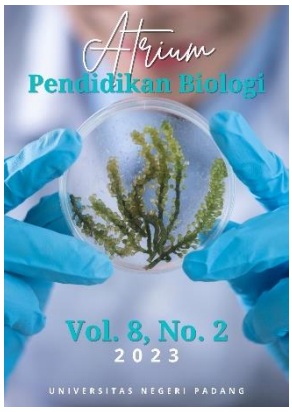
ONLINE ARTICLE

ATRIUM PENDIDIKAN BIOLOGI

Journal Homepage: http://ejournal.unp.ac.id/students/index.php/pbio
ISSN. 2656-1700



Identification of bird species in West Sumatra, as main component for developing local wealth-based teaching materials at university

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Article keywords:

Bird identification
Google lens
University

Abstract:

Google's developments, such as Google Lens, are increasingly providing opportunities and challenges to the world of education. These challenges and opportunities can be used as a way for lecturers as educational actors to explain the situation and solve student problems quickly, accurately, and precisely. So that lecturers need an innovative effort by utilizing Google Lens in lectures, especially in the field of biology. Google Lens is used as an identifier of an object, such as a bird, more effectively and efficiently. This study aims to produce initial data for the development of biology teaching materials at universities that are locally based and to find out the effectiveness of Google Lens as a bird species identifier in Padang City, West Sumatera, as well as to improve students' digital literacy skills, especially in Biology Department, Mathematics and Natural Science Faculty, Universitas Negeri Padang. This research went through stages including 1) collecting bird photos, 2) selecting photos to upload to Google Lens, 3) uploading photos to Google Lens, and 4) data confirmation. Bird photos were taken in various places in Padang city, West Sumatera, as well as at several locations in the adjoining cities, in the morning and evening. Confirm data using the https://ebird.org/ site and John MacKinnon's field book. As many as 60 bird species are documented and recognized on Google Lens. This study concluded that Google Lens is effectively used to recognize bird photos, by matching them to relevant internet sites. There are limitations to the quality of the photo and the angle of view of the photo, which results in a long time for object recognition.

Volume 8. Issue 2. September 2023
pp. 74-81
Article published: September 1st, 2023

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INTRODUCTION

Google as a very large information technology company, influences all aspects of human life. There is hardly a part of life today that is not spoiled by Google. Most human daily activities rely heavily on Google, from the moment we wake up, there is already a Google Calendar for daily schedule and agenda management, then accessing Google Mail to check e-mail, to the use of Google in its continuing activities.

Google provides software according to the needs of each user. Referring to the Google website, these applications include a) Google Maps; one of the world's most influential Google apps in the world. Google Maps uses satellites to describe the position of an area/ location[1], by a specific algorithm, b) Google Mail; to receive electronic mail with HTTPS web user accessibility[2], c) Google Search; to search for certain information according to current needs, and displayed according to trends at that time, for example, in 2019 the trend on Google Search is about the Coronavirus pandemic[3,4,5,6], and d) Google Lens; is a Google application to recognize an object by entering a certain photo or image into the application. Google Lens is used as an unrecognized object identifier. The use of Google Lens to recognize objects has been carried out several times to identify biological objects, for example, identification of plant species[7] and trees[8], insects identification[9], knowing plant body part[10] and other botanical studies[11], and identifying diabetic retinophaty[12].

In Indonesia, several bird studies have been conducted. This research, among others, was conducted by Asrianny, et al[13] who examined the diversity of bird species in the Bantimurung-Bulusaraung National Park using transect and GPS methods, they found 43 species (23 of which were endemic birds). Alamsyah and Marhento[14] conducted research to identify bird diversity on Pulau Rambut, Kepulauan Seribu using MacKinnon-1991 and MacKinnon-1998 matching methods, and found 24 bird species. Prakosa and Kurniawan[15] conducted identification of birds traded at the Splendid Bird Market, Malang using the field guide method of bird identification in Sumatera, Java, Bali, Kalimantan, and the Wallacea Region, and found 148 species, of which 92% of these birds came from Sumatera, Java, Bali, and Borneo. Waren, et al[16] counted diurnal birds in the Oransbari Mangrove Forest, South Manokwari Regency, and found as many as 15 species active at 06 a.m. to 10 a.m. and other 15 species active at 3 p.m. to 6.30 p.m. Misdiyanto, et al[17] identified lovebird species, but location was not stated, using K-Means Clustering method, 30 bird species were found. We found no research informing us of using Google Lens as a bird species identifier, so this research is worth doing.

