

## Improving Students' Awareness of the Quality of Brantas River and Its Environment

Herawati Susilo

**Abstract:** Beginning 1996, trainings for Biology, Chemistry, Geography and Economics teachers (and again in 1998) were conducted to help them integrate river as learning resources into their subject matter. Students from 29 SMUs along the Brantas River are brought to the river to learn to check the quality of water chemically and biologically, and to measure some physical conditions of the water. The economical use of the river were also observed and discussed. It is expected that the students will be aware of the quality of water and of the value of water resources. Competitions have been conducted to increase students' enthusiasms in studying the river and its environment. As a result of these activities, a network of schools around the river has been initiated which was called the Communication Network of Schools doing the checking of the Water Quality.

**Keywords:** educational effort, students awareness, water quality, Brantas River.

One of the biggest problems faced by people living in the surrounding of the Brantas River catchment area is the availability of clean water. According to the Minister of Health, Achmad Suyudi, the highest number of diarrhea patients is in East Java. One of the causes is the low quality of clean water management (Jawa Pos, September 9, 2000). This fact

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*Herawati Susilo is a lecturer at the Faculty of Mathematics and Science (FMIPA), State University of Malang.*

becomes a big problem for people surrounding the Brantas River catchment area because diarrhea is included in the five lethal sickness in this country.

The quality of the Brantas River, especially in the lower course (downstream), where there are many industries, is very low; whereas the Brantas River is the main water resources for producing drinking water. According to Amsyari, if the quality of the raw material is low, the quality of the product will also be low and not suitable for consumption (Jawa Pos, April 3, 2000). Wiryawan mentioned (Jawa Pos, August 20, 2000) that these facts were caused by the large amount of industrial and domestic waste thrown to the river without proper treatment.

The Brantas River suffers from a heavy load of waste. According to Sunaryo (2000), in 1989 there were 81.6 tons (68%) of domestic waste and 38.4 (32%) of industrial waste, totaling 120 tons. This number multiplies almost 2.5 times in 1998. The domestic waste becomes 205 tons (62%) and the industrial waste, 125 tons (38%), totaling 330 tons. This heavy load of the Brantas River should be lessen and minimized.

Efforts to minimize the domestic waste thrown to the river could be done through many ways. One of the efforts done by the government is by issuing a program called *Prokasih* (Program Kali Bersih or Clean River Program) beginning 1989. The main target of the *Prokasih* is to minimize the pollutants thrown to the river as to improve the quality of the water for its proper usage. The purposes of the program are to improve the river water quality, to decrease the load of waste pollutant and to improve the functions of local environment institution and human resources in the quality management of river resources and its environment.

In supporting the *Prokrasih* some activities have been conducted around the Brantas River, called *Safari Kali Brantas Bersih* (Safary of Clean River Brantas) with the objectives as follows: (1) to improve the awareness of the community about the importance of clean river environment; (2) to give insight to the people from the industry who live near the River Brantas and use the river water for their industry to participate in keeping the water clean so the function of the river for live could be realized; and (3) to take the accountability of the river user (community as well as industry) on the importance of the river for live (Dirut Perum Jasa Tirta, 2000).

In relation to the *Prokasih* and *Safari Kali Brantas Bersih*, some activities have been conducted in cooperation between FMIPA-UM and

*Perum Jasa Tirta* to improve the students' awareness of water resources (Winarno, dkk., 1997, 1998). This paper will present the activities done since 1996 until recently and what is expected in the future through education. It is realized that efforts through education can be done to develop the understanding of the people around the river about the quality of the river, its catchment area, and the water resources. This efforts to minimize the domestic waste should be done as early as possible to complement efforts to minimize the industrial waste.

## METHOD

We conducted the research under two different names, which are the Improvement of Schools' Awareness of the Importance of Water Resources and Network for Communication On Water Quality Monitoring.

The first phase of research has been done to improve the school's awareness of the importance of the River Brantas. In this research we conducted the field exploration (September 1996), teacher training (October 18-19, 1996), and check the quality of river water (December 1996-March 1997).

Exploration was done through questionnaire to 4 kinds of teachers (Biology, Chemistry, Geography, and Economy) from 60 Senior High School near Brantas River. The main question asked in the questionnaire was about the use of river as a learning resource. The result showed that the use of river as learning resources in teaching and learning processed should be increased, especially for Chemistry and Geography teachers.

To improve the teachers' ability and skills in using the river as a learning resource a teacher training was conducted in October 18 and 19, 1996. There were 48 teachers from 26 Senior Secondary Schools participated in the training. There were only two teachers from one school, either from Social Studies or Science Studies. Teachers were trained to integrate the knowledge of river water resources into the subject they teach. They were given knowledge materials on The Economic Value of A River, The Hydrology in River Catchment Area, The Water Pollution in River, The Use of Macroinvertebrate as an Indicator of Water Quality and The Network for Communication On Water Quality Monitoring.

