

Teaching iThink Biology in your classroom

A guide to teaching the Figs chapter



iThink Biology is different from the types of science textbooks we are familiar within India. The content, organization and features of the e-book have been developed with different objectives in mind. We hope that the chapter-wise guides prepared by the iThink Biology team will help a teacher make the best use of the resource in their learning spaces. The following text is a guide to teaching the Figs chapter. Please read through the section on how to read [iThink Biology](#) before using this resource.

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Introductory notes

- The book has been written in an informal and conversational style of English and important or difficult concepts have been linked to the glossary or elaborated in detail within the text.
- The book is hosted on a website (ithinkbiology.in), so the reader will require a computer, mobile or tablet to access it. An internet connection will be required to access the different pages of the website, as well as the different interactive features of the book such as weblinks, glossary terms, video interviews, and downloadable research papers.
- Several exercises in the book may require students to step out of their classroom and observe their surroundings, such as a city area, water bodies or a garden. The possibility of such an engagement can be important to meet the learning objectives of the book.

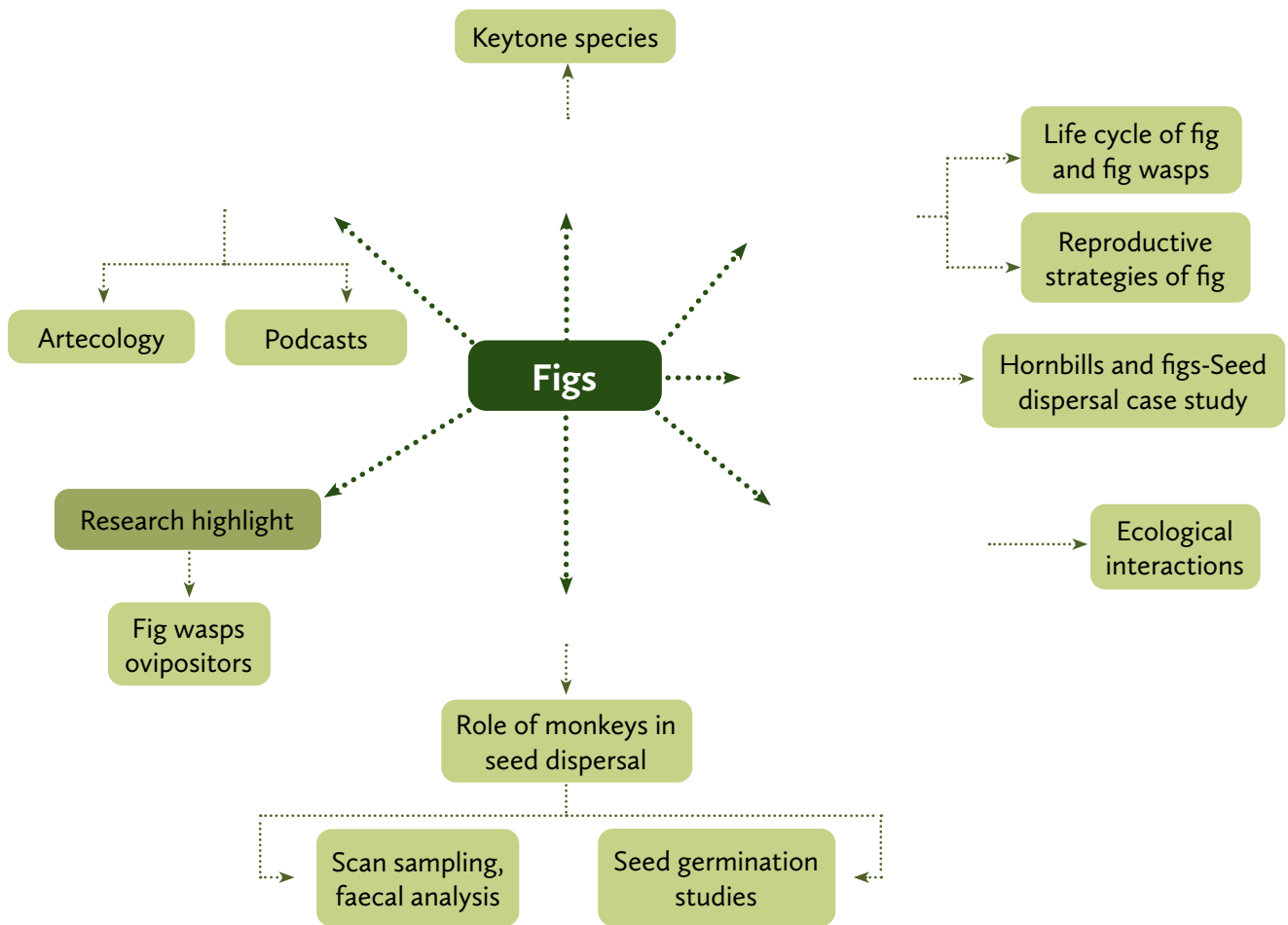
Content Mapping

This table will help you map parts of your syllabus to the content and capacity-building approach in iThinkBiology.

