JPPMS, Vol. 8, No. 1, 2024
Jurnal Penelitian Pendidikan Matematika dan Sains
http://journal.unesa.ac.id/index.php/jppms/

Development of Video Media on Reptilian and Aves Biodiversity at Ragunan Zoo

Oleh:
Fajar Adinugraha[1], Geskia Avikasari Sembiring[1], Frisca Olivia S[1], Junata Selvina[1], Ezra Angela[1], Anne Serafin Hutabarat[1], Agnes Feronika Situmorang[1]*
[1]Pogram Studi Pendidikan Biologi, FKIP-Universitas Kristen Indonesia, Jakarta
[*]fadinugraha0608@gmail.com

Abstrak — Hilangnya biodiversitas dan rendahnya pengetahuan usia muda tentang Reptilia dan Aves menjadi permasalahan yang harus dipecahkan. Salah satu upaya yang dapat dilakukan untuk meningkatkan pengetahuan adalah melalui media video pembelajaran eksplorasi berbagai jenis spesies dari Reptilia dan Aves. Eksplorasi lapangan dilakukan pada spesies yang ada di Kebun Binatang Ragunan. Eksplorasi spesies Reptilia dan Aves tersebut dibuat menjadi video pembelajaran. Berdasarkan hasil eksplorasi, terdapat 17 spesies dari Reptilia yang tergolong dalam tiga Order, yaitu Crocodilia, Squamata, dan Testudines. Video tentang Reptilia diunggah di YouTube dengan link https://youtu.be/NT5GOaZXmdQ. Video berdurasi 16 menit 44 detik. Berdasarkan hasil observasi di Kebun Binatang Ragunan, ditemukan 12 spesies dari kelompok Aves yang terdiri dalam 10 Order, yaitu *Galliformes, Gruiformes, Phoenicopteriformes, Bucerotiformes, Ciconiiformes, Columbiformes, Falconiformes, Psittaciformes, Struthioniformes,* dan *Pelecaniformes.* Video tentang Aves diunggah di YouTube dengan link https://youtu.be/aUGOXCsspmM. Video berdurasi 11 menit 47 detik. Video pembelajaran menggunakan hewan dan spesies asli diharapkan dapat memberikan pemahaman terhadap spesies hewan terutama Reptlia dan Aves. Penelitian selanjutnya akan dilakukan untuk mengevaluasi peningkatan pemahaman tentang biodiversitas menggunakan media video tersebut di dalam kelas.

Kata kunci: Aves, biodiversitas, Reptilia, Ragunan Zoo, media video, YouTube.

Abstract — The decline in biodiversity and lack of knowledge among young people regarding Reptilia or reptiles and Aves or birds are pressing issues that require attention. To address this, one of the efforts that can be done is making an educational video as learning media to explore various species of reptiles and birds. Field exploration was conducted in Ragunan Zoo. Resulting species data based on exploration was was then used to produce the educational video. The exploration results reveal the classification of 17 species of Reptilia into three orders: Crocodilia, Squamata, and Testudines. A video on Reptilia is available on YouTube at https://youtu.be/NT5GOaZXmdQ. The video has a duration of 16 minutes and 44 seconds. Observations at Ragunan Zoo revealed the presence of 12 Aves species from 10 orders: Galliformes, Gruiformes, Phoenicopteriformes, Bucerotiformes, Ciconiiformes, Columbiformes, Falconiformes, Psittaciformes, Struthioniformes, and Pelecaniformes. A video about Aves is available on YouTube at https://youtu.be/aUGOXCsspmM, with a duration of 11 minutes and 47 seconds. Educational videos that feature native animals and species can help viewers gain a better understanding of animal diversity, particularly Reptilia and Aves. Further study will be conducted to implement this media in classroom and evaluate student increase of knowledge on biodiversity.

Keywords: Aves, biodiversity, video media, Reptilia, Ragunan Zoo, YouTube.

Introduction

The decline in biodiversity can be attributed to an insufficient understanding of the subject. Biodiversity encompasses millions of plant, animal, and microorganism species, their genetic makeup, and the ecosystems they inhabit (Kurniasih, 2018). Several studies have examined the limited knowledge of biodiversity among young people. Research of Fauziah et al. (2019) revealed that students' knowledge of biodiversity was categorized as low. Sari et al. (2023) demonstrate that low biodiversity concepts can lead to misconceptions. Gultom (2019) found that students experience misconceptions in organism classification material, indicating a low level of knowledge of biodiversity among students.

Students have a limited understanding of biodiversity, particularly in relation to animal diversity. According to Fitri et al. (2021) students struggle to comprehend the characteristics of

Kingdom Animalia. Additionally, research by Agustin et al. (2020), shows that students generally lack understanding of vertebrate concepts. This is further supported by studies on students' lack of knowledge about Aves (Jayanti & Susantini, 2021) and Reptilia (Chyleńska & Rybska, 2019). Conservation knowledge of reptile groups among teachers is still relatively low (Isfaeni et al., 2022).

It is important to address these factors to improve knowledge about animals. Misconceptions about animals can arise due to various factors, including students, teachers, books, teaching methods, and context (Jayanti & Susantini, 2021). Students may struggle to understand the concepts being taught and find it challenging to compare the characteristics, differences, similarities, and shapes of animals (Gultom, 2019). The material on animal classification contains complex characteristics and numerous scientific names, which can make it challenging for students to comprehend (Yusriya et al., 2014). It is unfortunate that students in Indonesia have limited knowledge of vertebrates, particularly Reptilia or reptiles and Aves or birds.

Indonesia is a country with a diverse range of reptiles and birds. It is second only to Brazil in terms of fauna richness, with approximately 16% of the world's reptiles and 17% of the world's birds found in Indonesia (A. Setiawan, 2022). In fact, Indonesia has the fourth largest variety of bird species in the world, after Colombia, Peru, and Brazil (Azizah & Armanda, 2016). It is important for young people to have a good understanding of these animals. Lambert et al. (2019) suggest identifying the key positive conditions for reptiles and promoting their conservation. Additionally, birds (Aves) play a crucial role in the ecological food chain (Tabur & Ayvaz, 2010). To overcome any lack of understanding, it is important to develop educational materials about animals, with a particular focus on reptiles and birds.

