



Unit 40: Zoological Horticulture

Delivery guidance

This is an internally assessed optional unit for learners studying the Level 3 International Diploma and Extended Diploma in Horticulture (720 and 1080 GLH). Learners will gain the underpinning knowledge and understanding required to investigate fully the horticultural practice that takes place in zoological exhibits. By the end of the unit, they will be able to produce exhibit designs and a plan for the use and maintenance of plants in a specific setting.

The unit will be delivered through a mixture of classroom-based activities such as group work, research and guest speakers, as well as visits to zoological exhibitions and/or collections for the benefit of seeing a range of exhibits and the horticultural displays within them. Practical sessions will enhance this unit, as they will give learners the opportunity to produce plans and drawings.

Approaching the unit

There are many career opportunities within the horticulture industry and whilst zoological horticulture is a contemporary subject area, studying it allows learners to understand the diversity within the industry. In addition to this, the challenging nature of the unit will produce invaluable knowledge and transferable skills.

Learning aim A

Learning aim A mainly focuses on the suitability of different plant species for use in zoological exhibits based upon their:

- attractiveness and tolerance to animals
- poisons and chemical defence methods
- toxicity and characteristics.

The delivery of this learning aim will take a variety of forms such as group work, discussion and employer engagement, including organised external visits, guest speakers and practical activities to consolidate and build upon the knowledge and understanding obtained in the classroom.

Learning aim B

Learning aim B provides learners with the opportunity to produce a planting design to create a sustainable environment for a zoological exhibition. Learners will be required to strike a balance between animal welfare and landscaping, including the necessary planting considerations, use of plants as food sources and exhibit enrichment. This will help learners to develop their management skills, as they will need to demonstrate that they can plan and manage the successful growth of zoological horticulture by analysing and considering a range of factors.

Learning aim C

Learning aim C is where learners will be required to produce a horticultural management plan for a zoological exhibit. They will need to show that they can manage plant stock, health and research strategies and projects for endangered plant species. It is critical that the management plans and drawings they develop are accurate for successful completion of the summative assessment.

Within this learning aim learners need to understand the legal and environmental issues affecting different plant species and the implication of these on the planning and production of zoological horticulture exhibits.

Assessment model

Learning aim	Key content areas	Recommended assessment approach
A Investigate the relationship between plants, animals and environmental factors in zoological exhibits	A1 Plant stress, avoidance and defence A2 Plant poisons and chemical defence A3 Toxic species and their characteristics	An evaluation of the impact of plant toxicity in zoological exhibits. Annotated planting design for a zoological exhibit and an evaluation of its suitability.
B Produce a planting design to create a suitable environment for a zoological exhibit	B1 Planting considerations B2 Amenity and exhibit landscaping B3 Plant materials for exhibits and exhibit enrichment	
C Produce a horticultural management plan for a zoological exhibit	C1 Managing plant stock C2 Managing plant health C3 Research, strategies and projects for endangered plant species	A management plan for an exhibit design, focusing on implementation of the design, continued management of the plant stock and the role of conservation.

Assessment guidance

This unit is an optional internally-assessed unit available for the Level 3 International Diploma and Extended Diploma in Horticulture (1080 GLH), which is assessed using a number of independent tasks. The recommended assessment approach suggests two different assignments that are outlined below.

The first assignment covers learning aims A and B and involves an evaluation of the impact of plant toxicity in zoological exhibits. In order to gather the evidence for this Learning aim, you can arrange for learners to visits to local zoological exhibits. This will allow learners to compare and contrast different exhibits that they will encounter in a working environment, including the differences in the management of horticultural planting within them. The first assignment also requires the successful completion of an annotated planting design for a zoological exhibit and an evaluation of its suitability. Learners can use the ideas they have seen whilst undertaking practical activities at the centre and/or visits to support their planting designs.

The second assessment covers learning aim C with learners required to produce a management plan for an exhibit design, focusing on implementation of the design, continued management of the plant stock and the role of conservation. In order to gather the research for this assessment, learners will be able to use the practical activities and offsite visits to a variety of zoological exhibits carried out whilst completing the previous learning aims. In addition, guest speakers can help by outlining the routine zoological horticulture practices that they currently use and implement in their working environment. For example, you could invite a draughtsman into the centre to demonstrate technical drawing techniques and show different drawing styles to learners.



