

## Avian Virtual Gallery (Aviavista) as a Tool for Promoting Avitourism at Bandar Universiti Pagoh

Nur Alia Arisa Bahman<sup>1</sup>, Nor Atiqah Norazlimi<sup>12\*</sup>, Ilham-Norhakim Mohd Lokman<sup>2,3</sup>

<sup>1</sup> Department of Technology and Natural Resources, Faculty of Applied Sciences and Technology, UTHM Kampus Cawangan Pagoh, Hab Pendidikan Tinggi Pagoh, KM 1, Jalan Panchor, 84600, Pagoh, Muar, Johor, MALAYSIA.

<sup>2</sup> Environmental Management and Conservation Research Unit (eNCORE), Faculty of Applied Sciences and Technology, UTHM Kampus Cawangan Pagoh, Hab Pendidikan Tinggi Pagoh, KM 1, Jalan Panchor, 84600, Pagoh, Muar, Johor, MALAYSIA.

<sup>3</sup> Naturetech Resources, TL MRBP F32/A, Jalan Temenggong Ahmad, 84150 Muar, Johor, MALAYSIA.

\*Corresponding Author: [atiqah@uthm.edu.my](mailto:atiqah@uthm.edu.my)

DOI: <https://doi.org/10.30880/ekst.2025.05.02.077>

### Article Info

Received: 30 December 2024

Accepted: 25 January 2025

Available online: 19 December 2025

### Keywords

Avitourism, Aviavista, Virtual Gallery,  
Bandar Universiti Pagoh

### Abstract

Bandar Universiti Pagoh (BUP) has abundant bird biodiversity making it a great destination for edutourism and avitourism. This study intended to promote avitourism and edutourism at Bandar Universiti Pagoh by developing Aviavista, an avian virtual gallery. The platform uses immersive and interactive virtual experiences to highlight the region's unique avian biodiversity, focusing on bird enthusiasts, researchers, students, and tourists. Aviavista addresses the absence of creative tools for engaging visitors by highlighting the distinctive qualities of local bird species while promoting environmental awareness and sustainable tourism practices. Traditional ways of promoting avitourism and edutourism may not be able to fully use technological advancements in order to fulfil the changing demands of potential visitors. This virtual gallery allows users to discover many bird species located at Bandar Universiti Pagoh from anywhere. The project entailed gathering a comprehensive list of bird varieties in BUP, creating a user-friendly digital interface, and assessing the platform's effectiveness based on user feedback. 33 bird species were recorded throughout this study in BUP using visual and auditory methods. Aviavista, an avian virtual gallery was developed using Artstep platform. The survey was conducted to evaluate the effectiveness of Aviavista in promoting avitourism and edutourism in BUP. The findings show that Aviavista successfully boosts biodiversity awareness, improves educational outcomes, and generates interest in avitourism, despite ongoing constraints such as digital literacy, user involvement, and funding. Future developments include optimising the platform's design, increasing community interaction, and organising conservation-focused events. This study emphasises the potential of technology-enhanced instruments to promote ecotourism and biodiversity conservation.

## 1. Introduction

Avitourism is a developing sub-sector of nature-based tourism that revolves around birdwatching and has expanded globally due to increased popularity, disposable income, and affordable travel options. The diverse avian species in these endemic-rich environments is a primary draw for avitourism and attract enthusiasts worldwide [1]. Similarly, edutourism combines travel with education, bringing about cultural and knowledge exchange while boosting the local economy through better services and infrastructure [2] [3]. Taken together, avitourism and edutourism bring strong economic and educational benefits, especially in the promotion of environmental awareness and regional biodiversity [4].

