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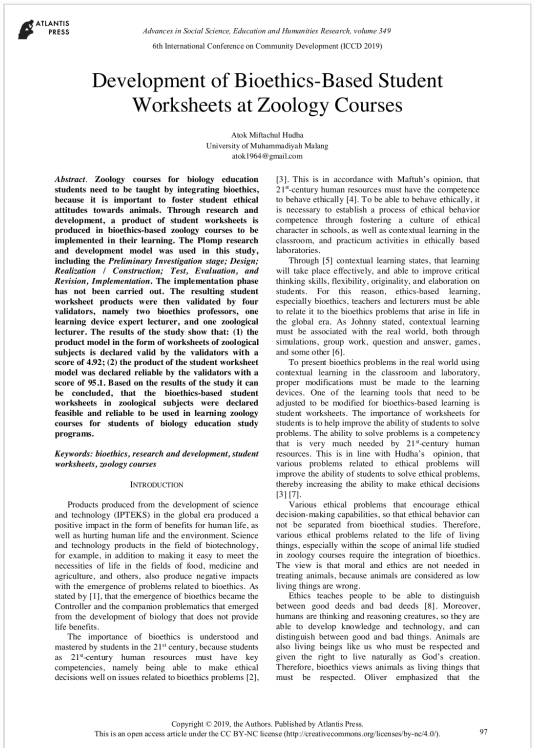

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Development of Bioethics-Based Student Worksheets at Zoology Courses

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Abstract. **Zoology courses for biology education students need to be taught by integrating bioethics, because it is important to foster student ethical attitudes towards animals. Through research and development, a product of student worksheets is produced in bioethics-based zoology courses to be implemented in their learning. The Plomp research and development model was used in this study, including the *Preliminary Investigation stage; Design; Realization / Construction; Test, Evaluation, and Revision*, *Implementation*. The implementation phase has not been carried out. The resulting student worksheet products were then validated by four validators, namely two bioethics professors, one learning device expert lecturer, and one zoological lecturer. The results of the study show that: (1) the product model in the form of worksheets of zoological subjects is declared valid by the validators with a score of 4.92; (2) the product of the student worksheet model was declared reliable by the validators with a score of 95.1. Based on the results of the study it can be concluded, that the bioethics-based student worksheets in zoological subjects were declared feasible and reliable to be used in learning zoology courses for students of biology education study programs.**

Keywords: bioethics, research and development, student worksheets, zoology courses

Introduction

Products produced from the development of science and technology (IPTEKS) in the global era produced a positive impact in the form of benefits for human life, as well as hurting human life and the environment. Science and technology products in the field of biotechnology, for example, in addition to making it easy to meet the necessities of life in the fields of food, medicine and agriculture, and others, also produce negative impacts with the emergence of problems related to bioethics. As stated by [1], that the emergence of bioethics became the Controller and the companion problematics that emerged from the development of biology that does not provide life benefits.

The importance of bioethics is understood and mastered by students in the 21st century, because students as 21st-century human resources must have key competencies, namely being able to make ethical decisions well on issues related to bioethics problems [2], [3]. This is in accordance with Maftuh's opinion, that 21st-century human resources must have the competence to behave ethically [4]. To be able to behave ethically, it is necessary to establish a process of ethical behavior competence through fostering a culture of ethical character in schools, as well as contextual learning in the classroom, and practicum activities in ethically based laboratories.

Through [5] contextual learning states, that learning will take place effectively, and able to improve critical thinking skills, flexibility, originality, and elaboration on students. For this reason, ethics-based learning, especially bioethics, teachers and lecturers must be able to relate it to the bioethics problems that arise in life in the global era. As Johnny stated, contextual learning must be associated with the real world, both through simulations, group work, question and answer, games, and some other [6].

