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WEEK

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Community Garden challenge

CREST
Awards

Department for Business, Innovation & Skills

CREST Discovery
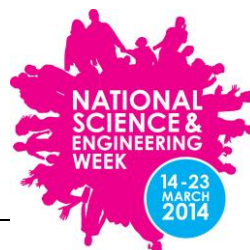
Community garden challenge

Introduction

The Community garden challenge has been designed to help teachers run an engaging one-day activity with 11 to 14 year olds for National Science & Engineering Week (NSEW).

This written resource, along with the accompanying videos (http://www.youtube.com/watch?v=H0NxdAjZO2o&list=PLycG4kuYXoz8LKAN1GytDstv5UiCHRzFH), forms a step-by-step guide to make running the Community garden challenge day easy and straightforward.

This activity has been produced for NSEW in partnership with the CREST Awards scheme. CREST is a UK award scheme for 11-19 year olds recognising success, building skills and demonstrating personal achievement in science, technology, engineering and maths project work.

If you would like your students to achieve a CREST Discovery Award for taking part in the day, you will need to register your students with your CREST Local Coordinator[1] before the event. Alternatively, if you do not wish to register for the full CREST Discovery Award, you can still use these activities and resources on their own.

We encourage schools to run this activity during NSEW (http://www.youtube.com/watch?v=H0NxdAjZO2o&list=PLycG4kuYXoz8LKAN1GytDstv5UiCHRzFH) and register their event on the NSEW online programme on www.nsew.org.uk.

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[1] Contact details available here:
www.britishscienceassociation.org/crest-awards/finding-your-crest-local-coordinator-list-view

Teacher's guidance
Getting started & challenge details

Getting started

http://www.youtube.com/watch?v=P3d1geqj5Y&list=PLycG4kuYXoz8LKAN1GytDstv5UiCHRzFH

If you would like to register your students for a CREST Discovery Award, please talk to your CREST Local Coordinator **before** your event. Your Local Coordinator will be able to provide helpful advice, and will send you the CREST Discovery Passport, a useful tool enabling your students to reflect on what they learnt during the challenge.

The Community garden challenge has been specifically developed to meet the CREST Discovery Award requirements. By undertaking the activity and completing the reflective CREST Discovery Passports, your students should be able to achieve an Award. You can find out exactly how the day fits the Award criteria in appendix 1 (page 10).

Before getting started, you should decide on:

- Whether you would like to register your students for a CREST Discovery Award, or deliver the activity on its own
- How many students will take part? Students will work as a team to design their gardens, and it is recommended that a team is made up of 13 – 15 students (please see page 5 for a breakdown of team roles)
- How many adults will be needed to supervise the activity? Adults will give role briefings, supervise activities and provide constructive feedback at the end of the challenge
- Will you need a technician to support the activity?
- Will you invite STEM Ambassadors to give you extra support and provide students with a view of the project process in industry? (www.stemnet.org.uk)
- The date – don't forget to plan the date and tell everyone well in advance. That way you can avoid other events conflicting with yours and get more support across the school.
- The location – how much space will you need, and which rooms will need to be booked?
- The timings – begin by establishing your desired finish time, work backwards from there and break down the day into timed sections (see the example timetable on pages 5 & 6 to get an idea of timings)
- What consumables and resources will you need? These should be sourced in advance of the day. (see the equipment list on page 21).

If you are organising your Community garden challenge during National Science & Engineering Week, don't forget to register your event on www.nsew.org.uk.

The Challenge

http://www.youtube.com/watch?v=9uM2txeAAcc&list=PLycG4kuYXoz8LKAN1GytDstv5UiCHRzFH

It is recommended that students work in teams of 13-15 (see break down below) to plan & design a community garden.

Each team will be made up of:

1 x Project manager
2 x Soil management
3 x Plant management
2 x Water management
3 x Wildlife management
2 x Building management

Each role has specific tasks and responsibilities. These are outlined in the team brief and role descriptions that can be handed out to your students (see pages 13 to 17).