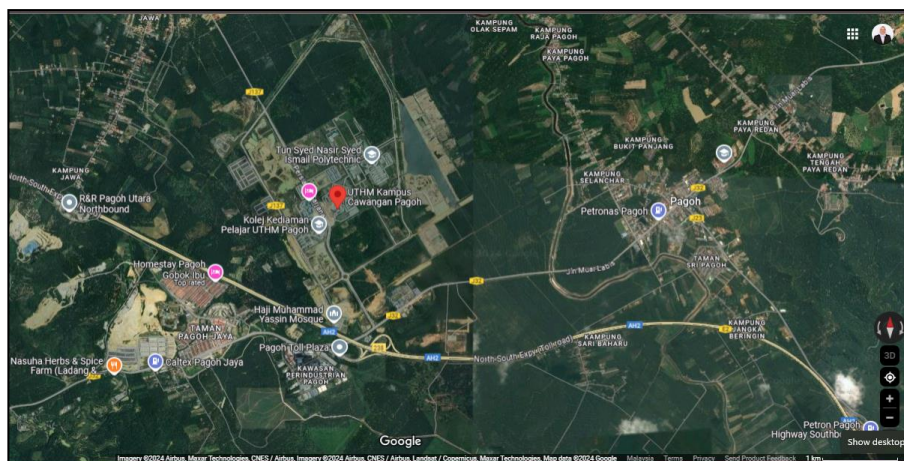
Museums play a pivotal role as a fundamental element of cultural and educational enhancement. Conventionally, museum exhibitions require visitors to be physically present at the museum to enjoy the exhibition. In the era of digitalization, an alternative approach has been introduced, visitors can access museum exhibitions beyond the physical visits through a virtual gallery which offer unparalleled accessibility, allowing users from around the globe to explore exhibits from the comfort of their homes. Open museums worldwide provide real-time and interactive access to remote visitors via the web, available at all times. Visitors can learn about a museum's collection online, even if they cannot visit in person [5]. Moreover, virtual galleries eliminate the environmental impact associated with constructing and maintaining physical spaces or travelling to a museum. While they lack the tangible, sensory experiences of physical exhibits, they compensate by offering scalable, cost-effective solutions that democratize access to knowledge and heritage. Among the successful examples of virtual gallery was demonstrated by National Museum of Natural History by Smithsonian Institution and Virtual Water Gallery which successfully engaged a global audience in shifting knowledge and behaviours [6].

Traditional physical museums limit access to the unique avian biodiversity of the area, particularly remote visitors. Similarly, the lack of innovation and interactive tools significantly reduces the ability to attract and engage visitors. Thus, this study aims to gather information of avian diversity in Bandar Universiti Pagoh (BUP). Besides, this study also attempts to develop Aviavista, an avian virtual gallery in BUP, to showcase regional avian biodiversity and evaluate its effectiveness in promoting avitourism and edutourism.

## 2. Research Methodology

### 2.1 Study Site

Bandar Universiti Pagoh (BUP) ( $2^{\circ}08'05.3''N$   $102^{\circ}44'06.2''E$ ) as shown in Fig. 1 is a planned township with both industrial and integrated higher education hubs, aiming to catapult Pagoh into a modern and sustainable town [7]. It is situated just off the Pagoh Interchange on the North-South Highway (Exit 238), around 20 minutes from Muar, the capital town of Johor. Aiming for sustainability, BUP comprised various habitats including urban areas (residential areas, higher education hub), agricultural areas (palm oil plantation), and wetland areas.



**Fig. 1** Location of Bandar Universiti Pagoh

(Source: Google Earth, 2024)

## 2.2 Methodology

A direct observation technique with the aid of binoculars (12 x 42) and a DSLR camera was employed in this study to capture the images of all avian species found in the sampling areas in BUP, Pagoh, Johor. All avian species were further identified according to the field guide by [8] and online databases such as eBird and MyBIS. Besides that, other information such as GPS coordinates in which the birds were found were recorded. The conservation status, intriguing morphology, and behaviour, habitat preferences, and local and scientific names were also recorded by reviewing the online databases. Besides that, bird sounds or calls were also recorded by using a sound recorder which was further analysed using the BirdNet app.

Next, an avian virtual gallery named Aviavista was developed using the user-friendly interface, the Art Step platform (<https://www.artsteps.com/>). Aviavista was then evaluated for its effectiveness as a tool for promoting avitourism and edutourism in BUP through an online survey distributed to 102 respondents. The respondents include school students, lecturers, residents, and tourists. The survey consists of several open- and closed-ended questions consisting of five sections – Section 1: focused on collecting demographic information of respondents; Section 2: focused on the interface and performance; Section 3: focused on the content quality; Section 4: focused on the effectiveness of Aviavista as an avitourism product; and Section 5: focused on the suggestions for improvement.

## 3. Result and Discussion

A total of 33 bird species were recorded throughout the sampling duration. 31 out of 33 species were listed as Least Concern (LC), one species as Vulnerable (VU) and one species as Near Threatened (NT) according to the IUCN Red List of Threatened Species. In addition, as many as 22 kinds of bird families were obtained from this survey. The summary of the recorded bird species is listed in Table 1.