Getting started

This provides you with a starting place for one way of delivering the unit, based on the recommended assessment approach in the specification.

Unit 40: Zoological Horticulture

Introduction

This unit provides learners with an understanding of the different ways in which horticulture can be utilised within zoological exhibits systems, including the advantages and disadvantages for animal welfare and plant health. Learners will gain a sound knowledge and understanding of all the species that are appropriate for horticultural planting purposes. They will also learn about the use of plants for zoological food production and environmental enrichment for zoo animal species.

Learning aim A: Investigate the relationship between plants, animals and environmental factors in zoological exhibits

- For learning aim A1, you could begin with a discussion establishing any prior learner knowledge followed by a presentation on abiotic and biotic plant stressors.
- Learners could work in small groups to research and produce mind maps of plant stress responses, including resistance, susceptibility and avoidance mechanisms, as well as tolerance levels of individual species.
- Learners could go out into the centre's own horticultural facilities and look at the different defence mechanisms of plants including: prickles, spines, trichome, colours, idioblasts and commensalism. This could be incorporated with an off-site visit to a horticultural/garden attraction where they could observe and compare the same defence mechanisms. This will allow them to see subtler and more elaborate examples of species that use these mechanisms.
- Facilitate a tutor-led discussion about chemical defence in plants and the effects of insects and other animals. You could split learners into small groups and allocate them with one each of the following:
 - simple phytotoxins
 - plant hepatotoxins
 - plant cardio/pulmonary toxins
 - plant neurotoxins.
- Learners could research their allocated topic and produce detailed factsheets, before presenting their factsheets to the rest of the class. The factsheets could be distributed to the class so all learners have a set of notes for future reference.
- For learning aim A2, you could facilitate a class discussion on the animal indicators to plant toxicity. Ask learners questions to check whether they are able to recognise when an animal has become exposed to toxicity.
- You could ask a guest speaker (e.g. a zoo keeper, a vet or veterinary nurse working with a zoo) to provide a talk about animal toxicity and how to recognise the signs and symptoms such as lethargy, vomiting and excessive salivation.
- As a formative assessment activity, learners should be given a worksheet with questions in order to establish that they understand how to recognise signs of toxicity in animals.
- You could deliver a presentation using images and diagrams of plants that illustrate the structure and function of potential toxic agents.
- You could organise a visit to a large-scale horticultural exhibit and speak to staff (if possible) about plant chemical defence methods, their purpose and the hazards that may be encountered when working with plants in zoological exhibits.

- Split learners into pairs and give each pair a different group of toxic agents, including alkaloids, aflatoxins, saps and saturated fatty acids, essential oils, sticky resins, glucosinolates, milky saps, acetylchlorine, serotonin, histamine, cyanides and soapy saponins. Learners should research their allocated toxic agent and create a presentation or facilitate a class discussion that uses the smartboard to capture feedback (e.g. an interactive mind map).
- For learning aim A3, you could begin with a class discussion to establish all the toxic plants that learners know and build on this to compile a comprehensive list. This should include the common name(s), Latin name, details about the poisonous parts, level of toxicity and effects on humans, animals or other plants. The list could be distributed to learners for future reference.
- You could carry out a matching activity where pieces of paper are placed on different tables with common and Latin names of various plant species. Learners can then go around the room and match them together, recording their answers and circulating the classroom until they have completed them all. At the end of the activity, you should clarify the pairs to ensure accuracy.
- Learners could work in pairs testing each other on matching the common name with the Latin name as an assessment preparation activity.
- In small groups, learners could provide different plants with a RAG rating (red, amber, green traffic light system) based on their levels of toxicity. Learners will rate the plants red (most toxic), amber or green (least toxic).
- Learners could complete a factsheet outlining all of the different plants that have toxic properties and the typical animals that would come into contact with them. This should include the plants' RAG rating along with the signs to recognise if animals have had contact with them.
- As a formative assessment activity, learners are to evaluate the impact of plant toxicity on using plants in zoological exhibits in preparation for their summative assessment for this learning aim.