Suggested format

Below is an example schedule to give an idea of how you can organise the day. You may want to create something similar based on the number of students taking part, and your school's own schedule.

Top tips
- When considering timings, start with the end of your school day and work backwards
- Take into account the timings that can't be changed - such as lunch breaks - and schedule around them
- Allow some leeway with your timings – sometimes things take a little longer than expected, especially if you're dealing with large groups!
- Try and plan your day so that you give your students as much time as possible for the practical activities
- Before presentations, allow five minutes for students to clear their tables and tidy away equipment
- If you've got more than seven teams presenting, you may wish to split them into two groups and send them to different rooms to give their presentations. This will help to save time at the end of the day.

Example schedule	
Introduction (40 minutes)	
9.00 – 9.10	The challenge is introduced to all students at the start of the day, possibly using the team brief (5– 10 minutes)
9.10 – 9.25	Once students have been split into teams, they must decide upon a project manager, who then oversees the allocation of roles – adults may need to support decision-making with some groups (15 minutes)
9.25 – 9.30	Role briefs are given out and read by all managers (5 minutes)
9.30 – 9.35	All managers, including Project manager, attend individual role briefings given by an adult i.e. Water Managers from every team are briefed by one adult etc. (5 minutes)
9.35 – 9.45	If you have registered your students for a CREST Discovery Award, explain what the CREST Discovery Passports are for, and give to Project managers to distribute to team members (10 minutes)
Research & practical activities (2 hours)	

9.45 – 12.30	Teams break out into their individual roles to carry out research and undertake practical activities. It will be the responsibility of the Project managers to monitor the progress of their teams, and they may want to bring their teams back together for a brief update during this time. (2 hours)
12.30 – 13.15	**Lunch (45 minutes)**
	Finalise garden design and presentations (1 hour 30 minutes)
13.15 – 14.45	Teams come together to discuss their research and findings, and to put together their final garden designs and practice their presentations. (1 hour 30 minutes)
	Presentations & wrap up (1 hour)
14.45 – 15.15	Teams give their 5 minute presentations (15 - 30 minutes, depending on the number of teams presenting)
15.15 – 15.25	If you have registered for a CREST Discovery Award, ensure that students have time to complete their CREST Discovery passport in order to reflect on their work, and qualify for an Award (10 minutes)
15.25 – 15.30	Teachers provide constructive feedback about presentations, and congratulate students on a successful project (5 minutes)

General tips for role briefings

Role briefings are an opportunity to ensure that students understand their tasks and responsibilities during the challenge.

- Hold all role briefings at the same time
- Give out the team brief and copies of the role descriptions to students
- Invite suggestions and ideas from students
- Try *not* to tell the students what they should do
- Students may be reluctant to make suggestions at first, so be prepared to wait a few moments to allow them thinking time, then ask questions to get the ball rolling
- Put the practical activities into context during the briefing and explain them carefully – note that some managers will not be engaging in a practical activity during the challenge. However, you could create a suitable/relevant practical activity of your own if you wish.

Management roles | Notes for briefings

Use the notes below to brief the team on their roles and key areas of responsibility.

A. Project manager:

- Manages team members
- Resolve disagreements
- Gives encouragement and advice to team members
- Makes key decisions about the project
- Ensures there is an even distribution of workload - re-assigns team members where necessary
- Maintains the high standard of work produced by the team
- Takes the opinions of all team members into consideration
- Assigns team members into specific role responsibilities, where necessary.

B. Plant management:

- Liaises with all other management roles within team
- Researches garden design ideas
- Collects information about plants e.g. types (trees, shrubs, annuals & perennials), colours, size, time of year when flowering and any other relevant knowledge
- Decides on layout and planting for the garden
- Follows the theme agreed by team where appropriate
- Produces final garden design on paper for the team.

