MICROSCIENCE AS AN SCIENCE PRACTICUM MODEL FOR DISTANCE EDUCATION STUDENTS

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Science education is one of Education for All intensions, which ensures that learning needs of all young people and adult are met through equitable access to appropriate learning and lifeskills programmes Microscience is a practical science on a very small scale or microscale and it has a lot of advantages over the traditional approach. Microscience uses microscience kit which is cheap, easy to store and easy to clean also save hazardous waste disposal. Microscience allows experiments to be carried out any where and in much less time, since preparation time is minimal. The integration of practical work with the theory may have contributed to the positive response of conceptual understanding. Distance education students is basely limited in conducting practical component of the courses offered can do their own practical work with the microscience kits in their home. Microscience approach is not aiming to provide for university degree programme, but first year- level courses and teacher upgrade programme.

Key words: *educaton for all, microscience, microscale, microscience kit, microchem, microchemistry kit, distance education, UNESCO, and IUPAC.*

INTRODUCTION

Word Declaration on Educaton For All in Article I - Meeting Basic Learning Needs, stated that: 1) Every person-child, youth and adult – shall be able to benefit from educational opportunities designed to meet their basic learning needs. One of basic learning need is sciences education (anonim1 st).

The microscience project is a collaborative effort of United Nation Educational Scientific and Cultural Organization (UNESCO) and the International Union of Pure and Apllied Chemistry (IUPAC) to advance the worldwide aspects of the sciences and to contribute to the application of science for people. Science is fundamentally an experimental subject, thus every learner must have a practical scientific experience (Sia, L, 2002).

The microscience poject that developed by UNESCO and IUPAC is a new idea fundamentally changed the way students work in the laboratory. In microscience experiments only the minimum of materials is used and experiment work can be done any where. In other words, microscience is an alternative sciences' practical work for distance education students.

They are cost effective and safe, in so far as pupils never need to use more than a couple of drops of chemicals for experimentation.

The overall objectives of this project are to:

1. To promote practical science experimentation using Microscience as an advocacy tool amongst policy makers

2. To improve science curricula by inclusion of hands-on experimentation for a better understanding of science
3. To increase the interest of young people in science so as to promote gender equality, scientific literacy and the choice of a scientific career
4. To promote capacity building for science education and enhance development of scientific thinking and experimentation for pupils (anonym 2 nd).

WHAT IS MICROSCIENCE?

Microsciene is practical science on a very small scale and it has a lot of advantages over the traditional approach. It uses equipment which is cheap, easy to store and easy to clean. It reduces laboratory confusion so that students can concentrate on what they doing rather than finding test tube and beaker glass, washing up and running out of chemicals. All students can do their own practical work, but results can be shared and compared with peers. The volume of chemicals used are considerably reduced making work safer and cheaper. The small volume of chemicals used also make the microscience is environment friendly.

Microscience instruction in schools was first attempted by Dr. John Bradley Professor of Chemistry, University of Witwatersrand, South Africa According to Sia, L (2002), In South Africa, Prof. Bradley described the poor learning situation in this country, where resources are very limited, facilities poor, and teacher without the required competence. In other hand, Bradley, J and Smith in Bradley, J (2000) stated that, in South Africa the science lectures, equipment for practical science soon emerged as a

major problem. These problems chellenge Dr Bradley to developed microscience project that promoted as low-cost, safe and easy equipment to use for chemistry. Microscience is not aiming for university degree programme, but for first year level cources, teacher upgrade programme, primary and high shools students.

The equipment known as microchemistry kit was developed in the form of an individual student kit which could be used anywhere: classroom, home, field, and laboratory. Microchemistry kit is a micro-scale equipment. It comprises a special microwell plate (comboplate), a small plastic plate approximatelly 125 x 80 x x20 mm and containing a combination of 12 large wells and 48 smaller wells that replaces tradition test tubes and beaker glass (Bradley, J 200).

According to Silawati, T (2006), In Indonesia, microscience is not a new idea especially in Indonesian Police Departemen (POLRI). It is widely used for in criminal laboratory at POLRI for drug abuse testing and foods testing for VIP (Nastiti, T,R. Pharmacist).

MICROSCIENCE FOR DISTANCE EDUCATION STUDENTS

Studying through distance education has gradually increased due to geographyc and economic constraints, flexibility, etc. Experience practical chemistry is difficult for a distance learner who cannot easily turn to someone for assistance. With the advance in technology using multimedia for experiment were also sought. As discussed by Benett in Akoobhai, B & Bradley, J, D. (2005), experimental simulation system have been developed, but simulation system do not allow science students to feel like real scientist,

performing experiment with real chemicals. Moreover, Chandler, J and Barnes, D (1981) states that, chemistry is a laboratory science, and its study is meaningless without a laboratory experience. With the advantages of microscale technique, microscience could be used an an alternative strategy for providing practical work for distance education students.

