INDONESIA UNIVERSITY OF EDUCATION

FACULTY OF MATHEMATICS AND SCIENCE EDUCATION

DEPARTMENT OF BIOLOGY

TCTP Program

DESIGNING INQUIRY PLAN FOR PRACTICAL ACTIVITY IN FIELD AND REPORT ON RESULTS

FOR:

BIOLOGY PRACTICAL/BI706/

PREPARED BY:

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Course content and outline for BI706 Biology Practical

- ✓ Integrated science process skills
- ✓ Analysis of content or curriculum design
- ✓ Experimental design or practical activity/lab. work/
- ✓ Evaluation or validation of designed lab. work
- ✓ Carry out experiment based on the designed lab work or guide line
- ✓ Inquiry worksheet design presentation
- ✓ Implementing the designed lab work in real class/under graduate program
- ➢ Designing field work activity with inquiry method
- ✓ Evaluation/validation of designed field work
- ✓ Performing or carry out fieldwork activity

Introduction

This course in general is designed in such a way that how teachers educators, facilitators or teachers teach biology practically for their students at junior, high school or college or university level with hands-on and minds-on activities.

To this end; we learn a lot about science inquiry method, designing of practical work, way of involving students in practical work design and implementation. Field work activity with inquiry method is one method from the multiple techniques of teaching biology with practical activity.

For such practical activity of biology we design plan or field guide in group, evaluate the designed plan in class and go to Ujung Genteng to held the designed field activity. The inquiry field plan and worksheet to collect data are presented as follows.

General Objectives of the field activity

Field related practical activity helps students to:

- See the nature of their environment and teach about it with hands-on and minds-on activities.
- Show what is going on nature that supports individual life and the whole community at large.

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- Create awareness about natural resources conservation and engaging students in such activity.
- Plan environmental conservation strategy and implement it to conserve the resources.
- Improve cooperative teaching and learning in biological science education.

Title: The Study of an Ecosystem around the Beach of Ujung Genteng; West Java.
Grade Level: 8
Duration/Time Required: 2 days (Nov. 23 and 24/2012)

Basic Competency or Content Standard:

- Understanding ecosystem components and their importance for life with scientific inquiry in field activity.

Competency based analysis

Knowledge, application	Science process skills	Ethics and attitude
- Explaining the concept of ecosystem. - List and describing the components of ecosystem - Observing and explaining the relationship among the major ecosystem components. - Comparing the species composition of different habitats.	- Observation and hypothesis formation - Way of observing, recording and study ecosystem - Communication/interaction/ - Evaluation of data and methods - Taking pictures and collecting life specimen.	- Protection of life and other resources - Prevent habitat loss - Value for the life of other creatures. - Cooperative learning by working as a team to study in field.

Specific Objectives:-

- After observing the beach area of Ujung Genteng students will explain the various biotic and abiotic components in the area.
- After observing the area students will identify a variety of habitats within the selected ecosystem.
- After the whole activity students will improve their skill in making and testing hypothesis in outdoor activities.
- After observing the nature of Ujung Genteng students will learn how to collect data in the field.
- After observing the beach students will be able to identify any five fauna and any five flora in the area using simple keys.
- After performing all field activities students will identify and use various scientific apparatus required for data collection methods in an ecological study.

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- After the end of the field activity students will develop scientific attitude in observing nature during their life.
- After the whole activity students will describe the role of both biotic and abiotic components for life of individual or the whole community at large.

Hypothesis/Prediction/: As the vegetation cover is high the species richness of the area also high.

Pre-Requisite Knowledge

Students should be familiar with the theoretical background of ecology, environment ecosystem and science process skills.

Suggested Materials/Equipment

Luxmeter, Thermometer, Plastic bags; Insect net; Fish net; Specimen bottles; Plankton net; Mammal trap; forceps; Scissors; Knife, Measuring Tape, Rulers, GPS, Data sheets, camera.

