



Application Research on Augmented Models and Smart Experiential Engagement in Ecological Conservation of Yim Tin Tsai, Sai Kung

Exploring YTT Nature ARchive Education Kit



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Part 1: Introduction



1.1 Welcome & Kit Overview

Welcome to the *Exploring YTT Nature ARchive* Education Kit.

This comprehensive digital resource has been developed for the project “Application Research on Augmented Models and Smart Experiential Engagement in Ecological Conservation of Yim Tin Tsai, Sai Kung” (“*Exploring YTT Nature Archive*”). Our initiative aims to bridge the rich ecological heritage of Yim Tin Tsai (YTT) with Augmented Reality (AR) technology to create a transformative learning experience.

Our Mission

This kit is designed to translate our on-island research and technological development into accessible, engaging, and curriculum-ready materials for you and your learners, and other learners and users. We aim to move beyond traditional textbook learning by fostering a direct, empathetic, and technologically-enhanced connection with a living Hong Kong ecosystem.

What is the Exploring YTT Nature ARchive Project?

Launched in September 2024, this three-year project is funded by the Countryside Conservation Funding Scheme (CCFS) and the Countryside Conservation Office (CCO). We collaborate with The Hong Kong University of Science and Technology (HKUST), Outdoor Wildlife Learning Hong Kong (OWLHK), the Yim Tin Tsai Village Committee, and the Salt and Light Preservation Centre.

The project has two core pillars:

1. **Ecological documentation** by conducting systematic ecological surveys to record and understand YTT’s biodiversity; and
2. **Technological innovation** by developing an AR-based mobile application and a 3D-printed Smart Ecological Game-based Learning Station (the learning station) to make this ecological knowledge immersive and accessible.

What’s Inside This Kit?

This kit provides everything you need to guide learners through the story of YTT – from its species and survey methods to the innovative tools used to conserve it. It supports learning before, during, and after a visit to the island, but can also be used for impactful classroom-based exploration.

1.2 Learning Objectives

This education kit is designed to support the core aims of the *Exploring YTT Nature ARchive* project. Through the activities and resources provided, learners and participants will work toward the following project-aligned learning objectives:

Objective 1: Ecological knowledge & awareness

- To identify selected flora and fauna species found on Yim Tin Tsai (YTT) and understand their basic ecological knowledge.
- To recognise the concept of biodiversity and explain its importance for ecosystem health and resilience.
- To describe the ecological value of YTT as a habitat supporting a rich diversity of species.

Objective 2: Connection to local heritage & narrative

- To explore and appreciate the interconnectedness between YTT's natural environment and its cultural history, as reflected in villagers' stories.
- To understand how human activities and conservation efforts shape the island's landscape and biodiversity.

Objective 3: Understanding the application of smart technology in conservation

- To explain what Augmented Reality (AR) is and how it can be used as a tool for education, engagement, and research in nature conservation and countryside revitalisation.
- To demonstrate the ability to use the *YTT ARchive* application to access ecological information and engage with interactive digital content about YTT.

Objective 4: Fostering stewardship & engagement

- To cultivate a sense of responsibility and personal connection to YTT's natural and cultural heritage.
- To inspire interest and identify potential pathways for personal or communal involvement in local conservation and revitalisation efforts.

STEAM Integration in this Education Kit

This education kit partially incorporates a multidisciplinary STEAM (Science, Technology, Engineering, Arts, and Mathematics) approach to provide learners with a holistic and engaging learning experience:

- **Science:** Learners engage with core ecological concepts such as biodiversity, species identification, habitat studies, and conservation biology through systematic surveys and field-based inquiry.
- **Technology:** The kit integrates Augmented Reality (AR) and mobile app technology to visualise ecological data, interact with 3D species models, and use digital tools for exploration and documentation.
- **Engineering:** The development of the Smart Ecological Game-based Learning Station involves 3D-printing, terrain modelling, and interactive system design, demonstrating engineering applications in conservation and education, although no technical skills in engineering are applied in the practices and tasks.

- **Arts:** Creative expression is encouraged through storytelling, digital media creation, photo documentation, and the design of conservation campaigns, blending ecological learning with artistic and narrative skills.
- **Mathematics:** Learners encounter mathematical thinking through the understanding of data collection (e.g., species counts, survey metrics), spatial reasoning (map navigation, habitat mapping), and analysis of ecological patterns and trends.

