How can Smartphone-Based Internet Data Support Animal Ecology Fieldtrip?

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Abstract. Identification and classification skills must be owned by the students. In animal ecology course, the identification and classification skills are necessary to study animals. This experimental study aims to describe the identification and classification skills of students on animal ecology field trip to studying various bird species using smartphone-based internet data. Using Invoving 63 students divided into 7 groups for each observation station. Data of birds were sampled using line transect method (5000 meters/station). The results showed the identification and classification skills of students are in sufficient categories. Most students have difficulties because of the limitations of data on the internet about birds. In general, students support the use of smartphones in field trip activities. The results of this study can be used as a reference for the development of learning using smartphones in the future by developing application about birds. The outline, smartphones can be used as a method of alternative learning but needs to be developed for some special purposes.

1. Introduction
Animal Ecology field trip is directly related to nature. Fieldtrip provide positive benefits for students because students can directly observe the actual objects they can find in the field [1,2]. Field trip activities should be developed with new methods or approaches in line with the development of science and technology. The advancement of digital technology, one of which mobile technology can be developed to assist students in conducting experiments based on the environment, facilitate student learning so as to improve experimental group learning performance and develop positive attitude in the investigation and provide more meaningful learning opportunities [3,4]. The affordability of mobile phone technology can improve acceleration in learning, facilitate data collection, analysis and presentation so as to encourage collaboration and enhance interaction among students to conduct discussions and will create new meanings and understandings in learning [5,6,7]. The progress of some smartphone applications with increasingly sophisticated features is not maximally utilized in learning. Smartphone applications are mostly used as a means of social interaction, games (games) and entertainment. It would be better if smartphone applications can be used in learning and field activities to support more effective learning [8,9].

Smartphones and other digital devices can be a potential source of support for learning. Mobile devices such as laptops, smartphones, digital assistants have great potential in supporting learning inside and outside the classroom [10,11,12]. Several studies have confirmed the use of smartphone...
Technology is effective to increase the ability of the student identification. This identification skill is important in supporting conservation efforts. Improving the identification skills can be done collaboratively with the help of the internet, video recording and Facebook applications as a simple new method [13,14,15]. The identification skills can be extracted by the real evidence available in nature freely, learning is not always limited to the classrooms, nature has provided an authentic learning resource to be learned in revealing the facts contained in the environment [16,17]. In addition to the identification skills, the essential classification skills are possessed by students in studying the species. Classification skills can assist in categorizing the species based on its specific characteristics. An important step in the classification process is the segmentation of data that is the assignment of boundaries between different classes of behavior within a certain timeframe [18] classification capability is indispensable to promote ecological progress [19].

Birds are an interesting species to be studied with various characteristics. Learning birds can be done with various methods, one with the help of smartphone-based internet data. Research on birds at this time is necessary because there has been a decline in some species of birds due to hunting or business purposes. Thus, the decline of bird populations indirectly affects ecology and conservation efforts are needed with various approaches [20]. The Internet provides a variety of data that we need, but not all data can be presented completely, it is a flame [21,22] for that it needs to be developed special features [23,24,25]. This study aims to describe the ability of identification and classification of students in studying the various species of birds found around the location of observations by using smartphone-based internet data. In the long term, students’ identification and classification skills can provide benefits, especially in ecological conservation.

2. Experimental Method
This research used the experimental method. Data was analyzed using the quantitative descriptive technique. This research involved 63 students divided into 7 groups during field activities in animal ecology. This research was conducted in Binuangeun area of Banten province from 23 to 25 October 2016.

2.1. Data collection

The identification and classification data was obtained from the field. Data was collected in the morning from 07.00-11.00 and in the afternoon from 14.00-17.00. Each sampling point is only given for 20 minutes. Bird data collected based on observations by the naked eye without the aid of tools such as telescopes. The results of field observations are further identified with the help of smartphones using internet data to measure student identification and classification skills tailored to each indicator. Data collection is also done through a questionnaire of student responses to the use of smartphones in field activities.
Figure 1. Line transects of 7 groups (A-G) each group has 11 bird observation points. Observations were made using transect line method divided into 7 stations (from A-G), each observation station was divided into 11 observation points. The observation is done as far as 5000m, the distance between station is 500m

2.2. Data analysis

The identification and classification skills were analyzed to determine its category. References to the criterion is based on the average score ideal ($Mi$) and the score of the standard deviation of the ideal ($SDi$) is achieved by a sheet instruments. This study used a questionnaire scale of 5 with the conversion value and scores, this study using a formula developed by [26]. Correlation test using $r$ test (Pearson correlation test). Questionnaires captured on student responses to the activities of field study and use of smartphones-based internet data.