C. Soil management:

- Tests the soil sample provided in the breakout lab
- Identifies the soil type, pH and chalk content using the *OPAL Soil and Earthworm* survey guide. (Download and print the guide from: www.opalexplorenature.org/takingpart)
- Collates list of potential plants which could grow well
- Researches methods of improving soil quality (such as: composting, wormeries, digging techniques, drainage, fertilisers, ways to change the soil make-up)
- Liaises with all other management roles within team, particularly the plant managers, to suggest inclusion and location of plants, compost heaps, wormery etc.

D. Water management:

- Designs pond and advises Plant manager on location
- Liaises with all other management roles, especially for pond wildlife and building water features.
- Researches and recommends methods for maintaining the water supply to the plants and any water features
- May investigate local climate and annual rainfall
- Could recommend plants which thrive in drier or wetter conditions
- Carries out the slow-waterer problem-solving activity (see page 19).

E. Wildlife management:

- Main aim is to encourage wildlife into the garden
- Should begin by listing possible wildlife visitors to the garden (this will vary depending on the school's location)
- Should consider food, water and shelter
- Researches animal-friendly plants (particularly insect-pollinated flowers, which provide nectar and pollen)
- Finds out about what food particular animals might need
- Designs and makes either a one-way bee escape, an insect house, or bird feeders/nest boxes (see page 19)
- Liaises with all other management roles.

F. **Building management:**

- Designs all hard landscaping – e.g. fencing, walls, paths, shelters, seating, sheds, greenhouses, raised beds, outdoor barbecues, ornamental features etc.
- Researches materials which could be used – needs to bear in mind any requirements for the specific theme, such as eco-garden, recycling, carbon footprint or organic
- Assists with pond design and structure
- Researches lighting, where appropriate, and makes recommendations to Plant manager
- Liaises with all other management roles.

Tips for keeping students on track

http://www.youtube.com/watch?v=9_kU5H7HbiQ&list=PLycG4kuYXoz8LKAN1GytDstv5UiCHRzFH

- Adults are there as facilitators – students are encouraged to make their own decisions and direct the project themselves
- There are no right or wrong answers
- Occasionally project managers should bring their teams together to check on progress
- Don't give out answers too easily – direct students to where they could find out for themselves (e.g. the book list at the end of this document)
- Bring all teams together during late morning to explore collectively 'what makes a good presentation?'
- Ensure that all students are working in a positive learning environment and manage behaviour appropriately
- If you have registered your students for a CREST Discovery Award, remind them to record comments in their CREST Discovery Passports as appropriate.

Team presentations

http://www.youtube.com/watch?v=1SuPJMstHF8&list=PLycG4kuYXoz8LKAN1GytDstv5UiCHRzFH

- Each team should prepare a 5 minute presentation
- Encourage all team members to stand up with the team, even if not all speak
- Teams should decide which information they have collected is relevant and should be included in the presentation
- Other information not mentioned in their presentation should be included on their poster display
- Avoid using computer presentations unless supporting access – school networks can be unreliable and students can waste time on the appearance or saving/uploading, to the detriment of the content
- Teams should allow plenty of time beforehand to collate their presentation and rehearse
- In large halls, students may need a microphone so that the audience can hear clearly.

Plenary

- After the presentations, provide teams with feedback/constructive criticism and congratulate them on their endeavors – make sure what you say is encouraging and celebrates the teams' successes
- If your students have been registered for CREST Discovery Awards, make sure you allow time for students to complete their CREST Discovery Passports – 10 – 15 minutes at the end of the day
- Schools may decide to make this challenge competitive and award a prize.

After the day
- Celebrate your students' achievements!
- Have a discussion with the other teachers/adults supporting you about the students' engagement and contribution to their team's effort, based on observations during the event.

Achieving a CREST Discovery Award

If your students are aiming for a CREST Discovery Award, you will have been following the Teacher Guidance in Appendix 1 (page 10), using the assessment criteria to observe their progress throughout the project.

So what should you do next?
- If you are unsure if an individual student should receive a CREST Discovery Award, review their CREST Discovery Passports and consider whether they have met the assessment criteria (it is not intended that teachers review all CREST Discovery Passports after the event)
- Confirm the names of all students who complete the Passport and activities successfully with your CREST Local Coordinator
- Your CREST Local Coordinator will issue CREST Discovery Award certificates for all those confirmed by you.

