.

Once lined up correctly the rest of class write Orbits as title then the first letters of each planet in a column below it.

d) Ask the group to line up in order of speed of its spin, rest of the class can call instructions.

Rest of class write Spin as title then the first letters of each planet in a column below it.

Planet people go and rejoin their groups.

Stage 3 - Each pupil chooses one of the categories and its column of letters. Ask them to write an acrostic poem.

Stage 4 - Class reads out a sample of the acrostics to see if they help in remembering the order. Ask if they trip off the tongue? Look at how the category of Position, Mass, Orbit or Revolution can be worked into the theme of the acrostic. This is not essential but will likely act as a mnemonic aid.

Stage 5 - Split class into small groups of three or four. Hand out photocopy examples of personal ads. Ask the groups to read the dating ads. Talk about them, imagine the kind of character they describe. What kind of language is being used?

Stage 6 - Ask each group to choose a planet and using an information sheet or reference books, write a personal advert from the planet's viewpoint. Ask if it is male or female, what kind of character would it have? Hot blooded and passionate, or cool and calm? What would they like to do: sunbathe, eat stray comets, hoola hoop? What would the other planets say about them, e.g. 'the others call me a dizzy mare, an ice queen, a Cyclops with a great red eye, I am an extremist and love high speed travelling, I am very caring and have four children and 35 pets.'

The adverts should give clues as to which it is without saying it directly.

Stage 7 - Children are asked to read out their adverts and the rest of the class guess which they are.

Follow up

You can ask the children to consider their planet's problems and get them to write a problem page letter for each planet.

You can introduce them to the Roman and Greek gods as ancient personifications.

activity 4 Personal Metaphors (Reversible And Irreversible Changes)

...its too late now, what's done is done, what's said is said, and I'm a match that has already been struck.

➔ General applications

Personalise and humanise the concepts of irreversible and reversible changes.

➔ Materials

Pens and paper.

Example poem (see appendix e).

➔ Instructions

After discussing the concept of reversible physical changes and irreversible chemical changes, with appropriate examples, burnt toast, salt solution, a struck match, an ice cube etc., make columns of the two categories.

Ask the class to think of incidents that people go through that represent a dramatic change. List them on board. Ask them to consider if each one is reversible or permanent. Use the examples of physical and chemical changes as metaphors and similes for the changes in human experience.

🕒 Examples

- a) Since it all happened I feel like burnt toast, thin and brittle. I am a different person these days.
- b) In this huge school I feel like I'm drowning, feel like I'm salt dissolving in water.
- c) He rubbed me up the wrong way and my anger flared so quick I couldn't stop myself. But its too late now, what's done is done, what's said is said, and I'm a match that has already been struck.
- d) I am like an ice cube in the freezer, waiting out my term as a hard nut, but I'm due to get out soon enough and then you can watch me melt and slip away.

Ask the class to come up with more examples, drawing on the lists. Then ask them to choose one and write a diary entry using the situation as a starting point to extend the metaphor. This can be developed into a role play game in pairs, small groups, or hot seating where one student is questioned by the whole class while in character.

🧑 Follow up

Give the students a card with a substance on created by an irreversible chemical change or a reversible physical change. Ask them to imagine this substance as a character. What kind of personality would this substance have if it was a person. Get them to list its properties and functions and transform them into character traits, i.e. Wax "I'm easily manipulated if put in a hot spot" etc. This can then lead to a guessing game of 20 questions or the like, where the rest of the class has to guess what the substance being played by the character is.

activity 5 Superheroes and Supervillains (Physical and Chemical Changes)

...ask them to imagine themselves as the hero on the day after they have had their first adventure.

➡ General applications

Observation of properties

➡ Materials

Pens, paper, pencils, felt tips pens.

Selection of superhero comics with heroes with and without superpowers: for example Batman and The Thing from the Fantastic Four (you could use film clips here instead of comics).

➡ Instructions

Tell the students to divide a piece of paper down the middle to make two columns. The students look at the heroes in action and list all the properties of the characters. What are they made of, what can they do, why are they able to do what they do (N.B. Batman operates as a hero because he has learned martial arts, gymnastics and is a millionaire equipped with numerous scientific gadgets, The Thing has been transformed into a super strong rock creature by gamma rays on a journey into space). When they have listed the properties they discuss the differences between them. The point being that one is irreversibly chemically changed whilst the other can live an ordinary life once out of his costume.

1st creative writing exercise – Working in pairs, they each choose one of the heroes. Ask them to imagine themselves as the hero on the day after they have had their first adventure, and used their powers / skills. They write a short diary entry reflecting on how it feels to be Batman or The Thing, (what have they gained, what have they lost, what do they wish for now). This should be a time limited exercise of 10 minutes. In their pairs they compare their entries. Have they come to any similar conclusions? Q & A with class. Whole class, with assistance from teacher (possibly with example experiment) list a number of things from everyday life that change as part of a process. Give a couple of examples to get them started, (water to snow, sand to glass) can they fill a whole page with changes (this could be a competitive race to fill the page in a time limit). When they have finished ask them to pick out the irreversible chemical changes.

2nd creative writing exercise – Ask them to choose one of the changes from their list and invent a superhero that has the properties of the changed or new substance. Get them to draw the hero with appropriate costume and write a short description that describes their origin, their powers, their strengths and weaknesses, the catalyst for change if they have one. They must include a personal problem for the superhero to have because of their powers (like all good superheroes have). They can follow this up by creating a comic strip.

⊕ Variation

(Depending on time and ability level) Get them to invent two superheroes, one based on a physical change and the other on a chemical change.

Ask them to create a comic strip where these heroes fight each other. Who would win and why?

activity 6 Like A Fish Out of Water

...ask the students if they have ever felt ‘out of place’, where they didn’t know how to behave or what they were supposed to do and how they tried to ‘fit in’.

General applications

Extension to habits, adapted features and survival.
Anchors ideas into personal experience.
Metaphoric play.

Materials

Pre-prepared cards (use those in the appendix)

Instructions

Ask the class about the expression, ‘I felt like a fish out of water’?

What it means to them. Ask what a fish does once placed out of water?

Establish that it means being in a habitat that doesn’t suit you, so you struggle to survive in it.

Ask the students if they have ever felt ‘out of place’, where they didn’t know how to behave or what they were supposed to do and how they tried to ‘fit in’. Collect some examples of these and discuss the feelings around them. Perhaps it was moving into a new school or joining a new club or moving to a different country or town. Write key terms on the board to use as a word hoard.

Ask the students to choose an animal and imagine it in a habitat that doesn’t suit it.

Trigger examples: A penguin in the desert, a mole in a tree top, a butterfly in the sea, a pigeon under the ground, an elephant in a cobweb in the corner of the garden, a whale in the River Thames, etc.

Writer suggestions of other animals in alien habitats on the board.

Give out cards and ask them to draw a picture of it in the alien habitat in the top section. Encourage them to think about how it would look, what would its facial expression be like, what it’s posture would be like? What would a mole in a treetop be doing? What small elements of the alien habitat can be included in the drawing to symbolize it.

10 minutes to draw pictures.

Let the students share their drawings with those on the same table.

Using a piece of scrap paper ask them to draft out the following ideas:

- a) Give your animal a name, Marty the mole, Barbara the butterfly, Peter the penguin.
- b) Write a little description of it in it’s predicament, describe its movements, its posture, it’s expression, what it would wish for, what conditions its body designed for, what might happen to it, what are the immediate dangers for it in this habitat, how might it try to adapt or ‘fit in’?