To present bioethics problems in the real world using contextual learning in the classroom and laboratory, proper modifications must be made to the learning devices. One of the learning tools that need to be adjusted to be modified for bioethics-based learning is student worksheets. The importance of worksheets for students is to help improve the ability of students to solve problems. The ability to solve problems is a competency that is very much needed by 21st-century human resources. This is in line with Hudha's opinion, that various problems related to ethical problems will improve the ability of students to solve ethical problems, thereby increasing the ability to make ethical decisions [3] [7].

Various ethical problems that encourage ethical decision-making capabilities, so that ethical behavior can not be separated from bioethical studies. Therefore, various ethical problems related to the life of living things, especially within the scope of animal life studied in zoology courses require the integration of bioethics. The view is that moral and ethics are not needed in treating animals, because animals are considered as low living things are wrong.

Ethics teaches people to be able to distinguish between good deeds and bad deeds [8]. Moreover, humans are thinking and reasoning creatures, so they are able to develop knowledge and technology, and can distinguish between good and bad things. Animals are also living beings like us who must be respected and given the right to live naturally as God's creation. Therefore, bioethics views animals as living things that must be respected. Oliver emphasized that the

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development of the discussion of ethics must also consider ethics in animals [9].

Initially, zoology courses were not designed to study animal bioethics, but as bioethics developed as a new scientific discipline, integrating bioethical values in zoological learning became very important. The importance of integrating bioethics in zoology so that the use of animals in research remains within the bioethics corridor. Franco explained that biomedical research that uses animals still has to prioritize the paradigm of ethical behavior in animals [10].

The facts show that many animals are seen by people as living things that do not need to be pitied, do not need to get the welfare of life, there is no value to be respected as a living being. Therefore, learning that integrates bioethics in animals must be implemented for students through valid and reliable learning tools.

The purpose of this study was to produce a learning device based on bioethics based worksheets on proper and reliable zoological learning.

METHOD

This study focuses on the purpose of research to produce learning device products in the form of bioethics-based student worksheets that are implemented in zoology courses. This study uses the research and development model of Plomp which has stages of Preliminary Investigation; Design; Realization / Construction; Test, Evaluation, and Revision, Implementation. The implementation phase will be carried out in further research to determine the effectiveness of bioethics-based student worksheets on zoological learning on broader variables.

The research subjects to determine the importance of bioethics in order to be integrated into biology courses, especially zoology course to support the development of bioethics-based student worksheets chosen was the second-year students of the Biology Education Study Program at the University of Muhammadiyah Malang in the 2014/2015 academic year.

Validation and reliability testing of the bioethics-based student worksheets produced was carried out by experts in bioethics, learning fields, and zoology subject lecturers. The main instruments in the study were bioethical-based student worksheets, and supporting instruments to validate student worksheet products, including content validation, material presentation validation, language validation, and validation of student worksheets.

The scope of the material presented in bioethics-based student worksheets is the material of vertebrates in the *Chondrichthyes* class, the *Osteichthyes* class, the *Amphibia* class, and the *Reptile* class. The resulting bioethics-based student worksheets were then tested validated by validators in bioethics, learning fields, and zoology subject lecturers. The main instruments in the study are the student worksheet itself and supporting instruments to validate the contents and constructs of the student worksheet products.

The validation category refers to the validation category with five coefficients, namely: 1) criteria $1 \leq Va < 2$ (invalid), 2) $2 \leq Va < 3$ (less valid), 3) $3 \leq Va < 4$ (quite valid), 4) $4 \leq Va < 5$ (valid), and 5) Va=5 (very valid).

Data analysis techniques in this study include (1) analysis of the preliminary research stage; (2) analysis of the design stage; (3) analysis of the realization/construction stage; and (4) test, evaluation, and revision stage analysis.

RESULT

The results of the *preliminary investigation* phase show that most students (78.86%) view that bioethics is very important to be integrated into the course and a small proportion (21.14%) expect bioethics to be a course. The survey results on the teaching and learning process at the lecturers at the Biology Education Study Program Faculty of Teacher Training and Education Muhammadiyah University in Malang are known that learning that contains values, moral, ethical, and spiritual, is dominant in the subjects of Al-Islam and Kemuhammadiyahan, while on zoology and practicum activities have not been carried out.