Educational videos are useful educational materials for teaching about animals. They provide visual aids that aid in the learning process, making it easier for students to comprehend the material (Putri & Fadly, 2021; H. C. Setiawan et al., 2022). Students can actively gain actively acquire knowledge from audio-visual learning resources (Sandika, 2017). Several studies have developed videos on animal topics, including educational video on animal classification material (Yusriya et al., 2014) and 3-dimensional animation video-based animal classification (Hidayah & Subarkah, 2019). However, these educational videos have not used real animal videos but instead have relied on images and animations. It has been suggested that the use of real objects, such as living things, in media can improve learning outcomes (Nadlah, 2012).

Efforts were made to design and develop educational video for reptiles and birds based on the results of field exploration in zoos. Zoos can be used as a source of learning about animals (Hendriyani & Aurora, 2023; Nugraha & Amelia, 2022). Reptiles and birds can be found at the Ragunan Zoo or Margawasatwa Park. Ragunan Zoo is a 147-hectare park that is home to 2,000 specimens and more than 50,000 trees (Ragunan Zoo, 2024). The videos are related to species belonging to the Reptilia or reptile and Aves or bird groups.

The aim of this study was to develop media for identification of reptile and bird species in Ragunan Zoo. These videos are intended to enhance public knowledge of animal diversity and promote the diversity of reptiles and birds. YouTube is a popular platform for younger generations to express themselves and communicate (Norðdahl et al., 2019).

Methods

The research method used in this study was field exploration, or field work. Field work is a methodological approach that involves observing behavior under natural conditions (Garcia & Sunderlin, 2011). It is conducted outdoors, outside of a laboratory, library, or office, and is usually labeled as qualitative in nature (Vero, 2021)(van de Ven & Poole, 2017). The field exploration for this study was conducted at the Ragunan Zoo in Jakarta. The team was divided into two groups: one that explored Reptilia or reptiles, and another that explored Aves or birds.

On October 28, 2023, from 09.00 to 13.00 WIB, exploration was conducted by observing along visitor path in the zoo. We obtained species data and matched it with literature sources from journals or books using the keywords of the animal species obtained. The data was then analysed descriptively. The results were used to create educational videos. Figure 1 presents the observation points of the exploration.

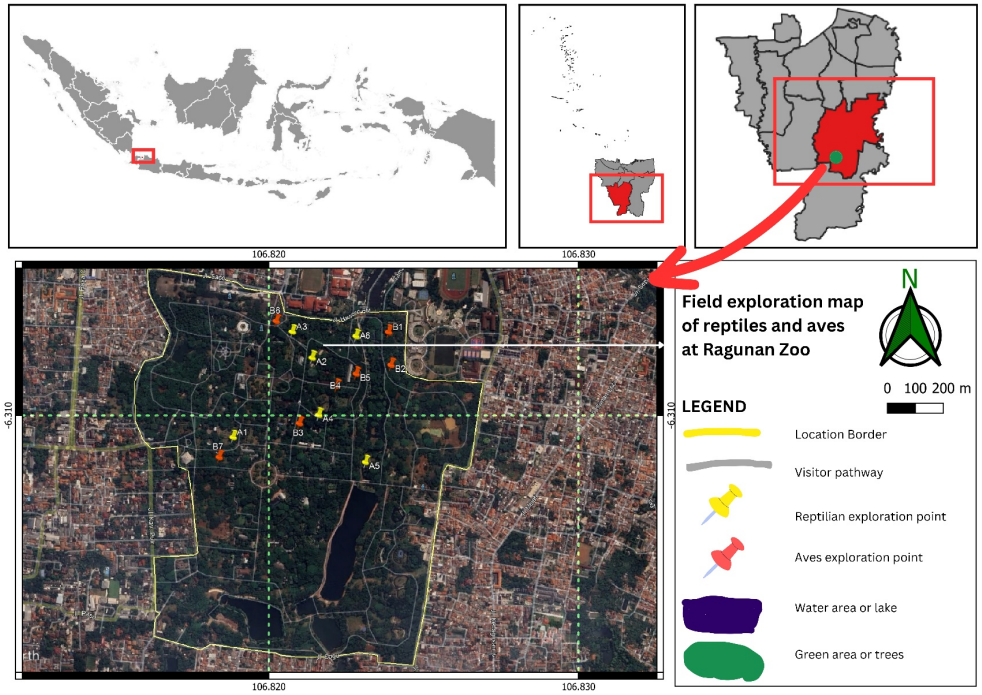

Figure 1. Map of locations for exploring reptiles and birds at Ragunan Zoo

The video was developed based on the data observed in the field exploration research. To make an educational video, follow these steps: 1) set the objectives or desired outcomes; 2) collect relevant materials or content; and 3) create a storyboard to outline the visual and narrative structure of the video (Buchner, 2018). The videos were presented for peer feedback, and the revised versions were uploaded to YouTube. Data for the educational videos was analysed descriptively.

Results and discussion

Knowledge about animals, especially Reptilia or reptiles and Aves or birds, needs to be promoted so that students have an understanding of various types of animals that may not have been seen before. Increased understanding will also increase awareness about biodiversity.

Reptilia and Aves belong to the Phylum Chordata within the vertebrate group. Vertebrates are members of the phylum Chordata, named after the notochord (Pough & Janis, 2019). They are characterized by small to very large forms with marked cephalization, a brain enclosed in a cranium, and a notochord that is partially or completely replaced by the spine (Lal, 2018). Most vertebrates have an endoskeleton consisting of cartilage or bone (Hickman et al., 2024).

Vertebrates comprise of lampreys, fish, amphibians, reptiles, birds, and mammals (Rao, 2020). They exhibit a wide range of locomotion, including swimming, crawling, walking, running, climbing, gliding, and flying (Linzey, 2016). This article focuses solely on the Reptilia and Aves classes. According to traditional systematics, reptiles and birds are classified at the same taxonomic level, such as Class Reptilia and Aves (Pough & Janis, 2019).

