Feasibility Study Of Cilaja River As Learning Sources for Freshwater Biology CourseTo Improve Science Process Skills

Wahyu Surakusumah, Hertien Soertikanti Koesbandiah,Tina Safaria Nilawati.

Faculty of Mathematics and Natural Sciences,
State Indonesia University of Education
Bandung, West Java, Indonesia

ABSTRAK: The aims of this study is to investigatefeasibility ofCilaja river as learning source for freshwater biology course and its influence on student improvement in science process skills. The feasibility study is based on the characteristics of the Cilajariver, suitability criteriatocurriculum of freshwater biology course, convenience and safetyaspect.Result showedduring February until June 2016, for chemical aspects showed a decreasing in water quality from upstream to downstream caused chemical pollution.Biotic aspect showed dynamic nature of biotic diversity from upstream to downstream significantly changes and the changes communities caused by land use change from upstream to downstream. Education aspect showedthat implementation of cooperative learning model with STM approach could minimizelearning implementation barriers, increasing effective, efficient, achievement of learning outcomes by students' mastery of concepts and the ability of science process skills.

KATA KUNCI: Cilaja river,feasibility study, science process skills, source of learning

1. INTRODUCTION

According Moeliono (1990) practicum has aims to fasilitatedstudentst have opportunity to study and implement real data obtained from lab activities. Moreover also by practicum, then various problems can be solved through laboratory experiments (Amien 1987). While the study field is also an important part of learning and fun in environmental science subjects (Maskall& Stokes, 2008), because it offers new learning. According to Andrews et al. (2003), field study can train studentsskills and develop personality in the form of discipline, teamwork, interpersonal and self-management capabilities. Benefits provided of course that field, it also provides financing such limitations, the willingness of the supervising staff (lecturers), time available, and the ability to work (Mauchline, et al. 2013).

freshwater biology courses are courses that equip students with competence to analyze the environmental conditions in freshwater, identify the factors that influenced and are able to analyze the relationships that occur that affect freshwater environments. To meet these objectives need we have todesigned learning process and learning tools that can support to achieve these goals. Learning source is one of the important factors that need to be developed. learning sources that are most suitable for freshwater biology course is aenvironmentlearning source. These sourceslearning can provide a wide range of information and data to help improve the effectiveness of learning.Alternative sources of learning-type environment that can be developed for freshwater biology course is watershed Cilaja.

Cilajariver is located in the village of Ujung BerungBabakanCimahi. Cilajariverprovides a variety of water needs including water for consumption as drinking water, water for agricultural irrigation and plantation. Cilajariver located in the village of GiriMekar, UjungBerung, Bandung. This river has unique characteristics and its location near the city of Bandung so it is potential to be developed as environmentlearning source. To determine the level of suitabilityCilaja river area to be developed into a learning source forfreshwater biology course is need to be investigated. Research carried out by identifying the suitability of characteristics ofCilajariverwith Sylabusfreshwaters biology course. The aims of this study is to investigate feasibility of Cilaja river as learning source for freshwater biology course and its influence on student improvement in science process skills.

2. METHODS

The study was conducted by descriptive methods which has aims to provide or describea situation or phenomenon that occurs at this time using the scientificprocedureto address the actual.This study consisted of two phases are: a feasibility study Cilajariver as a learning source for freshwater biology course and effect of the use of learning sources on freshwater biological field study to improve science process skills.Determination of suitability is determined by the demands of competences and content that can be provided by learning sources that comprise with aspects of content appropriateness, affordability and safety aspects. For the suitability of content aspects of learning sources conducted study of benthos diversity

analysis, vegetation analysis, chemistry and physical water analysis,characterisazion of the land along the Cilajariver. For the improvement of science process skills measured by written test and observation.

3. RESULT AND DISCUSSION

A. Characteristics of CilajaWatersheed

River basin Cilaja have differences in land use from upstream to downstream and can devide became three cluster. Cluster 1 (upstream): dominated by pine treesand coffee plantation. Cluster 2(Central): dominated by rice fields and cluster 3(downstream): dominated by the settlement area.Measurements the physical and chemical parameters of water showed that water quality in the River Cilaja at three cluster using Wilhm Physical Chemistry Index (Table 1), indicating that water quality at each cluster is different water quality. The waterriverquality in cluster 1 is not polluted, cluster 2 lightly polluted and cluster 3moderatly polluted. The high contamination occurs due to the inclusion of domestic waste from people and the transport of waste from the flow of coffee plantations and rice fields make the pollution load on the higher residential location

Table 1 Pollution Criteria Based on Wilhm Index

Sampling Site	Indeks	Pollution Level
Coffee plantation	1.58	Unpolluted
Paddy fields	1.33	Lightly polluted
Residential location	0.99	Moderately polluted

Determination of water riverquality at Cilaja besides using physical and chemical parameters was studied using biotic parameter with using makrozobenthosdiversity. Sampling was conducted at three locations and 993 individual obtained macrozoobenthos consisting of 3 Phylum, 4 Classis, 10 Order, 18 families and 18 genera. Benthos obtained at the time of the study are presented in Table 2.

