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Identification Skills Fish Diversity and Potential Use of Genome Data

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Abstract: Identification skills are essential for students to increase awareness of will importance of diversity and active protection. Grouping species based on information genome is well considered in effort conservation. Research objectives to describe courses diversity and classification vertebrates (KKV) in identifying fish morphology, genome, and perception student about identification diversity through genome data in one LPTK in Bogor. This research uses qualitative with 27 students in The Biology Education Study Program in one LPTK in Bogor in the odd semester 2022/2023. Data collection about results interviews, documentation, and responses implementation of the pre-college program. Analysis of research data done qualitatively. Research results describe that ongoing study. This does not yet give optimal knowledge in fish diversity in a manner morphology until genome. Findings this give description will need students to identify species in a manner morphology until genome and needed databases that can identify diversity in detail and available essential internal identification feature application.

Keywords: Fish Diversity; Genome Data; Identification Skills

Introduction

Indonesia has a diversity of biological largest in the world (Lembaga Ilmu Pengetahuan Indonesia, 2014). The diverse biodiversity of Indonesian freshwater fish, including native and endemic fish (freshwater fish), was recorded as many as 1,251 species (FishBase, 2022). There are 132 types of fish on Java Island, with native fish species (91%) and 12 native fish species (9%). This research produces a comparison total composition of native and endemic fish in several islands big in Indonesia, including Sumatra Island with native fish species (89%) and native fish from Kalimantan (62%) with native fish (38%) (Kottelat et al., 1993).

The diversity of fish resources in the water lands is generally strongly influenced by conditions of environmental waters because ecosystem fish species waters can promote as bioindicator condition environment waters. In addition, fish have become a source of quality protein and essential height, which is also vital for the economy (Hua et al., 2019). Information about fish species is essential thing in the management of fishery sustainability. This is needed to support efforts to conserve native and endemic fish species to protect them from the threat of extinction.

Diverse existing life moments, this is a must-gift preserved. Sustainability development goals (SDGs) must be integrated into education. Because it can build, awareness of will enhance the problem environment and its role central to changing attitudes toward nature (Audrin, 2022). Activity man becomes important and influential For guard sustainability (Coracero et al., 2022). Participant students born in Generation Z will role in guarding diversity in the future. Nevertheless, understanding this needs a mechanism for building awareness collectively and systematically through education.

Identification skills are essential for students to increase awareness of will importance of diversity and active protection. It is also helpful for enhancing effort

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conservation, monitoring species, and increasing connection with nature (Palmberg et al., 2019). Identifying species can do with various methods such as pictures, photos, video recordings, online help, traditional use of key dichotomous (Torkar, 2021; Erdem & Uzun, 2022), and even the use of trap cameras (Norouzzadeh et al., 2021).

Many assumptions in species determination use key dichotomous or identification in a morphology considered adequate (Lin et al., 2021). The development technology, at this time, there are various ways to study morphological characteristics, including the use of the iNaturalist application, which identifies many organisms that are widely found in nature (Niemiller et al., 2021), YOLOv4 identifies and classifies fish based on similarity morphology (Kuswantori et al., 2022), YOLOv3 recognizes and counts fish based on bone back (Cai et al., 2020), NicheNet based images, and distribution models species based niche (Lin et al., 2021).

Progress technology moment makes as necessary means more complete, simple, and more accessible applied for increased determination (Stagg & Donkin, 2013). Apart from morphology, grouping species based on information genome as well considered in effort conservation, selection diversity, got facilitate deciding to differentiate in a manner accurate between species in the genus or same family (Ude et al., 2020; Kushwaha et al., 2021; Piñeros et al., 2022). The mitogenome provides primary data (distribution geography, and study of phylogenetic species) (Kim et al., 2022), level of evolution molecular, ecological, especially endemic and threatened fish extinct (Kwak et al., 2020; Xiong et al., 2021). Identification of genomes is helpful in bioinformatics, ecology, genetics, evolution, and comparative studies because they can give more accurate information for managing fishing, conservation of wild populations, and management genetics (Gomes et al., 2021).

Therefore, this study wants to describe the learning process that is usually carried out in vertebrate diversity and classification courses especially fish diversity and provide an overview of the perceptions of prospective biology teacher students regarding identifying fish through genome data in one of the LPTK in the city of Bogor.

Method

Research location qualitative was done in one LPTK private sector in Bogor. In Semester 2022/2023 in the Biology Education Study Program. Biology Education is a vital study program for studying. Because of generated *output* prints, biology teachers can learn about diverse diversity, especially skills to identify what is used stock when they teach on the spot it works.