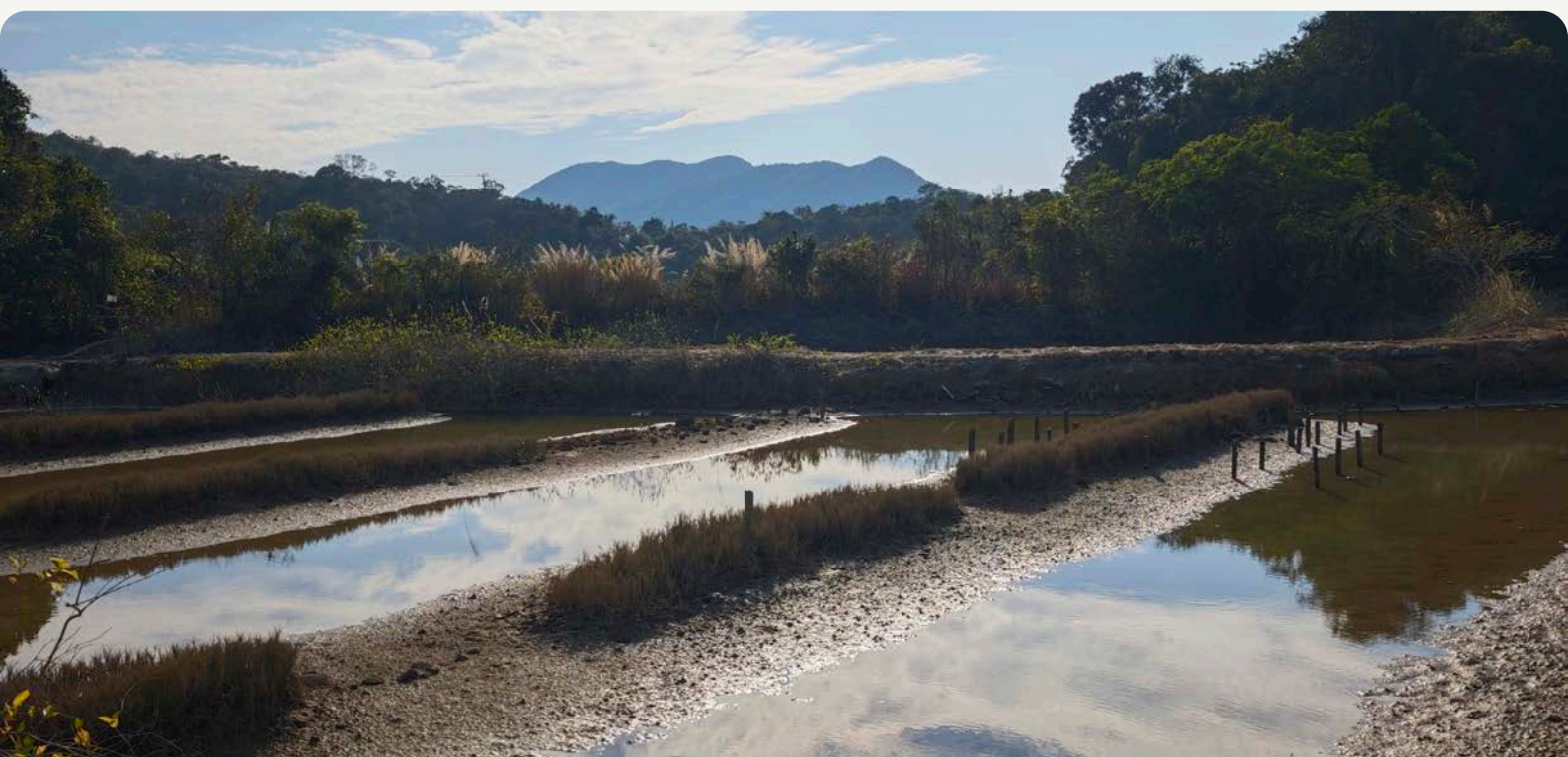
By weaving these disciplines together, the kit fosters critical thinking, creativity, problem-solving, and technological literacy, empowering learners to approach conservation challenges with an innovative and integrated mindset.

Connection to Sustainable Development Goals (SDGs)

The *Exploring YTT Nature ARchive* project and this education kit align with several United Nations SDGs, reinforcing the global relevance of local conservation efforts:

- **SDG 4:** Quality Education – The kit promotes inclusive, hands-on, and technology-enhanced learning, fostering environmental literacy, digital skills, and lifelong learning opportunities for all.
- **SDG 11:** Sustainable Cities and Communities – By highlighting the cultural-natural heritage of Yim Tin Tsai, the kit encourages the protection and revitalisation of rural communities and sustainable tourism practices.
- **SDG 13:** Climate Action – Learners explore climate impacts on biodiversity and habitats, building awareness and inspiring actionable responses to environmental changes.
- **SDG 14:** Life Below Water & **SDG 15:** Life on Land – The kit emphasises the conservation of coastal, mangrove, and terrestrial ecosystems, promoting the protection of biodiversity and sustainable use of natural resources.
- **SDG 17:** Partnerships for the Goals – The project demonstrates collaborative efforts among academic institutions, NGOs, government bodies, and local communities, showcasing a multi-stakeholder model for conservation and education.

Through these connections, learners are encouraged to see their local engagement as part of a larger global movement toward sustainability, stewardship, and equitable development.





1.3 Pedagogical Approach

The activities and structure of this kit are built upon three key educational philosophies to maximise engagement and depth of learning:

1. Place-based learning:

- Beyond a case study, YTT is the ecological open museum.
- Activities encourage learners to connect ecological concepts to specific locations on YTT (e.g., the salt pans, mangroves, villager paths). We integrate villager stories and historical land use to show how nature and culture are intertwined.

2. Experiential & inquiry-based learning:

- Learners learn by reading, observing, and exploring the island. This mirrors the actual work of field ecologists and conservation researchers.
- The kit includes species identification challenges and hands-on guides for using the AR app. Learners are positioned as active investigators rather than passive recipients of information.

3. Technology-enhanced learning:

- Digital tools are used as a powerful medium to deepen understanding, visualise the invisible (e.g., some species out of the season), and foster empathy.
- The AR app allows learners to interact with digital models of species and habitats, overlay information on the real world, and complete gamified learning quests. This makes abstract ecological concepts tangible, interesting, and engaging.

This blended approach aims to develop not only knowledge but also critical thinking, observational skills, and a lasting sense of stewardship for local environments.

1.4 Guidelines for Use

Suggested learning journey structure

This kit is designed to be flexible. You can adapt it for a single lesson, a multi-week project, or to support a field trip to Yim Tin Tsai.

Phase 1: Foundational learning (Pre-engagement)

- Setting: Classroom or virtual learning environment
- Goal: To build foundational knowledge and cultivate curiosity about YTT's ecology and the role of technology in conservation.

Recommended activities:

- Module A: Introduce biodiversity concepts and ecological survey methods used on YTT. Explore the relationship between human communities and natural environments using stories from YTT villagers.
- Module B: Brief overview of Augmented Reality and its applications in conservation. Download the *YTT ARchive* app and familiarise learners with its basic functions.