Meanwhile, bird identification research has also been carried out in Padang City, West Sumatera. Jarulis, et al[18] examined bird species in the city center and along green belt using MacKinnon list matching method, and found as many as 34 species. Andira, et al[19] researched the community structure of birds in three types of habitat at Universitas Andalas, and caught 72 birds (24 species). The identification method used was not explained, but the threat status of all birds' species was matched to https://iucnredlist.org/. Adawiyah, et al[20] conducted an ethno-ornithological study in Rawang Village, Padang City using MacKinnon list, and it was discovered that there were 24 species interact directly with humans, as pets, food, trade commodities, traditional and cultural symbols, medicines, and natural predators. This bird identification study in Padang City did not use Google Lens as an identifier, so this is another reason for the importance of conducting this research.

This study aims to produce initial data for development of biology teaching materials at universities based on local potential, in addition for knowing the effectiveness of Google Lens as a bird identifier in Padang City, West Sumatera, as well as to improve students' digital literacy skills, especially in Biology Department, Mathematics and Natural Science Faculty, Universitas Negeri Padang. This researchs' assumption media innovation and teaching materials must always be carried out. The current update is oriented towards Google's development, so students can use results of this research as lecture materials, prove the effectiveness of Google Lens, and can disseminate knowledge that is more contextual. The research results can also be used as a reference for further researchs.

METHOD

In data collection, we used 1 Canon EOS 750D, 1 Sigma 150-600mm f/5-6.3 DG OS HSM Contemporary for Canon, 1 camera tripod, 2 memory cards, 2 camera batteries, 1 camera battery charger, 1 notebook, 1 writing instrument, 3 binoculars, 4 folding chairs, and 4 cellphones with Google Lens installed. The Google Lens display is shown in the Figure 1. We took bird photos in the morning (6 a.m. to 9 a.m.) and evening (4 p.m. to 6 p.m.) in several places in Padang City, West Sumatera, and several neighboring cities. The location of the place can be seen in Table 1, in coordinates form. Data tabulation was formulated from photos obtained during photo collection. The photos obtained are then selected according to quality of the photos and clarity of the bird's body parts. Next, each photo is uploaded to Google Lens. Setting focus of the object is done by placing focus area as small as possible, so

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that object can be recognized as much as possible. To strengthen identification, the results were compared with https://ebird.org/ and John MacKinnon's field manual. After birds are recognized, all this information is matched with the applicable curriculum at Biology Department, Mathematics and Natural Science Faculty, Universitas Negeri Padang, so it can be integrated into lecture teaching material.

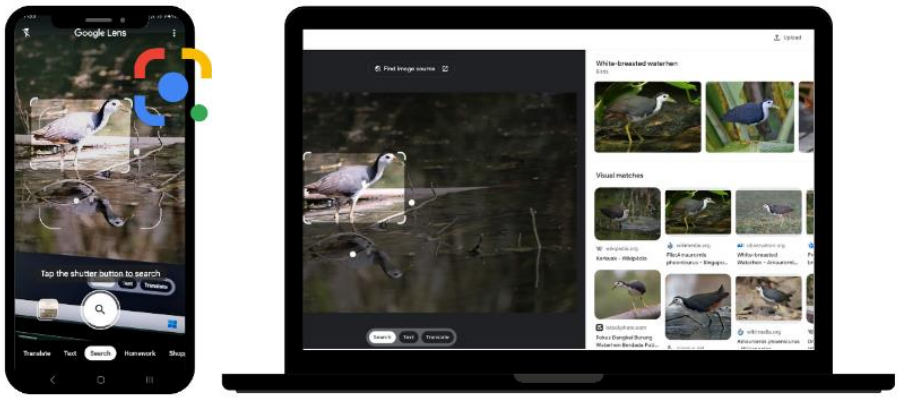

Figure 1. Google Lens view

Table 1. Location of data collection

Coordinates	
0°53'42"S 100°21'02"E	0°47'47"S 100°24'20"E
0°48'59"S 100°17'32"E	0°48'46"S 100°22'09"E
0°59'39"S 100°31'18"E	0°04'36"S 099°48'56"E
0°52'06"S 100°20'03"E	0°40'21"S 100°09'24"E
1°00'59"S 100°23'23"E	0°49'09"S 100°17'35"E
0°29'04"S 100°19'17"E	0°57'56"S 100°21'12"E
0°48'10"S 099°20'05"E	1°13'38"S 100°26'01"E
0°53'40"S 100°20'50"E	0°37'08"S 100°18'03"E
0°49'09"S 100°17'35"E	0°53'47"S 100°20'49"E
0°47'47"S 100°24'20"E	1°37'32"S 100°39'20"E
0°53'44"S 100°20'48"E	0°53'50"S 100°20'52"E
0°53'46"S 100°20'46"E	0°37'15"S 100°18'30"E
0°53'41"S 100°20'48"E	