| Numb | Score                             | Criteria   |
|------|-----------------------------------|------------|
| 1    | $x > (Mi + 1.8 SDi)$              | Excellent  |
| 2    | $(Mi + 0.6 SDi) < x < (Mi + 1.8 SDi)$ | Good      |
| 3    | $(Mi - 0.6 SDi) < x \leq (Mi + 0.6 SDi)$ | Sufficient |
| 4    | $(Mi - 1.8 SDi) < x \leq (Mi - 0.6 SDi)$ | Low       |
| 5    | $x \leq (Mi - 1.8 SDi)$            | Lowest     |

3. Result

The average score of identification and classification skills were 2.77 and 2.69 respectively from a maximum score of 4 (Fig. 2), which is categorized sufficient (Table 2).
Identification skills are essential in classifying. These two abilities are closely related to each other. Thus it can be assumed that if students have good identification skills then they will also have good classification capabilities as well. There is a significant correlation between the identification and the classification skills of \( r \)-Pearson correlation \((0.973)\), these correlation test results show a strong relationship between the two variables. The results of data analysis in this study showed that the identification and classification skills of students included in the category sufficient. To dig deeper into this finding, the researchers distributed a questionnaire of student responses related to these findings (Table 3).

Table 3. Data analysis of student questionnaire

| No. | Questions                                      | Frequency |
|-----|-----------------------------------------------|-----------|
|     |                                               | Yes | No  |
| 1   | Is smartphone use in field activities helpful?| 54  | 9   |
| 2   | Does the identification of birds using internet-based smartphones provide convenience? | 12  | 51  |
| 3   | Does the bird classification process use Internet-based smartphones ease? | 13  | 50  |
| 4   | Are there any constraints in accessing internet data? | 59  | 4   |
| 5   | Is the data available complete enough on the internet? | 3   | 60  |
| 6   | Is the internet network adequate at the observation location? | 29  | 34  |
| 7   | Does it need a special application in studying birds using a smartphone? | 61  | 2   |
| 8   | Do you agree that field activities using smartphones are more effective? | 33  | 30  |
| 9   | Are you interested in reusing smartphones in learning? | 46  | 17  |
4. Discussion

Student identification skills have declined as they are not implemented in schools so they are not used to identifying species when this is essential to an effort to conserve biodiversity and support sustainable development [16]. Students should be equipped with the ability to identify biodiversity so they understand the importance of species sustainability. Identification capabilities can be extracted with the real evidence available freely in nature, teaching and learning methods for the identification and knowledge of species for biodiversity education and sustainable development should always include project-based experiences and methods in authentic environments [1,17]. The identification process using smartphone-based internet data has limited data, making it difficult for students to identify birds in research locations.

The use of smartphones has contextual limitations that result in difficulty in obtaining complete data [21,24] Network services are a very important factor in using smartphones to obtain data from the internet. Inadequate network services will have an effect on data retrieval access in search of broader topics. The use of mobile learning can assist graduate students in accessing resources and research communities on a broader topic so as to generate ideas and build new [22]. The classification skills begin with the identification skills, if the student has good identification skills should the classification skills are also good. In this research, category of student classification ability is enough. As well as classification capabilities, some of the obstacles of using internet-based data are the lack of availability of the complete content needed to study birds. Content on the internet is so limited that we will have difficulty in obtaining complete data for specific needs [23].

Based on questionnaire data can be explained that most students are greatly helped by using smartphones in learning. But there are some obstacles in identifying and classifying birds among others. Difficulty in obtaining relevant data on the internet, data available on the internet is incomplete. Most of the students agree that smartphone use in learning needs to be developed and used in learning. We need to think about the implications of the use of smartphones in learning in the future. App development may be necessary to learn specific content. To overcome the limitations of the Internet network can be developed smartphone applications with offline data so that activities are not disrupted due to the bad network. In general, the results of this study explain that the smartphone can be used to support the field trip activities [1,2].

5. Conclusion

Animal ecology course can not be separated from field activities, indirectly will always be related to nature. The smartphone is a technological product that is growing rapidly with increasingly sophisticated features. However, smartphones are used very little in supporting learning, generally more used for personal communication, social media, games, music, and video players. This study tried to optimize the use of smartphones in learning, especially on field activities. The results of this study can be used as a reference in developing learning by using a smartphone. Smartphones can be used as a method of alternative learning, although they must be modified in such a way for a particular purpose. How smartphones are designed and developed to support innovative learning, this should be something to think about.

Acknowledgments

Thanks to our colleagues for their contribution, also to the Department of Biology Education and Faculty of Mathematics and Natural Sciences Education (Universitas Pendidikan Indonesia) for special support. Thanks a lot to students as participants in Plant Physiology course at 2016 and for the data contribution.
References

[1] Thomas R L and Fellowes M D E 2016 Effectiveness of mobile apps in teaching field-based identification skills *Journal of Biological Education* 9266 1–8

[2] Nelson A R, Cormier R L, Humple D L, Scullen J C, Sehgal R and Seavy N E 2016 Migration patterns of San Francisco Bay Area Hermit Thrushes differ across a fine spatial scale *Animal Migration* 3 1–13

[3] Ahmed S and Parsons D 2013 Abductive science inquiry using mobile devices in the classroom *Computers and Education* 63 62–72