Ecological and Science Context:

a. Background (for Teachers):

An **ecosystem** is a complete community of living organisms and the non-living materials of their surroundings. Thus, its components include plants, animals, and microorganisms; soil, rocks, and minerals; as well as surrounding water sources and the local atmosphere. The size of ecosystems varies tremendously. An ecosystem could be terrestrial or aquatic ecosystem that covers larger area like an entire rain forest, covering a geographical area larger than many nations, or oceans or it could be a puddle or a backyard garden. Even the body of an animal could be considered an ecosystem, since it is home to numerous microorganisms.

The types of organisms in an area are determined by various factors such as the climate, temperature, rainfall, etc. The organisms, in addition to being dependent on the environment for their needs, are also dependent on each other. This dependency is especially for food. This results in the presence of food chains and food webs.

ABIOTIC COMPONENTS	BIOTIC COMPONENTS
- Sunlight - Temperature	- Primary producers/green plants - Herbivores

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- Precipitation - Water or moisture - Soil (type, PH, salinity, etc) - Topography	- Carnivores - Omnivores - Detritivores etc.

All of these components of an ecosystem vary over space and or time and all are interdependent with each other. The suitable climatic condition including available sunlight, moisture, temperature and soil are strongly determine the success of any plant in a given habitat. The survival of the plant in the area in turn supports the existence of other life forms including herbivores, carnivores, scavengers and microorganisms.

This investigation is designed to determine what types of ecosystem and its components are found around the beach of Ujung Genteng. This fieldwork is also helpful to develop the skill of students for data collection, but students will ultimately learn how to use scientific instruments, take photos/pictures/, collecting life specimens, measurements, compile and present their findings. This lesson teaches both basic biology as well as larger ecological questions of how nature of ecosystem looks really with hand-on activities and information at the field.

b. Background (to present to Students):

When you go outside, how do you see the particular plants and animals in the area?

In ecological study why do you see the particular plants and animals in the area?

Why are these plants and animals live there?

The plant community, or collection of species in a certain locality/location/, is a product of plant adaptations, interactions with the biotic and abiotic environment, and some random chance. The plants that grow around Ujung Genteng are well adapted to the abiotic environment (temperature, winds, soils, moisture, etc in the area) and the biotic environment (insects that pollinate them, herbivores that graze them, parasites that attack them). These plant lives also associated with animal's life of the area.

We are going to conduct a field study like real ecologists, and try to observe the biotic and abiotic components of the ecosystem around the beach of Ujung Genteng. We are going to explore the different habitat types around the beach and life forms including the fauna/animals/ and flora/plants.

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Motivation and Initiative for Learning:

This is outdoor activity, so the students are excited to go on a field trip to begin with. The students will enjoy exploring the different microhabitats and land escapes together with the life they support. The group size is small enough (ranging from 5-6 individual per group), having group coordinator and provided with enough field apparatus. Students get more personal attention than in a classroom setting.

Finally, the students are introduced to a series of scientific instruments and methods they may likely have never seen before, and it's very exciting for them to observe and take the measurements.

Vocabulary:

- **Ecosystem** = a single unit consisting of all of the organisms in one region together with their environment.
- **Habitat** = the place or environment where a plant or animal naturally or normally lives and grows.
- **Humidity** = a measurement of the water vapor in the air.
- **Microhabitat** = the physical habitat factors immediately surrounding an individual plant or animal.
- **Organism** = a living thing
- **Observation** = a record of something noted or seen.
- **Species** = a group of organisms that resemble one another closely and are genetically related and potentially interbreed with each other.
- **Native species** = indigenous species, originally belonging to an area.
- **Invasive/non-native/ species** = An invasive species is a species of plant, animal, or other organism that was introduced (usually by man) to a non-native ecosystem, where it became harmful to the natural environment or to human health**.**
- **Biotic** = the living components of an ecosystem, such as plants, animals.
- **Abiotic** = the non-living components of an ecosystem, such as wind, soil, rainfall.

