Etho-morphology using smartphone apps to identify aves

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Abstract. Identification skills are indispensable in field activities. With the approach of etho-morphology assisted smartphone application makes it easier for students to identify Aves in Zoology Vertebrate course. We developed i-bird applications in smartphones that are used to identify the Aves based on their morphology on field activities. The purpose of this research is to describe the ability of student identification in field activity of the course. Using quasi experiment, this research involved 93 prospective Biology teachers which were conducted at Bandung Zoo. The results showed that the identification skills of prospective biology teacher were in sufficient category (2.78). The results of the analysis of several indicators of identification skills indicated that the highest identification is in indicator 1 (I-1 = 3.33) that is to write the morphological characteristics of each species based on morphology. The lowest identification skills indicator was found in indicator 5 (I-5 = 2.49) that is making a simple determination key. The identification skills of prospective Biology teachers are in sufficient category, therefore it needs to be improved in the future with various appropriate approaches or methods. Through questionnaires we found that low ability of students to make simple determination keys due to limitations of camera resolution.

1. Introduction

Identification skills are important owned by prospective biology teacher in field activities. Good identification skills will help students to identify species easily. Identifying the species can be done in various ways or commonly used methods using the key determination. Identifying field activities can increase student-centered interest and will provide a good learning experience in an authentic environment, since identification skills are the basis for classification \cite{1-3}. Advances in smartphone technology can be utilized in supporting learning especially for species identification in field activities. Identification can be done with the help of smartphone applications although identification capability does not guarantee a significant increase \cite{4-6}. At this time the most popular mobile device is used as a learning tool where people can use it anywhere and anytime, not limited space so as to provide flexibility for students to explore their knowledge and increase students’ confidence and involvement \cite{7-11}. To overcome the negative effects of the development of smartphone technology, should be done various ways so that the smartphone can be utilized in supporting learning. Students always use the smartphone without knowing the time limit and place will indirectly affect the students’ critical thinking skills \cite{12, 13}. Advancements in digital technology, one of which mobile technology can be developed to assist
students in conducting experiments based on the environment, accessing learning resources on the internet so that learning will be more effective and can increase student motivation [14-19]. Many smartphone applications developed in the form of learning modules, mobile learning and mobileEdu [20, 21].

Smartphone applications can be used to identify in field activities and monitor daily bird activity by developing special platforms [22-24]. Indonesia is the fourth richest country in the world's richest number of bird species after Columbia, Peru and Brazil [25]. In some National Parks, the presence of birds exhibits a high diversity [26, 27]. In some places in eastern Indonesia, there are many uniqueness- uniqueness of birds. The uniqueness of avifauna in the natural forests of eastern Indonesia holds more charm and diversity of high endemic species, this fact becomes an indispensable treasury of the archipelago's riches. As one of the areas in eastern Indonesia Sulawesi Island holds millions of mysteries related to the potential of its natural resources, the natural world of Sulawesi became the conservationist world's attention because it became the living place of various endemic animals of global value. In the field of ornithology Sulawesi is a paradise for unparalleled bird life, even ornithologists from all over the world give top priority to this island [28]. The decline of bird species in some places is due to reduced habitat and illegal trade and loss of natural habitat vegetation [29, 30]. Many birds live in forests or vegetation supports, reduced vegetation causes birds to seek shelter usually in agroforest areas. Agroforests have significant carrying capacity for the survival of wildlife, especially bird species. Therefore, the construction and management of information data of bird species in the agroforest area is the basic capital in the effort of species conservation. The preparation of field guides for bird introduction in agroforest areas with photographs is the first step in building a database as a source of information. In addition to forests, the second home habitat for birds is the agroforest area [31].

From some backgrounds, this study aims to develop smartphone applications that are used to identify birds. The identification process is focused on bird morphology using the etho-morphology approach with the help of specially designed smartphone applications. This is one of the efforts to help make it easier for students to identify birds, further as conservation efforts, as some species of birds are declining and even threatened with extinction.

2. Method
This research uses quasi experimental method involving 93 students of prospective biology teacher at Universitas Pasundan Bandung. The research was conducted in Bandung Zoo area. The study focused on identifying different species of birds with an etho-morphology approach using a smartphone application.

Identification skills developed into several indicators. Our developed indicator matches etho-morphology. Indicators of identification capabilities developed include: write down the morphological features of every part of the body (I-1), writing down the differences of each species by morphology (I-2), write down the equation of each species based on morphological (I-3), grouping each species based on morphology (I-4) and making simple determination keys based on morphology (I-5). This indicator we developed from several references [1-5, 22].