**Table 1** Checklist of bird species in Bandar Universiti Pagoh.

No.	Family	Name	Scientific name	Local name	Distribution status	IUCN status
1.	Hirundinidae	Tahiti/Pacific swallow	<i>Hirundo tahitica</i>	Layang layang pasifik	R	LC
2.	Estrildidae	Scaly-breasted munia	<i>Lonchura punctulata</i>	Pipit pinang	R	LC
3.	Pycnonotidae	Yellow-vented bulbul	<i>Pycnonotus goiavier</i>	Merbah kapur	R	LC
4.	Rallidae	White-breasted waterhen	<i>Amaurornis phoenicurus</i>	Ruak-ruak	RM	LC
5.	Cuculidae	Lesser coucal	<i>Centropus bengalensis</i>	Bubut kecil	R	LC
6.	Rallidae	Baya weaver	<i>Ploceus philippinus</i>	Burung tempua	R	LC
7.	Ardeidae	Purple heron	<i>Ardea purpurea</i>	Pucung Serandau	RM	LC
8.	Sturnidae	Common Myna	<i>Acridotheres tristis</i>	Tiong Gembala Kerbau	R	LC
9.	Columbidae	Zebra dove	<i>Geopelia striata</i>	Merbuk	R	LC
10.	Oriolidae	Black-naped oriole	<i>Oriolus chinensis</i>	Burung kunyit besar	RM	LC
11.	Corvidae	House crow	<i>Corvus splendens</i>	Gagak rumah	R	LC
12.	Sturnidae	Asian glossy starling	<i>Aplonis panayensis</i>	Perling mata merah	R	LC
13.	Laniidae	Long-tailed Shrike	<i>Lanius schach</i>	Tirjup ekor panjang	R	LC
14.	Coraciidae	Dollarbird	<i>Eurystomus orientalis</i>	Tiong batu	RM	LC
15.	Rhipiduridae	Malaysian pied-fantail	<i>Rhipidura javanica</i>	Murai gila	R	LC
16.	Cisticolidae	Yellow-bellied	<i>Prinia flaviventris</i>	Perenjak kuning	R	LC

		prinia				
17.	Alcedinidae	Collared kingfisher	<i>Todiramphus chloris</i>	Pekaka bakau	RM	LC
18.	Columbidae	Spotted dove	<i>Spilopelia chinensis</i>	Tekukur	R	LC
19.	Passeridae	Eurasian tree sparrow	<i>Passer montanus</i>	Ciak rumah	R	LC
20.	Ardeidae	Great Egret	<i>Ardea alba</i>	Bangau besar	RM	LC
21.	Alcedinidae	White-throated kingfisher	<i>Halcyon smyrnensis</i>	Burung raja udang	R	LC
22.	Charadriidae	Red-wattled lapwing	<i>Vanellus indicus</i>	Rapang minta duit	R	LC
23.	Sturnidae	Javan Myna	<i>Acridotheres javanicus</i>	Burung gembala-kerbau sawah jawa	R	VU
24.	Anatidae	Lesser whistling-duck	<i>Dendrocygna javanica</i>	Belibis	R	LC
25.	Ardeidae	Striated heron	<i>Butorides striata</i>	Pucung keladi	RM	LC
26.	Hirundinidae	Barn swallow	<i>Hirundo rustica</i>	Layang layang hijrah	M	LC
27.	Megalaimidae	Coppersmith barbet	<i>Psilopogon haemacephalus</i>	Takur akar	R	LC
28.	Rallidae	Eurasian moorhen	<i>Gallinula chloropus</i>	Tiong air	R	LC
29.	Rallidae	Gray-headed Swamphen	<i>Porphyrio poliocephalus</i>	Pangling	R	LC
30.	Ciconiidae	Lesser adjutant	<i>Leptoptilos javanicus</i>	Burung botak	R	NT
31.	Columbidae	Pink-necked green-pigeon	<i>Treron vernans</i>	Punai gading	R	LC
32.	Muscicapidae	Oriental magpie-robin	<i>Copsychus saularis</i>	Murai kampung	R	LC
33.	Phasianidae	Red junglefowl	<i>Gallus gallus</i>	Ayam hutan	R	LC

\*Note: R = Resident; RM = Resident Migrant; M = Migrant; LC = Least Concern; NT = Near Threatened; VU = Vulnerable