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Safety Information:

- Be careful while you will be working with sharp objects, scissors, and knife.
- Make sure students are supervised continuously when outside in the field activity.
- Instruct students **NOT TO TOUCH OR HARASS OR KILL ANIMALS**.
- Instruct students **NOT TO DISTURB or PROVOKE ANIMALS** in their natural habitat through shouting, throwing stones, etc on them.
- Keep the natural environment **NOT TO BE POLLUTED** especially plastic bags that used to hold food, candy or plastic bottles containing soft drinks or water **SHOULD NOT** be throw everywhere.
- **DO NOT MOVE IN TO WATER** for swimming or crossing it without any practice before on the depth of the water and nature of the environment. Dangerous animals like crocodile, water snake, etc might cause serious problem on you.
- **DO NOT MOVE ALONE.** Do and observe all things in the field collaboratively with your team members, field guider and your instructor.

Methods/Procedures/ for students:

a. Pre-investigation work:

Before the fieldtrip, the instructor should prepare official lettere and get permission for the study site from the concerned body, prepare accomodations including transportation and settlement. After this inform the students where and when the field trip will held on to prepare themselves. Then form a team/group/ and select volunteers to aid the students in guiding and managing during observation, measurement and data collection. In addition all measuring tools and apparatus should be prepared and brought in a large backpack to the site before the investigation began. Finally instruct the students what they should carry in the field activity, how they collect data and made aware of safety information to the whole students.

The instructor with his/her students should identify three to four distinct locations where ecosystem components will be studied and is serve them as the field sites. The sites should be distinct in the abiotic variables we choose to measure: temperature, sunlight, moisture, soil type. For example to this excercise, we chose a rough transect or line running away from the edge of the water to the beach surrounding. The site will represent different habitat forms like the river bank or edge of the water, at the beach, at the base of a hill, near a forested area, grassland, farmland, roadside, on the hillside in open area, etc depending on the nature of the environment.

b. Investigation work through inquiry activities:

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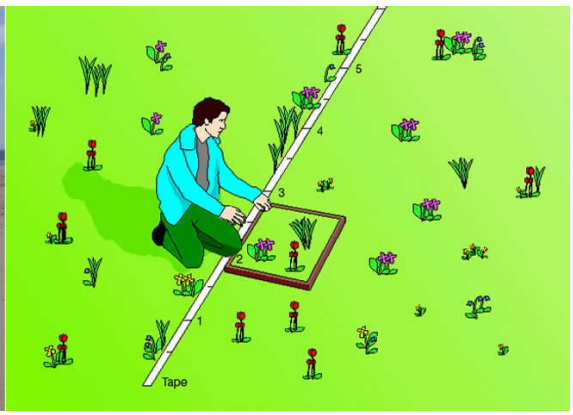
1. What evidence (data, samples) do students collect?

During field activities the challenges presented to students involve observing, constructing, describing, comparing or locating items in general ways. The problems or inquiry activities given to students not to have correct answers but they must help in improving students' critical thinking skills, observing skills, and ability to work and communicate as a team to find the solution.

The order in which you visit the sites is not much important but its best to end on the site closest to the boarding location. Moreover, as the first site severs as a training ground for measurements, it is better to start from the easiest level, easily accessible location or area, not a hillside or forest area to began the investigation.

Worksheets of data to be collected are provided to the whole group. Each group is assigned a number and responsible for taking all the data from the study sites using a **line transect** method. A transect line can be made using a nylon rope marked and numbered at 0.5m, or 1m intervals, all the way along its length. This is laid across the area you wish to study. The species touching the line may be recorded along the whole length of the line. In other words a **transect** is a path along which one records and counts **occurrences** of the phenomena of study (e.g. plants noting,animals).



Students first write a general description or physical features of the site and surrounding vegetation and then if possible they move on to measurement of temperature, humidity, sunlight, soil moisture, vegetation cover, plant types, plant height, stem thickness, animal types, locomotory structures of animals, body cover of animals, size, tail, etc. and record all the information on the worksheet.

Give inquiry activities or focus questions to the students. For instance the instructor may ask the following and students will be free to ask and investigate nature:

a. What types of biotic and abiotic components are found around the beach of Ujung Genteng at different habitats?
b. Which plant type is most dominant? Which is the least dominant?
c. Which animal is the most dominant and which is the least dominant in your sites?
d. How the observed animals move? What the observed animals feed in the area?
e. What is the nature (size, skin color, number of legs, etc) of the animal?
f. How many legs or locomotory structures are found on the animal?
g. Is life supported by different habitats types around the beach the same for everywhere?