Akoobhai, B & Bradley, J, D. researcher from Witswatersrand University, South Africa, conducted microscience research for distance education students at Mpumlangga, South Africa. The researcher found that, the use of microscience equipment at home, by students studying science through distance education was positively accepted by them. In other words, microscale kits can be used an an excellent alternative to tradition equipment of lower costs, greater safety, and lesser environment impact. All these are very important for home study, especially for distance education students. Moreover, success of using microscale equipment at home by distance education students who studying science was reported by Bennett in Akoobhai, B & Bradley, J, D. (2005). Majority os the students liked the flexibility and convenience, the students also comments such as ‘take-home labs are really neat and fun’.

In other hand, Silawati, T. (2006) stated Microscience is a science lab with small scale. Practicum in this way has several advantages compared with traditional lab work, such as equipment made of plastic, small size (microscience kit) and very simple, and easily cleaned and washed. In addition, the materials lab that is used very little in size milligrams and milliliters so that the budget can be reduced as low as possible practicum. Another advantage of microscience kit is packed in a neat state so easy to carry and sent to the student. Students can carry out practical work in their respective residence or by

groups, with a vibrant and safe feeling.

The advantages of the program is microscience

1. Equipment made by small scale
2. Materials lab that is used very little (in mL and g)
3. The equipment is made of plastic
4. The equipment can be reused
5. The equipment can be used several students
6. Practicum can be implemented at home
7. Safe and environmental friendly
8. Easy packed

The model of microscience lab can improve the understanding and scientific concepts both for teachers and students through the lab with small scale (microscale) are relatively safe to use. microscience kit is designed such that it can be used by teachers and students anywhere at home, in the field, or in the room. It is easier for teachers to convey a concept of science to students through the practice directly without having to have the laboratory.

By looking at these facts, the implementers of education is expected to facilitate the implementation of a practical wear microscience program for students, who are studying the distance learning system, which can not perform laboratory experiments. Through the application of microscience, lab work can be carried out without the lab building and without clothes praktikum. Forthermore, the lab equipment that is small and simple. The use of materials lab that very few can eliminate concerns about the practicum

waste harmful to the environment so that the program microscience, lab work can be carried out safely (Silawati, 2006).

PRACTICUM IN UNIVERSITAS TERBUKA

Universitas Terbuka is an institution that realize how important the experience practicum in laboratory for the students. So although Universitas Terbuka students are scattered throughout the territory of Indonesia and student access to laboratory experiments can not be easy, but Universitas Terbuka still trying to bring the experience practicum for students with a variety of models. In 1990 Faculty of Teacher Training (FKIP) in Universitas Terbuka create a model of lab kit chemistry for the students. Fakulty of Teacher Training sent this model lab to students of Diploma 2 Primary School Teacher Education (D2 PGSD). Under graduate students who take practicum, they carry out laboratory experiments available in educational institutions in cooperation with the Universitas Terbuka (Silawati, 2006).

Biological Science students carry out practical experiment with universities that have programs of study of biology that establish cooperation, so that the students of Biological Science Universitas Terbuka can use the facilities at the universities biology laboratory to carry out the biology lab.

According to Silawati, T. (2011) the Universitas Terbuka in 2011 began to develop a Dry Lab program, for practical purposes for science and social science. Practical methods for social science lab, for example, is Introduction to Accounting Lab (Hadiwidjaja et al, 2011). For science it is developing a Dry Lab for the Biology study program in Faculty of Mathematics and Natural sciences and the Chemistry Education in

Faculty of Teacher Training program. Dry Lab program that has been developed can be accessed through the website of the Universitas Terbuka.

Dry Lab, stands for Dry laboratories, namely virtual lab that conducted the simulation with the computers program. Dry Lab is also developed with the aim to provide an understanding of the material, equipment, and procedures before students carry out lab practicum in the lab. Dry lab can be access in (http://www.ut.ac.id/drylab/drylab/indeks.swf

RECOMMENDATIONS

The benefits of use of microscience equipment need to continue to overcome certain barriers for science students who study trough distance education. Universitas Terbuka as intitution that employed distance education may apply microscience equipment for science students, especially for chemistry, biology, and physics.

From the above results it can be concluded that the lab with small scale can be used as an alternative, for a lower cost, safe and no or little damaging to the environment.

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