From the data collected in subsequent research was analyzed by quantitative descriptive analysis technique that is describing and interpreting each component compared with reference criterion based on ideal mean (iM) and ideal standard deviation (iSTD) reached by instrument sheet. This study used a 5 (five) scale questionnaire with value and score conversion.

The smartphone app we designed is a prototype we named i-Bird. This app is specific to Android users. The i-Bird app is specially designed for students to learn independently. Students can input data in the form of photos, then provided a special form for a brief description contained in the application (Figure 1).
Figure 1. The i-Bird application used to identify birds; A. home screen display, B. data input form, filled by students by entering the image, name and short description, C. database, the image will be stored automatically in the database after stored in section B, D. morphological clicker, in this section students can determines the point on the parts of the bird to be identified, after the point is specified, if touched automatically magnifies the image, and E. the final display used for morphological identification

3. Result and discussion
The identification was done with the help of i-Bird which was previously installed by the students. To measure the ability of identification, data analysis is performed on several indicators with the weight of score 4 for each indicator. The results are presented in Figure 2.

Figure 2 shows the highest student identification score on indicator 1 (I-1) that is writing the morphological characteristics of each body part of the class of aves. The lowest identification score on indicator 5 (I-5) is making a simple determination key based on its morphology. Furthermore, the analysis of the category as a whole. The average score of student identification ability is 2.78. The results of the category analysis are presented in Table 1.
Table 1. The results of analysis of category of student identification skills.

| Numb | Score | Category   |
|------|-------|------------|
| 1    | $x > 3.16$ | Excellent |
| 2    | $2.92 < x < 3.16$ | Good |
| 3    | $2.68 < x \leq 2.92$ | Sufficient |
| 4    | $2.44 < x \leq 2.68$ | Low |
| 5    | $x \leq 2.44$ | Lowest |

Based on Table 1 shows that the average score of student identification ability (2.78) is in the range of 2.68 and 2.92. It can be concluded that student identification skills to identify aves class by using i-Bird application in field activity is included in sufficient category. Based on the findings, we sought to explore what is the cause of student identification capability included in the sufficient category. We conducted a random interview involving 23 students. From the interview results we get some information that is quite important as supporting data. Our interview results are summarized that most students think that the application is easy to use and practical, we no longer need to bring books on field activities. Camera resolutions on some smartphones become obstacles, we are difficult to take pictures of birds that are far enough distance, so the image of how many birds with a considerable distance is not clear, the limitations of camera resolution makes us difficult to compile the key determination, the image looks blur. Another deficiency in the i-Bird application is the form field used is not complete, there should be a special form to make a simple determination key in it some students showed interest because this application is very good, and their hope whenever possible applied to other lectures.

Based on the findings, in general, this smartphone application should still be developed in the future. Student identification capability included in the category is quite because some students get constraints regarding the limitations of camera resolution. Most of the students are very supportive of learning using applications in other lectures. According to them applications are helpful and learning is more efficient. Advances in smartphone technology can be utilized in supporting learning especially for species identification in field activities. Identification can be done with the help of smartphone applications although identification capability does not guarantee a significant increase [4-6]. Most students show interest in smartphone apps, they do not need to carry books as a reference, with smartphones more practical and can be used anytime. The most popular mobile device is used as a learning tool where people can use it anywhere and anytime, not limited space so as to provide flexibility for students to explore their knowledge and increase confidence and involvement [7-11].

We will attempt to design and revise the applications we make from some of the defects found. In the future we will create a special platform so that this application can be re-used for lectures in the future. Smartphone applications can be used to identify in field activities and monitor daily bird activity by developing special platforms [22-24]. We have long-term targets of how i-Bird apps are developed so as to make it easier for students to identify species especially aves classes. This study has limitations, we only do research on students in the same year on one university. For that we will try on the students in different years and different universities.

4. Conclusion
The identification skills of prospective biology teacher to identify aves class using smartphone application included in sufficient category. Low ability to make simple determination keys due to the limitations of camera resolution so that students difficult to take pictures far enough distance, the images obtained less clear. Most students strongly support the smartphone application used in other lectures.
Especially for i-Bird applications students suggest the need for development on certain features. These findings will be our reference to float and revise the applications we make to re-use in the future.

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