Limitations on research, i.e., first, conducted in Bogor, West Java, Indonesia; second, involving private Universities; third, a participant in the study this is limited to students and lecturers; four, participant students and lecturers in this limited to perception student related with the recovery process diversity and classification of vertebrates (KKV) course. Determination limitations are expected to be something description specific, inductive, and, finally, can describe the investigation of the results (Creswell & Guetterman, 2019).

Data collection is the results of studies documentation, response implementation of lecture programs, and interviews. Documentation in this study from Lesson Plan Semester (RPS) documents and modules lectures. Supporting lecturer studying diversity and classification of vertebrates and some students interviewed use guide interview (Creswell & Creswell, 2018). This guide function ensures that all the data needed is covered. The interview is still characteristic conversational and situational; the interviewee can speak comfortably and openly.

The interview collects data about the continuity of the activity process learning. Then, every student was given a questionnaire for more dig again about implementation learning. Given questionnaire form is open and purposeful for dig information about the knowledge about skills to identify fish species through genomic data. The form of the instrument used to obtain research data can be seen in Table 1.

Table 1. Research Instruments

Type	instruments	Data source
Analysis needs	Interview, observation	Documentation, students, lecturers
Description lectures	Plan semester learning (RPS)	RPS, module
Response student	Questionnaire response student	Student

Analysis of the data used in the study is a method analysis that refers to the technique of Miles *et al*. (2014). The stages cover collection information, simplification information, presentation information, and conclusions. Collected information, then simplified and focused on aspects of relevant importance with objective research. In qualitative research, information is served as narrative or descriptive. After the information is described, carried out conclusion with give analysis information and evaluation activities that lead to the results questionnaire and results conducted from interviews during research.

Result and Discussion

Subject KKV is a mandatory subject that students in the Biology Education Study Program must take. Subject this own weight of 3 credits with lectures in a manner stare advance in one semester. Theory and practice held 16 meetings in one lecture per week for 100 minutes. Nothing conditions special for students who will be contracted subject to this. Based on documentation Lesson Plan Semester (RPS), program learning outcomes are designing and implementing promotive ideas based on science biologically positive support effort preservation source power nature and environment to students, community and stakeholders interest special, with utilize technology relevant information and communication media.

Learning outcome in this course is the student's knowledge, insight, skill, and attitude in describing vertebrate animals that include zoogeography, classification, variability, phylogeny, life, and the role of primitive vertebrates, Chondrichthyes, Osteichthyes, Amphibian, Reptilian, Aves, Mammals for the environment and humans (especially species in Indonesia). Analysis results from the RPS document and syllabus subject KKV show that tree the discussed discussion in the subject are Phylum Chordata, Pisces (Chondrychtyes and Osteichtyes), Amphibians (Stegochepala, Caudata/ Urodela, Anura), Reptilia (Chelonia Squamata & Crocodilia), Aves Ratitae, Tenamae, Carinatae (*Aquatic birds, Predator birds, Arborial birds, Aerial feeders, Songbirds*), Mammalia (Prototheria, Methateria, Eutheria). Description implementation KKV course exposed the use of instrument primary form questionnaire responses to students on the lecture process in class and interviews with a lecturer and some students.

Based on the response questionnaire (Figure 1), concepts considered KKV difficult in learning material diversity that identifies the type of creature alive (36.4%). The identification process is task important in studying biological diversity, which consumes task time and is vulnerable to error (Barré et al., 2017). This is synced based on the results of interviews with the lecturer, explaining that activity is an ongoing study done in a conventional manner that only uses vital identification. Research results strengthened that recognizing types with the use of crucial dichotomous has become a common method used during this. Application key dichotomous in activity biology has been found to increase ability analysis and synthesis students (Anđić et al., 2019). However, the needed method is now straightforward in its application. One method that can be used is game cards and techniques association for the increased ability to recognize types (Stagg & Donkin, 2013). More methods and tools are needed to speed up and automate this process.

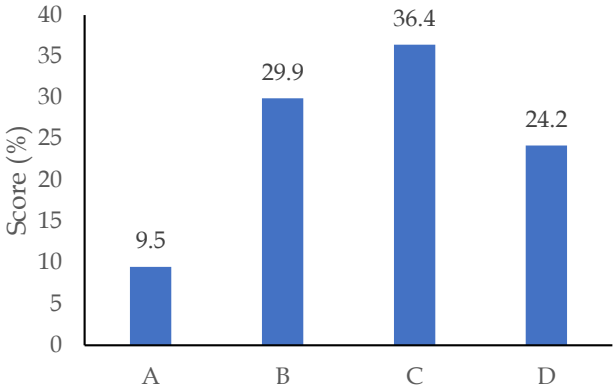

Figure 1. Indicator Score Difficulties Encountered During Learning

Information

A Difficulties to remember the name Latin for every species
B Difficulties in determining order taxon and naming every taxon
C Difficulties in identifying the type of diversity
D Difficulties in grouping creatures live based on characteristics possessed

