

***Bioplastic Preparation Training for Biology
Teaching Material Production***

Final Report Prepared for:

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Report on 27 May 2013

UPI

Acknowledgement

My deepest gratitude begun from Prof. Dr. Nuryani Rustaman, lecturer at UPI, for her effort in introducing each and every aspects of how to develop biology teaching and learning process at school, college and university levels. Then, I would like to thank Prof. Sumar Hendayana for his intensive and positive support for the training. My gratitude then goes to Ms. Rika Gunawati and Mr. Dian Hendriana who played greate role to create ground and fullfill the necessary conditions for the training. My last but not least deepest gratitude goes to Mr. Sara Suryana who spend his full time to train us and prepare training manual for the sucess of the training.

Introduction

Science teaching and students learning in schools are affected by many factors. Among these the availability of teaching resources, teachers competency, teachers subject matter knowledge, teachers pedagogical knowledge and pedagogical content knowledge, students' background knowledge, students interest to learn science, etc. are the major factors.

One of the major problem of science teaching in every country in general and developing countries in particular related with limitation of teaching aids. Not only the resource limitation affect science teaching and learning but also it is affected by the presence of knowledge gap, lack of motivation and lack of awareness on how to prepare, operate or use locally available resources for science teaching.

In order to minimize such problems in science teaching, to create awareness and fill the knowledge gap; teachers **on-job training program** for updating their existing attitude, knowledge and skills has a vital role.

Thus, the triangular cooperation in capacity development of mathematics and science teachers educators training held from September 2012 to June 2013 at Indonesia University of Education contribute a lot for such cases. This report include the skill developed on **bioplastic preparation** to produce teaching materials and improve quality of PRESET in the area of science (particularly biology) education.

Objectives of the training:

- to improve practical skills of material production for biology teaching.
- to develop the skill of preserving plants and animal cells by using bioplastic.
- to know the necessary chemicals and apparatus for preparation of bioplastic.
- to use the materials and procedures for producing sample preserved plant specimen in bioplastic.
- Prepare model preserved specimen

Theoretical Background

Bioplastic is a form of dry preservation in a resin block, for educational or other purposes. Embedding fragile vegetative specimens in plastic preserves these materials for repeated use. The specimens used for embedding in bioplastic include many varieties of insects, worms, ferns, mosses, leaves, bean seeds, assorted field crop and weed seeds, root nodules, inflorescences, flowers, and vegetative parts of several grasses and legumes, ears of corn, etc.



Photo: Introduction about Bioplastic preparation techniques by Mr. Sarna

Major reasons for the need of Bioplastic

In teaching biology practically for students, specimens preserved by using bioplastics have many functions. Some of these are:

1. Certain specimens are limited distribution and seasonal occurrence. Thus, preserving these specimen by using bioplastic helps to teach biological concepts related to the specimen at any time.
2. To preserve some unavailable specimens.
3. It is strong, clearly observable and durable preservation technique.
4. It is inexpensive and at the same time it is attractive.
5. Practical in storage process

Necessary materials required to prepare bioplastic

For the preparation or making preservation of specimens by using bioplastic, the following apparatus and chemicals are required:

- Resin (Polyster resin)
- Catalyst, namely, hydrogen peroxide or 5% Methyl Ethyl Keton Peroxide
- Cast or mold made of aluminium or plastic
- Desicated or dry specimen
- Labling and scale
- Glass paper
- San Poly
- Coloring or oil painting
- Stirrer, Dropper, Forceps



Photo: Some of the resources needed for making bioplastic

Procedures for embedding specimens in bioplastic

1. Preparation of the specimen by properly drying or desiccation
2. Mixing the resin with a catalyst

The basic principle of casting plastic specimen blocks is hardening of a liquid synthetic resin (Polyster resin) in the presence of a catalyst, namely, hydrogen peroxide or 5% Methyl Ethyl Keton Peroxide. The reaction between the resin and catalyst is **exothermic reaction** that can generate heat. The reaction is indicated by a color change from blue to green if we use hydrogen peroxide or from colorless to light yellow if we use 5% Methyl Ethyl Keton Peroxide. As the reaction goes to completion, the resin polymerizes or gels to a crystal-clear solid.

3. Pouring the specimen layer or block and wait until the liquid become harden.



Photo: During mixing the resin with the catalyst and making a layer in the cast

4. Placing the specimen and any labeling that needs to be done on to the base layer after the base layer become fully harden.
 5. Pouring the second layer called fixation layer and wait until harden.
 6. Pouring the third layer called covering layer on the specimen and wait until the layer fully hardening.
- The general principle of embedding dry specimens involves the preparation of three layers:
- ✚ a specimen-supporting layer
 - ✚ a specimen-retaining layer and
 - ✚ a specimen covering layer



Photo: Waiting until the embedded specimen until it became harden

7. Removing the end plates from the cast



Photo: Removing the hardening and embedded specimen from the cast

8. Grinding or smoothing the bioplastic using glass paper and polishing
(Note: Care should be taken in order not to form dust during the smoothing process. If rubbing made on dry glass paper the resin form a dust which is a carcinogenic chemical).



Photo: smoothing the bioplastic using galss paper



Photo: Final Bioplastic prepared at the end of the training

Common mistakes that lead to failure of Bioplastic preparation:

- Formation of too much bubbles during stirring and pouring
- Cracking of bioplastic due to excessive catalyst
- When preserved objects were not well deried and watery.
- Fading colour
- Rough surface of the bioplastic due to smoothening process
- The bioplastic become not transparent probably due to dust particles.

Summary and recommendations

From this tarining I clearly understand and develop the skill of preparing bioplastic for preservation of speciemens. This skill in turn will help me for giving practical training for Biology teachers who teach biology at different levels in Ethiopia. The final role of such exprience will help to develop the teaching and learning process practically in biology.

Recommendations

It is already known that practical activities and hands-on training help science teacher educators to develop their skills and share thier expreience for others. Therefore, for future training schedule such practical activities like microscope slide preparation, microscope maintenance, speciemen preservation, modeling, bioplastic methods, using locally available materials for science teaching, etc. should be planned and delivered.