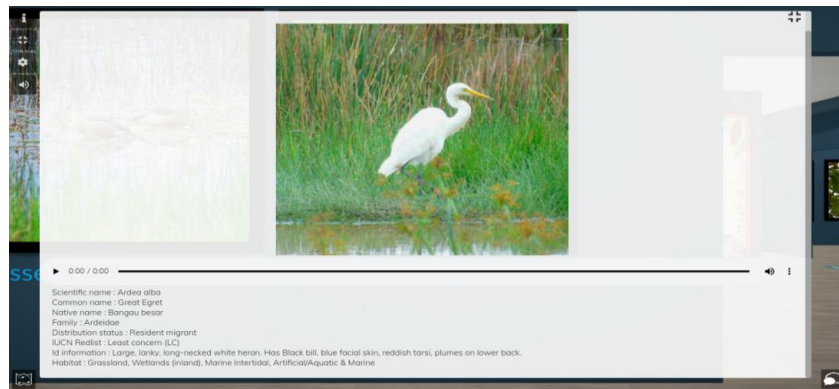
Table 1 highlights the diverse avian ecosystem in BUP, which supports various bird groups, including wetland and urban birds. Wetland birds such as the Great Egret (*Ardea alba*), Lesser whistling-duck (*Dendrocygna javanica*), were observed utilizing the artificial ponds in BUP. [9] noted that an artificial wetland offers an appropriate habitat to the birds as the shallow water and emergent vegetation make it an ideal place for birds to forage, reduce predator detection and offer an abundance of food resources.

Urban birds, including mynas and starlings, were also abundant in BUP. Many urban birds are generalists which are extremely flexible and tolerant to human presence, noise, and activity, allowing them to survive in human settlements [10]. Their adaptability in seeking shelter and food enables the generalists to be effective under various conditions and commensurate with human presence. For example, species such as Eurasian tree sparrow, house crow, and common myna can survive in densely populated areas due to their ability to forage and nest [11][12]. These generalists are often widespread and can be found in literally every park [13].

From the bird species recorded, an avian gallery, Aviavista was developed (see Fig. 2). The gallery would engage users through visuals, descriptions, and audio. The gallery integrates images of birds with comprehensive information, including scientific name, common name, native name, family, distribution status, IUCN Red List status, identification information, and habitat (Fig. 3). Information was sourced from reliable platforms such as eBird [14], IUCN Red List [15], and Birding in Malaysia [16]. Besides, to enhance engagement, some of the interactive features such as embedded quizzes and fun facts were displayed outside the exhibition area for the users.



**Fig. 2** The interior view of Aviavista



**Fig. 3** Example of information on birds displayed in Aviavista

To test the effectiveness of Aviavista in promoting avitourism and edutourism in BUP, a set of questionnaires was developed and blasted online for feedback (Questionnaire). 102 respondents participated in this survey. The demographic of the respondents is shown in Table 2.

**Table 2** Summary of Demographic information of respondents

Profiles	Items	Total number	Percentage (%)
Age	Under 18	6	5.9
	18-24	44	43.1
	25-34	18	17.6
	35-44	18	17.6
	45-54	12	11.8
	55-64	3	2.9
	65 and over	1	1
Gender	Male	47	46.1
	Female	55	53.9
State	Johor	33	32.4
	Kedah	3	2.9
	Kelantan	17	16.7
	Kuala Lumpur	4	3.9
	Melaka	8	7.8
	Negeri Sembilan	7	6.9
	Pahang	4	3.9
Perak	2	2	

	Pulau Pinang	4	3.9
	Putrajaya	2	2
	Sabah	1	1
	Sarawak	2	2
	Selangor	9	8.8
	Terengganu	6	5.9
Educational background	High school or equivalent	18	17.6
	Diploma	15	14.7
	Bachelor's Degree	62	60.8
	Master's Degree	7	6.9
	Student	37	36.3
Occupation	Employed full-time	51	50
	Employed part-time	2	2
	Self-employed	5	4.9
	Unemployed	5	4.9
	Retired	2	2
Monthly household income	Under RM 200	27	26.5
	RM 2000 - RM 3999	41	40.2
	RM 4000 - RM 5999	25	24.5
	RM 6000 and above	9	8.8
Marital status	Single	63	61.8
	Married	39	38.2

Section 2 discussed the findings of respondent’s feedback on the performance of Aviavista. Overall, Aviavista receive high ratings for its usability, navigation, visual appeal and functionality. 61.8% of respondents rated the overall performance as excellent (Fig 4) meanwhile 63.7% of respondents rated excellent for its visual appearance (Fig 5). Despite positive reviews, challenges were noted, particularly with navigation. Fig 6 reveals that while 55.9% rated navigation as excellent, 21.6% of respondents rated it as average or lower due to the difficulties in viewing the gallery on smaller devices. The feedback was taken seriously for future improvements to improve accessibility and optimization across various user interface.