[4] O’Bannon B W and Thomas K 2014 Teacher perceptions of using mobile phones in the classroom: Age matters! *Computers and Education* 74 15–25

[5] France D, Powell V, Mauchline A L, Welsh K, Whalley W B and Rewhorn S 2016 Ability of students to recognize the relationship between using mobile apps for learning during fieldwork and the development of graduate attributes *Journal of Geography in Higher Education* 8265 1–11

[6] Gikas J and Grant M M 2013 Mobile computing devices in higher education: Student perspectives on learning with cellphones, smartphones & social media *Internet and Higher Education* 19 18–26

[7] Vázquez-Cano E 2014 Mobile Distance Learning with Smartphones and Apps in Higher Education *Educational Sciences: Theory & Practice* 14 (4) 1505–1520

[8] Beri P S 2016 Migratory Birds Tracking System using RF as Communication Medium and Android Mobile Base Station *International Journal on Recent and Innovation Trends in Computing and Communication* 4 (5) 543–545

[9] Bouten W, Baatij E W, Shamoun-Baranes J and Camphuysen K C J 2013 A flexible GPS tracking system for studying bird behaviour at multiple scales *Journal of Ornithology* 154 (2) 571–580

[10] Sung Y.-T., Chang K.-E. and Liu T.-C. 2015 The Effects of Integrating Mobile Devices with Teaching and Learning on Students’ Learning Performance: A Meta-Analysis and Research Synthesis *Computers & Education* 94 252–275

[11] Shih B.-Y., Chen C.-Y. and Chen Z.-S 2006 An Empirical Study of an Internet Marketing Strategy for Search Engine Optimization *Human Factors and Ergonomics in Manufacturing* 16 (1) 61–81

[12] Alqaryan S, Alkalifa M, Alharbi M, Alabaishi S and Aldrees T 2016 Smartphones and professionalism: A cross-sectional study on interns and final-year medical students (5) 198–202.

[13] Kontkanen J, Kärrkkäinen S, Dillon P, Hartikainen-Ahia A and Åhlberg M 2016 Collaborative processes in species identification using an internet-based taxonomic resource *International Journal of Science Education* 38 (1) 96–115

[14] Mortimer J and Greene T 2017 Investigating bird call identification uncertainty using data from processed audio recordings *New Zealand Journal of Ecology* 41 (1) 1–8

[15] Stagg B C and Donkin M 2013 Teaching botanical identification to adults: experiences of the UK participatory science project “Open Air Laboratories” *Journal of Biological Education* 47 (2) 104–110.

[16] Palmberg I, Berg I, Jeronen E, Kärrkkäinen S, Norrgård-Sillanpää, P, Persson C and Yli-Panula E 2015 Nordic–Baltic student teachers’ identification of and interest in plant and animal species: The importance of species identification and biodiversity for sustainable development *Journal of Science Teacher Education* 26 6 549–571

[17] Robinson B S, Inger R and Gaston K J 2016 A rose by any other name: Plant identification knowledge & socio-demographics *PLoS ONE* 11 (5) 1–13

[18] Schuld C, Franz S, Hedel H J A Van, Moosburger J, Maier D, Abel R, … Rupp R 2015 International standards for neurological classification of spinal cord injury: classification skills of clinicians versus computational algorithms *Spinal Cord* 53 324–331
[19] Resheff Y S, Rotics S, Harel R, Spiegel O and Nathan R 2014 AcceleRater: a web application for supervised learning of behavioral modes from acceleration measurements Movement Ecology 2 27

[20] Zuckerberg B, Fink D, Sorte F A La, Hochachka W M and Kelling S 2016 Novel seasonal land cover associations for eastern North American forest birds identified through dynamic species distribution modeling Diversity and Distributions 22 717–730.

[21] Saltan F 2016 Blended Learning Experience of Students Participating Pedagogical Formation Program: Advantages and Limitation of Blended Education International Journal of Higher Education 6 (1) 63

[22] Cheng-lin H and Jian-wei C 2016 A Target Design of a Mobile App Providing Supportive Service for Flipped Classroom Journal of Educational and Social Research 6 (1) 27–32

[23] Jackson E A, Sc, B, Gardens A and Da K 2016 M-Learning devices and their impact on postgraduate researchers scope for improved integration in the research community The Online Journal of New Horizons in Education 6 (1) 104–113

[24] Pempek T A and McDaniel B T 2016 Young children’s tablet use and associations with maternal well-being. Journal of Child and Family Studies 25 8 2636-2647

[25] Hopkins N, Tate M, Sylvester A and Johnstone D 2016 Motivations for 21st century school children to bring their own device to school Information Systems Frontiers 1–13.

[26] Jumadi 2012 Pemetaan Kompetensi Pedagogik, Profesional, Kepribadian dan Sosial Guru Fisika SMA/MA di Daerah Istimewa Yogyakarta. (Makalah). LPPKM UNY. Unpublished.