Macrozoobenthos biotic index are presented in Table 3. Shannon-wiener index benthos diversity at three cluster showed on Cilaja river has Medium and low levels of diversity. Decreased levels of biodiversity, caused by water pollution. Index macrozoobenthos diversity in cluster 1 andcluster 2 are medium category, meaning the community of macrozoobenthos were in stable condition, which means that the community fauna macrozoobenthos adapt to the environment, but unlike in cluster 3 the residential location where macrozoobenthos plagued with water quality in the environment and can be difficult to adapt with the existing environmental conditions.

Table 2. Diversity of Makrozoobenthos at Cilaja River

Phylum	**Classis**	**Ordo**	**Familia**	**Genus**	**Site Sampling**		
					1 3	**2**	**3**
Arthopoda	Malacostraca	Bathynellacea	Syncaridae	*Syncaris*	157		
	Insecta	Coleoptera	Hydrophilidae	*Hydrochus*		13	9
			Dytiscidae	*Dytiscus*		2	
		Diptera	Dolichopodidae	*Dolichopodinae*		2	
			Chironomidae	*Chironomus*	3	3	12
			Tipulidae	*Hexatoma*		8	
		Ephemeroptera	Heptaginadea	*Heptagenia*	6	6	
			Baetidae	*Baetis*	53	186	65
			Caenidae	*Caenis*		78	
		Odonata	Libellulidae	*Libellula*		3	3
			Coenagrionidae	*Coenagrion*	6	20	8
		Plecoptera	Perlodidae	*Isoperla*	30		35
		Trichoptera	Hydropsychidae	*Hydropsyche*	30	151	21
			Glassosomatidae	*Glassosoma*	13		
		Hemiptera	Gerridae	*Gerrys*	21	3	33

Annelida	Clitellata	Arhynchobdellid	Hirudinea	*Hirudo*		3	
Molusca	Gastropoda	Neotaenioglossa	Thiaridae	*Melanoides*			5
			Lymnaeidae	*Lymnaea*			5
Number per location					319	478	196
Number species					9	13	10
Total Number					993		

Table 3 Biodiversity Index based Shannon Wiener

Sampling Location	Diversity Index (H')	
	Index	Criteria
coffee plantation	1.58	Moderat
paddy fields	1.53	Moderat
residential location	0.99	Rendah

Studies of land use change from upstream to downstream in the river Cilaja include changes in the plant community from upstream to downstream in the watershed Cilajaconducted by vegetationanalysis. The results of the analysis showed that there is a change of vegetation abundance of plants from three cluster as the table below 4 and Tabel 3. Tabel 3 and Tabel 4 showed that changes in land use from cluster 1 to cluster 3 will lead to a decrease in levels of plant diversity, it shows that the land use change causes disruption to the diversity of plants and lead to simplification of plant species.

Tabel 4.The dominance of different plants on land

No	Type	Station		
		Coffe Plantation	Paddy Field	Resident Area
1	Herb	*Setaria barbata*	*Digitaria didactyla*	*Synedrella nodiflora*
2	bush	*Euparotium Inulidolium*	*Tithonia divesifolia*	*Lantaca camara*
3	tree	*Pinus merkusii*	*Tithonia divesifolia*	*Bambusa heterostachya*

Tabel 5 Diversity Index different

No	Type	Station		
		Coffe Plantation	Paddy Field	Resident Area
1	Herb	2,64	2.34	2.19
2	Bush	1.63	1.64	1.17
3	Tree	1.25	1.32	1.23

Based on the characteristics of watersheds Cilaja that has been presented above, the data information is used as the data and information that will be used to analyze the suitability of the content on the syllabus. To analyze the suitability of content aspects of learning sources be examined through an analysis of the suitability of the syllabus with the characteristics of a learning source. Results of the study were drawn in figure1 and figure 2.