Example

Here is Marty the Mole,
Stuck up in a tree top,
Wishing he could fly like the sparrow.
His weak eyes can’t even see the floor
His long claws are for digging through soil,
Not climbing or clinging to branches.
He’s so scared he’s shivering
At any moment he might fall.

Once the students have drafted out their piece of writing they can re-write it below their drawing on the card.

Go around the class with each child showing their picture and reading out their piece of writing.

Reflect upon how animals adapt to new surroundings through natural selection.

activity 7 **Spells**

...set the scene of the lesson by introducing the relationship with magic and science, quest for knowledge, manipulation of the physical environment.

General applications

Creating mnemonic patterns.
Manipulating information into alternative written forms.

Materials

Examples of spells and spell style poems (see appendix f).

Pens and paper.

Text books or information sheets on specific science subject area.

Instructions

Set the scene of the lesson by introducing the relationship with magic and science, quest for knowledge, manipulation of the physical environment etc. It may be useful to play around with the idea that the class is a class of wizards and witches.

Give the class a model of a spell or spell style poem from the appendix. Discuss how they work, e.g. as a set of instructions or imperatives, somewhat like a recipe.

Split class into groups of four or five students.

Each group is given an information sheet on specific learning area (most effective when dealing with transformations, e.g. changing states, photosynthesis, forces, chemical catalysts, digestive enzymes etc.).

The groups are given a time limit of 15 minutes to write a spell that encapsulates the science and methodology and results of the transformation.

Each group is then given five minutes to practice their spell as an oral activity in preparation for performance.

Groups take it in turn to perform their spell.

Do learning checks after each spell, e.g. have they left anything out, is the science correct.



activity 8 Ceridwen's Cauldron

...tell the students we are going to play a game called Ceridwen's Cauldron. This is an ancient bardic game of magical shape shifting.

General applications

Creatively Exploring food chains and food webs.
Team work.

Materials

A version of the Welsh myth of Ceridwen and Taliesin from the Mabinogion (see Appendix G).

Example poems.

Paper and pens.

Instructions

Tell the students we are going to play a game called Ceridwen's Cauldron. This is an ancient bardic game of magical shape shifting. Ask who has seen the Disney film 'The Sword in the Stone'. Remind the students of the scene when Merlin and the witch do battle through magical transformation. That magical battle is called Ceridwen's Cauldron.

Before playing, read them the story of Ceridwen and Taliesin. An abridged and adapted version can be found in Appendix G of this manual but you can find other versions in print and on the web.

The story describes the magical conception and birth of the great Welsh poet Taliesin.

Tell tale.

Remind the students that this is a poet's game that was played in the halls and courts and around the hearth fires of ancient Wales. It may be useful to give a few brief examples of poems which use the same technique of transfiguration that Taliesin and Ceridwen use before starting the game. There is a children's version on the right, however Robert Graves's Amergin's Charm (Collected Poems, Cassell 1975), and I Am The Song by Charles Causley (Staying Alive, Bloodaxe Books, 2002) are both excellent examples.

Explain that they are going to use the game to explore food chains and survival.

Set game.

Set a time limit of 15 minutes for the writing part of the game.

Split class into pairs. One decides to be the hunter and one is the hunted.

The hunted goes first, deciding what to transform into and writing it down on a piece of paper, then saying it to their partner. They must write the full sentence which names the creature and gives a brief description.

I am the _____ that / with _____

e.g. I am a blade of grass beside a vast reed bed.

Note: (it is useful to get them to start at the lower end of the food chain)

Once they have written and said their line they pass the paper to their partner who decides what they will transform into to catch their prey. They write the second line in the same style and say it out loud then pass the paper back.

Repeat for at least six turns.

Example

I am the maggot crawling in the cold flesh of a dead rat

I am the black beetle hungry for the larva of flies

I am the hedgehog with a back full of spikes

I am the fly that hatches from bursts from the grub into the air

I am the frog that catches flies with a flick of its tongue

I am the swan whose wide wings are like clouds, whose beak crushes frogs

After 15 minutes ask the class to finish their line. Then give them five minutes to read through it out loud in their pairs and to edit or alter any of their words or imagery.

Ask for pairs of volunteers to come out to the front of the class and perform their magical battles.

Get the class to judge the best battle in terms of:

- a) creative writing
- b) performance
- c) the accuracy of representing the food web or food chain. (Movement and sound effects can be added to turn this into a more dramatic performance or part of a class presentation).

The Tale of Taliesin

Once in the ancient land of Wales there was a witch named Ceridwen. She had two children. Her daughter, was as beautiful a child as you could ever hope to see; the other, her son Afagdu, was so ugly, ill-favoured and stupid that he sickened everyone who saw him.

Ceridwen was sad about Afagdu and so she decided to use her magical arts to make him into such a great bard that no-one would mind his ugliness. She would cast a great spell so he would be able to weave words so well that he could enchant kings and charm the birds down from the trees.

Many were the rare plants that she threw into her cauldron, many the incantations she said over it. Once the recipe was mixed it needed to be stirred over a fire for a year and a day. Ceridwen was a busy witch and could not spend that much time away from all her other chores, so she kidnapped a young boy from a nearby village. His name was Gwion and she ordered him to stir the cauldron every day while she went about her business. So her Cauldron of Wisdom and Inspiration was kept boiling for a year and a day, and the first three drops from it would impart ultimate knowledge to the one who drank them. But the rest of the liquid would be deadly poison.

On the last day of the spell Ceridwen left her home to tend to her goats in the mountains, once more leaving the boy Gwion to stir the brew. So he stirred and stirred and suddenly three drops flew out onto his thumb. They were scalding hot, so that he thrust it into his mouth to stop the burning. Instantly, he had the wisdom and inspiration of ages, and the first thing that occurred to him was that Ceridwen would be very angry. So he ran away from her house across the field, but all too soon he heard the fury of her pursuit. Using his new magical powers of shape shifting he turned himself into a hare. Ceridwen turned into a greyhound bitch, and gained ever more on him. Snarling and barking in rage, her jaws snapping at his heels. He came to a river, leapt in and quick as thought itself became a fish. Ceridwen followed and became an otter. He leapt from the water, and in the middle of his

leap became a bird of the air. The witch Ceridwen became a hawk that tucked its wings and darted like an arrow at him, the talons ready to tear him to pieces. In desperation, he looked down and saw a pile of wheat. He dived, landed, and as it scattered he turned into a single grain. Then she landed and became a hen, and pecked at the grain until she had swallowed Gwion.

Soon after, Ceridwen found that she was expecting a baby. When she realized that the baby was Gwion, she resolved to kill it, and Afagdu wanted her to in revenge for his not becoming a poet. In due course, the babe was born, and Afagdu would have slaughtered him on the spot, but the mother said no, because it was the most beautiful child ever seen. His brow shone like a star. But she took him and, sewing him in a bag, set him adrift on the ocean.