RESULT AND DISCUSSION

Table 2. Species list

Kingdom	**Animalia**
Phylum	**Chordata**
Classes	**Aves**
Order	Passeriformes
	• *Acridotheres javanicus* author: Cabanis, 1851 • *Aegithina vidissima* author: Bonaparte, 1850 • *Anthreptes malacensis* author: Scopoli, 1786 • *Anthus rufulus* author: Vieillot, 1818 • *Aplonis panayensis* author: Scopoli, 1783 • *Artamus leuchorynchus* author: Linnaeus, 1771 • *Brachypodius atriceps* author: Temminck, 1822 • *Cinnirys jugularis* author: Linnaeus, 1766 • *Dicaeum trigonostigma* author: Scopoli, 1786 • *Helopsaltes certhiola* author: Pallas, 1811 • *Hirundo rustica* author: Linnaeus, 1758

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Kingdom	**Animalia**
Phylum	**Chordata**
Classes	**Aves**
	• *Hirundo tahitica* author: Gmelin, 1789 • *Lalage nigra* author: Forster, 1781 • *Lonchura maja* author: Linnaeus, 1766 • *Lonchura punctulata* author: Linnaeus, 1758 • *Lonchura striata* author: Linnaeus, 1766 • *Mixornis gularis* author: Horsfield, 1822 • *Muscicapa dauurica* author: Pallas, 1811 • *Orthotomus ruficeps* author: Lesson, 1830 • *Passer montanus* author: Linnaeus, 1758 • *Philentoma pyrhotera* author: Temminck, 1836 • *Ploceus philippinus* author: Linnaeus, 1766 • *Pygnonotus aurigaster* author: Vieillot, 1818 • *Pygnonotus brunneus* author: Blyth, 1845 • *Pygnonotus goiavier* author: Scopoli, 1786 • *Rhipidura javanica* author: Sparrman, 1788
Order	Charadriiformes
	• *Actitis hypoleucos* author: Linnaeus, 1758 • *Sternula albifrons* author: Pallas, 1764
Order	Coraciiformes
	• *Alcedo atthis* author: Linnaeus, 1758 • *Merops philippinus* author: Linnaeus, 1766 • *Merops viridis* author: Linnaeus, 1758 • *Todirampus chloris* author: Boddaert, 1783
Order	Gruiformes
	• *Amaurornis phoenicurus* author: Pennant, 1769 • *Lewinia striata* author: Linnaeus, 1766
Order	Pelecaniformes
	• *Ardea alba* author: Linnaeus, 1758 • *Ardea purpurea* author: Linnaeus, 1766 • *Bubulcus ibis* author: Linnaeus, 1758 • *Butorides striata* author: Linnaeus, 1758
Order	Caprimulgiformes
	• *Caprimulgus affinis* author: Horsfield, 1821 • *Hemiprocne comata* author: Temminck, 1824
Order	Cuculiformes
	• *Centropus bengalensis* author: Gmelin, 1788 • *Centropus sinensis* author: Stephens, 1815 • *Chrysophlegma miniaceum* author: Pennant, 1769 • *Cuculus saturatus* author: Blyth, 1843 • *Eudynamys scolopaceus* author: Linnaeus, 1758
Order	Piciformes
	• *Dinopium javanense* author: Ljungh, 1797 • *Picoides moluccensis* author: Gmelin, 1788 • *Prinia familiaris* author: Horsfield, 1821 • *Psilopogon haemacephalus* author: Muller, 1776
Order	Columbiformes
	• *Columba livia* author: Gmelin, 1789 • *Corvus enca* author: Horsfield, 1822

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Kingdom	**Animalia**
Phylum	**Chordata**
Classes	**Aves**
	• *Geopelia striata* author: Linnaeus, 1766 • *Macropygia ruficeps* author: Temminck, 1834 • *Spilopelia chinensis* author: Scopoli, 1786 • *Treron vernans* author: Linnaeus, 1771
Order	Accipitriformes
	• *Haliastur indus* author: Boddaert, 1783 • *Pernis ptilorhynchus* author: Temminck, 1821

Based on data in Table 2, the total is 57 species. When compared with bird data at TheCornelLab Merlin, this number is 10.3% of the total bird species in Sumatera. This shows a richness of bird species in West Sumatera, especially in Padang City. Of course, this has a very good potential to be included in teaching materials. Local information on natural resources is the focus of developing teaching materials at this time, where these teaching materials aim to produce a generation who are strong, character, intellect, and adaptable[21]. Learning based on local potential through certain learning methods will improve the quality of learning outcomes[22,23] because local wisdom is a social system that gives rise to self-regulation[24] with psychological influence of closeness to the material they are studying. In addition, this learning can also improve 21st century skills[23], science literacy skills[25], and friendly learning atmosphere[26].