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Data Collection Worksheet – I

Habitat 1.
Describe the location (where? on the beach? in water? near water edge? in the forest? on the road? farmland? etc)

_____

General characteristics
Climate (sunny? Rainy? Shady? Coldy? Moist? Hot? etc.)

_____

Soil characters (rocky? Sandy? Muddy? Lots of leaves? humus etc.)

_____

Surrounding vegetation (mosses and algae? grasses? trees? bushes? Dense forest? Number of plants? etc.)

_____

Habitat Measurements

1) Temperature (degrees Celsius)

_____

2) Sunlight (dim with cloud? Bright? etc)

_____

3) Soil Moisture (High moisture? Mild? Dry?)

_____

Habitat 2.
Describe the location (where? on the beach? In water? near water edge? In the forest? On the road? farmland? etc)

_____

General characteristics-

Climate (sunny? Rainy? Shady? Coldy? Moist? Hot? etc.)

_____

Soil characters (rocky? Sandy? Muddy? Lots of leaves? humus etc.)

_____

Surrounding vegetation (mosses and algae? grasses? trees? bushes? Dense forest? Number of plants? etc.)

_____

Habitat Measurements

Temperature (degrees Celsius)

_____

Sunlight (dim with cloud? Bright? etc)

_____

Soil Moisture (Highly moisture? Mild? Dry?)

_____

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Data Collection Worksheet – II

List at least five (5) plants that are found around the beach and gather photos or images of them.

Team members_____

Sketch or photo of plant	Name	
	Habitat	
	Justification/character/	
Sketch or photo of plant	Name	
	Habitat	
	Justification/character/	
Sketch or photo of plant	Name	
	Habitat	
	Justification/character/	
Sketch or photo of plant	Name	
	Habitat	
	Justification/character/	

Data Collection Worksheet – III

List at least five (5) animals that are found around the beach and gather photos or images of them.

Team members_____

Sketch or photo of animal	Name	
	Habitat	
	Justification/character/	
Sketch or photo of animal	Name	
	Habitat	
	Justification/character/	
Sketch or photo of animal	Name	
	Habitat	
	Justification/character/	
Sketch or photo of animal	Name	

2. How do students present the evidence (data)?

Presenting and transforming data:

a. Did you observe similar species composition in different area or habitat so study sites?
b. If yes, state the similarity and if no why these differences are largely occur?
c. Which habitat type support many types of living organisms? Why?
d. From your observation which habitat type has the least types of living forms? Why?

Before presenting field trip report in the follow up class, it's best for the instructor to compile the data from each site into a table format by each group members. Students will work collaboratively in the groups they worked at the time of the field trip. Its best for the teacher to prepare a schedule or time gap and assign each group when to present their finding or field report. The graphed data, photo, tables etc is collected and posted on the front board in a site where visible to the whole class members.

3. What conclusions are drawn from the evidence students collect?

Knowledge claims:

a. What is your conclusion based on the data collected in your study sites?
b. Is your conclusion accepts or reject the hypothesis?

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c. What is/are your suggestion/s/ for the future about the field observation at Ujung Genteng?

Following presentation by each group, the instructor and students will have a discussion about which site had the most suitable for the survival of organisms.

Assessment:

- Students will be assessed starting from the hands-on activities in the field work through observation. i.e, active participation in observation, recording data, ability to work as a team, asking questions, keeping the environment not to be polluted.
- Also comprehension was measured by the graphs, tables or sketches/photos/ presented and the conclusions that were made during the discussion.
- Ways of data analysis, presentation, discussion, conclusion and future direction related with conservation, research, etc, to the study sites.