1. How would you rate the overall performance of the Aviavista tool?  
102 responses

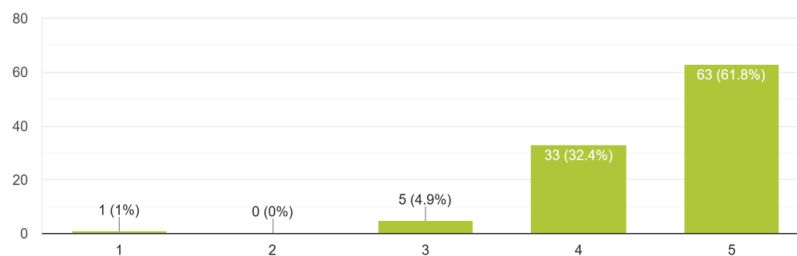
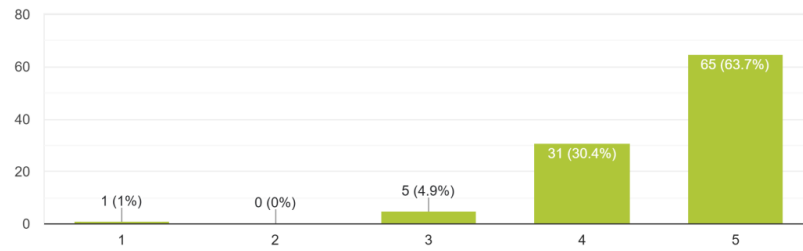


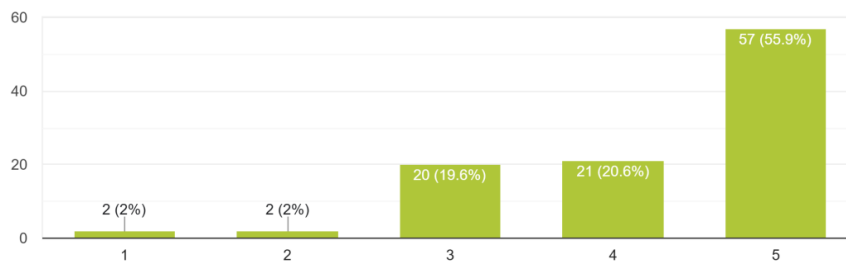
Fig. 4 Overall Performance of Aviavista

4. How would you rate the visual design and aesthetics of the Aviavista tool?  
102 responses



**Fig. 5** Visual Appearance

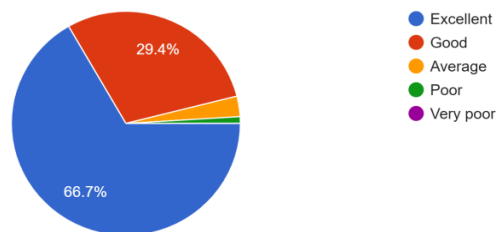
2. How easy was it to navigate through the Aviavista tool?  
102 responses



**Fig. 6** Navigation Experience

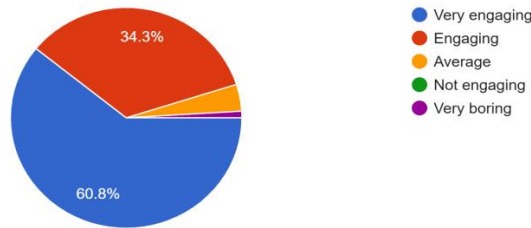
For content quality and educational impact (section 3), the majority of the respondents highly valued the multimedia content of Aviavista. 66.7% rate excellent for platform quality (Fig. 6) and 60.8% find the platform very engaging (Fig. 7). Meanwhile, 94.1% of respondents agreed that Aviavista enhanced their understanding of learning about avian biodiversity and conservation efforts (Fig. 8). Furthermore, 69.6% of respondents noted that the multimedia content significantly sparks their interest in avitourism (Fig. 9). These findings underscore the importance of Aviaviata in fostering educational and promotional tools for biodiversity conservation.