Phase 2: Immersive experience (On-site and in-app exploration)

- Setting: Field trip to Yim Tin Tsai, with guided app-based exploration
- Goal: To explore the ecological knowledge about the key species on YTT, with the immersive experience offered by the pre-downloaded AR app.

Recommended activities:

- Guided or self-exploration of YTT's seven key habitats.
- Visit culturally significant sites (e.g., salt pans, village) and reflect on human-nature relationships. Connect with ecological stories at key locations.
- Activate AR app features in designated discovery locations, unlock and learn about the selected species, take photos with each animated 3D species model, and share photos and the app on the learner's social media.

Phase 3: Reflection, synthesis & action (Post-experience)

- Setting: On-site or classroom-based group discussion
- Goal: Process the experience, deepen understanding, and translate learning into personal or communal action.

Recommended activities:

1. Reflection & synthesis
 - Module C: Use reflection questions to debrief the experience.
 - Have learners create personal "conservation story maps" based on their most impressive species and features on the island.
 - Have learners share one representative or their most favourite photo taken with the AR app.
 - Explore themes of resilience, change, and stewardship in the context of YTT and beyond.
2. Part 2: Action & ambassadorship
 - Learners develop a conservation action based on one of four pathways:
 - Educator: Create a presentation or digital post about a YTT species or features.
 - Storyteller: Write a creative piece from the perspective of a YTT species or features based on personal experience.
 - Digital advocate: Propose a new idea about an AR feature or a smart digital campaign.
 - Community action planner: Develop a personal conservation action plan.
3. Part 3: Project development & sharing
 - Learners work on their projects or assignments
 - Share the outcomes in class, via school display, or digitally using #YTTNatureARchive.

Phase 4: Educator reflection:

After completing the journey, you (as a teacher or an educator) may consider:

- What moments most engaged the learners?
- How did the blend of ecology, technology, and storytelling impact learning?
- How successfully did learners transition from learning to reflection to action?
- What would you adapt for future use?

Resource Checklist for Educators

Before starting:

- Review all modules and select activities
- Download the *YTT ARchive* app
- Test AR features and familiarise yourself with troubleshooting
- Gather necessary materials (your own worksheets, devices and backup devices with internet connection, field equipment, and stationery, if applicable)
- Plan logistics for any off-site activities

During the YTT visit:

- Emphasise conservation ethics and safety
- Support learners to experience in groups
- Balance screen time with direct observation
- Encourage questions and curiosity
- Allow learners to display their outcomes (e.g., photos, etc.)

After completion:

- Collect and celebrate learner reflections and projects
- Reflect on how to sustain conservation awareness beyond the activities
- Optional: Share notable work with the Project Team (by email on project website)

Conservation & Safety Ethics

- **Safety first:** For field trips, ensure adequate supervision, water, sun protection, and first-aid supplies. Be aware of terrain and weather conditions.
- **“Leave No Trace”:** Emphasise respecting all habitats. Stay on designated paths, do not disturb wildlife, and do not remove any plants, animals, or cultural artefacts.
- **Respectful engagement:** Frame interactions with the island and its stories (both natural and cultural) with respect and sensitivity. The kit encourages learning from, with, and for Yim Tin Tsai.

Technology Preparation

- Ensure devices (tablets/smartphones) are charged and have the *YTT ARchive* app downloaded prior to the session.
- A brief technical familiarisation is recommended for both educators and learners before on-site or in-depth app use.

Part 2:

Module A: The Living Island – Ecology & Biodiversity of Yim Tin Tsai (YTT)



A1) Understanding YTT's Biodiversity

What is biodiversity?

Biodiversity refers to the variety of life in a particular habitat or ecosystem. On YTT, this includes all living organisms – from plants and animals to fungi and microorganisms – and the complex ecological networks they form.

Why does biodiversity matter?

Biodiversity is essential for ecosystem health and human well-being. On YTT, it provides ecosystem services, including:

- **Provisioning:** Food, freshwater, medicinal plants
- **Regulating:** Climate moderation, water purification, pollination
- **Cultural:** Recreational, educational, and spiritual value
- **Supporting:** Soil formation, nutrient cycling, habitat provision
- **Resilience:** Diverse ecosystems are better able to withstand environmental changes and disturbances.

The biodiversity of YTT: A snapshot

Our baseline ecological surveys on YTT have documented the following categories of species (September 2024 – August 2025):

- **Plants:** 320 species (December 2024 – February 2025)
- **Birds:** 77 species
- **Butterflies:** 102 species
- **Dragonflies:** 22 species
- **Amphibians:** 7 species
- **Reptiles:** 9 species
- **Mammals:** 4 species

A2) Ecological Survey: How do we study YTT's Nature?

Field Survey Methods

Our research team employs standardised scientific methods to document YTT's biodiversity:

1. Point count method:

- Researchers stop at 10 designated points across the island
- Each point is observed for 10 minutes
- Species are recorded by sight and sound
- Particularly effective for birds, butterflies, and dragonflies

2. Transect count method:

- Researchers follow predetermined paths through different habitats
- All species encountered along the transect are recorded
- Provides data on species distribution across habitats

The survey process

1. **Habitat classification:** YTT has been divided into 7 key habitat types, including abandoned farmland, coastal, mangrove, shrubland, salt pan, village area, and woodland.
2. **Seasonal surveys:** Conducted monthly surveys with adjustments for seasonal variations in species activity.
3. **Community involvement:** Villagers, volunteers, and local guides participated in surveys, combining scientific expertise with local knowledge

Research insights

1. Different species are active at different times (diurnal vs. nocturnal)
2. Species diversity and abundance vary across habitats, reflecting ecological specialisation
3. Species distribution and behaviour vary seasonally in response to environmental changes



A3) Habitats of Yim Tin Tsai



Abandoned Farmland

The area was farmland in the 1960s and has transformed into a wetland through natural succession.