Development of video media on Reptile Diversity at Ragunan Zoo

The traditional definition of reptiles includes snakes, lizards, tuatara, crocodiles, turtles, and extinct groups such as dinosaurs, plesiosaurs, pterosaurs, and many other ancient amphibians (Hickman et al., 2024; Linzey, 2016). Unlike amphibians, reptiles do not have a larval stage, but immature individuals may differ somewhat from adults (Mayr, 1969). Reptiles are tetrapods (Slobodian et al., 2021). Four clades, which are often ranked as 'orders' in Linnaean classification, describe living non-bird reptiles: (1) Testudines, which includes turtles; (2) Squamata, which includes lizards and snakes; (3) Sphenodontida, which includes tuataras; and (4) Crocodilia, which includes crocodiles (Hickman et al., 2024).

The exploration fielded observations of 17 species. Reptiles possess dry skin and are covered in scales or fur made of beta-keratin (Hickman et al., 2024). These 17 species are classified into three orders: Crocodilia, Squamata, and Testudines. Table 2 presents the species data for Reptilia.

Table 2. Reptile species in Ragunan Zoo used in educational video production

No	Local name (Bahasa Indonesia)	Species	Genus	Family	Order
1	*Buaya senyulong*	*Tomistoma schlegelii* Müller	*Tomistoma*	*Gavialidae*	*Crocodilia*
2	*Buaya irian*	*Crocodylus novaeguineae*	*Crocodylus*	*Crocodylidae*	*Crocodilia*
3	*Ular sanca kembang*	*Malayopython reticulatus*	*Malayopython*	*Pythonidae*	*Squamata*
4	*Ular koros*	*Ptyas korros* Schlegel	*Ptyas*	*Colubridae*	*Squamata*
5	*Ular sapi*	*Elaphe radiata* BOIE	*Elaphe*	*Colubridae*	*Squamata*
6	*Ular cincin-emas*	*Boiga dendrophila* Heinrich Boie	*Boiga*	*Colubridae*	*Squamata*
7	*Komodo*	*Varanus komodoensis* Pieter Antonie Ouwens	*Varanus*	*Varanidae*	*Squamata*
8	*Biawak maluku*	*Varanus indicus*	*Varanus*	*Varanidae*	*Squamata*
9	*Kadal lidah biru*	*Tiliqua gigas*	*Tiliqua*	*Scincidae*	*Squamata*
10	*Iguana hijau*	*Iguana iguana* Linnaeus	*Iguana*	*Iguanidae*	*Squamata*
11	*Labi-labi*	*Chitra indica*	*Chitra*	*Trionychidae*	*Testudines*
12	*Kura-kura Kalimantan*	*Orlitia borneensis* Gray	*Orlitia*	*Geoemydidae*	*Testudines*
13	*Kura-kura Spinosa*	*Heosemys spinosa*	*Heosemys*	*Geoemydidae*	*Testudines*
14	*Kura-kura Sulcata*	*Centrochelys sucrata*	*Centrochelys*	*Testudinidae*	*Testudines*
15	*Kura-kura aldabra*	*Aldabrachelys gigantea* Schweigger	*Aldabrachelys*	*Testudinidae*	*Testudines*
16	*Kura-kura purba*	*Macrochelys temminckii* Troost	*Macrochelys*	*Chelydridae*	*Testudines*
17	*Kura-kura sawah*	*Cuora amboinensis* Daudin	*Cuora*	*Geoemydidae*	*Testudines*

There are two species in the order Crocodilia. includes alligators, caimans, crocodiles, and gharials (Hickman et al., 2024; Linzey, 2016). In Crocodilia, scales remain throughout their lives, gradually replacing wear and tear (Hickman et al., 2024). Crocodilia have long bodies with large, elongated heads (Lal, 2018). Crocodilia have a sinus venosus, two atria, and two ventricles (Hickman et al., 2024; Lal, 2018; Linzey, 2016; Slobodian et al., 2021). The tail of Crocodilia is long, heavy, and dense (Lal, 2018). Crocodilia and birds are sister groups among living vertebrates (Hickman et al., 2024).

Eight species of the Order Squamata were identified. Squamata includes lizards and snakes (Hickman et al., 2024; Lal, 2018; Linzey, 2016). Skin scales or keratinized epidermal plates, which are shed; movable quadrate; vertebrae usually concave at the front; paired copulatory organs; about 5,810 species of lizards and 3,370 species of snakes (Hickman et al., 2024). Squamates are the only group of vertebrates that have evolutionarily lost limbs, as snakes are thought to have evolved from lizards and lost both pairs of limbs and both girdles (Linzey, 2016).

There are seven species of Order Testudines. Testudinates includes the group of turtles (Hickman et al., 2024). Modern turtles have adapted to three different ways of life, namely living on land, living permanently or semi-permanently in freshwater, or living at sea (Avery et al., 1982). The shell is usually complete with scutes (Lal, 2018). Body in a bony box of dorsal carapace and ventral plastron; jaws with keratinized plates instead of teeth; spine and ribs fused to overlying carapace; temporal pit missing; about 325 species (Hickman et al., 2024). The number of species of Reptilia per order is presented in Figure 2.

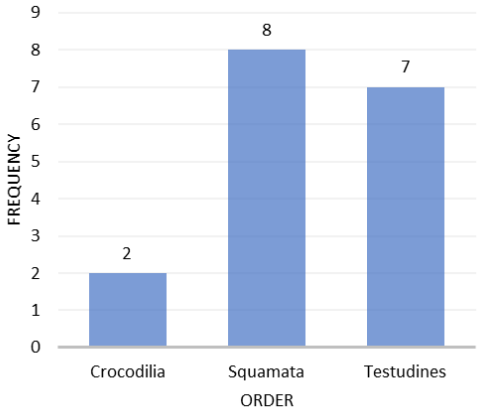

Figure 2. The number of reptile species featured in the educational video

The observations at the zoo in Table 2 were used as content in making the Reptilia video. The educational video on reptiles is uploaded to YouTube with the link https://youtu.be/NT5GOaZXmdQ. The video is 16 minutes and 44 seconds long. The video consists of three main parts, namely the opening, content, and closing. The opening section explains the title and learning objectives for reptiles. The content

explains the concept of reptiles, classifies species found in zoos, and explains species with vlogs. The closing section contains a conclusion of the reptile material. The video screenshot is presented in **Figure 3**.