For nine days and nights, the bag floated until it was caught in the river of Gwyddno Garanhir, a chieftain. That day, Prince Elffin the unlucky son of Gwyddno Garanhir, hoped to catch some fish, but instead found the leather bag. Hoping that the bag contained gold, Elffin opened it, and marvelled to find inside a beautiful infant with a radiant brow, so Elffin called the child Taliesin. Elffin brought the infant with him back to his father's home. Gwyddno asked his son if he had brought any fish back. Elffin replied that he'd got something better and showed the baby to his father. Gwyddno shook his head, 'A baby! What do I want a baby for, what do you want a baby for? It's just another mouth to feed!'. But the baby Taliesin opened his mouth and began to speak. He told the Gwyddno that Elffin would have more to gain from him than the river. Gwyddno was astonished that the baby could talk, and Taliesin then began to sing for Gwyddno and his court. After the song, Elffin took Taliesin home. And that is the beginning of the story of the greatest of the wizard-poets of ancient Wales, Taliesin. So this magical battle of shape shifting became a game that many poets played.

I am a sexy slimy slug, slithering along the mud,
I am a squawking bird that squawks all night.
I am a sly fox that sniffs in the shadows of the shore,
I am a lovely leaping lion that eats all night,
I am a pack of hyenas, worrying your golden mane.
I am a thunderstorm, stalking from the sky,
I am the sun that breaks through dark clouds,
I am the night that sends the sun to sleep.
I am the starlight that flickers on the ocean,
I am the dolphin that shatters the surface of the sea.
Gemma Harbinson & Shelby Copeland,
from Redcar Community College.

activity 9 Fantasy Newspapers

...this activity could be used in conjunction with a whole subject area over a number of lessons, involving copy editing, collation of images and arrangement and layout of the newspaper, within English, Art and ICT lessons.

➔ General applications

Collating detailed information.
Providing an alternative learning objective.
Providing a cognitive learning strategy.
Presenting material in fun and dynamic way.

➔ Materials

Text books or information sheets on specific subject area.

Paper and pens.

Large sheets of paper (A2).

Computers and layout software (preferable but not essential).

Newspapers as models.

Scissors and glue.

➔ Instructions

Analyse format of tabloid newspaper and identify key ingredients e.g. headlines, sports page, crime and current affairs, celebrity reporting, travel, gossip column, horoscopes, advice page, TV guide etc.

Split class into groups of reporters, giving them each one of the above categories.

Their task is to write a column or page for the tabloid, presenting the scientific information from the subject at hand in a mock fashion.

This activity could be used in conjunction with a whole subject area over a number of lessons, involving copy editing, collation of images and arrangement and layout of the newspaper, within English, Art and ICT lessons.

🎯 Examples

- The Hedgerow Herald may include news on events in the food chain, the magpie nest robberies, the immigration of birds from Africa, the environmental threats to the hedge, animal sports.
- The Milky Way Gazette may include Dear Jupiter – the planet size problems page, (Venus wants advice on how to stop overheating, the Earth needs to fix a hole in its ozone layer, Jupiter's stormy temper), visits from a celebrity comet, adverts on holiday destinations to the stars or moons.
- The Digestive Echo may include reports on the affair between Amylase and starch, a lonely hearts column: lonely stomach seeks rich protein source, travelogue of a pea as it passes from mouth to anus, horoscopes of the various components of the digestive system.

activity 10 **Diary Entries**

...ask the students to create a character sketch of a person through bullet point answers, e.g. gender, age, hobbies, occupations, loves and gripes, favourite possession.

General applications

Collating detailed information.
Providing an alternative learning objective.
Providing a cognitive learning strategy.
Presenting material in fun and dynamic way.

Materials

Pens and paper.

Pre-prepared template to provide structure (optional – see Appendix H).

Text books or information sheets on specific science area.

Instructions

Ask the students to create a character sketch of a person through bullet point answers, e.g. gender, age, hobbies, occupations, loves and gripes, favourite possession etc.

Ask them to imagine this character as a personification of an element or component of the system to be studied, e.g. an electron, a cloud, an enzyme, a chemical, an animal etc.

Give the character a name, e.g. Emily Electron, Andy Atom-Spinner, Carl Cumulus, Pauline Potassium.

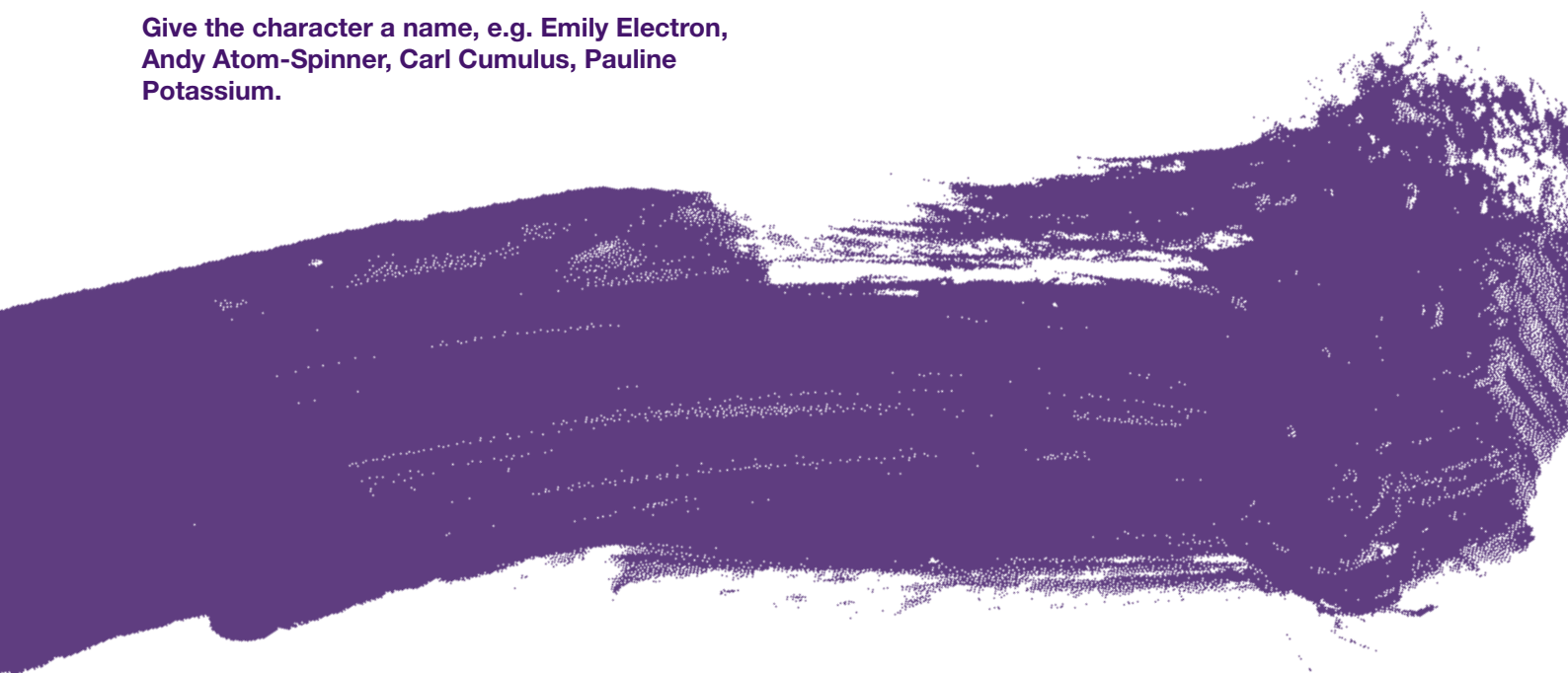
Provide the class with a narrative structure, which will help them write their diary entry, again initially through bullet pointed responses to the following trigger questions.

- What was the character doing?
- Where was he or she?
- What were they expecting to do?
- What actually happened (incident / event)?
- How did it make them feel?
- What were the consequences of the incident?
- Will they ever be the same again?