Learning aim B: Produce a planting design to create a suitable environment for a zoological exhibit

- For learning aim B1, you could organise a visit to a zoo or animal collection/exhibit. Learners can observe, make notes and take photos for future use on exhibit design, maintenance, nutritional factors and accessibility. These notes are to be utilised in future sessions back in the classroom.
- You could deliver a presentation about the planting considerations required when collection planning, such as the size of the zoo and/or the enclosures, availability of staff to help plant and their horticultural knowledge, maintenance and the range of animal species within the zoo or animal collection/exhibit.
- Learners could get into pairs to produce factsheets about the care and maintenance of plant stock within zoo exhibits.
- To cover the topic of prioritising animal welfare when horticultural tasks impact on animal husbandry and welfare you could organise a practical activity using the centre's zoological exhibits (or, if not possible, arrange a visit to a zoological collection). Learners should look at how animal welfare needs to be maintained when planting and maintaining plant species, for example, the use of indoor and outdoor areas, the need to move animals, the timing of planting and maintenance; they should take photos for future use.
- Arrange a formative assessment by creating a quiz to check that learners have a sound knowledge and understanding of how to maintain animal welfare within a well-maintained planted zoological exhibit.
- Facilitate a tutor-led discussion about the environmental considerations that need to be taken into account when planting for the animals within exhibits, including:

temperature, humidity, lighting and ventilation. Discuss the impact that animal urine, faeces and food waste can have upon these.



- Learners could get into small groups to consider how to strike a balance between the requirements of animals and those of plant species. They could write up their thoughts in a mind map and feed back to the class.
- Facilitate a class discussion that analyses the photos of zoological exhibits that learners have collected on previous visits. Whilst looking at these photos, discuss how planting scheme considerations need to meet both visitor and animal requirements, including maximising the potential for animal viewing and the animals' desire for privacy and enrichment.
- Split learners into small groups and, using their own photos along with online-sourced images, ask them to consider the use of viewing windows and platforms and how they meet both animal and visitor requirements.
- Ask a guest speaker (e.g. a zoo keeper or member of grounds staff from a zoo) to give a talk about the eating of plants by animals in zoological exhibits, the maintenance of plants and frequency of access.
- Facilitate a class discussion on the quality of plant requirements for animal feed production and how the maintenance of these may differ from the maintenance of plants within zoological exhibits.
- You could deliver a presentation on the production of planting design plans and the importance of accuracy, scale and basic drawing skills and techniques. Learners could be provided with some planting design plans so that they can see how they are produced and what details are required.
- For learning aim B2, learners should work in small groups to consider the different areas of zoological exhibits including: indoor areas, outdoor areas, temperate and tropical environments, herbaceous and woody stock, lawns and meadows, hedges, trees and aquatic planting (both cold and tropical water).
- Learners are to be allocated a different animal species each, to research independently the types of zoological exhibit that would need to be produced to accommodate its habitat (e.g. arid, temperate forest, tropical forest, rainforest, arboreal, boreal, shrubland, wetland and meadow, savannah or grassland). Learners should present their findings in a class discussion.
- Facilitate a tutor-led discussion about the disposal methods of vegetation including composting, chipping and mulching and the use of these products within the zoological collection.
- For learning aim B3, you could organise a visit to the centre's zoo facility (or an external visit to a zoo) for learners to examine the growth and reproduction of plant stock including: general plant species for enrichment, general plant species for food, forage and herbs, aquatic species, species for specific enclosure design including large trees, large shrubs and large tropical species. It would also be beneficial to discuss the alternative ways that plant waste materials can be used (e.g. as mulch).
- As a formative assessment, learners should produce planting design plans in preparation for their assessment for learning aim B: an annotated planting design for a zoological exhibit and an evaluation of its suitability.

Learning aim C: Produce a horticultural management plan for a zoological exhibit

- For learning aim C1, you could deliver a presentation on the sourcing of plant species, including ethical sourcing and the consideration of the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES).
- You could organise a visit to a large-scale horticulture exhibit or invite a guest speaker to discuss national and international suppliers, transport logistics and the importance of maintaining plant health and requirements whilst in transit.
- In pairs, learners should research the costs of different plant species commonly used in zoological exhibits, either in the classroom or at a horticultural exhibit. They should look at the costing and ordering process and how to work with allocated budgets when planning and costing a horticultural management plan.