1. How would you rate the overall quality of the mul...edia content (videos, images, audio) on Aviavista?  
102 responses



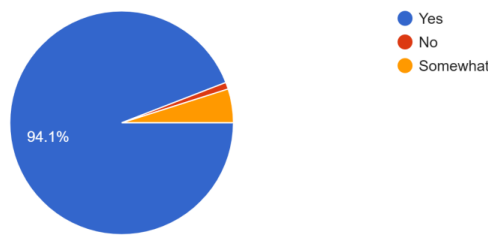
**Fig. 7** Multimedia Content Quality

2. How engaging did you find the multimedia content on Aviavista?  
102 responses



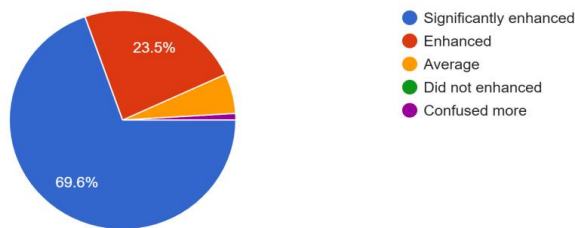
**Fig. 8** Multimedia Engagement

5. Did Aviavista inspire you to learn more about avian biodiversity and conservation efforts?  
102 responses



**Fig. 9** Influence on Learning and Conservation Awareness

6. How well did the multimedia content enhance your understanding of avitourism topics?  
102 responses

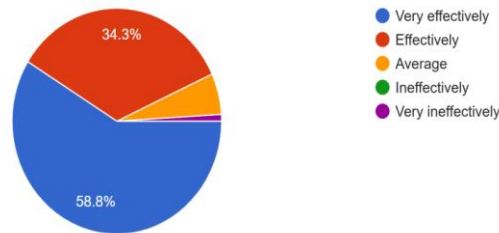


**Fig. 10** Multimedia Content increasing the interest of respondents in avitourism

For section 4, Aviavista received well-rounded support from respondents for its ability to promote birdwatching activities. 58.8% of respondents found the platform very effective while 34.3% rated it as effective (Fig 10). Moreover, 58.8% of respondents stated that Aviavista very likely to provide sufficient information on birdwatching destinations and hotspots (Fig. 11), which in turn makes it a valuable planning tool for bird enthusiasts. Other than that, 63.7% of respondents indicated they would be very likely to recommend Aviavista to their birdwatcher’s friend (Fig. 12) which displays the importance of this tool to encourage participation in avitourism.