In the first column, you will find units and topics from your syllabus and the subsequent columns contain the sections, subsections and concepts from our book iThinkBiology. By using this table, you can easily identify the relevant concepts from the book that align with your syllabus.

Existing syllabi	Corresponding Topics in iThink Biology			
Subject, Topic	Headings/ Sections	Subsection	Concepts explored	Capacities
Ecology , phytogeography, keystone species, Taxonomy , inflorescence	Introduction	Why are figs considered important?	Scientific and cultural aspects	Bridging science, society and the environment
		Distribution of figs in India	What decides species distribution?	Reading and Interpreting
Ecology , Population interactions, reproductive life cycles, structure of fig syconium	Biology of the fig and fig wasp	Fig – wasp life cycle	Mutualism, sequence of events in the fig wasp life cycle	Reading and Interpreting
		Reproductive strategies of figs	Monoecious and dioecious syconia	Reading and Interpreting
Hornbills and figs		Seed dispersal, case study by Kannan and James	Scientific process	
Challenges associated with accessing the syconium		Microcosm, ecological interactions (competition, mutualism, predation, parasitism), fig wasp ovipositor: structure and adaptations	Reading and Interpreting	
Ecology , seed dispersal Research Methodology , Research Design	Are fig eaters effective seed dispersers?	How is seed dispersal studied?	Role of rhesus macaque in seed dispersal, scan sampling, faecal analysis	Scientific tools
		Findings of the study	Seed germination studies	
Ecology , Population interactions. Biology of Insects , Insect Plant Interaction	Science communication	Communicating science through performing art	Artecology, using art, music, dance or theatre to communicate science	Bridging science, society and the environment
		Breaking barriers through podcasts	Audio episodes based on a theme; Podcast ‘Janasuddi’	Bridging science, society and the environment

Concepts introduced in the chapter



Capacities developed in this chapter

You will notice that every chapter has a set of questions appearing at the beginning of the chapter. These describe the content (indicated by the questions) related to the capacity (indicated by the icon).

In this guide, we have followed different subsections from the iThink Biology book. We have suggested different activities that are focused on teaching different concepts given in the chapter. We have added two annexures to this guide. Annexure-I has three worksheets that teachers can provide to students to record observations for different suggested activities. Annexure II has a suggested project that students can do for their dissertations or assignments.

CAPACITIES TAUGHT IN THIS CHAPTER



What are the characteristics of a fig?
How does a syconium function as a closed ecosystem?



Why are figs considered a keystone species?



How do we investigate the effectiveness of seed dispersers?



How can we use the arts to communicate science?

Notes for Instructors

In this document, we provide some suggestions for instructors on how to get students to engage with the critical thinking questions that are present throughout the chapter. We have provided the answers, suggested activities and learning objectives for each critical thinking question. It would be ideal to use these questions along with the book chapter but do adopt these questions and activities to related topics in your curriculum. We hope that this document encourages you to create similar critical thinking questions for the concepts in your course syllabus.

In our experience, there is much value in group work conducted between students. If a student can be accompanied by even one other student while attempting some of the exercises, it will make a difference to their learning experience.

If you do conduct these exercises in groups, ensure that the group sizes are not too large (not more than 5 students per group) so that all the students participate in the discussions. Students tend to be curious, but having a few pre-prepared questions and hints to promote conversation in groups might be helpful. A wrap-up discussion to combine and connect the individual group learnings is essential to ensure learning objectives are achieved. Do keep some extra time while conducting group work since they tend to run longer than the time estimated.

D2.1 Introduction and Distribution of figs

Bridging science, society and the environment

Question

What do you know about figs? Make a list of things you know about figs. Your points can be related to your experience of figs in everyday life, or they can be biological facts.

Hint

Learn about fig trees from your surroundings.

Answer: There is no right or wrong answer to this question. Students will use their previous knowledge to make a list about figs.

Suggested Activity

Suggested time - 30 mins.

Divide the class into groups (3-5 students in each group, depending on the strength of the class). Ask each group to explore if they have seen any fig trees in their vicinity. Students are most likely to be familiar with peepal or banyan trees. Each student can make a list of the things they already know about fig trees.

One student from each group can share the collective knowledge of the group with others in the class.

Some questions and responses are provided here for teachers' reference.

Teachers can provide **worksheet-1** given in **annexure I** to students to write their responses; they can also add more items to the list.