Please note: *The process of issuing the CREST Discovery Award certificates needs to be clarified with your Local Coordinator before the day, so please speak with them regarding this process.*

If you have enjoyed the day:

- Make CREST Discovery days an annual event!
- CREST Discovery Award provides an ideal introduction to more conventional CREST project work (www.britishscienceassociation.org/crest)
- Encourage your STEM colleagues and students to engage in CREST Bronze projects. To get some free ideas, see www.britishscienceassociation.org/crestresources
- Your students can become free members of the CREST Alumni Network. They can register at www.britishscienceassociation.org/crestalumni to receive a regular newsletter with information about CREST and other STEM competitions, events and opportunities across the UK.

Appendix 1 | CREST Discovery Award

If you have registered your students for a CREST Discovery Award, you will be recognizing the skills that students will gain through participation in the day. To help with this, your CREST Local Coordinator will give you a CREST Discovery Passport for each student to complete.

Teachers should observe students individually throughout the day and record any information which could be used to provide evidence of students meeting the following assessment criteria:

Self-management
Readiness to accept responsibility, flexibility, effective time management, motivation to improve own performance; confidence when tackling tasks
Team-working
Respecting others' work and views, working collaboratively, negotiating/persuading, contributing positively to discussions
Problem-solving
Analysing facts and circumstances in order to apply creative (imaginative) approaches in developing realistic, innovative and original solutions
Research
Acquiring new knowledge relevant to the task and applying it appropriately
Communication
Following written and verbal instructions (the brief), talking and listening to other team members, producing a structured presentation which relates to the original brief and which reflects the creativity applied by the group during the day
Reflective practice
The ability to recognise: what knowledge and skills have been gained, where they could have worked more effectively, where they achieved/exceeded expectations.

Please note: If you do not wish to register for the full CREST Discovery Award you can still use these activities and resources on their own. Full registration means you will receive copies of the CREST Discovery Passport and individual certificates for the students.

CREST Discovery Passport

This is primarily intended as a self-reflection tool for students. Each student is assessed as an individual even when working within a team.
Teachers should remind students at regular intervals to add comments to their own Passports.
The Passports should be collected at the end of the day and may be used to confirm (or not) if a student has met the assessment criteria. This should only be needed if teachers have any concerns about the performance of particular individuals.
It is *not intended* that teachers must review all CREST Discovery Passports after the event.
If the student has met the assessment criteria, they can receive a CREST Discovery Award. Let your CREST Local Coordinator know the names of those that have achieved the Award and they will issue the certificates for them.

Pupil's guidance
Team brief & role descriptions

Team brief
Your team is asked to design a community garden

You must work together as a team to:

- Produce a final plan of the garden

- Include in your garden the listed requirements

- Write and deliver a 5 minute presentation.

You should think about:

- Using the individual strengths of your team members

- How you will research the information you will need

- How your team will cooperate with each other to complete the challenge.

Allocating roles

You will need to allocate one of these roles to each member of your team (with the *recommended number of people in brackets):

(1 x)   Project manager
(2 x)   Soil management
(3 x)   Plant management
(2 x)   Water management
(3 x)   Wildlife management
(2 x)   Building management

*For teams with fewer or more than 13 members, decide which are the most important roles and make sure there are enough members assigned to these roles.

Project manager

Your role is to:

Oversee the entire project and make sure that team members work together and share information. Take responsibility for meeting team deadlines

Details

- Attend project manager briefing

- Manage your team members to the best of their capabilities

- Resolve disagreements

- Give encouragement and advice to team members

- Make key decisions about the project

- Ensure there is an even distribution of workload - re-assign team members where necessary

- Maintain the high standard of work produced by your team

- Take the opinions of all team members into consideration

- Assign team members into specific role responsibilities, where necessary.