Once answered in notes ask the class to write these up as a more considered diary entry.

Read out diary entries and do a learning check to test the inclusion and accuracy of the scientific information.

Alternative method or follow up: a longer story form exploring the day in the life of... e.g. a rain drop in the water cycle, a pea in the digestive system, an electron in a circuit.



activity 11 Syllabic Poetic Forms – (Haiku, Renga, Tanka, Sijo)

...although we are using this within our core activities section it is ideal for focus, introductory, vocabulary generation and closure / revision activities.

➔ General applications

Can be used to cover any subject area.
Although we are using this within our core activities section it is ideal for focus, introductory, vocabulary generation and closure / revision activities.
Observational skills.
Crystallization of ideas and impressions.

Haiku: a minimalist verse form which communicates its meaning and feeling by capturing a concrete image and comments upon it through a tight structure of three short lines, traditionally totalling seventeen syllables broken down as line one. Five syllables, line two. Seven syllables, line three. Five syllables. The haiku is focused on clarity and precision, avoids abstraction and is capable of expressing great scale and deep insights.

➔ Materials

Examples of haiku, renga, tanka and sijo (see appendix).
Paper and pens.

🎯 Example

The crumpled daisy
Its white teeth and yellow tongue
Waiting for the rains.
At the switch's flick
I flow through the wire,
The light bulb flickers.
Each coil of copper
Makes my pull ever stronger,
With magnetic force.
From the hedgerow's shade
The hunting vole meets its death
Beneath the hawk's claw.

🗨 Instructions

This can span a number of lessons, working accumulatively to cover the various forms, and exploring how the structure of the forms effect the content of the material. They can be used to explore any area of the science curriculum, but are particularly effective in capturing close observational details and the effects and reactions within experiments.



Renga: An extension of the haiku format but composed either individually or collaboratively from a series of short poems. Each constituent part should make sense independently, but connect with the preceding and following verse. Renga usually contain 20, 36 or 100 verses, and while it involves a range of further rules, a simplified structure for our purposes here involves an opening hokku verse of three, seven, five syllables, followed by a waki verse of seven, seven, syllables, which is repeated throughout until the final ageku verse carefully wraps up the poem and brings it to a sense of closure.

Once students have developed an understanding of haiku, it is a useful exercise to develop renga as a collaborative chain poem with each person responding to the previous student's verse and developing the sequence. In traditional renga a seasonal word is required at specific intervals and the whole piece spans four seasons, a reference to the moon is often placed in the third verse, a reference to a flower in verse 19. However, within a science context you may wish to set a rule that a specific science word needs to be used every at specific intervals, or divide the sequence into stages of an observed experiment or phenomenological process.

For further information on renga see <http://en.wikipedia.org/wiki/Renga>

Tanka: Thirty one syllable poems that have been popular in Japan for at least 1300 years. Older than haiku, tanka poems evoke a moment or mark an occasion with precision and musicality. Traditionally divided into five lines of syllabic units: five-seven-five-seven-seven. However, it is more important to hone the poem's observational clarity onto one image that is developed than trying to cram in too many images just to fit the syllable count. Many western tanka contain less than 31 syllables in order to achieve the flow of a single thought which is inherent in the original Japanese form. Similarly to haiku the content of tanka often express and observe the effects of nature.

Sijo: A traditional Korean form of syllabic verse, which consists of 44-46 syllables in three lines. Each line being 14-16 syllables long. Line one introduces an image or theme, which is developed in line two, while line three provides a conclusion, a twist or a surprise. Delicate and compact is perhaps more flexibility than haiku, but usually embodies the unique and complex Korean concept of hope and sadness called 'Han'.

Example

The lone grey wolf slips silently through the hushed night

Travelling carefully along the moonbeam's silver path.

Up to the snow covered hilltop to sing his heart's sorrow.

Melissa K. Newton

There are many other fascinating poetic forms that can be employed to explore scientific observations such as the cinquain, triolet, pantoum and roundel. For information of these it is worth searching for guidelines and examples on the world wide web.

Example

The bulbous raindrop
Hanging from the oak leaf's tip
Prepares for its fall
To the river's mirror-face,
Its journey back to the sea.



D – Closings

This section is designed to provide fun activities to check retention of learning and for revision sessions. They work through transposing the scientific terms and information into other contexts.

Activities

- 1 Everyday Journeys
- 2 Wacky Ads
- 3 Racetrack Revision
- 4 Reviews in the Style of...
- 5 Poetry Slam
- 6 Choral Reading
- 7 Editing and Listing
- 8 Response Doodles
- 9 Limerick Revision
- 10 Acrostics

activity 1 **Everyday Journeys**

...ask class to think of everyday journeys they take. Journeys they have been on many times, to school, to town, to a friend's, or relative's house.

General applications

Memory aid through making maps and use of poetic language.
Grounding systems in personal experience.
Creation of material for future revision.

Materials

Pens and paper.

Instructions

You can use both stages of this exercise together or independently. Ask class to think of everyday journeys they take. Journeys they have been on many times, to school, to town, to a friend's, or relative's house, a paper round. Ask them to pick one they can visualise clearly. Give them a minute to bring it clearly into their memory.

Stage 1 - Ask them to think of the different stages of the journey, the route they take, the places they pass, the obstacles they might encounter. Ask them to start making written notes and draw a map of their journey.

Stage 2 - Ask them to describe the journey as a sequence of smells linked by the connective words From and To.

Example

From the smell of bacon and eggs to the stink of the beck.

From the smell of cut grass to the heady creosote tang of the railway sleepers.

From the exhaust pipes' fumes on the High Street to the musty smell of old leaves in the cemetery.

Stage 3 - Now you have them working in terms of memory you can start revising specific scientific areas. For example stage 1 can lead to a map of the digestive system, the circulatory system, the respiratory system. This should then be followed up with a 1st person writing exercise, e.g. you are a potato that has been eaten. Describe your journey and what happens to you what you encounter, you are the air that has been inhaled etc. Obviously this could be applied to the planets, circuitry, anything that contains stages in a system. Stage 2 can similarly be followed up by substituting the stages of the system for the stages of the journey, providing memorable metaphors, images, and rhythm and helps them to retain the order and properties of a system.

Example

From the grinding cave of the mouth, soaked in saliva to the snake-hole of the gullet, From the simmering acidic swamp of the stomach to the coiled labyrinth of the small intestine.

activity 2 **Wacky Ads**

...with adaptation this can be used as a revision for many areas of the curriculum.

General applications

Revision of scientific vocabulary, scientific processes, properties and functions.

Materials

Advertisements from magazines and radio adverts on tape.

Information on area of revision.

A3 paper and felt tips.

Tape recorder to record their radio ads (if desired).

Instructions

With adaptation this can be used as a revision for many areas of the curriculum.

Stage 1 - List of products and processes from your example ads (do not show them any ads yet to ensure cognitive learning). Ask them in pairs to consider how you would sell each one with a slogan. Q & A to collect answers on board.

Stage 2 - Distribute adverts from magazines to small groups of four to five students. Ask them to identify what the unique selling points and general selling points the advertiser has chosen. What kind of language is being used to sell the product? How do the imagery and the words relate to each other? Who is it targeted at?

Stage 3 - Distribute information from area of revision, e.g. Mirrors and Reflections.

Ask them to think of a time before mirrors existed. Ask them to list anything that people might have seen their reflections in, e.g. ice, icicles, still ponds, an animal's eye, a baby's teardrop, crystals, polished metal, weapons.