2. How effectively does Aviavista promote bird-watching activities?

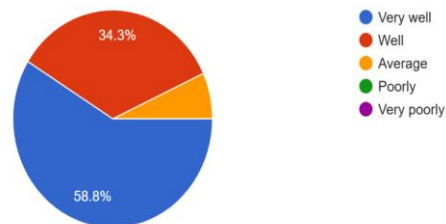
102 responses



**Fig. 10** Effectiveness in Promoting Birdwatching Activities

4. How well does Aviavista provide information on bird-watching destinations and hotspots?

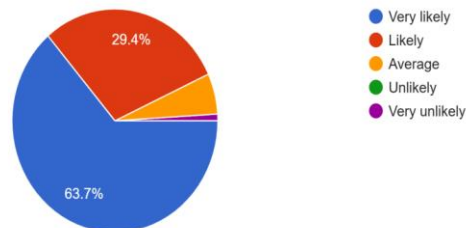
102 responses



**Fig. 11** Information on Birdwatching Destinations

5. How likely are you to recommend Aviavista to other bird-watching enthusiasts?

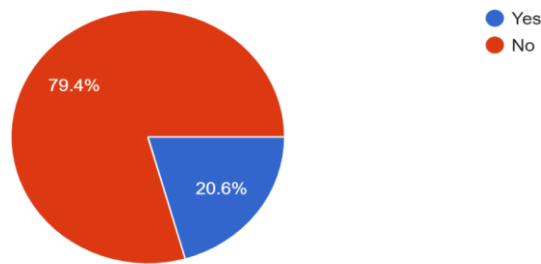
102 responses



**Fig. 12** Recommendation Likelihood

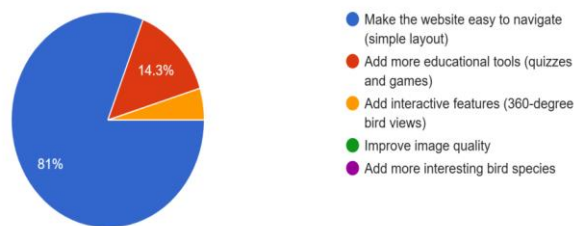
The last section, section 5, requires the users to give recommendations for improvement for Aviavista. Generally, Aviavista receives positive feedback from the users with 79.4% agreeing that they are satisfied with the performance of Aviavista as a tool for promoting avitourism in the BUP (Fig. 13). The rest of the respondents responded that there are some improvements to be done to improve user's experience with majority recommending a simpler navigation layout while the rest 4.3% suggested the inclusion of educational tools such as quizzes and games, while 4.8% proposed interactive features like 360-degree bird views (Fig. 14).

1. Do you have any suggestions for improving Aviavista?  
102 responses



**Fig. 13** Recommendations Likelihood

1. If yes, what can be improve?  
21 responses



**Fig. 14** Suggestion for improvement

The flexible virtual characteristics of Aviavista present substantial potential for growth beyond Bandar Universiti Pagoh. Its digital framework facilitates participation in ecotourism for individuals from rural and underrepresented regions, effectively overcoming geographical and economic obstacles. According to [17], virtual galleries provide users with the opportunity to access content from various locations "as if in one place," thereby enhancing the visibility of Malaysia's abundant biodiversity to audiences both domestically and globally.

Virtual galleries are aligned with the ecotourism goals of Malaysia, as they serve as crucial education tools that will enhance knowledge on how to practice sustainability and conservation. Virtual platforms have a much greater reach compared to traditional physical galleries, and the cost is lower with lesser environmental impacts [18]. In addition, the immersion in leading-edge technologies of virtual or augmented reality experiences might draw many user groups with different backgrounds, including schools, nature lovers, and tour groups.

Several challenges accompany the growth of Aviavista. Reliable infrastructure, such as internet access and digital literacy, is a prerequisite but often in short supply in rural areas. Furthermore, engagement and authenticity have to be brought to the fore to mimic the enriching experience that accompanies traditional ecotourism, requiring constant updating and interactive elements to keep users interested. Ultimately, this platform can only expand with further collaboration in academic institutions, ecotourism stakeholders, and governments, besides the acquisition of stable financial resources for long-term sustainability.

#### 4. Conclusion

This study successfully documented 33 avian species in Bandar Universiti Pagoh, Muar, Johor covering wetland and urban birds reflecting the diverse ecosystems. The development of an avian virtual gallery, Aviavista, effectively showcased detailed information and interactive features to boost the interest of users. From the feedback of respondents across Malaysia, it is confirmed that Aviavista serves as a vital tool for promoting avitourism and edutourism with high scores for its functionality, content quality and design. Considering the room for improvement, it is suggested to include more avian species in Aviavista's databases and make it more comprehensive as a source of reference. Moreover, enhancing the design and integrating additional features can be considered to create more immersive experiences. In a nutshell, this study demonstrates the potential of integrating biodiversity research to promote conservation and sustainable tourism.

## Acknowledgement

The authors would like to thank the Faculty of Applied Sciences and Technology, Universiti Tun Hussein Onn Malaysia, for its support. Special thanks to the owner of the Bukit Mor ex-mining site, Muar, Johor for allowing us to conduct the study in his area.

## Conflict of Interest

Authors declare that there is no conflict of interests regarding the publication of the paper.

## Author Contribution

The authors confirm their contributions to the paper as follows: **study conception and design:** Nur Alia Arisa Bahman; **data collection:** Nur Alia Arisa Bahman; **analysis and interpretation of results:** Nur Alia Arisa Bahman, Nor Atiqah Norazlimi, Ilham-Norhakim Mohd Lokman; **draft manuscript preparation:** Nur Alia Arisa Bahman, Nor Atiqah Norazlimi. All authors reviewed the results and approved the final version of the manuscript.