Team task

Your team **must** produce a presentation (approx. 5 mins) which includes:

- A final garden plan

- Details of the plants to be included in the garden

- The pond design - both from above and from the side to show the varying depths

- Explanations of how the water, soil, pests, wildlife, honey bees and hard landscaping would be managed in the garden

- A description of how the garden would be used to benefit the local community (as a place to meet; to grow vegetables/fruit/flowers to sell; to improve the local environment; somewhere to visit away from the hustle and bustle of everyday life?)

- Demonstrations of the one-way bee escape and slow waterer devised by your team.

Soil manager

Your role is to:

Determine the soil type and quality, research methods for improving soil quality and advise the plant management team

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Details

- Attend the soil management briefing

- Assess the quality of the soil in the community garden by testing a sample of soil from your garden:

    1. Measure the pH of your soil (remember to make sure you have done a fair test).

    2. Find out the type (e.g. sandy; loamy etc.) by following the key provided

    3. Is your soil chalky? Use the acetic acid provided to test some - what do you observe?

- Find out about the benefits and disadvantages of organic gardening. Present your findings to the team in a balanced argument, particularly involving the plant managers, water managers and wildlife managers, and come to a decision on whether your garden will be organic or not. Tell the project manager your decision

- Advise the plant managers about which plants might grow well in the garden

- Ask the plant managers about their soil requirements - do they need you to provide/change the soil type in some parts of the garden?

- Research ways to improve and maintain soil quality (e.g. digging methods; planting methods; composting; wormeries; fertilisers); How you decide to improve the soil quality will depend on whether your garden is organic or not.

- Check with the wildlife managers before making any changes to the soil quality and type - something you change might affect the wildlife which visits the garden

- Talk to the building managers about any landscaping requirements e.g. raised beds, plant pots/containers, fences and walls.

Plant manager

Your role is to:

Decide which plants you will grow (including vegetables/fruit for selling) and where they will be located within the garden. Lead the team in designing the garden

Details

- Attend the plant management briefing

- Decide on the type of plants which will be included in the garden (e.g. flowers, vegetables, shrubs, trees, wildflowers/native species)

- Take advice from the soil managers about soil type, so you can include in the community garden plants which would thrive

- Ask the soil managers about how you could grow plants which would not normally thrive in the garden's soil type, but which you want to include in the garden

- Talk to the wildlife managers about plants which support wildlife

- Find out about the plants you want to include (e.g. how long do they take to grow to full size, how big do they grow, how much space do they need, when do they flower?)

- Discuss the pond's design and location with the water managers

- Work closely with the building managers on the layout of the entire garden

- Work out the final layout of the garden and make a design on paper from above and from the side to show the varying depths.

Water manager

Your role is to:

Decide how will you maintain and manage the amount of water needed in the garden

Details

- Attend the water management briefing

- Supply the garden with all the water it needs

- Find out about the weather in your part of the country. What are the average temperatures and rainfall? Is there likely to be a shortage of water in the summer?

- Find ways to keep all the plants in the garden sufficiently watered, taking into account the variations in rainfall during the year. What will you do if there is a hosepipe ban?

- Provide the plant managers with information about water availability in the garden so they can make decisions about which plants to include

- Find out about buildings planned for the garden - can you make use of them to help with water conservation?

- Decide on the size, position and features of the pond which will be sited in the community garden

- Discuss with the wildlife managers how you can make the pond attractive to wildlife

- Ask the building managers to help you decide on the design, what materials to use and how to build the pond. When should the pond be built - time of year; stage of garden design?

- Provide the plant managers with drawings of your pond design (from above and also side-on). These drawings will be used in the final team presentation

- Investigate how to make a slow-waterer out of an empty plastic milk bottle - it must take a minimum of 4 hours to empty. Tell the project manager about your findings, and explain how this could be used in the garden.

Wildlife manager

Your role is to:

Make the garden as attractive as possible to wildlife

Details

- Attend the wildlife management briefing

- Find out which wild animals might visit your garden. This should include: mammals; insects; birds; amphibians; reptiles

- Research ways to attract wildlife into the community garden - remember that all animals need food, drink and shelter

- Research some strategies to support wildlife in the garden e.g. Which plants are best; where will the beehive be sited; will there be space for log-piles for insects and fungi? Pass on your suggestions to the plant managers

- Advise the water and building managers about the best types of pond design to attract wildlife

- Find out about the different species of bees which might visit the garden. Remember that not all bees live in large communities in beehives!