Tell them they have to choose one that was probably used as a mirror, one that might possibly have been and one that is unlikely to have been. When they have three they become Ye Olde Tymes advertising agency. They have to come up with three adverts for cave walls for these products. The ads need to include image, slogan and copy (writing about the product's qualities and uses).

The groups share their adverts.

Discuss which of the things they have chosen would make the best mirrors and why. This is where you can revise the scientific properties of light on reflective surfaces.

Stage 4 - Following the invention of the first mirror the advertising agencies create a new advert to sell it, this time it is a radio ad and should include up beat comparisons against the previous products and lists all the improved qualities and all of the possible uses for the mirror.

Stage 5 - (for more advanced students). You are preparing an information file to sell the mirror to a specific client (MI5). How can you persuade them to use it in their military and spy work. This should include an explanation of the laws of reflection.

These stages are specific to our example, but giving your students examples of ads and following it up by advertising agency role-play can be used to revise the properties of all kinds of areas of the curriculum, e.g. types of rock, natural forces, diseases, biological systems, planets, body parts (selling hearts, kidneys, eyeballs can be gruesome, tasteless and therefore a lot of fun).

activity 3 **Racetrack Revision**

...in this activity the students design a board game, which can be used to revise any number of subject areas.

General applications

Revision and test for learning retention.
Collaborative work and small group support.

Materials

A1 sheet of card for each group.
Sets of Dice.
Question cards and text books or revision sheets.

Instructions

In this activity the students design a board game, which can be used to revise any number of subject areas. It is time consuming to construct but both preparing and playing it are good revision activities. It might be necessary to devote a whole session to designing and preparing the board and cards, and subsequent sessions to play it.

Design and preparation.

The students are going to make a steeplechase racetrack. It should have five tracks for the horses to move along, each track should have 200 squares and ten fences spaced evenly around the course, a starting post and a finishing post.

Split class into small groups of five. Each group devises 10 questions around a different subject area and writes them on the question cards. Collect all question cards and photocopy them all 10 times so there are 10 sets of cards with a 100 different questions.

Rules of the game.

The game must be played in groups of five.
Each person rolls dice to see who goes first to fifth.

Object of the game is to move around the board, jump the fences by answering a question correctly at each fence and reaching the finishing post.

You might want to think of a set of prizes, house points etc. according to place so that the game is played to the end.

Follow up

The students are sports journalists who review the race, including some of the questions answered correctly and incorrectly.

activity 4 **Reviews in the Style of...**

...this activity should be used as a follow up from an experiment or scientific activity.

General applications

To relate scientific experiment to popular culture and personal experience.

Materials

Some sample reviews of films, computer games and concerts / gigs, sporting events etc.

Instructions

This activity should be used as a follow up from an experiment or scientific activity.

Hand out reviews to small groups. Ask them to identify the target audience / reader, discuss the kind of language, similes and metaphors used and key points of information given. How is it conveyed through 'lively writing'?

Ask each student or pair to write up the activity/ experiment in the style of one of the reviews they have just analysed. For example they could describe a chemical reaction as though it was a Hollywood blockbuster, as a boxing match etc.

15 minutes writing time

Ask for volunteers to read out their draft reviews. Discuss with the class if the vital scientific information is given in the review and if it achieves the style it was aiming for, and how it might be improved.

activity 5 **Poetry Slam**

...they choose the best poem from their group to compete in the class slam with.

General applications

Revision and retention of knowledge through competitive activity

Materials

Poems produced in main part of session or in previous lessons (this works particularly well with Braggin', Praisin' & Dissin' poems but can work with any).

Sets of Score Cards marked 1-10, one for each group.

Instructions

Students are divided into groups. They choose the best poem from their group to compete in the class slam with. They practice reading the poem chorally, splitting the lines between themselves, some times lines said all together, sometimes individually.

The Slam is held in rounds. Each team performs their piece. Each piece receives one score from each of the other teams. The highest and the lowest are disregarded (this stops blatant cheating). The other scores are added up. The team with the highest score wins the round. You may wish to stress that the categories for the scoring are:

- Accuracy of scientific information.
- Quality of poem.
- Quality of performance.

If this is a just a closing activity to a lesson you can restrict it to one round – highest score wins. However, it could be extended to be a whole closing lesson to a topic. In this case you may hold three rounds, eliminating a number of teams with low scores each time, and allow a final showdown between the two top teams. However, this will require the teams to have several poems to perform in different rounds.

activity 6 Choral Reading

...this is an alternative method of oral presentation without the competitive element of the Poetry Slam.

General applications

Whole class dynamics.
Revision and retention of knowledge.

Materials

Poems produced in main part of session or in previous lessons.

White Board.

Percussion instruments (optional).

Instructions

This is an alternative method of oral presentation without the competitive element of the Poetry Slam. It can be done with the whole class working together on one poem, or split the class into groups, but give each group the same poem to turn into a performance piece.

Get them to read the poem out loud in different ways, i.e. altogether as quick as possible, as slow as possible, then at normal pace, then designating lines to different voices (individuals or groups), adding vocal sound effects, echoes, whispers, rounds, rhythmic variations, moments of silence, with accompanying clapping or using percussion instruments with voices. There are obviously many more variations and this can be done intensively for a whole session leading to a performance for the school or just a simple closing activity.

activity 7 Editing and Listing

...each pair is given one piece of creative writing to edit and check for corrections and the accuracy.

General applications

Polishing poems / writing produced in earlier sessions for display / publication.
Identifying the scientific information from pre-written creative writing.
Literacy (specially of scientific terminology).

Materials

Student's own creative work.

Scientific textbooks for fact checking.

Instructions

Split class into pairs.

Each pair is given one piece of creative writing to edit and check for corrections and the accuracy of scientific facts contained. This can be their own work or from another student.

Ask them to read through the piece three times and list all the scientific facts and implications contained within it. Then they check these facts using the text books provided or internet if accessible.

If desirable, get each pair to feedback their checked results.

activity 8 Response Doodles

...ask some of the doodlers to explain what they have drawn and how it relates to the writing and the science.

General application

Listening skills.
Generating discussion & questions (particularly around interpretation).

Materials

Drawing paper and pencils / felt tip / charcoal.
Pre-written creative work.

Instructions

Choose a number of pieces to be read by students to the rest of the class.

Each reader reads out their creative writing.

The other students listen carefully and respond by drawing quick doodles / sketches of what comes to mind as they listen to the writing.

Give them a few minutes after the piece has been read to finish off their drawings.

Place all the drawings in a line and the whole class views them together, pick out similarities and differences and ask some of the doodlers to explain what they have drawn and how it relates to the writing and the science.

Repeat with another piece if time allows.

activity 9 Limerick Revision

...check that they understand the rhyming scheme, the repetition and structure of a limerick.

General application

Creative manipulation of scientific facts.
Retention of knowledge through humour.

Materials

Example limericks.
Pens and paper.
Facts from science subject area (perhaps given on fact cards) .

Instructions

Give some example limericks orally.
Put a few example limericks up on screen.
Get volunteers to read them out.

Check that they understand the rhyming scheme, the repetition and structure of a limerick.

There was a young girl called Felicity a
Who played too near electricity a
Her kite hit the pylon, b
She was fried in her nylons, b
That foolish young girl called Felicity a

There was a old owl called Domain
Who thought he was top of the chain
He thought he could dare
To mess with a bear
And flew away hooting in pain

Give out fact cards or list key facts from the lesson on the board.