Besides, they are also given Student Work Sheets on Water Quality Monitoring, Guidance Before Go to the River and 13 activities related to the Use of Macroinvertebrate to measure the water quality, and the

measurements of dissolved CO<sub>2</sub>, pH, BOD, total suspended solid, dissolved O<sub>2</sub>, COD, Volumetric Imhoff method for solid sediment, water debit, turbidity, soil texture, the usage of river by the community and the identification of waste thrown to the river.

As a follow up activities the teachers were expected to bring their students to the river or to the area near the river to check the quality of river water and/or to observe the usage of river. Every school was expected to send their monitoring report periodically to the researcher.

To further improve the awareness of school of the importance of water resources, another teacher training was conducted on March 23 and 24, 1998 as the second phase of the research. The training was held for teachers from the same schools invited in 1996 because at that time only teachers from either Social Studies or Science studies participated. There were 48 teachers from 28 Senior Secondary Schools participated to complete all four teachers from each school. During this training it was decided to initialize a network called *Jaring-jaring Komunikasi Pemantauan Kualitas Air* (JKPKA or Communication Network of Schools Doing the Checking of the Water Quality). Through the network it was expected that the students from different schools could have good communication in exchanging information and experiences in river water monitoring activities.

Further efforts have been done in coordinating in the activities. There was one central coordinator and 3 local coordinators for the upper course area of the river, middle course, and lower course area of the river. Nine to ten Senior Secondary Schools was coordinated under each local coordinator. As a means of communication there was *WARTA JKPKA* (JKPKA Bulletin) issued under the supervision of *Perum Jasa Tirta*. Competitions were also conducted to increase students' enthusiasms in studying the river and its environment.

## RESULTS

Senior Secondary Schools students from 29 SMU along the Brantas River in 14 municipalities and districts were brought to river by their teachers to learn to check the quality of water chemically and biologically and to measure some physical conditions of the water. The economical use of river were also observed and discussed. By doing their tasks in

the river it is expected that the students will be aware of the quality of water and of the importance of water resources.

Between November 1996 and March 1997 there were 21 schools (80.87%) did the monitoring of the river water quality. There were also efforts in every school to build an organization of students who love water and like to research the quality of water resources. One outstanding performance had been shown by two students from Senior Secondary School II (SMU II) Jombang who succeeded in creating a hymn about water resources called *Mars Gabungan Siswa-siswi Pecinta dan Peneliti Air* (MARS GASIPPA or Hymn for the Group of Students who Love Water and Like to Research the Quality of Water Resources). There were around 21-25 schools who did the monitoring of the river water quality in year 1998 and 1999.

Competitions have been conducted twice in 1999 and in 2000. There were competitions in writing reports on water quality, writing scientific paper around water and water resources, making poem and poster about water, and in making photograph of activities around river. For the first competition there were 28 reports, 33 scientific papers, 90 poems and 22 posters entered the competition. For the second competitions there were 28 reports, 14 scientific papers, 49 posters and 22 photograph entered the competition. The trophy for the first competition were presented to the winners in February 18, 1999 and for the second competition they were presented in May 20, 2000 during the meetings for the network members. It is expected that not only teachers but also students as members of the network can meet regularly to share their experiences problems, and enthusiasms in conducting their activities.

Based on interview with the central coordinator (SMU II Jombang), in year 1999/2000 the planned activities has been conducted 100% with the 82.7% members participated (from 29 school members there were only 25 school members being active in conducting the river quality checking). The non active member are one from upper course area and 4 from middle course area of the river. The central coordinator mentioned that 6 of the 7 performance indicator of the JKPKA have been fulfilled, which are: (1) reports of river quality monitoring; (2) supports from the principals; (3) good responds from JKPKA members; (4) active communications among members; (5) internal infrastructure of JKPKA; and (6) development of JKPKA to become self-funding and self-reliance. Only

one performance indicator could not be reached (and also was not planned to be performed in 1999/2000), which is to enlarge the number of JKPKA members to include other Senior Secondary Schools in areas surrounding Brantas River.

## DISCUSSIONS

Based on the results reported above, the efforts of improving students awareness have shown some promises in the future. Although most of teachers and students given positive responds to this efforts, there still be some factors to be taken into consideration about the sustainability of doing the river quality checking activities. Factors affecting efforts to improve the students awareness of the quality of Brantas River and its environment are policy, school principals, teachers, facilities and materials, funds, and community.

There were no policy to include the environmental education to become a local curriculum. Therefore, the inclusion of river as learning resource depends on the willingness and ability of teachers to integrate this in their subjects.

School Principals play very important roles in decision making. It is very important that the school principals support the teachers and students in doing these activities. The supporting principal may provide teachers with funds and opportunities to bring students to the river.