Table -1: List of questions about fig trees

Questions	Responses
How many fig trees have you seen in your neighbourhood?	Students have most likely seen banyan and peepal trees in their neighbourhood. Some students might know about more fig trees.
List all the fig species you know.	Banyan (<i>Ficus benghalensis</i>) and Peepal (<i>Ficus religiosa</i>). Students can add more to the list. These two are the most commonly found fig trees.
How old do you think the tree is? (How would you estimate?)	Students can guess answers to this question based on the trees they have seen around them.
Think and write about the structure of roots that you have seen in any fig trees around you.	In the banyan tree, aerial roots are present. These roots arise from the branches of the plants and go downwards towards the soil. These provide extra mechanical support to the tree.
Have you ever seen fig flowering? (What kind of flower does it have?)	Fig trees do not have blossoms. They have a unique inflorescence called syconium, which harbours many small flowers inside.
Do you know how it is pollinated?	Figs are pollinated by tiny fig wasps. Each wasp species is specific to the fig species it pollinates.
Have you eaten its fruits? (Type of fruit/Taste/texture)	Fig fruits are eaten fresh as well as dried. Fresh fruits have a sweet taste and have many seeds inside giving them a crunchy texture. Dried fruit is also known as 'anjeer'.
Are there any medicinal uses?	Fig fruits have shown medicinal properties. They have good fibre content and are rich in calcium and potassium.
What is the cultural significance of figs in your community?	The peepal tree is worshipped in many communities in India. The living root bridges of Meghalaya demonstrate deep knowledge of the Khasi people about fig trees.
Do you know any economic importance of figs?	Fig fruits are eaten. Various parts of the plant are used as home remedies for different ailments. Figs have both traditional and medicinal importance around the world.

What does this question make students do?

This will open a discussion in the classroom. Students will learn the importance of figs. They will be able to relate prior knowledge with scientific explanations.

Scientific Process**Question**

Why do some fig species have a wide distribution and others don't?

Hint

Distribution of species in a particular area depends on abiotic and biotic factors.

Answer: The distribution of species is dependent on the interactions between biotic and abiotic factors. Abiotic factors include climatic conditions such as temperature, air, water, soil, light, nutrient availability, etc., and biotic factors include interactions among organisms, such as predation, mutualism, and competition. The availability of pollinators and seed dispersers also determines species distribution. One of the major reasons for endemism is the presence of physical barriers such as mountains, water body, deserts etc. which prevents the seed dispersal of a species. The geographical isolation can lead to allopatric speciation.

To read more about speciation, refer to this [link](#).

Bear in mind that time scales are different for speciation vs. a species establishing itself in a particular region.

Suggested Activity

Suggested time: 1.5 hours

The teacher can use table- 2 given below to educate students on the distribution of common fig species found in India. For each fig species, images are also provided. The teacher will focus on the distribution of figs, and how some fig species are widespread in India while others are endemic.

Table -2: Common fig trees of India and their distribution

Scientific names	Common names	Growth form	Distribution
<i>Ficus religiosa</i>	Sacred fig/ Peepal tree	Strangler fig	Wild in sub-Himalayan regions, cultivated elsewhere
<i>Ficus benghalensis</i>	Banyan tree	Strangler fig	Wild in sub-Himalayan regions and Andamans, cultivated elsewhere
<i>Ficus virens</i>	White fig	Strangler fig	Throughout up to 1700 m
<i>Ficus elastica</i>	Indian rubber tree	Strangler fig	North-east India, cultivated elsewhere
<i>Ficus racemosa</i>	Cluster fig	Tree	Throughout
<i>Ficus carica</i>	Indian fig	Small tree or large shrub	Cultivated throughout
<i>Ficus pumila</i>	Creeping or climbing fig	Liana	Cultivated
<i>Ficus microcarpa</i>	Chinese banyan	Tree	Northeast, Peninsular region, Punjab, Rajasthan, Andamans
<i>Ficus andamanica</i>	-	Tree	Endemic to Andamans
<i>Ficus arnottiana</i>	Indian rock fig	Tree	Endemic to Tamil Nadu
<i>Ficus benjamina</i>	Weeping fig	Tree/ houseplant	Cultivated throughout
<i>Ficus lyrata</i>	Fiddle-Leaf Fig	Tree/ houseplant	Cultivated



Ficus religiosa
AJT Johnsigh, [Wikimedia commons](#), CC-BY-SA 4.0



Ficus benghalensis
Delonix, [Wikimedia commons](#), CC-BY-SA 3.0



Ficus virens
AJT Johnsigh, [Wikimedia commons](#), CC-BY-SA 4.0



Ficus racemosa
AJT Johnsigh, [Wikimedia commons](#), CC-BY-SA 4.0



Ficus carica
Juan Emilio Prades Bel, [Wikimedia commons](#),
CC-BY-SA 4.0



Ficus elastica
Prodewald, [Wikimedia commons](#), public domain



Ficus pumila
Mokkie, [Wikimedia commons](#), CC-BY-SA 4.0



Ficus microcarpa
Shihchuan, [Wikimedia commons](#), CC-BY-SA 2.0



Ficus andamanica
[RBG Kew](#), CC BY 3.0



Ficus arnottiana
[India Biodiversity Portal](#), CC-BY 4.0



Ficus benjamina
Vinayaraj, [Wikimedia commons](#),
CC-BY-SA-4.0



Ficus lyrata
Mokkie, [Wikimedia commons](#),
CC-BY-SA-3.0

After teaching students about the distribution of figs, teachers can hold a discussion in the classroom about species distribution, endemism, and conservation.