Get the class to write their own limericks.

Ask for volunteers to read theirs back to the class.

activity 10 **Acrostics**

...ask the students to select one key word from the lesson / fact cards and write in vertically down the left hand margin.

General applications

Retention of information.
Creating mnemonics.

Materials

Example acrostic.

Paper and pens.

Fact cards or listed facts from lesson.

Instructions

Ask the students to select one key word from the lesson / fact cards and write in vertically down the left hand margin. Show them a few examples of acrostic poems. Here is one from a workshop on hedgerows and habitats.

Red fluffy chest to keep her warm,
On branches looking for juicy berries,
Black beady eyes, black as the night.
In the air, gently gliding,
Nests in a brown prickly home.

Laura Bland
Ormesby Primary School

Here is one we have written from the digestive system for the enzyme amylase:

Attacks the starch in clumps of food
Makes the molecules break down,
You can't taste the sweetness
Like sherbet on your tongue,
All the same,
She's making sugar
Ensuring you feel the rush.

Give out fact files (if desired) so they can write an acrostic including the related science.

Read out results. Collect for class display.

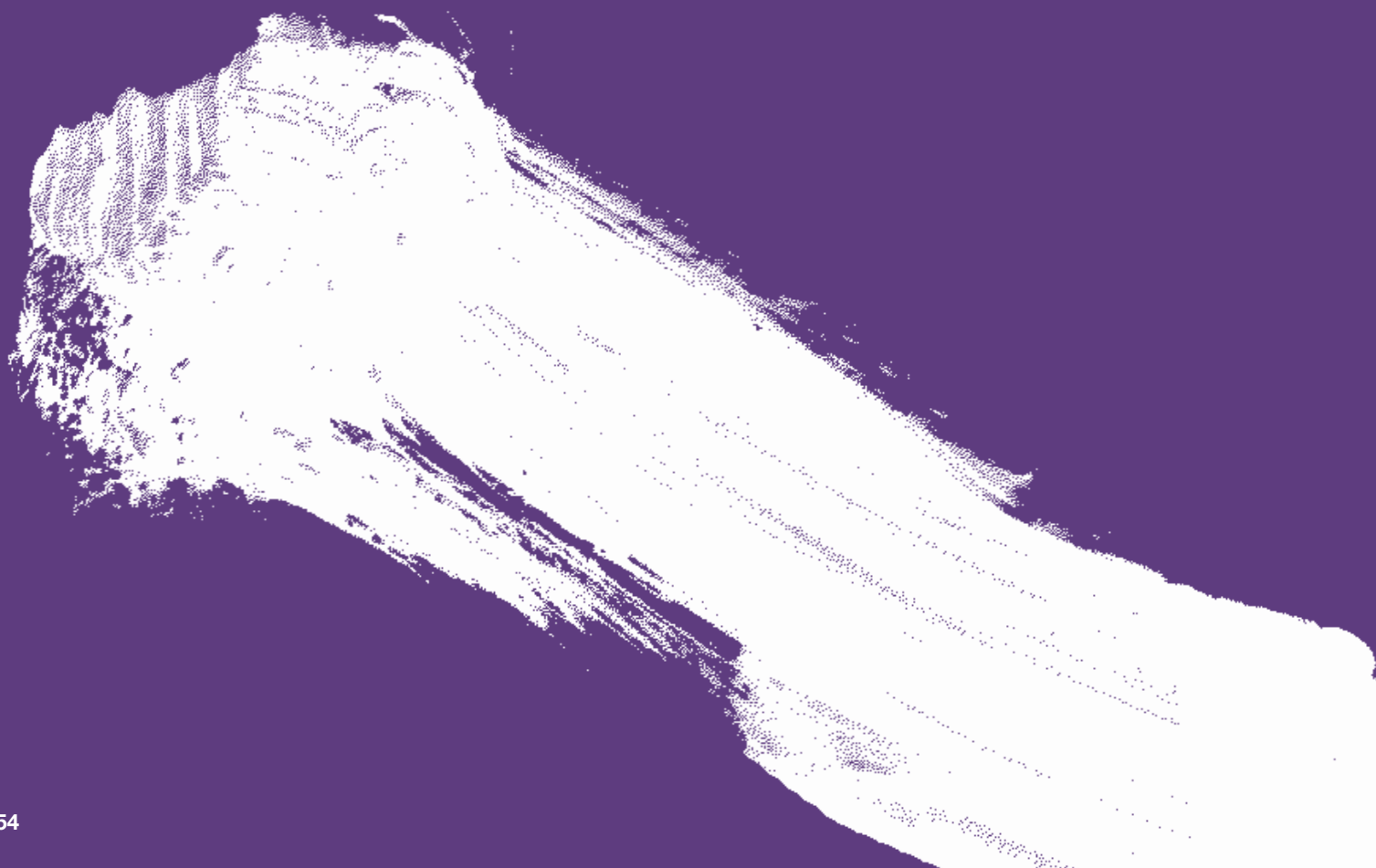
D – Sample Sessions

These sample sessions are generated from the activities described in the manual previously. We would point out that many of our activities can be used as warmers, main activities or revision activities. We have presumed here that you have time to have all of these in one lesson, but practically, you may choose to spread them over several sessions or use them alongside more conventional lessons.

The topics we cover here are illustrative of the specific subject areas, but the activities can be adapted to suit a range of science subject areas. Similarly, most of the activities can be extended or shortened and used as introductory, main or closing activities. As you can see from our sample sessions we have occasionally used ‘introductory’ activities as the main focus of the lesson.

Activities

- 1 Changing States
- 2 Habitats
- 3 Digestion
- 4 Electricity



Changing States

session 1 Everything Changes

Aims

To alert the students to the presence of change.
To personalize the science for the students.

Focus

State and Event.

Intro

World From a Window (as intro rather than focus).

Main

Personal metaphors.

Closing

Response Doodles.

session 2 Where There is No Turning Back

Aims

Introducing the idea of reversible and irreversible change.

Focus

Jigsaw words using words for substances that change (from introductory activities used as a focus activity).

Once reassembled discuss which are reversible and which irreversible.

Intro

Liquid, Solid, Gas, producing vocabulary and linking the qualities of substances to personal experience and producing similes.

Main

Diary Entries - Personification of substances.
For example the students write a diary entry of one memorable day in the life of a snowflake.

Closing

Editing and Listing.

session 3 Creative Play with Subject Matter

Aims

Students will apply their scientific knowledge in creative production of characters.

Focus

Three Word Poems – using one agreed substance.

Intro

Riddles exploring substances that change state.

Main

Superheroes and Super Villains, probably using 2nd creative writing exercise only, depending upon time.

Closing

Poetry Slam or create wanted posters for the villains.

session 4 Remembering Change

Aims

To revise the topic and create mnemonics.

Focus and intro combined

One Minute of History
(Followed by a discussion of which writings captures changes that occurred in the minute).

Intro

Chain Poem Race capturing all of the changes noted during the minute.

Main

Spells.

Closing

Choral readings.

Habitats

session 1 What is a Habitat?

Aims

Increasing observational skills and recording impressions.

Focus

One Minute of History.

Intro

Sonic Play – The sound scape of a chosen habitat in writing.

Main

Activity - Set Forms – Haiku during a walk to a habitat if possible or response to a picture.

Closing

Response Doodles.

session 2 Life Inside the Habitat

Aims

To explore food chains, adaptation and / or lifecycles.