The other key persons at school are teachers. Some teachers felt too depressed by the crowded curriculum and could not find time to integrate river water as learning resources for their subject. The teachers' creativity to find time and funds in conducting these activities might also become a determining factor for this activities. The researches reported here is fortunate to have an outstanding teacher from SMU 2 Jombang to become central coordinator. This teacher serve as the motor of these activities.

Facilities and Materials are also contributing factors in doing these activities. Some schools do not have enough facilities to do the checking of water quality, for example for geography activities there should be analytical balance and oven, for chemistry there should be Imhoff tube. The chemicals provided by the researchers could only be used for 4 - 5 times of measurement. After that the schools are expected to provide the chemicals. Teachers or group of teachers coordinated by local or central

coordinator should try to do their best in doing this. Teachers in Jombang had decided to work together in preparing the needed chemicals.

Funds also have to be taken into consideration. There are funds needed for transportation, consumption, documentation and first aid. Schools or student parent association are expected to provide the funds for these activities. The local government and industry are invited to provide some funds to support these activities.

Community around school could become another important factor. There are still no good examples for the surrounding community. Many of them still throw the solid and liquid wastes to the river. Good examples from the leaders of community to change this habit is expected.

## CONCLUSION AND SUGGESTIONS

Based on the discussion above it could be concluded that the efforts to improve students' awareness have been fruitful and promising. However, there are still some factors to be taken into consideration.

For the future it is expected that all the factors mentioned above could be taken into consideration by all through socializing these efforts to more people, more institutions and government officials: the education of future citizen is the responsibilities of us all.

The supporting condition of this efforts should be maximized in achieving the objectives in improving student awareness of the quality of Brantas River and its environment. Gratitude to *Perum Jasa Tirta* who gives some support to the JKPKA activities by providing funds and facilities for meetings, seminars and competition. Appreciation to all principals teachers and students who have been actively participate in the JKPKA activities.

In the near future it is expected that more schools could be invited to participate in this kind of activities. Also it is expected that more creative and interesting activities could be implemented to boost the teachers' and students' enthusiasm in doing activities around river and its catchment area.

As one of the promoters of this efforts, the writer has an obsession to see this kind of efforts to be a model for improving student awareness of the quality of river and its environment in other provinces of Indonesia.

The central coordinator suggested that more trainings be conducted for teachers from other schools surrounding the Brantas River catchment

area as to increase the number of JKPKA school members. He also suggested to refresh the teachers spirit and motivation in making the students learn from the river surrounding. The writer thinks about inviting English teachers in the training to help students communicate with other students abroad doing the river activities through GREEN or *Global Rivers Environmental Education Network* (Stapp and Mitchell, 1995). Another obsession of the writer is to see the student member of JKPKA communicate with their friends of water lover is overseas.

The writer thinks about other skills to be trained to the teachers participating in this efforts how to conduct action researches and how to write scientific articles. Through this empowerment, it is expected that the teachers' professionalism in conducting their job will increase including their philosophy in teaching learning activities as to what and how to give their best to their students and community.

## REFERENCES

- Dirut Perum Jasa Tirta Malang. 2000. *Monitoring dan Modeling Kualitas Air di DPS Kali Brantas*. Makalah disampaikan dalam Seminar Nasional Bencana Lingkungan Sungai dan Pantai di DAS BRANTAS di Surabaya, 24 Oktober 2000.
- Jawa Pos, 3 April, 2000. *Kali Surabaya; Keruh Warnanya, Tak Enak Rasanya*.
- Jawa Pos, 22 Agustus, 2000. *Hilir Brantas Airnya Kurang baik*.
- Jawa Pos, 24 Agustus, 2000. *Satu Meja Atasi Lingkungan*.
- Jawa Pos, 9 September, 2000. *Soal Air Bersih, Jatim "Dijewer" Menkes*.
- Stapp, W.B. & Mitchell, M.K. 1995. *Field Manual For Global Low-Cost Water Quality Monitoring*. Dexter, Michigan: Thomson-Shore Printers.
- Sunaryo, T.M. 2000. *Pengelolaan Daerah Pengaliran Sungai Kali Brantas*. Makalah disajikan dalam Pelatihan Guru SD Kotamadya Surabaya dan Malang mengenai Air, Kerjasama Universitas Negeri Malang dan Hanns-Seidel Foundation (HSF), 3-4 Juli 2000.
- Winarno, R., Susilo, H., Syamsuri, I., Soebagio & Utaya, S. 1997. *Peningkatan Kepedulian Sekolah terhadap Sumberdaya Air Di Daerah Pengaliran Sungai Brantas Melalui Program Pendidikan dan pelatihan*. Laporan Akhir. Malang: PKPKLH Lemlit IKIP MALANG.
- Winarno, R., Susilo, H., Syamsuri, I., Soebagio & Utaya, S. 1998. *Pengembangan Jaring-jaring Komunikasi Pemantauan Kualitas Air*. Laporan akhir. Malang: PKPKLH Lemlit IKIP MALANG.