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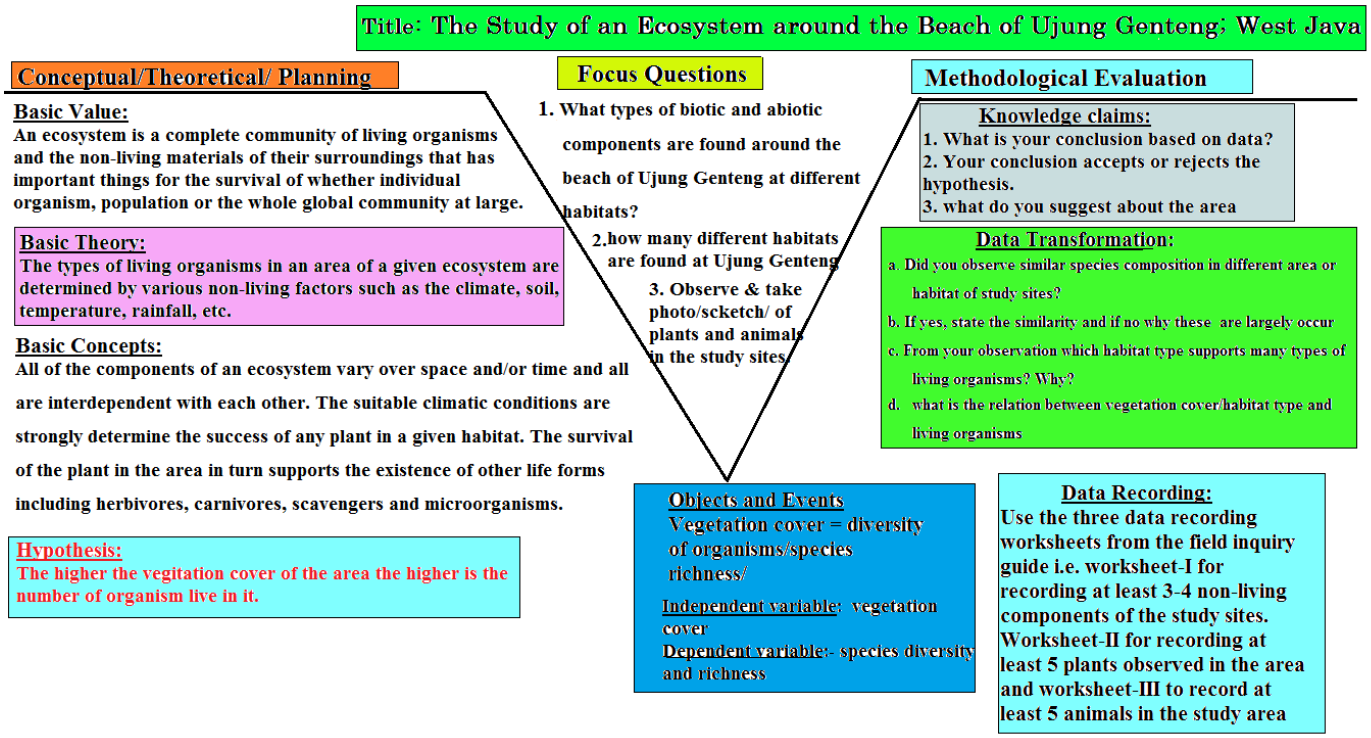

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Field Observation Result Report

Title: The Study of an Ecosystem around the Beach of Ujung Genteng; West Java.
Grade Level: 8
Duration/Time Required: 2 days (Nov. 23 and 24/2012)

Date on which field study held on November 23-24/2012

Site of field activity: Ujung Genteng; West Java

Members of Observers:

1. Lilis Lismaya
2. Neneng Kartini
3. Citra Dewi
4. Ekowati Rahayu
5. Fayo Wado
6. Sisay Hailu

Introduction

Ujung Genteng "end of the roof tile"; The hidden paradise lies on the south coast of west Java about 293 km from Bandung city and 110 kilometres from the provincial city of Sukabumi. The route that one follow from banidung to Ujung Genteng is as follows:

Bandung - Cianjur - Sukabumi - Jampang Tengah - Jampang Kulon - Surade -Ujung Genteng

Source: http/www. Landscapeindonesia.com

The first day, Thursday 23/2012 at 12.30 pm. mid night, Our meeting point was at the the main get of Indonesia University of Education/UPI/. From there we started the trip on Friday at 01:00 am by bus with the route from Bandung to - Cianjur - Sukabumi - Jampang Tengah - Jampang Kulon – Surade with mild and cold temperature and silent natural beauty of the night route. On our arrival at Surade; we have breakfast and take a rest. After 30 minutes rest, we continue our journey from Surade to Ujung Genteng; our final destination where most of us are egger to reach and then see its natural beauty and natural creatures around it.