Focus

List poems of organisms within a particular habitat and arrange into a food chain .

Intro

kennings for one of the organisms.

Main

Ceridwen's Cauldron – Personification.

Closing

Doesn't need one as the end of the activity involves a vocal poetic battle akin to a slam.

session 3 Life Inside the Habitat 2

Aims

To help to assess and use information in creative ways.

Focus

Graffiti Wall.

Intro

Concrete poems creating all or part of the habitat, e.g. poem in the shape of a hedge, tree or pond.

Main

Fantasy Newspaper, e.g. The Hedgerow Herald, The Rockpool Tribune (you could not create a full newspaper here in one session, but you could spread it across a number of lessons or just do a front page as a taster).

Closing

Editing and Listing.

session 4 Adaptation and Suitability

Aims

To explore the features of organisms and how they are suited to a particular habitat.

Focus

Word association.

Intro

Riddles relating to creatures within the habitat.

Main

Like a fish out of water.

Closing

Acrostics.

Digestion

session 1 The Digestive Route

Aims

Identifying the components and arrangement of the digestive system.

Focus

Graffiti Wall – What did you eat today?

Intro

Jigsaw Words ending in arrangement of the right words on a diagram of digestive system.

Main

Dairy Entry of a piece of food travelling through the digestive system.

Closing

Wacky Ads, based on travel and tourism adverts, e.g. visit the Stomach for a great day out for all the family!

session 2 Parts of the Digestive System

Aims

Identifying the key elements and their functions.

Focus

One Minute of History (perhaps focusing on physical/ biological sensations).

Intro

kennings – renaming the parts of the digestive system.

Main

Odes in Praise of.

Closing

Concrete Poem incorporating verbs for each part of the system (could be done for separate organs, which are then placed in order to make a poetic diagram).

session 3 Digestion & Healthy Eating

Aims

To consider the needs of the body and what the digestive system requires to maintain a healthy body.

Focus

List poems exploring what is healthy and what is junk.

Intro

Chain poems on eating habits of a healthy and unhealthy diet.

Main

The Dating Agency using components of the digestive system to write ads for what they need using personification. This could be recorded on video in a fun, spoof Blind Date style. “Hi I’m Amylase and I’m looking for a strong starchy guy to call my sweetheart.”

Closing

Write the Dating Agency’s Wacky Advert using their successes as examples.

session 4 Revising the System

Aims

Retention (with some adaptation and supportive information this could also be an introductory lesson).

Focus

Writing The Body, using food stimulus, i.e. give them all a segment of fruit and describe in writing the sensations and functions of the body while eating it.

Intro

Sonic Play, write a sound poem for the experience of chewing and swallowing, (function of the mouth and gullet) together on the board by collecting sound words. Then get them to choose another component and write their own sound poem for it.

Main

Braggin’ Praisin’ & Dissin’ with key parts of the digestive system, personified as rapper M.C.s.

Closing

Poetry Slam.

Electricity

session 1 Electrical Safety

Aims

To introduce the vocabulary of electricity and its effects.

Focus

Graffiti Wall, collecting the classes current knowledge of electricity.

Intro

Jigsaw Words, using components of electrical circuits, insulators, conductors, electrons etc.

Main

Cautionary Tales (extended version with illustrations used as main activity), exploring safety with electricity.

Closing

Choral Reading or Limericks.

session 2 Components and Parts

Aims

To create mnemonics and visual recognition of circuitry.

Focus

List Poems.

Intro

Concrete poems inspired by the scientific symbols used in circuit diagrams.

Main

Braggin, Praisin, Dissin, this time the M.C.s are the components of the electrical circuit.

Closing

Poetry Slam.

session 3 How Electricity Works

Aims

To explore the nature of electricity through personification.

Focus

Three Word Poem.

Intro

Chain Poem using statements of personal metaphors, e.g. "I felt electrified when..."

Main

Diary Entries, a day in the life of a negatively charged electron.

Closing

Choral Readings.

session 4 Uses of Electricity in the World

Aims

To consider practical and imaginary uses of electricity.

Focus

List poems of all the things they have used today that function on electricity.

Intro

Riddles from one chosen object on the lists, exploring what it does, how, why and how this task was done before electricity was used as a power source.

Main

Superheroes and Supervillains, exploring the diverse uses of electricity in our world and insulators, conductors, batteries, and the ways electricity can be generated.

Closing

Graffiti Wall, overwriting the original with new knowledge and images of the super heroes and supervillains.

Appendix a

State & Event

Picture of Harold Lloyd



Appendix b

Jigsaw Words Sheet

The Digestive System

MOLE	CAR	MO	HY	SU
PRO	BO	UTH	TINES	STOM
TUM	TTY	US	DRATE	REC
ENZ	SOL	LE	CULE	GAR
YMES	INT	EST	GUL	AC
ACH	FA	ION	UB	IDS

Appendix c

Roots

A Martian Sends a Postcard Home
by Craig Raine, 1979

Caxtons are mechanical birds with many wings
and some are treasured for their markings -

they cause the eyes to melt
or the body to shriek without pain.

I have never seen one fly, but
sometimes they perch on the hand.

Mist is when the sky is tired of flight
and rests its soft machine on ground:

then the world is dim and bookish
like engravings under tissue paper.

Rain is when the earth is television.
It has the property of making colours darker.

Model T is a room with the lock inside -
a key is turned to free the world

for movement, so quick there is a film
to watch for anything missed.

But time is tied to the wrist
or kept in a box, ticking with impatience.

In homes, a haunted apparatus sleeps,
that snores when you pick it up.

If the ghost cries, they carry it
to their lips and soothe it to sleep

with sounds. And yet they wake it up
deliberately, by tickling with a finger.

Only the young are allowed to suffer
openly. Adults go to a punishment room

with water but nothing to eat.
They lock the door and suffer the noises

alone. No one is exempt
and everyone's pain has a different smell.

At night when all the colours die,
they hide in pairs

and read about themselves -
in colour, with their eyelids shut.

Appendix d

Sonic Play

The Loch Ness Monster's Song
By Edwin Morgan

Sssnnnwhuffffle?
Hnwhuffl hnnnwfl hnfl hfl?
Gdroblboblhobgbl gbl gl g g g gblgl.
Drublhaflablhafubhafgabhafihafi fl fl -
gm grawwww grf grawf awfgm graw gm.
Hovoplodok-doplodovok-plovododokot-doplodokosh?
Splgraw fok fok splgrafhatchgabrlgabrl fok spfok!
Zgra kra gka fok!
Gombl mb bl-
blm plm,
blm plm,
blp.

Appendix e

Personal Metaphors

A Snowman Heart
By Andy Willoughby

I melted like a snowman
When my paperboy pal brought round the lost
pup he'd found
Her floppy ears and dark pool eyes turned my
cold heart to slush
And it flowed into a river when she barked and
jumped and rushed
My old man said we could keep her when I
cajoled and begged
Though he said he didn't like the look of her big
paws and rangy legs

I froze like a snowman
When she ran way in the November frosted park
My blood turned to ice and I got an ice ball
for a heart
As I sat at home vainly waiting for her bark,
For her to scratch at the door or jump the
garden gate
I prayed for her return but it was a glacial wait

I didn't want to cry so I put on a snowman's grin
Set solid with coal that let no one in
And my snowman's heart remained long
after spring.

Appendix f

Spells

From Macbeth by William Shakespeare

Thrice the brinded cat hath mew'd.