The teacher can provide more examples of endemic species. Some examples are:

- Indian giant squirrel - India
- Giant Pandas - China
- Asiatic Lion - Gir Forest National Park, Gujarat
- Lion-Tailed Macaque - Western Ghats
- Purple Frog - Western Ghats

For this discussion, students will be divided into groups of five. Each group will be given a question to brainstorm and discuss. Students will be given 20 mins to brainstorm together. The teacher can use the following questions for discussion.

Note: this is not a debate, the goal of the discussion is to learn together.

1. Can a species extend its geographical distribution? If so, how?

Hint:

- Think in terms of the formation or removal of a barrier.
- Introduction of a species to a new geographical area.
- Example: Rock pigeons used to reside in crevices of rocks. Now, they are widespread, settling in urban areas as well.

2. What will be the effect of disturbances on widespread and endemic species?

Hint:

- Endemics are most vulnerable to habitat destruction.
- Habitat destruction of an endemic species reduces population and makes it more vulnerable to extinction.
- Example - Asiatic lions are restricted to India, they are endangered due to poaching and habitat loss. The Indian government launched the 'Asiatic Lion Reintroduction Project' to protect them from extinction.

3. Which Indian fig species are endangered and why?

Hint:

- *Ficus andamanica* is endemic to the Andaman Islands.
- It is endangered due to habitat loss.

4. How can we protect endemic species?

Hint:

- We can protect endemic species by increasing public awareness, creating protected areas and captive breeding.
- We can also increase the habitat range of the endemic species.

5. Is it a good idea to reintroduce a new species? What should be kept in mind while re-introducing a species?**Hint:**

- Species are reintroduced to re-establish themselves in their natural ranges from where they have been lost.
- While reintroducing a species, identify any current and potential future threats that the species may face.
- It is crucial that species has a suitable habitat, ensuring it can survive beyond captivity. It is also important to keep in mind how the introduced species interacts with existing species, including predator-prey interactions.

6. How is species re-introduction different for plants and animals?**Hint:**

- To reintroduce a plant to a new habitat, make sure it can thrive in the new habitat. Availability of plant's pollinator is crucial, if the plant is dependent on a biotic agency for pollination.
- In case of animals, the selected area must be protected area, and it must be large enough for animals to move freely.
- Re-introduction is successful when a species can reproduce and establish itself in the habitat.

7. How do time scales differ for speciation and species distribution?**Hint:**

- Speciation is an evolutionary process in which a species splits into new distinct species. It can take a few decades to thousands of years.
- Species distribution is the spatial arrangement of different species. If conditions of habitat are suitable for a species to grow and reproduce, it can establish itself in the area smoothly.
- The changes in geographical distribution can happen much faster than speciation.

Suggested reading:

Students can learn further about the case of Kuno Wildlife Sanctuary, Madhya Pradesh, where African cheetahs have been reintroduced from Namibia.

Here are recommended links to learn more about it:

Suggested reading: <https://www.conservationindia.org/articles/finding-refuge-in-india-the-relocation-of-asiatic-lions-or-african-cheetahs>

Suggested podcast: <https://www.spreaker.com/user/14859220/the-unanswered-questions-about-the-cheet>

Teacher will conclude the class by answering the questions of students and giving them a brief about species conservation using the hints given above.

What does this question make students do?

Students will learn what governs the distribution of different species. They will learn about endemism, endangered species, and their conservation.

D2.2 Biology of the fig and fig wasp

D2.4 The syconium as a closed ecosystem

Note: We have combined the activities for topics D2.2 and D2.4 to provide a cohesive understanding of the related topics.

D2.3 has a separate activity which will appear next.

Scientific Process, Reading and Interpreting

Question

Differentiate between male and female flowers in the syconium. What are the different organisms found inside the syconium?

Hint

Cut open and study the syconium in detail. Inside the syconium, you may find its pollinators, nematodes and other insects (study them carefully).

Suggested Activity

Suggested time: 2 classes

We have divided this activity into two parts. This activity can take place in two classes. In the first class, students will study the syconia of fig in detail.

Part 1. Students will collect the fig fruits from nearby areas (or the teacher can procure the fruits for students). One group can also buy figs from the market as a control to see if they find any insects.

Students will examine the morphology of the fruit and look at the structure of the ostiole. Then, figs will be cut in half using a scalpel and studied under a dissection microscope.

Material required: figs, scalpel, dissecting microscope, petri dishes, slides, worksheet, pen/pencil.

Students will observe and document the following:

- Different types of flowers in the syconium.
- Male and female wasps (try to distinguish between the two).
- Other insects/ organisms found in the syconia.

Students will draw the structure of male and female flowers, along with all the insects they find inside the syconium. They will also draw the life cycle of the fig and fig wasp. Students will observe and write their own responses.

A worksheet is provided here for the reference of teachers which can be used to compare students' responses. The teacher can provide worksheet-2 given in annexure I to students to write their observations.

Remember - there are high chances that the control group will not find any insects inside the syconia.

Note: Don't be discouraged if the inside of syconium looks crowded and messy, be patient and try to look for different types of flowers and organisms.