- Design and make a one-way bee escape so that a bee colony can be moved to a new beehive in a more suitable location within the garden

- Decide where to locate the new beehive in the community garden. Make sure that all visitors to the garden are protected and that the bees can come and go in peace. Ask the building managers to help you work out what is needed for the new location

- Recommend to the plant managers suitable plants to support the wildlife which you want to attract to your garden.

Building manager

Your role is to:

Decide what structures you will include (pathways, sheds, greenhouses, shelters, seats, walls & fences). Select and design any lighting to be included in the garden

Details

- Attend the building management briefing

- Find out from the project manager what the community garden will be used for, and who will be using it (e.g. families, children, disabled people)

- Discuss with the plant managers, soil managers and water managers what hard landscaping will be needed (paths, buildings, shelters, pond, walls & fences) to fit in with the use of the garden

- Design the hard landscaping - making sure your designs fit into the general garden plan or theme

- Check that any hard landscaping and buildings you choose will meet Health and Safety regulations e.g. playground equipment, building materials, paint and so on.

- Will you include any lighting in your garden?

- Talk to the wildlife managers about any structures they would like to include in the garden

- Work with the plant managers to agree where in the garden these structures will be sited

- Supply details of your designs to the project manager and those drawing up the plans for the community garden.

Practical activities explained

Health and Safety: Schools should conduct their own risk assessments on these activities to ensure their students' safety.

See the equipment list on page 21 for details on what equipment is needed for the activities

Soil managers | Soil testing

The task
Soil Managers should conduct tests on a sample of soil in the local area to find out:

- The soil pH
- The texture of the soil (you can use the Soil and Earthworm survey key for this)
- The chalk content
- What plants to recommend as suitable for this soil (pH preferences)

Soil pH
Add a small amount of water to a watch glass or test-tube containing soil, mix thoroughly, and test using Universal Indicator paper.

Soil texture
Download/print the OPAL soil and earthworm survey field guide from the OPAL website: www.opalexplorenature.org/takingpart. Roll some damp soil (about the same volume as an egg) in your hands and follow the key to decide upon the type of soil that is being used.

Chalk content
Add a few drops of distilled vinegar (can be from a sachet) to about 2p size of soil and record observations. If fizzing is observed, then the soil contains chalk (calcium carbonate).

pH preferences
Soil Managers can identify suitable plants for their garden using the pH preferences table.

Notes to teachers:
- *Soil pH test: More able students may decide to test the pH of the water used to make it a fair test*
- *Chalk content: More able students may appreciate that this is a neutralisation reaction and that the fizzing is due to the generation of carbon dioxide.*
- *Soil Managers should be encouraged to explore ways to modify or improve the soil in their garden, for the benefit of the plants.*

Water managers | The slow waterer problem

Slow waterers deliver a steady volume of water to specific plants, so that their roots are in a constant, moist environment. This allows the uptake of nutrients by the root hairs and promotes growth.

The task
Make a slow waterer that empties over the course of at least 4 hours. Use a clean plastic milk bottle (capacity of 2.27 litres or 4 pints), add pin-holes and test the flow of water to achieve the desired timing.

- Only one plastic bottle will be available, so this task must be carefully planned.
- Don't forget to plan how to test the slow waterer to prove it has met the objective – bearing in mind the bottle can't just be filled up and then left for 4 hours!
- Use a timer and measuring cylinder to work out if your design will work.

Notes to teachers
- Have spare bottles available out of sight in case they fail to solve the problem first time around
- Most students should be able to work out how to use a timer and measuring cylinder to see if their design will work, but some may need guidance
- More able students will realise that the flow rate will drop as the water level lowers, due to reduced pressure
- The smaller the pin-hole, the better. Students will find that a single hole, placed at the bottom of the bottle, will do the trick.