Mangrove

An extensive mangrove primarily composed of the *Kandelia obovata* tree species.



Woodland

Woodland features a dense canopy of trees, providing shade and shelter.



Salt Pan

Small-scale salt pan in operation, scanty vegetation is found, with shallow water and mudflat present.



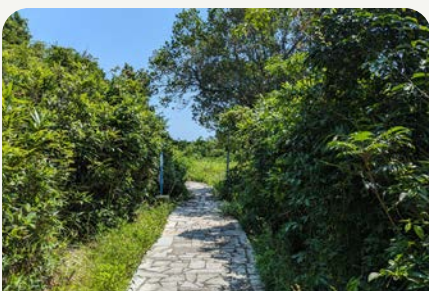
Coastal

The coastal area primarily encompasses the rocky shoreline at the old pier.



Village

The Village includes abandoned structures covered in dense vegetation.



Shrubland

Covering the largest portion of the island, shrubland is characterised by dense, woody shrubs and small trees.

Significance of Habitat Preservation

- Intact habitats deliver mutual ecological benefits; for instance, mangroves stabilise coastlines and support adjacent ecosystems.
- Habitat heterogeneity enhances species richness and strengthens ecosystem resilience.
- Connectivity among habitats enables coexistence and reduces the isolation of small populations.
- Migratory species rely on diverse island habitats for seasonal food, shelter, and breeding opportunities.

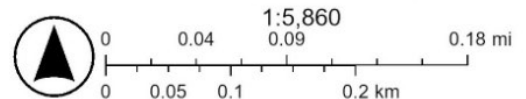


8/12/2025

YTT

- Shrubland
- Coastal
- Woodland
- Abandoned Farmland
- Mangrove
- Village

- Saltpan
- World Imagery
- Low Resolution 15m Imagery
- High Resolution 60cm Imagery
- High Resolution 30cm Imagery
- Citations
- 1.2m Resolution Metadata



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Yim Tin Tsai Habitat Zoning Map

A4) Featured Species: Ecological Stories of YTT



Collared Scops Owl

The soft “hoo—hoo—” calls heard in the forest at night often come from the Collared Scops Owl, a small species of owl. The name refers to the upright ear tufts that resemble tiny horns. These tufts are not true ears but specialised feathers that act as camouflage, helping the bird blend with tree branches and remain hidden.



Black-capped Kingfisher

Don't be misled by the thick, bright red bill and compact blue-and-yellow body. This striking bird is not a toucan at all, but the Black-capped Kingfisher! A seasonal visitor to mangroves, it excels at perching quietly among the trees, waiting patiently before swooping down to snatch crabs and shrimps.



Great Blue Spotted Mudskipper

The Great Blue Spotted Mudskipper is the largest and most easily recognised mudskipper in Hong Kong. Its body is decorated with striking blue spots, and its specially adapted pectoral fins allow it to crawl and leap across mudflats, showcasing remarkable survival skills in the challenging intertidal zone.



Chinese Bullfrog

The name “Chinese Bullfrog” may sound unfamiliar, yet it refers to the same frog that is widely served in Chinese cuisine as “field chicken”. Overhunting across the Chinese Mainland has driven wild populations into sharp decline, leaving the species endangered. Fortunately, wetlands on the islands remain healthy, and this powerful jumper can still be found there.



Splendid Fiddler Crab

Recognisable by its red claw and a carapace patterned with black and bluish-green markings, the Splendid Fiddler Crab is nicknamed the “Watermelon Crab.” Its most iconic behaviour is the dramatic waving of its oversized claw—a display that both attracts females and defends territory.



Lanternfly

As the Chinese name suggests, the Lanternfly favours Longan trees. Its striking red, elongated “nose” and a green “cloak” patterned with yellow and white spots make it highly eye-catching. Yet despite the unusual appearance, this insect is no lantern at all—it is actually a type of planthopper!



Dingy Dusk Hawker

Dingy Dusk Hawker is often seen in woodlands, hanging from branches. Its abdomen is long and slender, and its most distinctive feature is a blue diamond-shaped mark on the synthorax.



Dark Brown Ace

Unlike most butterflies with bright colours, the Dark Brown Ace is dressed in subtle shades of brown. When at rest, it holds its wings half-open, resembling the posture of a tiny fighter jet.



Bamboo Pit Viper

The Bamboo Pit Viper is a natural predator that relies on venom to subdue its prey—an essential part of its survival strategy. With a marked preference for rats, this snake becomes an unexpected ally to villagers, helping to keep rodent numbers under control.



Wild Boar

The Wild Boar is a well-known large mammal. It digs through the soil in search of food such as roots and fruits. In the ecosystem, it acts as a natural “cleaner” while also helping to disperse plant seeds.

A5) Conservation Challenges

Threats to YTT's biodiversity:

1. **Habitat fragmentation:** Potential construction on the island may increase the isolation of small habitats, leading to greater species vulnerability.
2. **Climate change:** Rising temperatures, sea levels, and extreme weather conditions, e.g., typhoons and rainstorms, may alter habitats.
3. **Invasive species:** Non-native species can compete with local species and disrupt ecological balance.
4. **Human disturbance:** Tourism and development pressures may cause habitat loss and biodiversity risk.
5. **Carrying capacity:** Excessive human activity or wildlife numbers strain resources and degrade habitats.

