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by Diana Hernawati

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The use of iNaturalist on learning courses of zoology vertebrates for prospective biology teachers

D Hernawati¹, D M Chaidir¹ and V Meylani¹

¹Biology Education, Universitas Siliwangi, Tasikmalaya, Indonesia

Corresponding author: hernawatibiologi@unsil.ac.id

Abstract. Applications based on the current living creatures are already a lot on the internet, but there are still few who utilize the application as a source of learning. This research aims to know the response of prospective biological teachers and effectiveness of iNaturalist applications. The research method used is qualitative descriptive. The population in this study is all students in Biology education department in one of university in East Priangan, Indonesia which contracted the course of zoology vertebrates of the academic year 2018/2019 with the sampling used is the total sampling. The data used in this research form the data of exploration of students to various surrounding animals in Tasikmalaya, both animals in the wild, zoos, and pets as well as student response questionnaires. The results showed that there were 5488 observations with the most uploaded animals, *Felis domestica* (234 Observations). The Data shows students tend to search for animals that are only around them and students do more observations in captivity. Despite this, the application contributes well to students, because with the application students learn more about the taxonomy of vertebrate's animals and the opportunity to know with scientists and citizen science from various fields around the world.

Keywords: *iNaturalist, vertebrates, prospective biology teachers*

1. Introduction

Internet-based learning is a common thing in the revolution of the 4.0 industry. This learning will also be influenced by developing artificial intelligence, The internet of things (IoT), big data and robots. Accordingly, hyper automation allows more robots and AI (Artificial Intelligence) to produce outputs and analyze results [1]. It can be seen that all enterprises need many technological developments and innovations brought by the concept of Industry 4.0 [2]. Therefore, we need to do various innovations in learning one of them by using big data. As a prospective biology teacher should also know the various platforms that can be used to collect data on biodiversity specimens available through online portals such as iDigBio (<https://www.idigbio.org/>), the Global Biodiversity Information Facility (GBIF) (<https://www.gbif.org/>), Symbiota (<http://symbiota.org/>), and regional consortia (e.g., SouthEast Regional Network of Expertise and Collections [SERNEC]; <http://serneconet.org/>) [3]. One alternative platform that is more accessible and used, which is based on the Internet, uses data to store the documentation of specimen learning that is iNaturalist, Because internet use is one of the most benefits of technology, instantaneous access to information [4].

iNaturalist is a free resource available online (<https://www.iNaturalist.org/>) or downloaded as a mobile app [3]. Users record biodiversity observations, including date, time, location, taxonomic identification, images, audio recordings, and a countless number of other user-defined data fields. Validation of data on iNaturalist is easy as records are accompanied by photographs, and anyone can



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validate an identification [6]. The iNaturalist is one of the latest interactive online platforms for recording, sharing and identifying plants and animals [7], [8]. For classroom implementation ideas, teachers can begin by reviewing the iNaturalist Teacher's Guide, existing iNaturalist classroom projects, and resources designed to support iNaturalist learning experiences [9]. The use of naturalist clearly can be used in learning vertebrate zoology courses, prospective biology teacher can interact directly with researchers and citizen science from all over the world with various expertise in the field of taxonomy.

Traditionally, learning taxonomy has been an exercise in memorizing rank-based names, one that is supremely boring, provides limited and sometimes misleading information and it is increasingly irrelevant [10]. Learning process in taxonomy should be able to encourage students to dig more information about certain subjects especially about vertebrates by observing, asking, experimenting, processing data or information, presenting data or information, analyzing the data, reasoning, drawing conclusions, creating, and thinking at lower or higher level [11]. So that the use of these iNaturalist students is expected to be more passionate teachers in learning taxonomy zoology vertebrates. Biodiversity studies, such as zoology vertebrates, assist in building more complete ranges for species, which are vital for ecological, evolutionary and applied biological research [12]. Prospective biology teachers will be able to teach students about biodiversity, especially better vertebrates zoology because that zoology as a subject has the enormous potentiality to offer job opportunities, self-employability & it can also inculcate entrepreneurship among the students. Even zoology as a subject can solve our country's some of the major problems provided a few corrective measures [13]. But more importantly, in learning the zoology of the students of prospective biological teachers can be more sensitive to the kind of each taxon of ecological functions and keep their sustainability.

This research aims to know the response of prospective biological teachers as its users and the effectiveness of iNaturalist applications. In addition, this research also aims to see how the distribution of vertebrate animals contained in Tasikmalaya, which had not been much data visible.

2. Research method

2.1. Participants

The research method used is the qualitative descriptive method. The population in this study is all students majoring in Biology education in one of university in East Priangan, West Java, Indonesia which contracted the courses of zoology vertebrates of the academic year 2018/2019 with the sampling used is the total sampling. The data used in this research form the data of exploration of students to various surrounding animals in Tasikmalaya and its surroundings, both animals in the wild, zoos, and pets as well as prospective biology teacher response questionnaires. Questions asked about the use of an iNaturalist platform that has been implemented for a semester in taking and collecting data on vertebrates.