- Facilitate a tutor-led discussion on the importance of stock taking and taking action to ensure that plant supplies are readily available, including ordering timeframes and lead times.
- You could deliver a presentation about the legal requirements of the use of certain plant species including import and export documentation, plant passports and CITES paperwork.
- Learners could undertake a practical activity where they visit the centre's horticultural or zoological facilities (or an external visit to zoo or horticultural exhibit) to look at the requirements for storing and maintaining plants, including glasshouses, polytunnels and external housing.
- For learning aim C2, you could deliver a presentation on the legislation and regulations necessary regarding the use of plants in zoological exhibits, the plant health and seed inspectorate (PHSI), Animal and Plant Health Agency (APHA), Control on Import and Movement, plant quarantine requirements, plant controls, plant disposal, biosecurity, the use of fertilisers and the role of DEFRA, BIAZA and WAZA (see unit specification).
- For learning aim C3, you could facilitate a class discussion about the legislation regarding endangered plant species, including a recap of the role of CITES and different types of invasive plant species (i.e. EU Invasive Alien Species Regulation).
- In pairs, learners should research the use of endangered plant species in zoological exhibits. They could create a table outlining the advantages and disadvantages of using endangered plant species in this way.
- You could deliver a presentation about the current research into plant conservation and the role that zoos can play (e.g. whitebeam, Venus flytrap and butterwort). Learners could then create a poster on how effective plant management and the maintenance of plant health can be in supporting plant conservation strategies and projects.
- Facilitate a class discussion on the use of information boards to promote and communicate plant conservation in both a zoological setting and externally to the public.
- In small groups, learners could evaluate some examples of information boards, considering their effectiveness, their advantages and disadvantages and making recommendations to improve them before they feed back their findings to the class.
- As a formative assessment activity, learners should produce a plan of the management of the design plan produced previously. They should consider the techniques, level of maintenance required to maintain the health of the plant stock and the impact of conservation and research upon the design.



Details of links to other BTEC units and qualifications, and to other relevant units/qualifications

This unit links to:

- Unit 2: Estate Skills
- Unit 3: Understanding Environmental Management
- Unit 7: Work Experience in the Land-based Sectors
- Unit 27: Identification, Planting and Care of Plants
- Unit 28: Routine Plant Management
- Unit 33: Pests and Disease in Plants
- Unit 41: Wildlife Ecology and Conservation Management.

Resources

In addition to the resources listed below, publishers are likely to produce Pearson-endorsed textbooks that support this unit of the BTEC Internationals in Agriculture/Horticulture/Land-based subjects. Check the Pearson website (<http://qualifications.pearson.com/endorsed-resources>) for more information as titles achieve endorsement.

Textbooks

Smith A B, *Poisonous Plants of All Countries: With the Active, Chemical Principles Which They Contain and the Toxic Symptoms Produced by Each Group*, Forgotten Books, 2018 ISBN 9780266154525 – a useful textbook for identifying toxic plants and their toxic properties

Martin T and Clineff K, *The New Terrarium: Creating Beautiful Displays for Plants and Nature*, Broadway Books, 2009 ISBN 978 0307407313 – a useful textbook for understanding the range and creativity that can be applied in exhibits

Rees P, *An Introduction to Zoo Biology and Management*, Wiley Blackwell, 2011 ISBN 978 1405193504 – a useful textbook for seeing how plants can be used in zoo management

Websites

www.biaza.org.uk – The British and Irish Association of Zoos and Aquariums (BIAZA) – a useful website as it outlines standards within zoos and aquariums and allows for the sharing of information, training and education

www.waza.org – The World Association of Zoos and Aquariums (WAZA) – a useful website as it outlines global standards within zoos and aquariums and allows for the sharing of information, training and education

Pearson is not responsible for the content of any external internet sites. It is essential for tutors to preview each website before using it in class so as to ensure that the URL is still accurate, relevant and appropriate. We suggest that tutors bookmark useful websites and consider enabling students to access them through the school/college intranet.