Table -3: Fig flowers and insects found inside the syconium

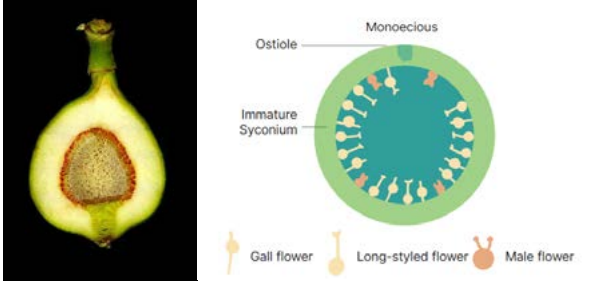







Fig parts and organisms	Description	Image
Syconium (Fig inflorescence)	<ul style="list-style-type: none"> • Urn-shaped receptacle • Small opening called ostiole • Has a cluster of tiny male and female flowers 	 <p>a. Gubin Olexander, Wikimedia Commons, CC BY-SA 4.0</p>
Long-styled female flower	<ul style="list-style-type: none"> • Sepals - 3 to 4 • Funnel-shaped stigma • Long style present • Produce seeds 	 <p>@E.M. Collins, 2001</p>
Gall flower	<ul style="list-style-type: none"> • Sepals - 3 to 4 • Short style present • Harbour fig wasps 	 <p>@E.M. Collins, 2001</p>
Male flower	<ul style="list-style-type: none"> • Sepals - 3 to 4 • Two stamens present • Present near the ostiole 	 <p>@E.M. Collins, 2001</p>

Fig parts and organisms	Description	Image
Male wasp	<ul style="list-style-type: none"> • Wings are absent • Do not have ovipositors • Underdeveloped eye structure 	 <p>a. Alandmanson, Wikimedia Commons, CC BY 4.0 b. Tzeng HY et al., 2006</p>
Female wasp	<ul style="list-style-type: none"> • Wings are present • Ovipositor is present to lay eggs • Well developed compound eye 	 <p>a. Alandmanson, Wikimedia Commons, CC BY 4.0 b. Van Goor J. et al., 2021</p>
Nematodes	<ul style="list-style-type: none"> • Roundworm • Parasitic in nature • Infects pollinating fig wasps and non-pollinating fig wasps 	 <p>a. Vyzhdova V, Wikimedia Commons, CC BY 4.0 b. Van Goor J. et al., 2021</p>
Parasitoid wasp	<ul style="list-style-type: none"> • Long needle-like ovipositors • Inject eggs into the syconium from outside • They grow inside the syconium 	 <p>a. Nikhil More, Wikimedia commons, CC-BY-SA 4.0. b. Van Goor J. et al., 2021</p>
Other insects/organisms		

Some questions to think about:

- The female fig wasp that pollinates the syconia dies inside it, what happens to her body?
- The male fig wasps that are born in the syconia die inside it. Do we consume their dead bodies while eating the fruit?
- Are there any figs that grow without pollination by wasps?

Mind/interaction map

A syconium is in itself a micro-world where many organisms are living and interacting. Fig and

fig wasps show a mutualistic relationship. However, non-pollinator species will have a negative interaction with the fig as well as the fig wasp.

Students will further make a mind map of interactions among all the organisms found in the syconium they are studying.

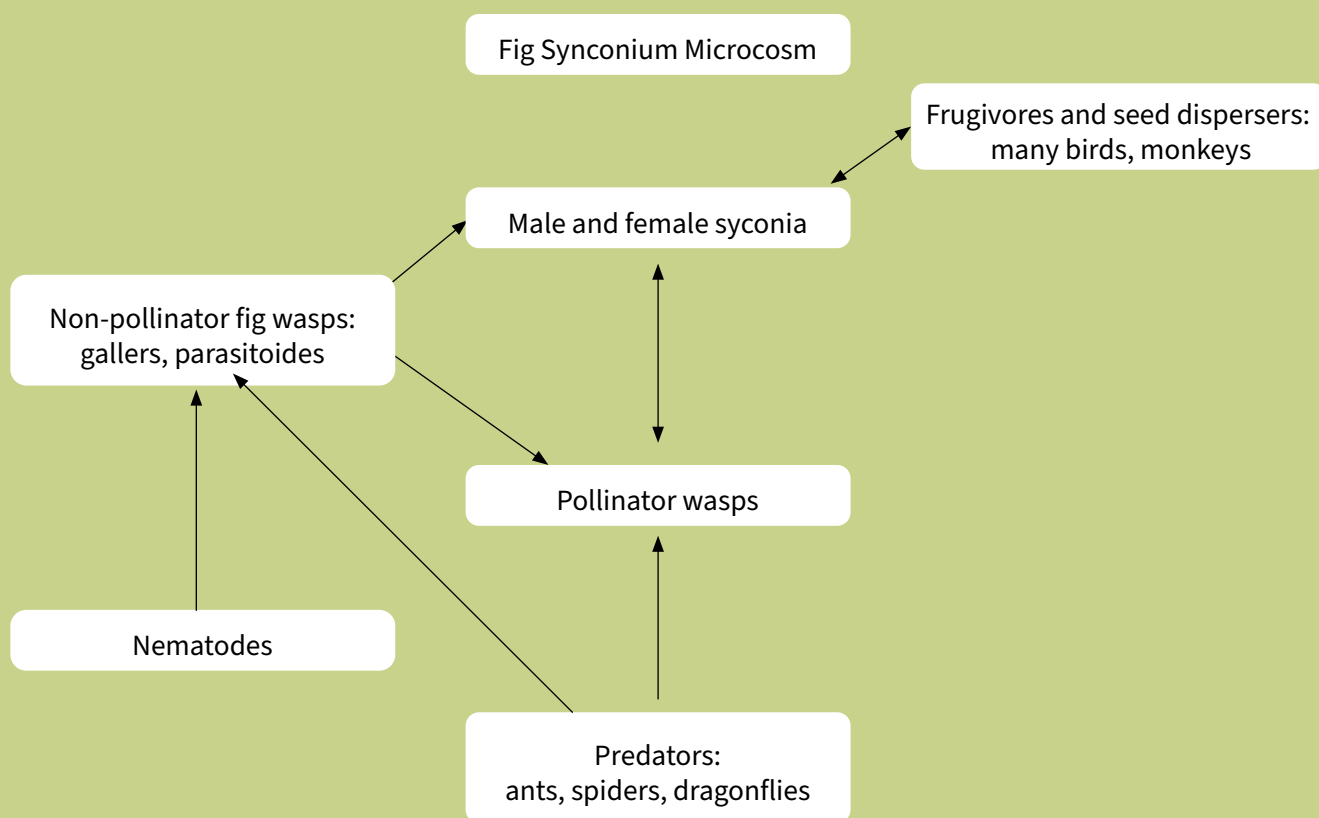
Teachers can refer to exercise D2.3 given in the figs chapter in the book.