2.2. Procedure

Prospective biology teachers must register and create an iNaturalist account first. Then they must join the project that has been created by the lecturer on the course of the courses of zoological zoology, with the project name "Tugas Zoologi Vertebrata" then they include the data of the image, the description of the region of discovery and sought to know the type or scientific name of the animal they are entering into their respective iNaturalist account. The iNaturalist project page for the study reported here is <https://www.iNaturalist.org/projects/tugas-zoologi-vertebrata> (last visited 4 July 2019). If some do not know the name of the species of animals found, usually they will be assisted by some experts or netizen science. Students must also abide by the terms and rules that exist in the iNaturalist program, if known to violate the account will be in the key or banned. Student data will usually be verified until the level of research grade by some taxon and netizen science that is data derived from the wild, not the result of captivity or that is not in the zoos [14].

3. Results and Discussion

The collected iNaturalist data is made with the traditional projects found on the iNaturalist platform. Then, prospective biology teachers can collect data and store it in the data. For the process of uploading the data can be done in a moment or done later. The following is project drawings created using the iNaturalist platform.



Figure 1. Project “Tugas Zoologi Vertebrata” created by using the iNaturalist platform.

The project can be seen by anyone collecting and storing the most specimen data up to the least amount. In addition, there are the most widely observed species of biological teachers. However, sometimes students forget to describe of the specimen, entering the data which should be captive to be from wild, in addition to naming the species there are still some erroneous to get a strike from several accounts that exist in iNaturalist. The following is the observation data performed by the prospective biology teachers.

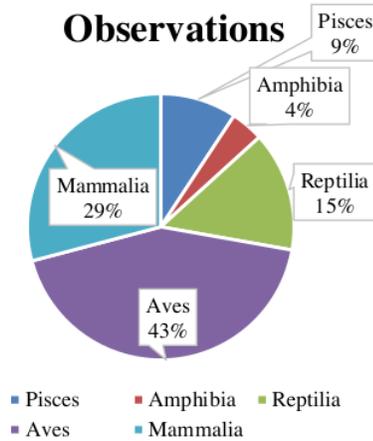


Figure 2. Diagram of the observation results based on classis in the phylum chordata inserted into the project

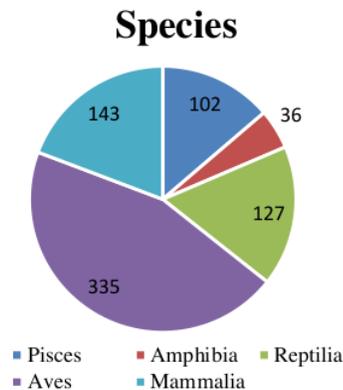


Figure 3. Diagram of the number of species based on class inserted into the project

The results showed that there were 5488 observations (figure 1), with the greatest number of the class Aves (43%), and Mammalia (29%) (figure 2). For the number of species identified by 756 species, the most number in the Aves is also. This is because many birds are documented especially during observations in the bird market. Although the amount of data entered is quite a lot but with the most uploaded animals, namely *Felis domestica* (234 Observations), *Gallus gallus* (105 Observations), and *Columba livia* (84 Observations). Based on figure 2 and figure 3. The least number of observations and species identified are amphibians, so because of the many types of amphibious, especially those belonging to the Anura order are nocturnal animals [16]. So, students rarely do night observations and find different types of amphibians around them. Some types of amphibious are also said to be focal species or bioindicators, because they are sensitive to the environment and some are found only in certain areas, especially those with good environmental conditions and quality environments [15].

From the number of observations, there are also only 268 from 5488 total observations and 69 from 756 species that are verified or categorized as research grade or verified. Most of the results are animals found to be from animals and zoos, so that it will not enter the category of research grade found in the iNaturalist program. Data shows mostly students tend to search for animals that are only around them and so students do more observations in captivity or zoos.

Based on the results of the questionnaire provided, the results of students of prospective biological teachers benefit with the use of iNaturalist, because they can more understand each species they find and be able to know the error that occur, but how many students still do not have an interest in the use of iNaturalist, it is also seen with some students who collect little data on the project that is created. Students are also pleased by seeing some of the species they find and when they can identify them. After this research is expected to also improve technological pedagogic content knowledge for prospective biology teachers. They also feel more knowledge after using the iNaturalist platform. Given the rapid growth of technology, which affects various social and life aspects, these biological teachers must also be able to integrate them in their learning [16], [17].

Although it is still found some obstacles and shortcomings in finding data, it is hoped that the use of iNaturalist platform becomes an alternative in learning with taxonomy, not only on vertebrate zoology, but also can be done on courses or other subjects such as invertebrates and botany zoology. The data found is expected to be one of the assistances in biodiversity information that is around until it can be used to look at a variety of changes in the species in in the future. So it can be beneficial for scientists and policymakers in the regulation and the distribution of existing animals [18].

4. Conclusion

The use of the iNaturalist platform is quite effective to use by prospective biology teachers, it is seen by the amount of data entered quite a lot. That program can also make students as a citizen science who can make a chance to do various research collaboration with various researchers who exist in the world, because the iNaturalist can help students communicate with researchers and experts in certain areas of the world. Students also feel many benefits to the use of iNaturalist by studying the taxonomy world in different ways. The use of the program is also very helpful to keep the spread of animal data in the area of Tasikmalaya and its surroundings, because students also easily to store and upload data that they directly to the central database iNaturalist. Although The included vertebrate animal data tends to be dominated by pets and animals that have been captivity, therefore for lecturers who want to use the platform can provide the rules and regulations to the students, so that the results gain maximum. The use of this iNaturalist is also one of the alternatives in increasing the technological knowledge that the prospective teachers must have today.

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