Based on bird identification using Google Lens, there are several obstacles, that make identification time longer. When compared with other techniques, Google Lens has the disadvantage that it is closely related to the quality of the uploaded images. We found one of these situations when we identified Aegithina vidissima (bahasa: Cipoh Jantung). The point of view of this species photo yields very different results, which refers to Treron sieboldii (bahasa: Merpati Hijau Berperut Putih). So, it needs to be explained that angle of view of the photo can affect Google Lens performance. Photos that can be identified quickly are photos that have morphological components of the crown, forehead, beak, chin, throat, wings, chest, abdomen, legs, tail and stubble. The more components on the photo, easier identification will be. The following photo shows a kind that are easily recognized (Figure 2) and photos that are difficult or even not recognized (Figure 3) by Google Lens. Apart from the point of view, differences in the interpretation of objects can occur due to the quality of the photos[27] and similarity of objects that already exist on the Internet [10], but this application is still highly recommended for biology learning [7].

Figure 2. Photo of *Dicaeum trigonostigma* (Bahasa: Cabai Bunga Api).

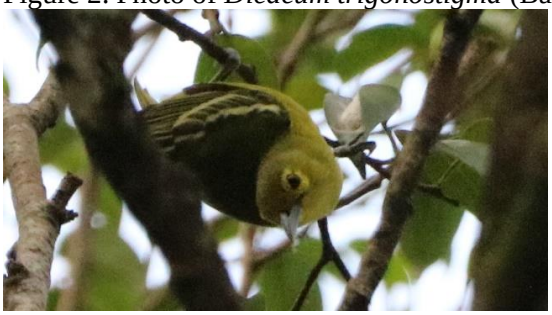

Figure 3. Photo of *Aegithina vidissima* (Bahasa: Cipoh Jantung)

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Google Lens has great potential as an identifier of biological objects. Not only recognize birds, but also other species. Such as mammals, reptiles, amphibians, fish, invertebrates, plants, bacteria, pathogens, and others. This recognition starts from finding an image of object, this can be done through photography or sketching. Based on this research, we recommend that future researchers before using it to have good quality photos, make sure that the object's body parts can be seen as completely as possible, and right lighting. This is so that photos are recognized correctly according to big data on the Internet. The resulting data with its validity can be used to develop biology teaching resources. Teaching resources based on local potential can be developed. Researchers in the field of local wisdom studies identify the rich biota of certain regions and develop them into learning resources. So that students are able to learn the information around them, their knowledge becomes deeper and sticks around longer. We ensure that teaching information, which comes from around the students, can make learning meaningful.

Our results are important data for the development of teaching materials based on local potential. Students will get more experience because of psychological encouragement to discuss things around them. Learning will become more contextual, which in turn increases understanding of what is learned[28,29,30,31]. Course Outcomes (COs) in the Ornithology course at Universitas Negeri Padang are students able to explain the general concept of ornithology (CO1), students are able to explain the basic concepts of differences in morphology, behavior, physiology, phylogenetics, and bird conservation (CO2), students are able to identify and classify bird species based on morphology (CO3), and students are able to apply bird research methods (CO4). The bird species found from this research can be integrated into lectures to increase CO2 and CO3, while the Google Lens identification method can support CO4. Projection of lecture innovation can be seen in Table 3.

Table 3. Projection of data integration into curriculum

COs	COs-projection
CO2. Students are able to explain the basic concepts of differences in morphology, behavior, physiology, phylogenetics, and bird conservation.	CO2. Students are able to explain the basic concepts of differences in morphology, behavior, physiology, phylogenetics, and bird conservation.
SUB-CO2. Students are able to explain the basic concepts of bird conservation.	SUB-CO2. Students are able to explain the basic concepts of bird conservation in Padang City, West Sumatera.
CO3. Students are able to identify and classify bird species based on morphology.	CO3. Students are able to identify and classify bird species based on morphology.
SUB-CO3. Students are able to identify and classify bird species based on morphology.	SUB-CO3. Students are able to identify and classify bird species based on morphology in Padang City, West Sumatera.
CO4. Students are able to apply bird research methods.	CO4. Students are able to apply bird research methods.
SUB-CO4. Students are able to apply bird research methods.	SUB-CO4. Students are able to apply bird research methods using Google Lens in Padang City, West Sumatera.

CONCLUSION

This research has found data on bird species in Padang City, West Sumatra, by identification using Google Lens. This application has proven to be used effectively in identifying biological objects, so that it is declared suitable for use in learning. Besides that, this data can also be used to improve the standard of lectures at Universitas Negeri Padang, by adjusting curriculum towards local wealth of West Sumatra. Students' digital abilities can also be improved as a feature of 21st century skills.

ACKNOWLEDGMENTS

We would like to thank all the students at the Mathematics and Natural Science Faculty, Universitas Negeri Padang who participated in data collection, and to the bird research team, SightSeer Indonesia, we express our great gratitude for the ideas and support. Furthermore, thanks to Chancellor of Universitas Negeri Padang through the university's research institute which has funded this research so that this article can be completed.

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