Fig. A natural land escape on the way to Ujung Genteng

Friday morning, at 11.30 am we arrived in Ujung Genteng and got a lodging at…….. Our first impression was to see the natural beauty of the area. But the temperature was high around 30 ^{0}C and almost all of the group members become tired at the time of arrival due to the long but really attractive journey and need to take rest. Some of the group members come and move to the coastal area to take photo and appreciate the nature and wave created on the ocean.

Fig.2. Natural beauty of Ujung Genteng

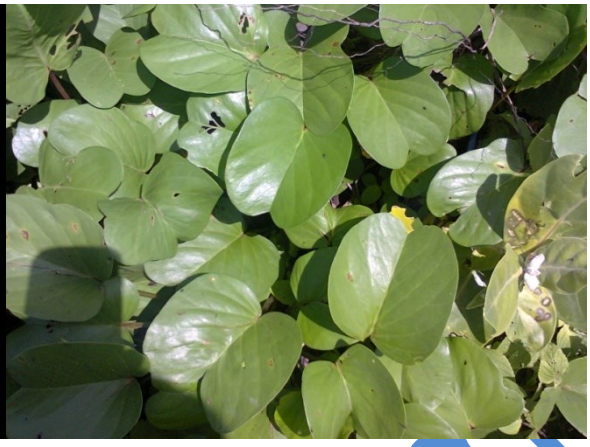
After some time of break all the participants started to perform their plan through hands-on activity among their perspective group and collect data from 2:00 pm until 5:00 pm.

Fig. 2 During data collection/Observation/

Wedelia biflora

Chlorophyceae

Calotropis gigantea



Ipomoea pescaprae

Rhodophyceae

Fig. Some plants observed around the beach of Ujung Genteng

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Data Collection Worksheet – I

Habitat 1.

Describe the location (where? **on the beach**? in water? near water edge? in the forest? on the road? farmland? etc)

on the beach

General characteristics

Climate (sunny? Rainy? Shady? Coldy? Moist? Hot? etc.)

sunny

Soil characters (rocky? Sandy? Muddy? Lots of leaves? humus etc.)
_____muddy_____
Surrounding vegetation (mosses and algae? grasses? trees? bushes? Dense forest? Number of plants? etc.)
_____no vegetation _____
Habitat Measurements

1) Temperature (degrees Celsius)
___29^{o}C_____
2) Sunlight (dim with cloud? Bright? etc)
___445Luxmete_____
3) Soil Moisture (High moisture? Mild? Dry?)
___44,5%_____

Habitat 2.
Describe the location (where? on the beach? In water? **near water edge**? In the forest? On the road? farmland? etc)
_____**near water edge**_____
General characteristics-
Climate (sunny? Rainy? Shady? Coldy? Moist? Hot? etc.)
_____sunny_____
Soil characters (rocky? Sandy? Muddy? Lots of leaves? humus etc.)
_____rocky_____
Surrounding vegetation (mosses and algae? grasses? trees? bushes? Dense forest? Number of plants? etc.)
_____mosses and algae_____
Habitat Measurements
Temperature (degrees Celsius)
__28,5^{o}C_____
Sunlight (dim with cloud? Bright? etc)
__400Luxmeter_____
Soil Moisture (Highly moisture? Mild? Dry?)
49%

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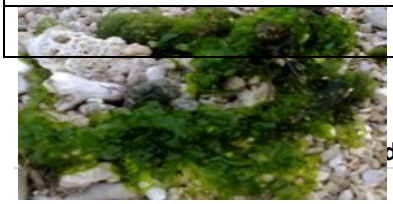
Data Collection Worksheet – II

List of plants that are found around the beach and gather photos or images of them.