A6) Suggested Learner's Activities and Discussion Questions

Knowledge check

1. What is biodiversity? Introduce one species from YTT and explain its ecological role and cultural significance.

Guide to answer: Biodiversity refers to the variety of living organisms within an ecosystem, including diversity within species, between species, and among ecosystems. An example from Yim Tin Tsai is Pop-gun Seed (*Bridelia tomentosa*). This native tree not only provides berries for birds but also supports butterfly populations by serving as host plants for the caterpillars of various butterfly species. It contributes to both plant and insect diversity while connecting to local cultural stories - village children traditionally used its seeds as "bullets" in toy bamboo guns.

2. Describe one ecological survey method used in this project on YTT.

Guide to answer: Refer to the 2nd Newsletter or other reliable online resources.

One method is the Point Count survey. Researchers establish 10 fixed points across YTT. At each point, they pause for 10 minutes to observe and record all target species (such as birds and butterflies) seen or heard within that timeframe. This method helps track species presence and abundance at specific locations over time.

One method is the Transect Count survey. Researchers establish designated transect that pass through various habitats on YTT (such as woodlands, shrublands, or mangroves). While walking steadily along these transects, they record all target species observed within a predetermined distance of the line. This method is particularly effective for understanding species distribution across habitats and for systematically covering larger or more varied terrain.

3. Identify three species on YTT, with one fun fact about each species.

Guide to answer: Refer to the 2nd Newsletter or other reliable online resources.

Discussion questions

1. How does YTT's island geography affect its biodiversity?

Guide to answer: YTT's isolation as an island creates a smaller, contained ecosystem. This can lead to unique species compositions, but also makes species more vulnerable as they cannot easily migrate if conditions change. The variety of habitats (like mangroves, woodlands, and salt pans) within a small area creates "micro-habitats" that support different species, contributing to overall diversity.

2. Why are certain uncommon species observed on the island but not widely seen in Hong Kong?

Guide to answer:

- Habitat diversity: YTT supports a wide range of habitat types, providing ecological niches that sustain a rich variety of species.
- Geographic isolation: The surrounding sea channel restricts dispersal, allowing species to persist locally.
- Historical influences: Limited urban development has preserved habitats on YTT.

3. How do traditional village activities relate to biodiversity conservation?

Guide to answer: Traditional activities often existed in a balance with the local environment. Two aspects of such relationships: (i) The role of traditional village activities in shaping today's YTT biodiversity, and (ii) How these activities or practices actively support the ongoing preservation of the environment and biodiversity.

- Sustainable practices: Activities like small-scale farming or salt production were adapted to local conditions and likely had a lower impact than intensive modern methods.
- Cultural knowledge: Villagers' stories and practices contain valuable ecological knowledge about species, seasons, and sustainable resource use.
- Habitat creation: Some traditional land uses, like maintaining fishponds or vegetable plots, can create habitats that support particular species.

4. What conservation measures would you recommend for YTT?

Guide to answer: Encourage creative yet practical ideas, such as:

- Habitat protection & restoration: Prioritise protecting key habitats, such as wetlands and woodlands, and consider restoring native plant communities.
- Sustainable tourism management: Implement visitor guidelines (e.g., staying on paths, quiet zones) to minimise disturbance to wildlife, especially during breeding seasons.
- Community & youth engagement: Continue and expand programmes that involve local communities and students in monitoring and storytelling, fostering a sense of ownership.
- Climate resilience planning: Study potential climate impacts (e.g., sea-level rise on mangroves) and develop adaptive strategies.
- Biosecurity: Implement measures to prevent the introduction of invasive plant and animal species that could harm native biodiversity.

Are any of these measures appropriate and feasible on the YTT?

A6) Suggested Learner's Activities and Discussion Questions (cont'd)

Self-reflection prompts

Personal connection

1. Which habitat or species on the island resonated most with you, and why?
2. How did exploring the island's diversity change the way you see your relationship with nature?
3. What small actions can you take in your own life to support biodiversity?

Environmental awareness and conservation responsibility

1. Did you notice any similarities between the island's ecosystems and your own daily environment?
2. What human activities could threaten these habitats, and how might they be reduced?
3. What challenges do you think villagers face in protecting island ecosystems?
4. What role does cultural or community involvement play in sustaining biodiversity?



A7) Additional Resources

Glossary

Biodiversity

Biodiversity refers to the variety of living organisms within a given ecosystem, region, or across the globe, encompassing diversity at genetic, species, and ecosystem levels.

Ecosystem services

Ecosystem services are the benefits that humans derive from natural ecosystems, categorised into four types: provisioning services (e.g., food and water), regulating services (e.g., climate regulation and pollination), cultural services (e.g., recreation and spiritual value), and supporting services (e.g., nutrient cycling and habitat provision).

Native species

Native species are organisms naturally present in an area, not introduced by humans.

Habitat

A habitat is the natural environment in which a species or community lives and reproduces, providing all necessary biological and physical conditions for survival—such as food, water, shelter, temperature, and soil. Habitat diversity and integrity are key to sustaining biodiversity.

Further reading and digital resources

- Project newsletters (Issues 1 & 2)
- Project website: www.yttnaturearchive.org
- Species database (available on project website)
- Reference materials provided in this education kit

Note: Module A prepares learners to appreciate YTT's ecological richness and understand the scientific approaches used to study and conserve it. This foundation supports the technological explorations in Module B.

Part 3:

Module B: Technology as a Conservation Tool – The Augmented Reality Experience

B1) Understanding Augmented Reality (AR)

What is Augmented Reality (AR)?

Augmented Reality (AR) is a technology that overlays digital information, such as images, 3D models, text, or animations, onto the physical world in real time. Unlike Virtual Reality (VR), which creates an entirely immersive digital world, AR enhances users' perception of reality by adding interactive digital layers to what they already see.