Wildlife managers | One-way bee escape

There is a colony of honey bees in a dead tree in the community garden. Although there may be up to 30,000 bees, they are protected by law and must not be killed.
As the community garden will be used by many people, the bees need to be moved to a new hive in a more suitable part of the garden, where they will not be near the human users.

The task
Wildlife managers are tasked with designing and constructing a one-way bee escape. These are devices which are used to move honey bees from unsuitable locations to a more suitable location nearby.

The design
The one-way escape is a tool for relocating bees. It is placed over the entrance to the colony and acts like a maze; the bees fly out of the tree, towards the light, but their way is blocked by the device. They gather in the device, and gradually find their way out via the narrow corridors which should be the width of one bee (to prevent them turning around and re-entering the tree).

When the bees return after gathering pollen, they are unable to find their way in to the colony. Eventually, they will seek out a new location and will move to the new beehive which would already be in place.
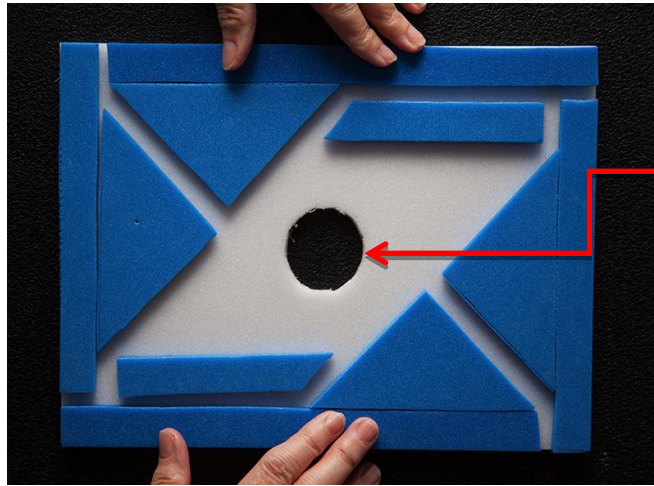
Bees exit the tree via this hole – they go towards the light

The device in the photograph was constructed from 2 A4 sheets of plastazote, but other materials such as thick card, corrugated plastic or thin plywood could be used. The transparent cover has been removed in the photograph, but remember that there should be a cover which allows light through, but not bees.

To find more designs for these devices, please visit:

www.dave-cushman.net/bee/vortexescape.html

Notes to teachers
Students should be encouraged to:
- Come up with their own designs, not just copy ones they find using internet searches
- Find out about bees (social structure, differences between honey bees and solitary bees)
- Appreciate the importance of bees in the environment.

Alternative suggestions for wildlife managers' activities
- Design and make an insect house using short lengths of hollowed out bamboo bound together (you can use a plant pot to hold them in a bundle)
- Design/make a bird feeder or nest box
- Design a feeding station for mammals
- Design/make a bat box.

Equipment and resources list

Equipment required for **each team**

For general working

- Ideally, **tables and chairs grouped together in a hall** with one breakout lab for the practical activities which involve water and soil
- Where possible, access to computers for research and some of the books from the suggested reading list (page 25).

For the soil testing activity

- Universal Indicator paper or pH probes
- Sample of local soil (not soaking wet, but doesn't have to be completely dry)
- Test tube for shaking soil and water mixture
- Water (both tap and distilled/de-ionised available if possible)
- Watch glass or shallow dish for chalk test
- Distilled vinegar (no more than 5mls) or vinegar sachet
- 2 disposable pipettes
- pH preferences sheet (page 23)
- OPAL soil and earthworm field guide (download from www.opalexplorenature.org/takingpart)
- *We recommend anti-bacterial hand wash is made available.*

For the slow-waterer activity

- 2 clean (empty) plastic milk bottles (2,27 litres/4 pints size)
- 1 measuring cylinder – 100ml + 1 measuring cylinder – 10ml
- Rectangular plastic tray (like those used in prep rooms for equipment storage)
- 1 stop clock/timer
- 1 filter funnel
- 1 calculator
- Selection of pins, needles & nails for making holes
- Paper for rough working.