Here is the link to the [exercise](#)

Different interactions are summarised in the table below:

Organism 1	Organism 2	Interaction
Syconia	Fig wasp	Mutualism
Syconia	Seed dispersers	Mutualism
Fig wasp	Parasitoid wasp	Parasitism/ Competition
Spiders/ ants/ dragonflies	Fig wasp	Predation
Parasitoid larvae	Fig wasp's larvae	Parasitism
Syconia	Gall-inducing wasps	Parasitism

Mind map of the fig syconium microcosm



Teachers can use this mind map to compare with students' responses.

After studying the syconia in detail and understanding the different interactions in it, the teacher will ask students to come prepared for the next class. For the next class, students will form groups to study different organisms associated with the syconia. More details are given below.

Suggested video:

<https://www.youtube.com/watch?v=xy86ak2fQJM>

We highly recommend teachers and students to watch this video about figs. This will help students to appreciate a fig tree and its importance. It will invoke a sense of wonder in students and they will learn about the intricate relationships found in nature among different organisms. They will also understand how much life a fig tree can sustain.

- We showed this video in our classroom and asked the students to create an interaction map while watching the video. They used arrows to show relationships of different organisms with the fig tree and among each other. Here is one of the interaction maps created by one of our students in the classroom.



Suggested Activity

Part 2. From the previous activity, students gained an understanding of different interactions in a small syconium. Students were able to appreciate the 'syconium as a micro-world.'

For this activity, students will form a group of five. From each group, one student will be representative of the group. Each student will act as the organism found in the syconium and talk about their contribution to the figs and try to push for their advantage.

Suggested time: *this activity will take one class and students will come prepared for it.*

Group 1 - Fig wasp

Group 2 - Parasitoid wasps

Group 3 - Parasitic wasps

Group 4 - Small worms/ nematodes

Group 5 - Seed dispersers

Group 6 - Predators

Group 7- Humans

Each group will be given 5 minutes to make their statements. One group will be assigned to ask a question from the presenting group. For example, group 7 can ask questions from group 1, group 6 can ask questions from group 2, and so on.

After the meeting, students will be able to recognise how one syconium is able to sustain many lives.

In the end, the teacher will wrap up the session by summarising all the interactions found in the syconia.

What does this question make students do?

Students will be able to recognise that fig syconium is an ecosystem of its own. Many species are taking advantage of the flower and wasps.

D2.3 Studying figs as a keystone species

Scientific Process, Quantitative skills

Question

What are the different research questions students can ask to understand figs as a keystone species?

Suggested Activity

For this activity, students will formulate their own hypotheses and experiments that they can conduct. Teachers can refer to the subsection '[science process](#)' from the Western Ghats.

Note: students are not required to conduct the experiments. They are only required to formulate their questions, hypotheses, and experiments.

Some questions are given below as examples:

How much life is supported by a fig tree?

How can you estimate the number of fruits produced by a fig tree?

What are the different factors affecting the abundance of fruits?

If a fig tree is removed from its area, how many organisms will be affected?

What does this question make students do?

Students will learn how to ask questions. They will be able to design scientific experiments.

D2.5 Are fig eaters effective seed dispersers?

Scientific Process

Question

How would you find out what kind of birds feed on fig fruits?