2 WITCH. Thrice and once, the hedge-pig whin'd.

3 WITCH. Harpier cries:—'tis time! 'tis time!

1 WITCH. Round about the caldron go;
In the poison'd entrails throw.—
Toad, that under cold stone,
Days and nights has thirty-one;
Swelter'd venom sleeping got,
Boil thou first I' the charmed pot!

ALL. Double, double toil and trouble;
Fire burn, and caldron bubble.

2 WITCH. Fillet of a fenny snake,
In the caldron boil and bake;
Eye of newt, and toe of frog,
Wool of bat, and tongue of dog,
Adder's fork, and blind-worm's sting,
Lizard's leg, and owlet's wing,—
For a charm of powerful trouble,
Like a hell-broth boil and bubble.

ALL. Double, double toil and trouble;
Fire burn, and caldron bubble.

3 WITCH. Scale of dragon; tooth of wolf;
Witches' mummy; maw and gulf
Of the ravin'd salt-sea shark;
Root of hemlock digg'd i the dark;
Liver of blaspheming Jew;
Gall of goat, and slips of yew
Sliver'd in the moon's eclipse;
Nose of Turk, and Tartar's lips;
Finger of birth-strangled babe
Ditch-deliver'd by a drab,—
Make the gruel thick and slab:
Add thereto a tiger's chaudron,
For the ingredients of our caldron.

ALL. Double, double toil and trouble;
Fire burn, and caldron bubble.

2 WITCH. Cool it with a baboon's blood,
Then the charm is firm and good.

Spell For A Green Leaf

By Bob Beagrie

Bloom-wake, Spring morning's day break,
Let night shadows race like hares to shrink
Under logs, into sets and vole nests.
Pour fresh sunlight into palisade cells,
Where solar cream curdles in chloroplasts.
Quaff carbon dioxide through stomata -
Holes, not wounds, on the underside of leaves.
Root hairs, scavenge moisture and minerals:
From dirt's deep cauldron: nitrogen, phosphorous,
Potassium. Breathe birds, my song of oxygen.
Let me photosynthesise. Let me brew glucose,
Weave biomass in chains of starch; form thorn,
Hard bark and stamen, from daily infusions,
Mixed in the crucible of chlorophyll -
A glittering canopy of lush scales.

Appendix g

Ceridwen's Cauldron The Tale of Taliesin

Once in the ancient land of Wales there was a witch named Ceridwen. She had two children. Her daughter, was as beautiful a child as you could ever hope to see; the other, her son Afagdu, was so ugly, ill-favoured and stupid that he sickened everyone who saw him.

Ceridwen was sad about Afagdu and so she decided to use her magical arts to make him into such a great bard that no-one would mind his ugliness. She would cast a great spell so he would be able to weave words so well that he could enchant kings and charm the birds down from the trees.

Many were the rare plants that she threw into her cauldron, many the incantations she said over it. Once the recipe was mixed it needed to be stirred over a fire for a year and a day. Ceridwen was a busy witch and could not spend that much time away from all her other chores, so she kidnapped a young boy from a nearby village. His name was Gwion and she ordered him to stir the cauldron every day while she went about her business.

So her Cauldron of Wisdom and Inspiration was kept boiling for a year and a day, and the first three drops from it would impart ultimate knowledge to the one who drank them. But the rest of the liquid would be deadly poison.

On the last day of the spell Ceridwen left her home to tend to her goats in the mountains, once more leaving the boy Gwion to stir the brew. So he stirred and stirred and suddenly three drops flew out onto his thumb. They were scalding hot, so that he thrust it into his mouth to stop the burning. Instantly, he had the wisdom and inspiration of ages, and the first thing that occurred to him was that Ceridwen would be very angry. So he ran away from her house across the field, but all too soon he heard the fury of her pursuit. Using his new magical powers of shape shifting he turned himself into a hare. Ceridwen turned into a greyhound bitch, and gained ever more on him. Snarling and barking in rage, her jaws snapping at his heels. He came to a river, leapt in and quick as thought itself became a fish. Ceridwen followed and became an otter. He leapt from the water, and in the middle of his leap became a bird of the air. The witch Ceridwen became a hawk that tucked its wings and darted like an arrow at him, the talons ready to tear him to pieces. In desperation, he looked down and saw a pile of wheat. He dived, landed, and as it scattered he turned into a single grain. Then she landed and became a hen, and pecked at the grain until she had swallowed Gwion.

Soon after, Ceridwen found that she was expecting a baby. When she realized that the baby was Gwion, she resolved to kill it, and Afagdu wanted her to in revenge for his not becoming a poet. In due course, the babe was born, and Afagdu would have slaughtered him on the spot, but the mother said no, because it was the most beautiful child ever seen. His brow shone like a star. But she took him and, sewing him in a bag, set him adrift on the ocean.

For nine days and nights, the bag floated until it was caught in the river of Gwyddno Garanhir, a chieftain. That day, Prince Elffin the unlucky son of Gwyddno Garanhir, hoped to catch some fish, but instead found the leather bag. Hoping that the bag contained gold, Elffin opened it, and marvelled to find inside a beautiful infant with a radiant brow, so Elffin called the child Taliesin. Elffin brought the infant with him back to his father's home. Gwyddno asked his son if he had brought any fish back. Elffin replied that he'd got something better and showed the baby to his father. Gwyddno shook his head, 'A Baby! What do I want a baby for, what do you want a baby for? It's just another mouth to feed!'. But the baby Taliesin opened his mouth and began to speak. He told the Gwyddno that Elffin would have more to gain from him than the river. Gwyddno was astonished that the baby could talk, and Taliesin then began to sing for Gwyddno and his court. After the song, Elffin took Taliesin home. And that is the beginning of the story of the greatest of the wizard-poets of ancient Wales, Taliesin. So this magical battle of shape shifting became a game that many poets played.

Appendix h

Personal metaphors and Diary Entry Template Static Electricity

1. I felt like a charged electron...

I felt like a wild field of negatively charged electrons dancing...

I felt like negative electron on a focused point when...

2. Invent a brief character sketch of a person.

Decide:

Male or female. _____

Age _____

A hobby _____

A pet hate _____

A job or type, e.g. cub scout, taxi driver, hairdresser, school girl.

Imagine this character as an electron.

Give him / her a name. (e.g. Emily Electron, Andy Atom-Spinner)

Name: _____

6. Answer the following questions in rough notes.

It is a narrative structure to help you invent an electrifying adventure for them.

What was the electron character doing?

Where was he or she? (e.g. on the surface of a balloon,)

What were they expecting to do?

What happened to charge them with electricity?

What happened to the electron character?

How did it make them feel?

Will they ever be the same again?

7. Write a diary entry of a charged electron using some of the ideas from your first three sentences about being a charged electron and your character's electrifying adventure.

date __/__/__

Appendix i

Cautionary Tales

[illegible][illegible]

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"Intuition is the source of scientific knowledge"

Aristotle

Some pupils soak up science like sponges soak up water.
Some don't!

Even the most able students can benefit from new ways of learning.

Even the most able teachers can benefit from new ways of teaching.

Young people who have danced their way through atomic theory will never forget it.

The evolve project is a two year initiative which brings together a comprehensive package of exciting and inspiring activities for young people, teachers, PGCE students, artists and arts graduates in the Tees Valley. evolve is a professional development opportunity which aims to embed new and innovative ways of delivering cross curricular activity through creativity.

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