## References

- [1] Steven, R., Morrison, C., & Castley, J. G. (2014). Birdwatching and avitourism: a global review of research into its participant markets, distribution and impacts, highlighting future research priorities to inform sustainable avitourism management. *Journal of Sustainable Tourism*, 23(8-9), 1257–1276. <https://doi.org/10.1080/09669582.2014.924955>
- [2] Bodger, D. (1998). Leisure, learning, and travel. *Journal of Physical Education Recreation & Dance*, 69(4), 28-31. <http://dx.doi.org/10.1080/07303084.1998.10605532>
- [3] Ritchie, B. W. (2009). Crisis and Disaster Management for Tourism. *Multilingual Matters*. <https://doi.org/10.21832/9781845411077>
- [4] Meyer-Lee, E., and J. Evans. (2007). "Areas of Study in Outcomes Assessment." In *A Guide to Outcomes Assessment in Study Abroad*, edited by M. C. Bolen. Carlisle, PA: The Forum on Education Abroad, pp. 61-70.
- [5] Carmo, M. B., & Cláudio, A. P. (2013). 3D Virtual Exhibitions. *DESIDOC Journal of Library & Information Technology*, 33(3), 222–235. <https://doi.org/10.14429/djlit.33.3.4608>
- [6] Arnal, L., & Schuster-Wallace, C. (2024). The Virtual Water Gallery: Art as a catalyst for transforming knowledge and behaviour in water and climate. *EarthArXiv* (California Digital Library). <https://doi.org/10.31223/x5wd78>
- [7] Sime Darby Property. (2024). Bandar Universiti Pagoh — First University Township in Johor. [www.simedarbyproperty.com](http://www.simedarbyproperty.com). <https://www.simedarbyproperty.com/bandar-universiti-pagoh>
- [8] Jeyarajasingam, A., & Pearson, A. (2012). *A Field Guide to the Birds of Peninsular Malaysia and Singapore*. Oxford University Press.
- [9] Rajpar, M. N., & Zakaria, M. (2013). Assessing an Artificial Wetland in Putrajaya, Malaysia, as an Alternate Habitat for Waterbirds. *Waterbirds*, 36(4), 482–493. <https://doi.org/10.1675/063.036.0405>
- [10] Sulaiman, S., Mohamad, N. H. N., & Idilfitri, S. (2013). Contribution of Vegetation in Urban Parks as Habitat for Selective Bird Community. *Procedia - Social and Behavioral Sciences*, 85, 267–281. <https://doi.org/10.1016/j.sbspro.2013.08.358>
- [11] Lowe, K. A., Taylor, C. E., & Major, R. E. (2011). Do Common Mynas significantly compete with native birds in urban environments? *Journal of Ornithology*, 152(4), 909–921. <https://doi.org/10.1007/s10336-011-0674-5>
- [12] Francis, R. A., & Chadwick, M. A. (2013). *Urban ecosystems : understanding the human environment*. Routledge
- [13] Jasmani, Z., Ravn, H. P., & van den Bosch, C. C. K. (2016). The influence of small urban parks characteristics on bird diversity: A case study of Petaling Jaya, Malaysia. *Urban Ecosystems*, 20(1), 227–243. <https://doi.org/10.1007/s11252-016-0584-7>
- [14] Cornell Lab of Ornithology. (2019). eBird - Discover a new world of birding... [Ebird.org](https://ebird.org/home). <https://ebird.org/home>
- [15] IUCN. (2024). The IUCN Red List of Threatened Species. *IUCN Red List*. <https://www.iucnredlist.org/>
- [16] Birding in Malaysia. (2024). [Birdinginmalaysia.com](https://www.birdinginmalaysia.com/). <https://www.birdinginmalaysia.com/>
- [17] Chai, S. (2016). VIRTUAL URBAN GALLERY: An immersive installation based on 3D remote experiences of Toronto Public Art - OCAD University Open Research Repository. [Ocadu.ca](https://openresearch.ocadu.ca/id/eprint/676/1/Shengquan_Chai_2016_MDes_Digital%20Future_Thesis.pdf). [https://openresearch.ocadu.ca/id/eprint/676/1/Shengquan\\_Chai\\_2016\\_MDes\\_Digital%20Future\\_Thesis.pdf](https://openresearch.ocadu.ca/id/eprint/676/1/Shengquan_Chai_2016_MDes_Digital%20Future_Thesis.pdf)
- [18] Parsons, A. (2023). Virtual Art Galleries as Learning Spaces and Agents of Praxis. 2. <https://doi.org/10.5772/acrt.14>