Hint

Think of the kind and number of observations you would make.

Suggested Activity

To understand which fruits are preferred by birds, students need to observe a fig tree. In this activity, we suggest that a student visit a fig tree twice within one week. Each visit should at least last 15 minutes with one visit in the morning and one in the evening.

Students should note down the date, time, location (using GPS) and weather conditions of the area that they visit.

Students can ask the following questions:

- What are the different types of birds visiting the tree?
- Do the same birds visit the tree in both morning and evening? And when do they visit more?
- Are all birds feeding on fig fruits?
- Are there any birds nesting on the tree?
- How much fruit does a bird eat in one visit?
- Do bats visit the tree during the evening?
- What other organisms are visiting the tree? (Such as monkeys).

We have provided Worksheet-3 in annexure I for students to record their observations.

What does this question make students do?

Students will learn the skills of observation. This question will help students to learn the diets of different birds and food availability.

D2.6 Science communication

Bridging science, society and the environment

Along with reading, learning, and working in the laboratory, it is important to learn the art of communicating science.

Suggested Activity

1. You are taking a walk around your place with your 10-year-old cousin. You come across a fig tree loaded with syconia. Your cousin asks you if he can eat fruit from this plant. He further asks what the flowers look like on this tree before they form fruits. How will you explain fig trees to a 10-year-old?
2. You can ask students to create a 5-minute video on '**appreciating the complexity of figs**' for the college's social media page. The video should avoid technical jargon.
3. Students can write an article for their college's magazine on '**Figs-a keystone species.**' Make sure that the article is written in simplified language for the general audience to understand. Avoid the usage of technical jargon.

Note: Topics given for the video and article above are only suggestions. Students are free to come up with their own ideas.

What does this question make students do?

This activity will help the students to learn the art of communicating science to a wider audience.

Takeaway:

- Students should be able to appreciate fig trees.
- They should be able to understand the complexity of figs and their importance in the whole ecosystem.

Annotated Papers – Research Highlights

Many chapters in iThink Biology include a [Research Highlight](#). These research highlights give the reader an introduction to a scientific journal article, and at the end allow students to download an annotated PDF of the article. The annotations are meant to clarify difficult concepts or jargon, and they also point to conventions that scientists follow in publications that a beginner may not be familiar with.

All these papers are based on work that has been done in India.

In the Figs chapter, the research highlight includes a publication that investigated the relationship between the structure of ovipositor of the fig wasp and the stage of fig fruit development at which the egg is laid.

This exercise is extremely useful in training students to read primary literature. Follow this [link](#) on suggested steps to use the annotated paper.

Annexure-I

Worksheet - 1

Use your prior knowledge about fig trees to fill this worksheet. This should not take more than 15 minutes.

Questions	Responses
How many fig trees have you seen in your neighbourhood?	
List all the fig species you know.	
How old do you think the tree is? (How would you estimate?)	
Think and write about the structure of roots you have seen in any fig trees around you.	
Have you ever seen fig flowering? (What kind of flower does it have?)	
Do you know how it is pollinated?	
Have you eaten its fruits? (Type of fruit/Taste/texture)	
Are there any medicinal uses?	
What is the cultural significance of figs in your community?	
Do you know any economic importance of figs?	

Worksheet - 2

Record your observations after cutting open the syconia.

Material required: figs, scalpel, dissecting microscope, Petri dishes, slides, worksheet, pen/pencil

	Description	Image
Syconium (fig inflorescence)		
Long-styled female flower		
Gall flower		
Male flower		
Male wasp		
Female wasp		
Nematodes		
Parasitoid wasp		
Other insects		

Worksheet - 3

Find a fig tree in a nearby area. Visit this tree twice within a week. In one day, visit the tree in both morning and evening for 15 minutes. Sit patiently, enjoy nature, and record your observations.

Materials required: a fig tree, pen/pencil, worksheet

Date: _____

Time: _____

Location: _____

Weather: _____

We have created a single worksheet to answer the following questions. A single worksheet will be easier for you to handle and record your observations. You can also alter the worksheet to address more questions.

The given worksheet addresses the following questions:

- What are the different types of birds visiting the tree?
- Do the same birds visit the tree in both morning and evening?
And when do they visit more?
- Are all birds feeding on fig fruits?
- Are there any birds nesting on the tree?
- How much fruit does a bird eat in one visit?
- Do bats visit the tree during the evening?
- What other organisms are visiting the tree? (Such as monkeys).

Notes:

- **For morphology**, you don't need to know the exact size of the bird; an approximation is fine. You can also write small or large.
- **No. of fruits eaten:** You don't need to know the exact number of fruits eaten. An estimate is fine.
- **Name of the bird:** You are not supposed to know the names of all the birds. But with the morphology, you can try to find out the name of the bird. *(This activity helps you gain observational skills.)*
- If you have binoculars, we encourage you to use them for this activity.
- You can also click images of the birds, if possible.