Key characteristics of AR:

- Real-time interaction: Digital content responds to users' movements and the environment.
- Environment-aware: Uses device cameras and sensors (Global Positioning System – GPS, Inertial Measurement Unity – IMU, magnetometer) to understand physical space.
- Accessible: Often requires only a smartphone or tablet with a camera and network connection.

How AR differs from other technologies:

1. Virtual Reality (VR): Fully immersive, blocks out the real world through a headset, a computer or a device screen.
2. Mixed Reality (MR): Blends physical and digital worlds where both can interact.
3. AR: Adds digital elements to the real world without replacing it.

Examples of AR:

- Navigation apps: AR arrows overlaid on live camera view to show directions.
- Social media filters: Interactive effects and animations on faces or environments.
- Retail & try-on: Visualising furniture in your home or trying on glasses virtually.
- Educational apps: Interactive 3D models of animals, planets, or historical artefacts with photo-taking and social media share functions.

B2) AR in Conservation: Global and Local Applications

Why use AR for conservation?

AR transforms conservation from passive observation or classroom and indoor learning alone into active, immersive engagement in the actual environment. It brings abstract ecological concepts to life, making them tangible and relatable, while fostering an emotional connection between people and places or species they might never otherwise encounter. By integrating ecological and environmental education with experiential learning, AR upgrades traditional field trips and outdoor studies, turning them into interactive, technology-enhanced explorations that deepen understanding and inspire lasting stewardship.

Some examples in AR conservation:

- **WWF Forests**
<https://www.worldwildlife.org/resources/activities/educational-apps/wwf-forests/>
- **Marine XR (also developed at HKUST)**
<https://marinexr.hkustvgd.com/>
- **What's that bumblebee**
<https://www.bumblebeeconservation.org/resources/get-our-free-bumblebee-id-app/>



The YTT ARchive project: From concept to creation

Development process:

1. **Drone photogrammetry:** Drones captured images of YTT to create a highly detailed 3D terrain model.
2. **AR modelling & processing:** Use software such as Blender, ZBrush, 3D Painter, and Maya to create the 3D models and animation of the selected species, with models refined based on professional comments by the ecological research team.
3. **3D-printing & testing:** Small-scale 3D prints were created to verify accuracy before producing the final large-scale island model.
4. **AR integration:** Ecological survey data and species information were embedded into the projection of the learning station and the AR app.

Project components:

5. **3D printed island terrain model:** A physical, tactile representation of YTT.
6. **The Smart Ecological Game-based Learning Station:** The installation of the 3D island model, projector, and touchpad, where visitors can explore YTT's ecology through AR.
7. **AR smart application:** An AR mobile app that incorporates the selected species model on a digital map with GPS to locate the users and facilitate them to walk to specific locations on the island to unlock the selected species models.

Research and educational value of AR in conservation:

- **Integration with ecological survey results:** AR overlays real field survey results, making survey findings interactive and accessible.
- **Makes the invisible visible:** Shows hidden ecological species and their knowledge through the learning station.
- **Enhances immersion:** Allows users to interact with the species models through the AR app, take photos, and share on their social media.
- **Encourages exploration:** Gamified and locational elements motivate discovery and learning, incorporating real species records and survey insights.

B3) Hands-On Guide: Using the YTT ARchive App



Step 1: Download and install

- **Device compatibility:** Requires iOS 15+ or Android 8+ with a rear-facing camera.
- **Download:** Available on the App Store and Google Play.
- **Permissions:** Allow camera and location access when prompted for full functionality.

App navigation overview

- **Main Menu screen:** Icons for Map, Journal, Settings, and About.
- **Go to Settings:** Select your preferred language, mode (on island or not on island).
- **Map:** The digital map showing the locations of the selected species.
- **Journal:** User's collection of the species.
- **Reset the journal** under Settings when necessary.
- **About:** The project information.



Main Menu



Map



Journal



Species Stories

Key steps

1. Click to unlock a specific species (e.g., Collared Scops Owl) in “not on island” mode, or go to the location to detect and unlock the species.
2. Learn more about each species.
3. Take a photo with the species, with the position, size, and background you like.
4. Save your photos on your smart device.
5. Share your photos on your social media.



FAQ for educators

1. Q: Do we need an internet connection on YTT to use the app?
A: Yes, for downloading the ARapp. However, users are advised to download the app in advance to avoid poor internet connection in an outdoor environment.
2. Q: Can the app be used outside YTT or in a classroom?
A: Yes! Users can unlock a specific species (e.g., Collared Scops Owl) in “not on island” mode under Settings.
3. Q: Is the app suitable for all age groups?
A: The interface is designed for all ages, but younger learners should use it with guidance. Users are advised to use a smart device safely in outdoor settings, especially when walking on YTT while watching the app via the screen.

Troubleshooting common issues

Issue	Possible solution
1. AR not activating	Ensure the camera lens is clean, and the lighting is adequate.
2. Floor not recognised	Move around the space and rotate your phone to capture more of the environment
3. App crashes	Close other apps, restart the device, or reinstall the app.
4. Photos not saved	Ensure your smart device has sufficient storage space.
5. Social media share button not working	Check your internet connection.

B4) Suggested Learner's Activities and Discussion Questions

Educational Activity: AR Scavenger Hunt

Learning outcomes:

- Practice using AR technology for ecological discovery.
- Reinforce species identification and habitat knowledge.
- Encourage teamwork and observational skills.

Preparation:

- Complete Module A.
- Download the app.
- Divide learners into small groups with one device per group.

Activity steps:

1. Design different routes for each group to explore the habitats on the app.
2. Using the app, the groups navigate to designated locations of habitat on YTT.
3. At each location, the groups must:
 - Unlock the species
 - Learn at least one piece of ecological knowledge for each species discovered.
 - Take one group photo with each species model.
4. Groups compile their findings into the "Journal" within the app.