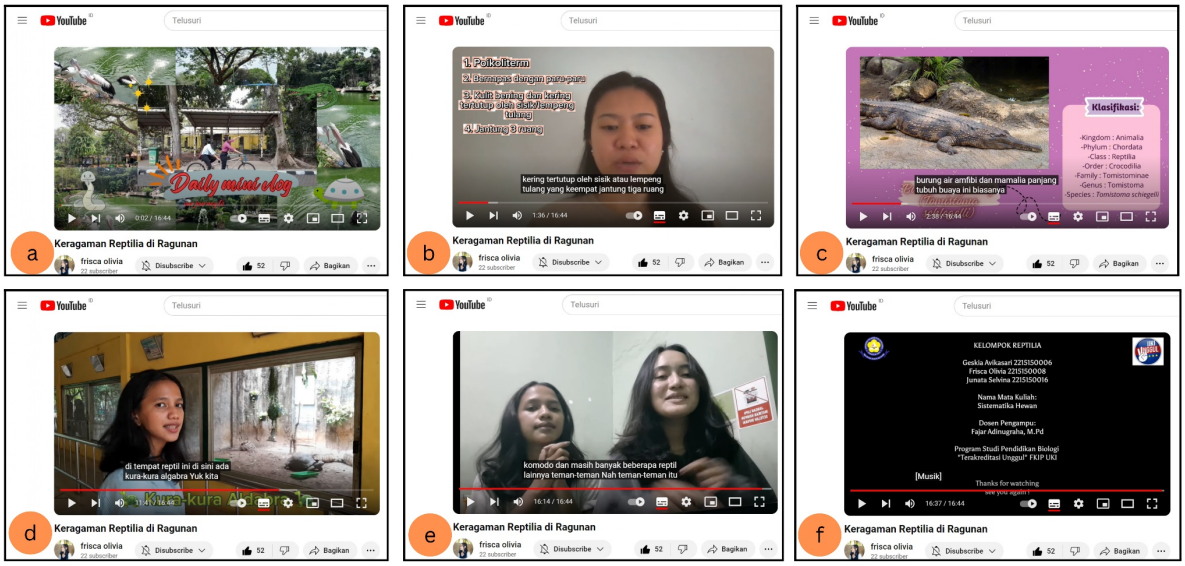

Figure 3. Educational video on reptiles. (A) Video title: Reptiles (B) Explanation of learning objectives and concepts about reptiles; (C) Explanation of the classification of the 17 identified species of the Reptilia group; (D) Explanation with vlogs; (D) Conclusion of the video about reptiles; and (E) Video Closing.

Educational Video on Aves or Bird Diversity at Ragunan Zoo

Aves are also referred to as the bird group. Birds are a lineage of dinosaurs that evolved flight during the Mesozoic (Pough & Janis, 2019). In carinate (flying birds), penguins (which are strong swimmers) have a sternum with a central keel, or carina, that serves to attach the large flight muscles, but in ratites (flightless birds), such as ostriches and emus, they do not have a sternum keel (Linzey, 2016).

The Aves educational video was created using 12 species observed at Ragunan Zoo. Birds are identifiable by their feathers, beaks, and wings and are commonly associated with their ability to fly (Pough & Janis, 2019; Slobodian et al., 2021). The 12 species belong to 10 orders, including Galliformes, Gruiformes, Phoenicopteriformes, Bucerotiformes, Ciconiiformes, Columbiformes, Falconiformes, Psittaciformes, Struthioniformes, and Pelecaniformes. Table 3 presents the species data from Aves.

Table 3. Bird species identified in Ragunan Zoo used in video

No	Local name (Bahasa Indonesia)	Species	Genus	Family	Order
1	*Merak hijau*	*Pavo muticus* Linnaeus	*Pavo*	*Phasianidae*	*Galliformes*
2	*Maleo senkawor*	*Macrocephalon maleo S. Müller*	*Macrocephalon Müller*	*Megapodiidae*	*Galliformes*
3	*Jenjang mahkota*	*Balearica regulorum* Bennett	*Balearica*	*Gruidae*	*Gruiformes*
4	*Flaminggo*	*Phoenicopterus ruber roseus*	*Phoenicopterus Linnaeus*	*Phoenicopteridae Bonaparte*	*Phoenicopteriformes Fürbringer*
5	*Julang emas*	*Aceros undulatus*	*Aceros*	*Bucerotidae*	*Bucerotiformes*
6	*Bangau tongtong*	*Leptoptilos javanicus Horsfield*	*Leptoptilos*	*Ciconiidae*	*Ciconiiformes*
7	*Dara mahkota*	*Goura scheepmakeri*	*Goura Stephens*	*Columbidae*	*Columbiformes*
8	*Elang laut kepala abu*	*Ichthyophaga ichthyaetus Horsfield*	*Ichtyophaga*	*Accipitridae*	*Falconiformes*
9	*Kakatua cempaka*	*Cacatua sulphurea citrinocristata Fraser*	*Cacatua*	*Cacatuidae*	*Psittaciformes*

No	Local name (Bahasa Indonesia)	Species	Genus	Family	Order
10	*Kakatua sulphurea*	*Cacatua sulphurea Gmelin*	*Cacatua*	*Cacatuidae*	*Psittaciformes*
11	*Kasuari gelambir-ganda*	*Casuarius casuarius Linnaeus*	*Casuarius*	*Casuariidae*	*Struthioniformes*
12	*Pelikan*	*Pelecanus conspicillatus*	*Pelecanus Linnaeus*	*Pelecanidae Rafinesque*	*Pelecaniformes*

There are two species from the order Galliformes. Galliformes includes quail, grouse, pheasants, ptarmigan, turkeys, and domestic fowl (Hickman et al., 2024; Pough & Janis, 2019; Slobodian et al., 2021). Beneficial groups are economically and culturally important to humans (Slobodian et al., 2021). More than 200 of its species are soil-dwelling (Pough & Janis, 2019). Ground-nesting herbivores such as chickens have strong beaks and heavy feet (Hickman et al., 2024). The legs are usually adapted for scratching and running (Lal, 2018).