For the one-way bee escape

- Scissors or craft knife
- Steel ruler for measuring and cutting out
- Cutting mat (optional)
- Circular template (e.g. 10p size or slightly larger) for the bee entry hole
- 2 A4 sheets of thick card, plastazote, corrugated plastic or equivalent material
- 1 A4 sheet of transparent material e.g. acetate for overhead projectors, or similar flexible material, to cover the device (optional, as long as students understand it *would* be there in practice)
- Double-sided sticky tape or glue stick to attach the cut-out shapes to the main sheet.

For general work and poster production

- Sticky labels to write names and roles on
- A range of stationery – scissors; pencils; pens; coloured pencils; felt pens for poster work; rulers; glue sticks; plain paper for planning, note-taking etc.
- Flip chart or other large sheets of paper for posters
- If you have any free-standing display boards, one per team would be very useful for collating/displaying the work. The board should be sited adjacent to the team tables.

For reference
pH preference chart & book list

pH preferences

Soil managers can this table as a guide to find the ideal soil pH to grow various fruit, vegetables and flowers in their community garden.

Vegetables	pH preference
Asparagus	6.0-6.8
Beans	6.0-7.5
Beetroot	6.0-6.8
Broccoli	6.0-6.8
Brussels sprout	6.0-7.5
Cabbage	6.0-6.8
Calabrese	6.5-7.5
Carrot	5.5-7.0
Cauliflower	5.5-7.5
Celery	6.0-7.0
Cucumber	5.5-6.8
Leek	6.0-8.0
Lettuce	6.0-7.0
Onion	6.0-7.0
Pea	5.5-6.8
Potato	5.0-6.8
Radish	6.0-7.0
Rhubarb	5.0-6.8
Spinach	6.0-7.5
Swede	5.5-7.0
Tomato	5.5-6.8

Flowers/Shrubs	
Azalea	4.5-6.0
Camellia	4.5-5.5
Carnation	6.0-7.5
Chrysanthemum	6.0-7.0
Clematis	5.5-7.0
Daffodil	6.0-6.5
Dahlia	6.0-7.5
Fuchsia	5.5-6.5
Fruit	
Blackberry	5.0-6.0
Blackcurrant	6.0-8.0
Gooseberry	5.0-6.5
Raspberry	5.0-6.8
Strawberry	5.0-7.5

Book List

Use the following book list to find out useful information and tips for the community garden.

Book title	Author	ISBN
Nature's Gardener - How to garden in the 21st Century	Matthew Wilson	978-1-84533-652-3
Complete Gardener's Manual	Royal Horticultural Society	978-1-4053-6583-3
Wildlife Gardening	Alan Titchmarsh	978-1-84-607409-7
The Bee Garden	Maureen Little	978-1-905862-59-7
Gardening for Wildlife	Adrian Thomas	978-1-4081-2230-3
Step-by-Step Veg Patch	Lucy Halsall	978-1-4093-8661-2
High Impact Low Carbon Gardening	Alice Bowe	978-0-88192-998-0
How to Create an Eco-Garden	John Walker	978-1-903141-89-2
The Wildlife Pond Handbook	Louise Bardsley	978-1-84517-141-4
Companion Planting	Bob Flowerdew	978-1-85626-931-5
Composting	Bob Flowerdew	978-1-85626-930-8
The Bee-Kind Garden	David Squire	978-0-85784-024-0
Beekeeping	Andrew Davies	978-1-84340-418-7
Ponds	Chris McLaren	978-1-905400-75-1
101 Ideas for a Wildlife-friendly garden	Michael Lavelle	978-1-846-07730-2
Concise Pond Wildlife Guide	The Wildlife Trusts	978-1-84773-977-3
Guide to the butterflies of Britain	FSC	978-1-85153-848-5
Guide to the 'top 50' garden birds	FSC	978-1-85153-279-7
Guide to bees of Britain	FSC	978-1-85153-230-8