Ethical use guidelines

- Respect the environment without any disruption in habitats and species while using AR.
- Share the smart devices with others wanting to experience AR.
- Balance screen time with direct observation of nature.

Discussion questions

1. How did using AR during the scavenger hunt change the way you observed or identified species, compared to looking without the app?

Guide to answer: This question links to the learning outcome of practising AR technology and reinforces how digital tools can enhance – or sometimes distract from – direct observation.



2. What challenges did your group face while trying to balance using the device and observing nature directly? How might this affect how we use technology in conservation learning?

Guide to answer: This question aligns with the ethical guidelines on balancing screen time with real-world observation and encourages reflection on mindful tech use in environmental education.

3. If you could add one new feature to the AR app to make the scavenger hunt even more engaging or educational, what would it be and why?

Guide to answer: This question encourages creativity, connects to teamwork and idea-sharing, and prompts learners to think critically about how technology can better support ecological learning.

4. Based on your experience, how does the Exploring YTT Nature ARchive project integrate STEAM (Science, Technology, Engineering, Arts, Mathematics) into conservation education? Provide one example for at least one STEAM component.

Guide to answer: This question encourages learners to recognize the interdisciplinary nature of the project. Possible examples include:

- Science: Conducting ecological surveys to study biodiversity.
- Technology: Using AR to overlay digital species models onto the real environment.
- Engineering: Designing and 3D-printing the Smart Ecological Game-based Learning Station.
- Arts: Creating visual stories, photos, or digital content about YTT's species.
- Mathematics: Analyzing species distribution data or mapping habitats using coordinates.

5. Which Sustainable Development Goals (SDGs) do you think are most supported by this project, and why?

Guide to answer: Learners should identify SDGs directly connected to the project's goals, such as:

- SDG 4 (Quality Education) – through interactive, technology-enhanced learning.
- SDG 15 (Life on Land) – by promoting biodiversity conservation and habitat protection.
- SDG 11 (Sustainable Communities) – through cultural heritage preservation and community engagement.
- SDG 13 (Climate Action) – by raising awareness of climate impacts on ecosystems.

The learners are encouraged to explain how specific project activities, e.g., AR education, ecological surveys, or community storytelling, etc., contribute to these global goals.

B5) Additional Resources

Further reading and digital resources

- Project newsletters (Issues 1 & 2)
- Project website: www.yttnaturearchive.org
- Reference materials provided in this education kit

Module B equips educators and learners to leverage AR as a meaningful tool for conservation learning, blending technology with real-world ecological engagement.

Part 4:

Module C: Reflection, Action & Stewardship



C1) Learners' Reflection on Nature Conservation and YTT

Guided reflection questions

On personal connection with YTT:

1. What is one memory, species, or place on YTT that stood out to you most? Why?

Guide to answer: Think about a specific moment or thing that caught your attention – maybe it was the view from the salt pans, the sound of a bird, or the story of a plant and other species on YTT. Describe why it stayed with you – was it beautiful, surprising, or meaningful in some way?

2. How did visiting YTT, or learning about it, change the way you see Hong Kong's natural environment?

Guide to answer: Compare your view before and after. Did you think of Hong Kong as mostly urban before? Has learning about YTT shown you that nature is closer or more diverse than you realised? Explain how your perspective shifted.

3. Have you ever felt a sense of responsibility toward a place in nature? When, and why?

Guide to answer: Think about a park, a beach, a trail, or even a tree near your home. Did you ever feel you wanted to protect it? Maybe because it was special to you, or because you noticed it was under threat. Describe that feeling and what triggered it.

On learning experience:

4. Before this experience, what did “conservation” mean to you? How has your understanding expanded?

Guide to answer: Start with your old definition – maybe “saving animals” or “keeping nature clean.” Then explain what you learned – maybe that conservation also includes cultural stories, community involvement, using technology, or protecting a species and even a whole habitat.

5. What is one thing you learned about YTT's ecology that surprised you?

Guide to answer: Think about something unexpected, for example, how many species live in a small place, or how some species depend on specific habitats (e.g., the floating fern in wetlands). Explain why it was surprising to you.

6. How does hearing villagers' stories affect the way you think about conservation?

Guide to answer: Consider how stories (e.g., about playing with seeds or working in a farmland) connect people to nature. Did it make conservation feel more personal, more about people and history, not just science? Explain your thoughts.

On smart technology and engagement:

7. How did using AR change how you observed or understood YTT's environment?

Guide to answer: Compare using AR to just looking without it. Did AR help you see things you would usually miss? Did it make the information easier to understand? Did it add a "fun" or "interactive" layer to learning?

8. Can technology like AR bring people closer to nature, or does it create distance? Why?

Guide to answer: Think of both sides:

- Closer: AR can reveal hidden details, tell stories, and make learning engaging.
- Distance: It might distract from real observation or make people rely on screens.

Give your opinion with an example from your experience.

9. If you could add one feature to the *YTT ARchive* app, what would it be and why?

Guide to answer: Think about what would make the app more useful or fun, for example, maybe a "sound map" of animal calls, a seasonal species tracker, a way to upload your own photos/observations, or a mini-game about habitat restoration. Explain how it would improve learning or engagement.

On challenges and responsibility of nature conservation:

10. What do you think is the biggest challenge facing YTT's environment today?

Guide to answer: Consider: habitat loss, climate change, pollution, invasive species, or balancing tourism with conservation. Pick one and explain why it is a challenge for YTT specifically.