During exploration, only one species from the order Gruiformes was observed. Gruiformes includes cranes, rails, and coots (Hickman et al., 2024; Linzey, 2016; Pough & Janis, 2019). A diverse assemblage of small to very large swimming and land-dwelling birds with morphological diversity (Marchant & Higgins, 1993). There are more than 300 species, most of which are herbivorous birds associated with freshwater habitats (Pough & Janis, 2019). Feathers with an aftershaft have weak or strong flight (Lal, 2018).

Similarly, there was only one species from the order Phoenicopteriformes. Phoenicopteriformes includes the flamingo (Hickman et al., 2024). Flamingos are highly adaptable species, able to thrive in aquatic habitats with high salinity and/or alkalinity and occupy unique feeding niches (Buckles, 2018). Large, colorful, wading birds that use the lamellae in their beaks to filter zooplankton from the water (Hickman et al., 2024). Flamingos are highly specialized aquatic filter feeders found in the tropics (Pough & Janis, 2019).

Order Bucerotiformes was also only found one species. Order Bucerotiformes include hornbills (about 55 species of omnivorous birds with very large beaks from Africa, Asia, and Melanesia), hoopoes (insectivores found in Europe and Africa), and wood hoopoes and scimitarbills (8 insectivorous species from Africa) (Pough & Janis, 2019). Most nest in tree cavities and have large, curved bills (Hickman et al., 2024).

One species was identified from the order Ciconiiformes. Order Ciconiiformes includes waders, storks, and herons (Hickman et al., 2024; Linzey, 2016). They are characterized by long-necks and long legs (Azizah & Armanda, 2016; Hickman et al., 2024; Lal, 2018), which allow them to catch fish easily and are adapted to muddy wetland habitats (Azizah & Armanda, 2016). This group is a long-beaked, sturdy wader with 19 species mostly distributed in the tropics (Hickman et al., 2024).

One species was identified from the order Columbiformes. The order Columbiformes includes pigeons and doves (Lal, 2018; Linzey, 2016; Pough & Janis, 2019; Slobodian et al., 2021). There are more than 300 species of mostly rock-dwelling, mainly seed-eating birds (Pough & Janis, 2019). All have short necks, short legs, and short, slender beaks (Hickman et al., 2024; Lal, 2018). The tarsus is shorter than the toe and produces pigeon milk for young pigeons (Lal, 2018).

One species was identified from the order Falconiformes. Order Falconiformes includes Vultures, Kites, Hawks, Falcons, and Eagles (Hickman et al., 2024; Lal, 2018; Pough & Janis, 2019). There are about 60 species of extremely fast scavengers and birds of prey (Pough & Janis, 2019) that primarily prey on other birds, with 67 species distributed worldwide (Hickman et al., 2024). The beak is stout and hooked at the tip, with soft, bare skin (cere) at the base and legs adapted for gripping with sharp, curved claws (Lal, 2018).

There are two species in the order Psittaciformes. Order Psittaciformes includes parrots and parakeets (Hickman et al., 2024; Lal, 2018; Linzey, 2016; Pough & Janis, 2019). Nearly 400 bird species are arboreal and mostly fruit and seed eaters (Pough & Janis, 2019). This group has hinged beaks and movable upward, fleshy tongues with 395 species (Hickman et al., 2024). In addition, the beak is stout, narrow, sharp-edged, and hooked with brilliant blue-green, yellow, or red feathers (Lal, 2018).

Table 3 shows that there is one species from the order Struthioniformes. Order Struthioniformes includes ostriches (Hickman et al., 2024; Linzey, 2016; Pough & Janis, 2019). The Common Ostrich is the largest living bird, standing at 2.4 m tall and weighing 145 kg (Hickman et al., 2024). Its feet have only two toes of unequal size and are padded, allowing it to move quickly over sandy soil (Hickman et al., 2024). Flightless, terrestrial, sternum without keel, and feathers without aftershafts (Lal, 2018).

One species was found from the Pelecaniformes order. The Pelecaniformes order includes ibises, spoonbills, herons, pelicans, frigatebirds, gannets, cormorants, and anhingas (Hickman et al., 2024; Lal, 2018; Linzey, 2016). Possible paraphyletic groupings include pelicans, which are waterbirds with large throat sacs; shoe storks, which are large African waterbirds; and hammerheads, which are waterbirds found in Africa, Madagascar, and Arabia (Pough & Janis, 2019). Most colonial fish-eaters inhabit coasts, lakes, wetlands, and rivers. There are 118 species distributed worldwide, especially in the tropics (Hickman et al., 2024). The foot web includes all four toes, and the nostrils are vestigial or absent (Lal, 2018). Figure 4 presents the number of species of Aves per order.