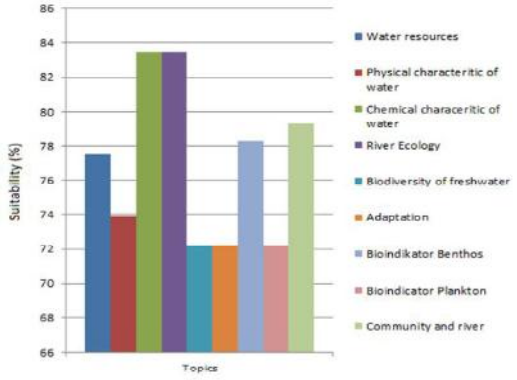

Figure 1. Suitability with Sylabus

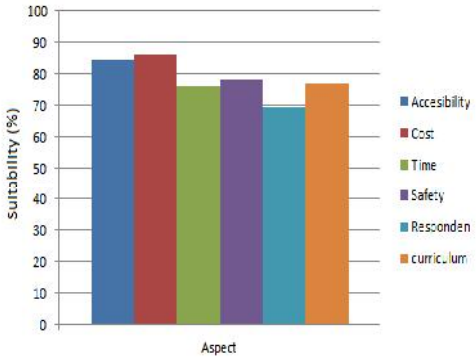

figure 2. Suitability with Feasibility of Learning Sources

The results of conformity assessment characteristics Cilajariver with content in freshwater biology syllabus showed the percentage suitability of aspects content on average is 76.9%, and suitabilitytpaspects learning source is 78.6%. Results indicated that the level of biological content suitability of learning resources Cilajariver is appropriate.To determine the effect of use of learning resources to the improvement of science process skills, observations wasconducted during the field study activities. Aspects which observed consisted appear are observational skills, skills classify, predict, communicate, measure, concluded, controlling varaibel, making operational definition, create hypotheses, interpreting, do the experiments and create models. The results of the observation is showed in figure 3.

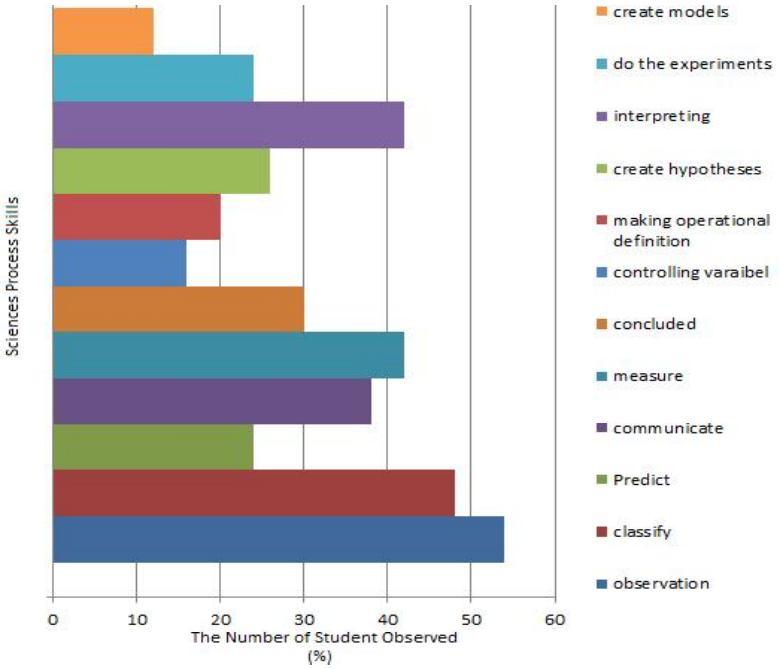

Figure 3. Percentage the number of students who have observed science process Skills

Figure 3 showed aspect science process skills that most students is conducted during filed study are observation, classifying, measuring and interpreting with percentage of students who perform successively 64%, 48%, 42% and 42%. This aspect is the most widely performed by the students because students are required to obtain the required data for create report of the field study. While the smallest percentage performed by student is aspects of formulating a model is only 12%. This aspect is not easily performed by students unless they understood the concept reach this highest stage of science process skills.

4. CONCLUSION

Learning resources Cilaja river in the village BababakCimahi based on aspects of the content is appropriate suitable with characteristics of Cilaja river.chemical aspects showed a decreasing in water quality from upstream to downstream caused chemical pollution.Biotic aspect showed dynamic nature of biotic diversity from upstream to downstream significantly changes and the changes communities caused by land use change from upstream to downstream. Education aspect showedthat implementation of cooperative learning model with STM approach could minimizelearning implementation barriers, increasing effective, efficient, achievement of learning outcomes by students' mastery of concepts and the ability of science process skills.

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