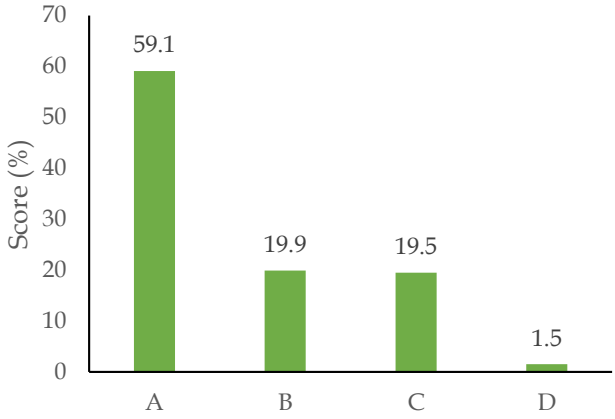

Figure 2. Indicator Score Tool for Identification In the Learning Process

Information

A Book identification diversity
B Book encyclopedia
C Software/ applications diversity
D Cladogram

Based on the score indicator tool help with identification in the learning process and disclose about use of technology in fish diversity identification. Amounting to 59.1 % or half of amount whole class, they state that no one use based on android, the internet, or other to identify species. It naturally becomes noted in the research that, at the moment, this becomes a must in

learning involving technology. Increasing ability identification can be improved with the internet and achieved with video recording (Kontkanen et al., 2017). The development of high-speed technology influences education. The existence of technology aims to make it easier to achieve learning goals. Education in the digital era is a must and can align with technological progress. If so, education will be encompassed. Progress technology information and communication give a new chance to use technology relevant to computing in development education to give a new experience for students (Mahenge & Sanga, 2016).

The trend that is currently developing is the use of mobile devices (smartphones). There are increasingly sophisticated features, and one can search for information related to the characteristics of living things using the internet. Current development of the internet, this role is essential and used in education and learning, and almost all students own internet access available to facilitate the learning process (Grant et al., 2019; Mahenge & Sanga, 2016). By this means, development technology, specifically internet usage, can be made learning as innovative as possible to increase the effectiveness of the learning process.

Efforts to develop technology in the learning process continue to be pursued. The development of an integrated curriculum technology computing *online* can help the student increase engagement and motivation to learn, improve scientific skills, and improve student digital literacy to answer the challenges of the times towards effective education (Marty et al., 2013).

Learning by utilizing internet features is not bound by space and time constraints. This gives students the freedom to explore their knowledge further. When a technique is developed in a specific manner, got helps increase practice in learning and gives a chance for more carry-on To build the relationship and strengthen collaboration between students and teachers (Gikas & Grant, 2013)s.

Technology integration in the learning process is necessary for learning in the 21st century and the industrial era 4.0. In supporting the learning process, digital devices have potency for development. Mobile devices, such as laptops, smartphones, and digital assistants, can be developed to support the learning process inside and outside the classroom by considering several aspects of integrating them (Masiu & Chukwuere, 2018). Implementing utilization technology in the learning process gives more profit than learning with the traditional method. Based technology can increase cooperation among the group, add new experience, leads to constructive learning, and help increase learning collaboration among student (France et al., 2016).

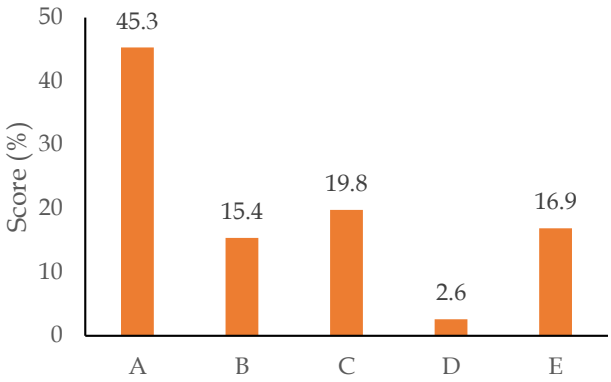

Figure 3. Indicator Score Needs In Identifying Living Beings Information

A There is a feature essential for detailed identification
B Tree phylogenetic
C Element genome in a species
D Picture
E Traits/characteristics every taxon

Based on Figure 3. Illustrate that student at the time. They need knowledge addition to make it easy to identify fish diversity. Various research has been done to make it easy to identify biodiversity. Identify species automatically using a presented image with niche ecology (Lin et al., 2021), identification in a manner genome in a manner bioinformatics (Gomes et al., 2021). It was viewed from different results of research that has been done. There still are several things become attention to one completeness of existing features in the applications that use, there needs to be key identification species and give description intact about the genome.