11. How might climate change affect YTT's species and habitats in the future?

Guide to answer: Think about rising sea levels, stronger storms, hotter temperatures, changing rainfall, or other extreme weather. How could these impact coastal areas, wetlands, or forest species on YTT? Use examples like mangroves or freshwater habitats if helpful.

12. What role do you think young people, such as students, can play in conserving places like YTT?

Guide to answer: Think about action:

- Learning and sharing knowledge
- Joining clean-ups or citizen science
- Using social media to raise awareness
- Making sustainable choices
- Advocating for protection

Explain one or two roles you think are meaningful and achievable.



C1) Learners' Reflection on Nature Conservation and YTT (cont'd)

Reflection activity: "My Conservation Storymap"

Instructions:

Create a personal "storymap" that documents your journey with YTT and nature conservation. This map can be drawn, written, collaged, or created digitally. It should visually and textually integrate your observations, learning moments, and personal commitments to conservation.

Learning outcomes:

- Visually and spatially connect learning to real locations.
- Reflect on personal experience.
- Translate reflection into a tangible, personal conservation commitment.
- Practice observation, documentation, and creative expression.

Your map should include:

1. Location-based observations & photo documentation
 - Use a printed map of YTT to mark at least 3 places where you had meaningful experiences.
 - For each location, add:
 - A photo you took on-site or a sketch of the view or species.
 - A short caption describing what you observed there (e.g., a butterfly in the shrubland, mangroves along the coast).
2. Before & after: Personal perspectives
 - "Before" snapshot: Write or illustrate what you thought about nature and conservation before your YTT experience. (Example: "I used to think conservation was just for scientists.")
 - "After" snapshot: Show how your view has shifted after visiting or learning about YTT. (Example: "Now I see that conservation is also about stories, technology, and community.")
3. Key moments & feelings
 - Along your marked locations, add notes or symbols representing key moments: something you saw, learned, or felt strongly about.
 - Examples: "Heard a bird call I recognised," "Felt amazed by the mangrove's adaptation," "Connected a villager's story to the salt pan habitat."
4. Commitment & action zone
 - On your map, designate an "action zone" where you write or draw one specific commitment you will make moving forward.
 - This should be an explicit, doable action related to conservation.
 - Examples: "I will reduce single-use plastics," "I will bring trash away from YTT," "I will share one YTT species story with my family," "I will recommend YTT to my schoolmates," "I will revisit YTT and join a workshop or activity."

C2) Post-Visit Action: Become a YTT Conservation Ambassador

After completing the experiential learning activities, the learners have better understood YTT's unique biodiversity and the approaches the research project uses to identify these ecological resources. Now, learners are invited to become YTT Conservation Ambassadors. This is a call to action – to carry the knowledge and experience learners have acquired into their daily lives and communities.

What is a YTT Conservation Ambassador?

Someone who:

- Understands the ecological and cultural values of YTT.
- Shares knowledge and stories about YTT with others
- Promote this research project and the AR application to others.
- Acts in ways that support YTT's conservation in their own context.
- Advocates for the protection of natural and cultural heritage.



Choose your ambassador pathway:

Pathway 1: An Educator

Action: Create a short presentation, video, or social media post to teach others about one YTT species or a conservation issue.

Pathway 2: A Storyteller

Action: Write a story, poem, or letter from the perspective of a YTT species (e.g., a Kingfisher) to YTT to describe their relation.

Pathway 3: A Digital Advocate

Action: Design a proposal for a new AR feature, app interface, or digital campaign to raise awareness about YTT's nature conservation.

Pathway 4: A Community Scientist

Conduct a mini biodiversity survey in your own neighbourhood using methods learned from YTT (point count or transect count, and the mobile app "iNaturalist").

Pathway 5: An Action Planner

Action: Develop a "personal conservation action plan" with 3 small, achievable steps you will take in the next month to reduce your ecological footprint or support local biodiversity. Prepare a checklist or calendar with your planned actions and reflections.

C3) Sharing Your Work & Staying Connected

How to share:

1. Submit your ambassador project to your teacher or group leader.
2. With permission, share on social media using #YTTNatureARchive #YTTAmbassador.
3. Email a short sharing in Chinese or English, with one or more photos, to the Project Team at: yttnaturearchive@gmail.com (selected works may be featured on the project website, social media, or in future project newsletters).

Stay engaged:

1. **Follow the project:** @yttnaturearchive on Instagram/Facebook.
2. **Visit the website:** www.yttnaturearchive.org for updates, species lists, and AR app downloads.
3. **Promote our project and activities** (e.g., public workshops, guided tours, and the launch of the Smart Ecological Game-based Learning Station) to others.

C4) Closing Reflection: Your Role in Hong Kong’s Conservation Story

Hong Kong is often seen as a city of skyscrapers, but countryside places such as Yim Tin Tsai remind us that nature and culture are deeply woven into its identity. Conservation is not only about protecting what is rare – it is about valuing what connects us to our home, our history, and each other.

“Yim Tin Tsai is one island, but its story is part of a much larger one – Hong Kong’s relationship with its land, water, and living heritage. Where do you see yourself in that story?”

Module C is designed to deepen learning through reflection and empower learners to translate awareness into meaningful, personalised action. The goal is not just to learn about YTT, but to carry its lessons forward.

Action plan template

My Ambassador Pledge

I, [Name], choose to take the _____ Pathway.

My goal is to: _____

By: [Date] _____

Steps I will take:

1. _____
2. _____
3. _____

How this supports YTT & conservation:

I will know I have succeeded when:

Part 5: Resources & Appendices



Project Information

Project social media: @yttnaturearchive on Instagram/Facebook.
Project website: www.yttnaturearchive.org.

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Exploring YTT Nature ARchive

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Funding Organisations



鄉郊保育資助計劃
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Salt+Light