Team members_____

Sketch or photo of plant	Name	*Chlorophyceae*
	Habitat	Near the edge of water

	Justification/character/	Green, nonvascular, floating over water
Sketch or photo of plant	Name	*Rhodophyceae*
	Habitat	Near the edge of water
	Justification/character/	Red, nonvascular,
Sketch or photo of plant	Name	*Ipomoea pescaprae*
	Habitat	Near to the beach
	Justification/character/	Green, broadleaf, flowering plant
Photo of plant	Name	*Calotropis gigantea*
	Habitat	Near to the beach
	justification	Green, broadleaf, flowering plant

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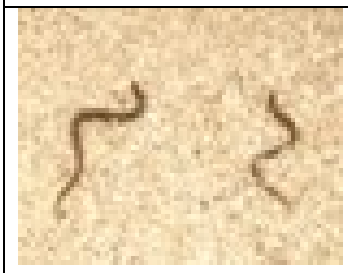
Data Collection Worksheet – III

Some list of animals that are found around the beach and gather photos or images of them.

Team members_____

Sketch or photo of animal	Name	*Bivalveae sp*

 Snail	Habitat	Near the edge of water
	Justification/character/	Soft bodied covered with hard coiled shell, attached to the rock
Sketch or photo of animal	Name	Fish snake
 Fish snake	Habitat	Near the edge of water
	Justification/character/	Thin, slimy and soft body that lack locomotory structure
Sketch or photo of animal	Name	Ants
Ants	Habitat	On the beach
	Justification/character/	Small size, three body parts with three pairs of legs
Frog	name	frog
	habitat	On the beach near to water
	justification	Soft body with two pairs of legs

After that, we went to the beach together. We walked through the very wide white sands, looked for the most attractive spot and wave of the ocean from different sites. Ujung Genteng is very beautiful beach besides the conservation office. The water was so pure and clean looks blue, green and yellow with different wave actions. We took about more than half hour for observing the natural beauty on the beach.

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Fig. Ujung Genteng Turtle conservation area

We were also lucky to observe young turtles releasing to the ocean. When released on the beach all the baby turtles run innately towards the ocean just the mother call reach to them. Surprising!! newly hatched baby turtles searching and immediately begin running to their natural home/habitat/ without any training/experience/.

Fig. Baby turtles running to the ocean

After this observation we are informed that the mother turtle may probably come out of the ocean to lay eggs after 9:30 pm. Then all of us decided to go back and we come back to the cottage for taking a rest and having a dinner. After having a dinner we were waiting the information whether the mother turtle come out or not from the turtle conservation area workers. Finally one message sends from the area to our coordinator that she comes out and to be there and observe how it lays egg.

Now there is no taxi to go there and it was dark to go on foot. Then the group decided to go with motor cycles separately. We rent for motors and go to the conservation area one by one.

After the arrival of the members, the conservation area workers gave information how we will observe it. Once it starts to lay eggs we must kept quite and not to show any light from torch, mobile or camera and then we go to the site where the mother turtle lays eggs.

Fig. Mother Turtle laying eggs, Nov. 23/2012

Once it finished laying eggs it starts to cover all the eggs through the beach to protect the eggs from predators. Then we measure the body length and width of the mother turtle and the width of the hole prepared by the mother turtle to lay eggs. The body length of this mother is about 114 cm, its width is 100cm and the width of the hole is 130cm.

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Fig. The mother turtle covering the eggs with the beach

Conclusion

Here from the field activity students learn more actively than the passive lecture form/traditional way/of teaching. We together with the 2nd year Post graduate students practically proved this on our field activity carried out at Ujung Genteng by the coordination of Dr. Sri Anggreani on the course **Practical Biology/BL.706/.**

As we observed from the Ujung Genteng the edge of water and areas with high vegetation contain large species of both plants and animals than the beach which has no vegetation cover at all.

Recommendation

- Ujung Genteng is attractive and it is a tourism area. So it must be kept clean from the damage by the activity of human interference.
- Since it is a tourism industry area the facilities like hotels and clinics for emergency should be available.
- The road towards the area especially from Surade to the beach and turtle conservation area needs to be constructed.
- Plastic bags and other used materials must be collected and burned or recycled not to be thrown into the coastal area.

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