Other findings were obtained. This student needs a feature to make identifying the fish among them easy. There is feature essential detailed identification (45.3 %), elements genome in species (19.8%), and traits/characteristics of every taxon (16.9%). The identification process needs observation of pictures or photo with high quality, and internet databases can help identify species (Lin et al., 2021). Relevant technology can increase identification skills like digital cameras and mobile devices, access the distance far to the database, and introduce pictures and patterns (Thomas & Fellowes, 2017; Wäldchen et al., 2018).

Interview results with several students and results questionnaire give description will need the student to that data. Students disclose that some information on the internet (*Blogspot*) needs to be more accurate. The source must be clarified, and the data found does not show the genome. Supported results research in Figure 5 shows that 77% of students need to know that identity genome can sort phylogenetic observed species. Findings become notes essential that the information

genome in a species is vital for the student to understand.

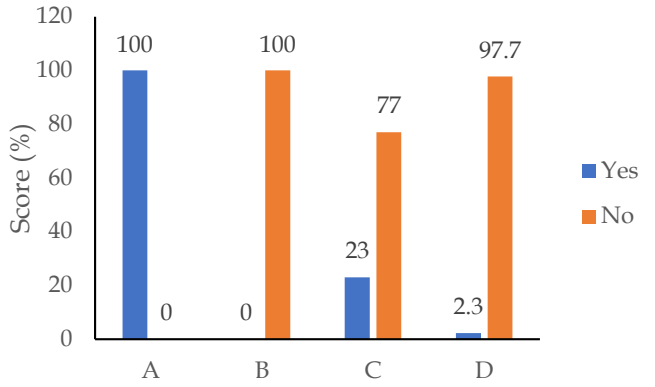

Figure 4. Indicator Score Knowledge Regarding Genome Data Information

A Identify fish morphology
B Once identified fish genome
C Know with identity genome Can sort phylogenetic observed species
D Once make a tree phylogenetic

The importance of understanding information genome for a student can sort phylogenetic observed species. According to Kim *et al.* (2022), mitogenome provides primary data (distribution geography and study of phylogenetic species. The genome also provides information level evolution molecular and ecological data (Gomes et al., 2021; Xiong et al., 2021). In addition, grouping species based on information genome is well considered in effort conservation and selection diversity biological (Kushwaha et al., 2021; Piñeros et al., 2022; Ude et al., 2020), especially endemic and threatened fish extinct (Kwak et al., 2020). Diversity biological and development sustainability (SDGs) must be integrated into education to raise awareness of what will solve the problem of biological diversity and To change attitude care toward natural (Audrin, 2022).

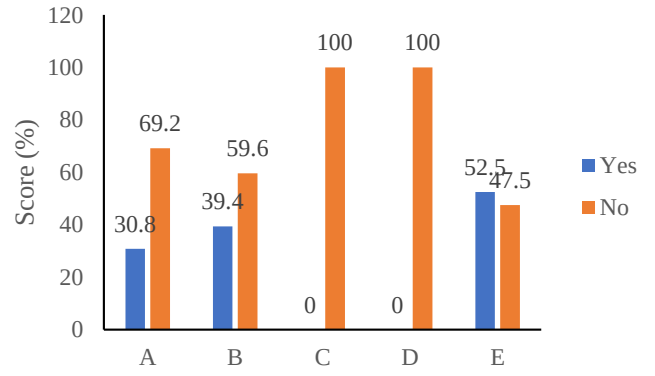

Figure 5. Indicator Score Knowledge about Every Application Used In Identifying Information

A Own difficulty using the application that you use
B Feel satisfied with the completeness of feature android app ever You use
C Existing features _ in the application ever _ You use there are key identification species.
D Application already _ Once You use Can show the genome
E Application already _ Once You use to make it easy to sort taxon

Response results from students related to the application: For identifying fish diversity, they used to show students No feel satisfied with the completeness feature of existing applications, amounting to 59.6%. Complaining will matter. Application for detecting and classifying fish species at the time is already good. However, rate accuracy must improve return (Kuswantori et al., 2022). Sometimes some data is not following what to be target identification, and not all data generated is valid (Rifa'i et al., 2020).

Conclusion

Based on the results, the findings obtained that lecture diversity and classification of vertebrates during this learned not associated with level evolution molecular. However, molecular data be fundamental if, in a manner, morphology identifies species' level of high similarity. Perceptions of students related to genomic data show that students need more information about the matter. Lack of information is possible because the learning process needs more direct use of mitogenome data. Findings This gives a description that will need students to identify species in a manner morphology until genome and needed databases that can identify fish diversity in detail and available essential internal identification feature application.

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