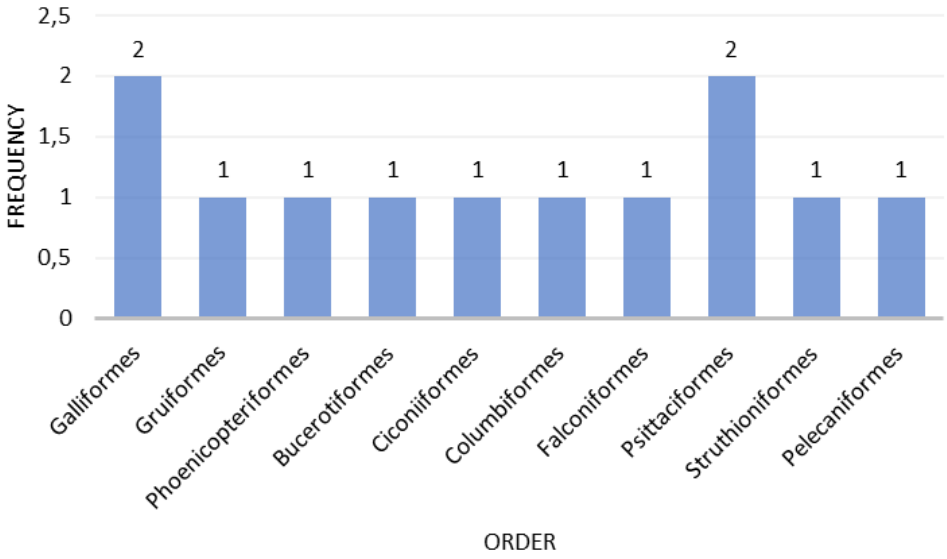

Figure 4. The number of birds species featured in the educational video

The observation results were utilized to create the reptile video, which is available on YouTube at https://youtu.be/aUGOXCsspmM. The video is 11 minutes and 47 seconds long and is divided into three main parts: opening, content, and closing. The opening section introduces the title and learning objectives related to Aves. The section on content explains the concept of Aves, the classification of species found in zoos, and the use of vlogs to explain species. The closing section provides a conclusion about Aves. Figure 5 presents a screenshot from the video.

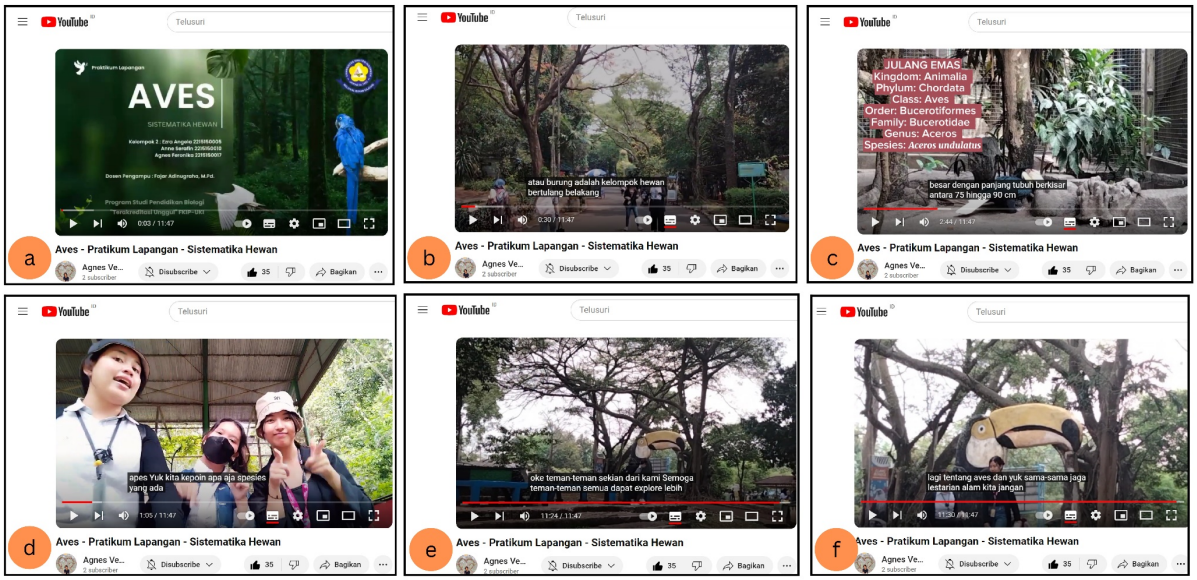

Figure 5. Educational video on reptiles. (A) Video title: Aves (B) Explanation of learning objectives and concepts about birds; (C) Explanation of the classification of the 17 identified species of the Aves group; (D) Explanation with vlogs; (D) Conclusion of the video about Aves or birds; and (E) Video Closing.

The use of educational videos linked to YouTube media can enhance vocabulary, including species names. Failure to comprehend vocabulary can impede communication and discourage students from retaining information in their memory (Dávila et al., 2021). According to Fiorella et al. (2020), students benefit most from viewing images from dynamically generated videos and then verbally explaining what they have learned. The educational video provides an alternative to on-site learning in situations where it may not be feasible (Adinugraha, 2022b).

While students may enjoy learning through videos, it is not always the most effective didactic format (Wu, 2016). This study has a limitation in that the effectiveness of the learning video in increasing students' understanding of Reptiles and Aves is unknown. When creating educational videos, it is important to incorporate 21st-century skills to encourage students to develop their abilities and share their experiences with others (Budiarti & Harlis, 2020), include science process skills. Science process skills are very important for students to face globalization, which requires competition between people (Saputra & Purnomo, 2023). Additionally, integrating different learning approaches can enhance the uniqueness of the video.

The learning approach should incorporate the principles of the scientific process and student-centered learning to align with 21st-century education. This includes the scientific approach (Adinugraha et al., 2021), exploring the natural surroundings (Adinugraha, 2018), and incorporating local wisdom or indigenous knowledge and culture(Adinugraha, 2022a; Adinugraha et al., 2021). Integrating local wisdom and indigenous knowledge with biology subjects through ethnobiological studies such as ethnobotany, ethnozoology, and ethnoecology has the potential to explore the local wisdom and culture approach (Adinugraha, 2022a). Further research can be suggested to implement the video made in this study in classroom setting and evaluate the increase of knowledge regarding Aves and Reptilian biodiversity.

Conclusion

Exploratory research indicates that there are 17 species of Reptilia, which belong to three orders: Crocodilia, Squamata, and Testudines. A video about Reptilia is available on YouTube at https://youtu.be/NT5GOaZXmdQ. The video has a duration of 16 minutes and 44 seconds. Based on observations at Ragunan Zoo, 12 species from the Aves group were found in 10 orders, namely Galliformes, Gruiformes, Phoenicopteriformes, Bucerotiformes, Ciconiiformes, Columbiformes, Falconiformes, Psittaciformes, Struthioniformes, and Pelecaniformes. A video about Aves has been uploaded on YouTube at https://youtu.be/aUGOXCsspmM. The video has a duration of 11 minutes and 47 seconds. Educational videos featuring native animals can help students understand different animal species, including Reptilia and Aves. Further study will be conducted to implement this media in classroom and evaluate student increase of knowledge on biodiversity.