Total number of different species visited the tree - _____

S.No.	No. of individuals visited	Morphology			Behaviour					Time of visit (Morning/ evening)	No. of fruits eaten	Species name	
		Colour	Size (Approx.)	Any other feature	Resting	Preening	Eating	Nesting	Any other activity				
Species 1													
Species 2													
Species 3													
Species 4													
<p>During the evening, do any bats visit? If yes, record their behaviour - _____</p>													
<p>What other organisms are visiting the tree? Record their behaviour.</p> <ol style="list-style-type: none"> 1. _____ 2. _____ 3. _____ 													



Annexure-II

Suggested Project

Aim: To prepare herbarium specimens of different fig species.

Herbarium: A herbarium is a collection of dried plant specimens that are mounted on a sheet of paper with scientific names and collection data. The standard herbarium mounting sheet size is 11½ x 16½ inches.

Method: To collect specimens from fig trees, a student can visit nearby areas where they are most likely to find peepal and banyan trees. They can also visit a nursery to collect indoor species of figs. To collect more fig species, we encourage the students to visit a botanical garden in their city. This will also help them to identify the species.

We expect a student to collect at least 10 species of fig trees. Take photographs of the tree species.

Preparation of a herbarium specimen

Step 1: Collection

- Collect the branch of a plant with leaves and flowers (use scissors/clippers/ sharp knife to cut the twig).
- Use a cotton ball to remove dirt or small insects from the branch.
- In the case of figs, you can collect the syconia of the species.
- While collecting the specimen, make sure you record the following information:
 - Name of the collector
 - Date of collection
 - Site of collection
 - Collection number
 - Common name
 - Scientific name
 - Family
 - A 2–3-line description about the species can also be added.

Note: In the case of plants with small fig syconia, they can be collected attached to the plant. But if the syconia are large, then you can collect them separately, dry and store them in archival boxes. This will act as a supplement to the main collected specimen.

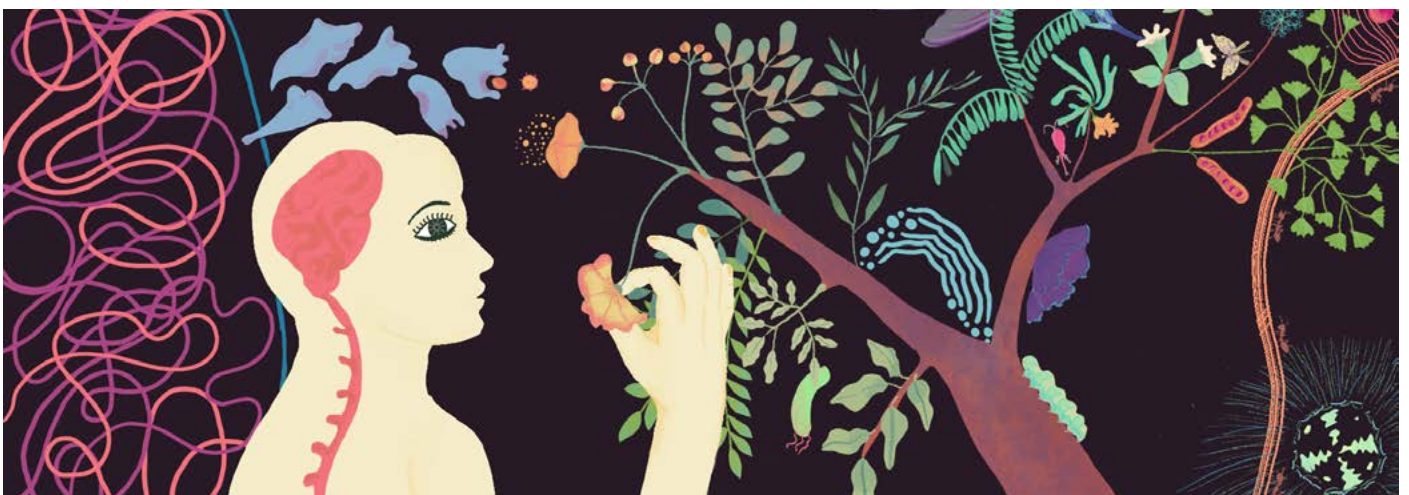
Step 2: Pressing

- Make sure you press the collected specimen flat, carefully to avoid any damage to it.
- Keep your specimen in a newspaper to dry before mounting it on a herbarium sheet (you can keep a stack of books on your specimen to press it).
- Since plants have moisture, keep on changing the newspaper in 2-3 days to make sure your specimen dries properly.

Step 3: Mounting

- Take a herbarium sheet and glue a label on the right-hand lower corner of the sheet and add all the recorded information on it.
- Transfer the plant specimen to the herbarium sheet carefully to avoid any damage.
- You can glue, stitch, or tape your specimen to the herbarium sheet.

The student can submit these herbarium specimens to the herbarium of their college. If the college doesn't have herbarium, then this project can act as a seed to set up a new herbarium in the college.



Azim Premji University
Survey No. 66, Burugunte Village,
Bikkanahalli Main Road, Sarjapura
Bengaluru – 562125

azimpremjiuniversity.edu.in

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