The results of the *design or prototyping* phase show that the design of bioethics-based student worksheets includes the activities of students to develop bioethical knowledge, make ethical decisions, and express their ethical attitudes. The components in the student worksheet consist of: a) name, NIM, group and class, b) topic of the problem, c) Students worksheet identity: study program, course, subject matter, time allocation, d) learning outcomes, d) course learning outcomes, e) sub-subject learning outcomes, f) learning objectives, g) learning steps, h) summary of material, i) literature, j) subject matter, k) ethical decision sheet, l) engagement statement sheet behaving ethically, m) self assessment sheet (ethical attitude) on the problem being studied, n) and assessment instrument validation of student worksheets.

The results of the *Realization or Construction* phase of the research were the construction of bioethics-based student worksheets and assessment instruments. The assessment instrument is a student work assessment sheet which is used to decide on the assessment, covering aspects of the contents of the student worksheet, presentation of material, use of language, and display of student worksheets.

The results of the *test, evaluation, and revision* phase are the main results of the research which show the results of validation and reliability. The results of the student worksheet validation from the validators were 4.92 or 98.5% with valid results, as in Table 1.

Table 1. Results of Validation of Student Worksheets

No	Aspect	Validator				Everage	%
		I	II	III	IV		
1.	Fill in the student worksheet	4.8	4,6	5	5	4,85	97
2.	Presentation of material	4.8	4.8	4,8	5	4,85	97
3.	Language use	5	5	5	5	5	100
4.	Display	5	5	5	5	5	100
	Total Scor					**4,92**	**98.5**

Table 1 shows that student Worksheets are valid based on validity criteria [11] which is 4 ≤ Va <5. These results indicate that the bioethics-based student worksheets designed have been used to test learning models without revision.

The reliability test results for student worksheets from the four validators obtained an assessment of 95.1%, as shown in Table 2.

Table 2. Reliability of Student Worksheets

No	Aspect	A-B	A+B
1.	Fill in the student worksheet	3	57
2.	Presentation of material	5	45
3.	Language use	0	30
4.	Display	0	30
Total Scor		**8**	**162**
	Reliability ®		**95,1%**

Notes: A = Maximum assessment of indicators observed by the validator;
B = minimum assessment of indicators observed by the validator; R = Reliability coefficient.

Based on Table 2 it is known, that the reliability obtained is 95.1% or greater than 75% (R> 75%), then based on the established criteria it can be concluded, that MFIs are declared reliable and can be used for the field trial stage in the class implementation. Nieveen pointed out, the category of a product is based on three categories, namely: feasibility, effectiveness, and practicality [8].

The student activity sheet developed is a properly written guide (valid) to be used in learning activities in zoological subjects through classroom learning and in the laboratory. As one of the science courses, zoological learning will be able to improve student attitudes to be positive. As the results of the study show, that attitudes toward science learning are positively correlated with the learning environment in the class (r = 0.515) and the science laboratory learning environment (r=0.526) [4]. The classroom learning environment and learning environment in science laboratories are significant predictors of attitudes [4]. The activity on the student worksheet aims to improve student competence in ethical behavior through ethical decision-making processes and ethical attitudes.

The implementation of bioethics-based student worksheets in zoological subjects is then expected to be implemented through various existing learning models, such as: social learning models, simulation learning models, group investigation learning models, Triprakoro learning models, or OIDDE learning models [3], [7], [11]–[13]. Worksheets are now a tool for advancing school development, but educators have not done much about the multiple intelligences (MI) [5].

CONCLUSION

Development of bioethics-based student worksheets for zoology courses has been produced validly and reliably. It can conclude that: 1) a bioethics-based student worksheet is feasible to be developed and implemented in real learning in the classroom and laboratory. 2) Bioethics-based student worksheets are recommended to be followed up with further research at the implementation stage.

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