References

Adinugraha, F. (2018). Pendekatan Jelajah Alam Sekitar (JAS) Pada Mata Kuliah Sistematika Hewan. *Pro-Life*, *5*(3), 598. https://doi.org/10.33541/pro-life.v5i3.838

Adinugraha, F. (2022a). An approach to local wisdom and cultural in Biology learning. *Proceedings of the 3rd International Conference of Education and Science, ICES 2021, November 17-18, 2021, Jakarta, Indonesia*. https://doi.org/10.4108/eai.17-11-2021.2318660

Adinugraha, F. (2022b). Video Youtube hutan kota sebagai media pembelajaran tentang pengetahuan hutan kota dan vegetasinya Di Purworejo. *Pro-Life*, *9*(November), 533–546.

Adinugraha, F., Ratnapuri, A., Ponto, A. I., & Novalina, N. (2021). Learning approaches in Biology learning. *Formatif: Jurnal Ilmiah Pendidikan MIPA*, *11*(1), 25–34. https://doi.org/10.30998/formatif.v11i1.6529

Agustin, W. N., Suprapto, P. K., & Meylani, V. (2020). Profil pengetahuan dan proses kognitif peserta didik pada sub materi vertebrata. *Quagga: Jurnal Pendidikan Dan Biologi*, *13*(1), 14. https://doi.org/10.25134/quagga.v13i1.3368

Avery, R. A., Bartholomew, G. A., Firth, B. T., Gans, C., Huey, R. B., Lillywhite, H. B., Maderson, P. F. A., Mautz, W. J., Minnich, J. E., Nagy, K. A., Pough, F. H., Tracy, C. R., & Turner, J. S. (1982). *Biology of the Reptilia vol.12* (C. Gans (ed.)). Academic Press Inc. (London) LTD.

Azizah, U. N. U. R., & Armanda, D. T. (2016). Keanekaragaman burung Ordo Ciconiiformes di kawasan konservasi Mangrove Tambaksari Desa Bedono Kecamatan Sayung Demak. *Prosiding Seminar Nasional from Basic Science to Comprehensive Education*, 272–279.

Buchner, J. (2018). How to create educational videos: From watching passively to learning actively. *R&E Source*, *12*(September), 1–10.

Buckles, E. L. (2018). Phoenicopteriformes. In

Pathology of Wildlife and Zoo Animals (pp. 687–696). Elsevier Inc. https://doi.org/10.1016/B978-0-12-805306-5/00028-6

Budiarti, R. S., & Harlis, D. N. (2020). High order thinking skills for biology education: Applied microbiology learning videos based on Jambi local wisdom. *Universal Journal of Educational Research*, *8*(2), 689–694. https://doi.org/10.13189/ujer.2020.080242

Chyleńska, Z. A., & Rybska, E. (2019). What can we do for amphibians and reptiles at schools? Between personal conceptions, conceptual change and students' pro-environmental attitudes. *Animals*, *9*(8). https://doi.org/10.3390/ani9080478

Dávila, N., Moura, E., Versieux, L. M., Carvalho, F. A., & Calvente, A. (2021). Urban Forest Fragments as a Living Laboratory for Teaching Botany: An Example from Federal University of Rio Grande do Norte, Brazil. *Systematic Botany*, *46*(1), 6–17. https://doi.org/10.1600/036364421x16128061189378

Fauziah, S., Surbakti, A., & Sikumbang, D. (2019). Perbandingan pengetahuan biodiversitas dan sikap peduli lingkungan antara peserta didik di sekolah kawasan Taman Nasional Way Kambas dan kawasan perkotaan. *Bioedusiana*, *4*(2), 44–54. https://doi.org/10.34289/285230

Fiorella, L., Stull, A., Kuhlmann, S., & Mayer, R. (2020). Fostering generative learning from video lessons: Benefits of instructor-generated drawings and learner-generated explanations. *Journal of Educational Psychology*, *112*(5), 895–906. https://doi.org/10.1037/edu0000408

Fitri, R., Syofyati, N., & Alberida, H. (2021). Undertanding's analysis the concept of classification of living organism for student's class VII at SMPN 8 Padang. *Bioeducation*, *5*(2), 68–76.

Garcia, V. R., & Sunderlin, W. D. (2011). Methods for research and fieldwork. In *Measuring Livelihoods and Environmental Dependence* (pp. 1–23).

Gerl, T., Randler, C., & Neuhaus, B. J. (2021). Vertebrate species knowledge:An important skill is threatene d by extinction. *International Journal of Science Education*, *0*(0), 1–21. https://doi.org/10.1080/09500693.2021.1892232

Gultom, D. L. S. (2019). Miskonsepsi siswa pada materi klasifikasi makhluk hidup di kelas VII MTs. Swasta Al-Washliyah Sigambal tahun pembelajaran 2018/2019. *Jurnal Berkala Mahasiswa*, *1*(2), 39–42.

Hendriyani, Y., & Aurora, R. (2023). Rancang bangun aplikasi pengenalan hewan pada kebun binatang Bukittinggi berbasis Augmented Reality dengan Metode Markerless. *Voteteknika (Vocational Teknik Elektronika Dan Informatika)*, *11*(1), 103. https://doi.org/10.24036/voteteknika.v11i1.120276

Hickman, C. P., Keen, S. L., Eisenhour, D. J., Larson, A., & I'Anson, H. (2024). *Integrated principles of Zoology* (19th ed.). McGraw Hill LLC.

Hidayah, D. U., & Subarkah, P. (2019). Media pembelajaran tentang klasifikasi binatang berbasis video animasi 3 dimensi di SMP Negeri 2 Wangon. *MATRIK : Jurnal Manajemen, Teknik Informatika Dan Rekayasa Komputer*, *19*(1), 45–52. https://doi.org/10.30812/matrik.v19i1.492

Isfaeni, H., Wulaningsih, R. D., & Noor, M. I. (2022). Media herpetofauna sebagai pengayaan pengetahuan bagi guru Sekolah Dasar (SD) di lingkungan Desa Hambalang, Bogor. *Jurnal Pengabdian Masyarakat Biologi Dan Sains*, *1*(1), 10–16. https://doi.org/10.30998/jpmbio.v1i1.949

Jayanti, D. N. D., & Susantini, E. (2021). Profil miskonsepsi peserta didik SMA pada materi Kingdom Animalia menggunakan four-tier multiple choice diagnostic test. *Berkala Ilmiah Pendidikan Biologi (BioEdu)*, *10*(3), 479–489. https://doi.org/10.26740/bioedu.v10n3.p479-489

Kurniasih, M. D. (2018). Menumbuhkan karakter konservasi biodiversitas melalui penerapan species identification and response software. *Edu Sains: Jurnal Pendidikan Sains & Matematika*, *6*(2), 30. https://doi.org/10.23971/eds.v6i2.991

Lal, S. S. (2018). *Practical zoology vertebrate* (Vol. 53, Issue 9). Rastogi Publications.

Lambert, H., Carder, G., & D'Cruze, N. (2019). Given the cold shoulder: A review of the scientific literature for evidence of reptile sentience. *Animals*, *9*(10), 1–22. https://doi.org/10.3390/ani9100821

Linzey, D. W. (2016). *Vertebrate: Biology* (Vol. 5, Issue 1). ohns Hopkins University Press.

Marchant, S., & Higgins, P. . (1993). Gruiformes. In *Handbook of Australian , New Zealand & Antarctic Birds* (Vol. 2, pp. 834–846). Oxford University Press.

Mayr, E. (1969). *Principles of systematic zoology*. McGraw-Hill Book Company New.

Nadlah, I. (2012). Peranan media benda nyata (makhluk hidup) divariasikan dengan papan gabus dapat meningkatkan hasil belajar materi Spermatophyta (Tumbuhan Biji). *Jurnal Penelitian Pendidikan Unnes*, *29*(2), 123780.

Norðdahl, K., Magnúsdóttir, E., Meier, M., Kastaun, M., Hottmann, A., Bushnyashki, Y., Dobreva, Y., & Josephson, J. (2019). *VIDUBIOLOGY creative video for biology*. Kulturring in Berlin e.V.

Nugraha, R. N., & Amelia, M. (2022). Pengembangan model wisata edukasi di Taman Margasatwa Ragunan. *Jurnal Inovasi Penelitian*, *Volume 3*(6), 6487–6494.

Pough, F. H., & Janis, C. M. (2019). *Vertebrate life* (10th ed.). Oxford University Press.

Putri, E. A., & Fadly, W. (2021). Viper sebagai upaya meningkatkan belajar peserta didik dalam pembelajaran daring di era pandemi Covid-19. *Proceeding of Integrative Science Education Seminar*, *1*(Covid 19), 370–377.

Ragunan Zoo. (2024). *Ragunan zoological park*. https://ragunanzoo.jakarta.go.id/about/ragunan-zoological-park-2/

Rao, K. R. (2020). *Vertebrate zoology: General characters of Chordata* (Vol. 1, pp. 5–6). Department of Zoology.

Sandika, B. (2017). Hasil belajar dan respons mahasiswa terhadap pembelajaran dengan metode blended learning berbasis online laboratory pada materi struktur anatomi hewan. *Jurnal Penelitian Pendidikan Matematika dan Sains*, *1*(2), 51-56.

Saputra, C. S., & Purnomo, A. R. (2023). Analisis bibliometrik dari ketrampilan proses sains dan experiential learning pada tahun 2020-2021. *Jurnal Penelitian Pendidikan Matematika Dan Sains*, *7*(1), 13–21.

Sari, I. H. K., Asih, I. S., Khoirunnisa, L., Tamherwarin, H. R. J., & Rizkiani, Z. B. (2023). Pemahaman peta konsep dan miskonsepsi siswa SMA kelas X semester 2 pada materi keanekaragaman hayati. *Jurnal Pendidikan Dan Pembelajaran*, *2*(2), 152–159. https://doi.org/10.54259/diajar.v2i2.1365

Setiawan, A. (2022). Keanekaragaman Hayati Indonesia: Masalah dan Upaya Konservasinya. *Indonesian Journal of Conservation*, *11*(1), 13–21. https://doi.org/10.15294/ijc.v11i1.34532

Setiawan, H. C., Nugroho, W., & Rofi, H. A. (2022). The importance of video as learning media according to principle of media production "Visuals." *Interdiciplinary Journal and Hummanity (INJURITY)*, *1*(3), 92–97. https://doi.org/10.58631/injurity.v1i3.24

Slobodian, V., Rizzato, P. P., & Sobral, G. (2021). Vertebrates (Chordata). In *Encyclopedia of Animal Cognition and Behavior* (Issue April). Springer Nature Switzerland AG. https://doi.org/10.1007/978-3-319-47829-6

Tabur, M. A., & Ayvaz, Y. (2010). Ecological importance of birds. *Second International Symposium on Sustainable Development*, 560–565.

van de Ven, A. H., & Poole, M. S. (2017). *Field research methods* (Issue October 2017, pp. 867–888). The Blackwell Companion to Organizations. https://doi.org/10.1002/9781405164061.ch38

Vero, S. E. (2021). Fieldwork ready: An introductory guied to field research for agriculture, environment, and soil scientists. In *Science Signaling* (Vol. 11, Issue 551). American Society of Agronomy, Inc., Crop Science Society of America, Inc., and Soil Science Society of America, Inc. and John Wiley & Sons, Inc.

Wu, J. (2016). Learning through video production - An instructional strategy for promoting active learning in a biology course. *ASCILITE 2016 - Conference Proceedings - 33rd International Conference of Innovation, Practice and Research in the Use of Educational Technologies in Tertiary Education: Show Me the Learning*, 677–682.

Yusriya, A., Santosa, K., & Priyono, B. (2014). Pengembangan video pembelajaran materi klasifikasi hewan sebagai suplemen bahan ajar biologi SMP. *Unnes Journal of Biology Education*, *3*(1), 50229.