Promoting Teaching Mathematics through Problem Solving Using Lesson Study

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University of the Philippines
National Institute for Science and Mathematics Education Development (UP NISMED)

Coverage of the Presentation

- UP NISMED's Lesson Study Project (Collaborative Lesson Research and Development Project)
  - Collaboration with teachers in schools
  - Lesson Study Book 1
  - Lesson Study Website
  - National Conference on Lesson Study

- Lesson Study on Typhoons and Floods

The Collaborative Lesson Research and Development Project

- Covers the three main functions of NISMED
  - research
  - curriculum development
  - professional development of teachers

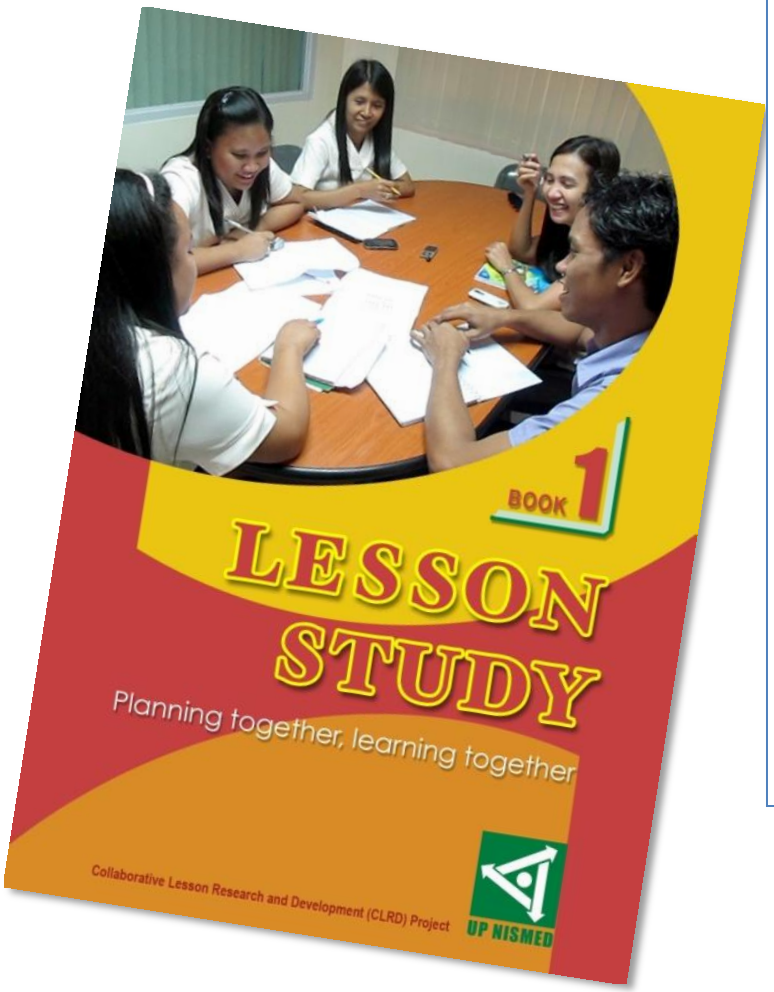
- Involves all academic staff of NISMED
  - Elementary School Mathematics
  - High School Mathematics
  - Elementary School Science
  - High School Earth and Environmental Science
  - High School Biology
  - High School Chemistry
  - High School Physics
  - (Audiovisual Group)

The Collaborative Lesson Research and Development Project

- Uses lesson study to promote teaching:
  - mathematics through problem solving
  - science through inquiry

- Includes all mathematics and science subjects in grades 1 to 10 of basic education

- Involves collaboration with teachers from 7 schools



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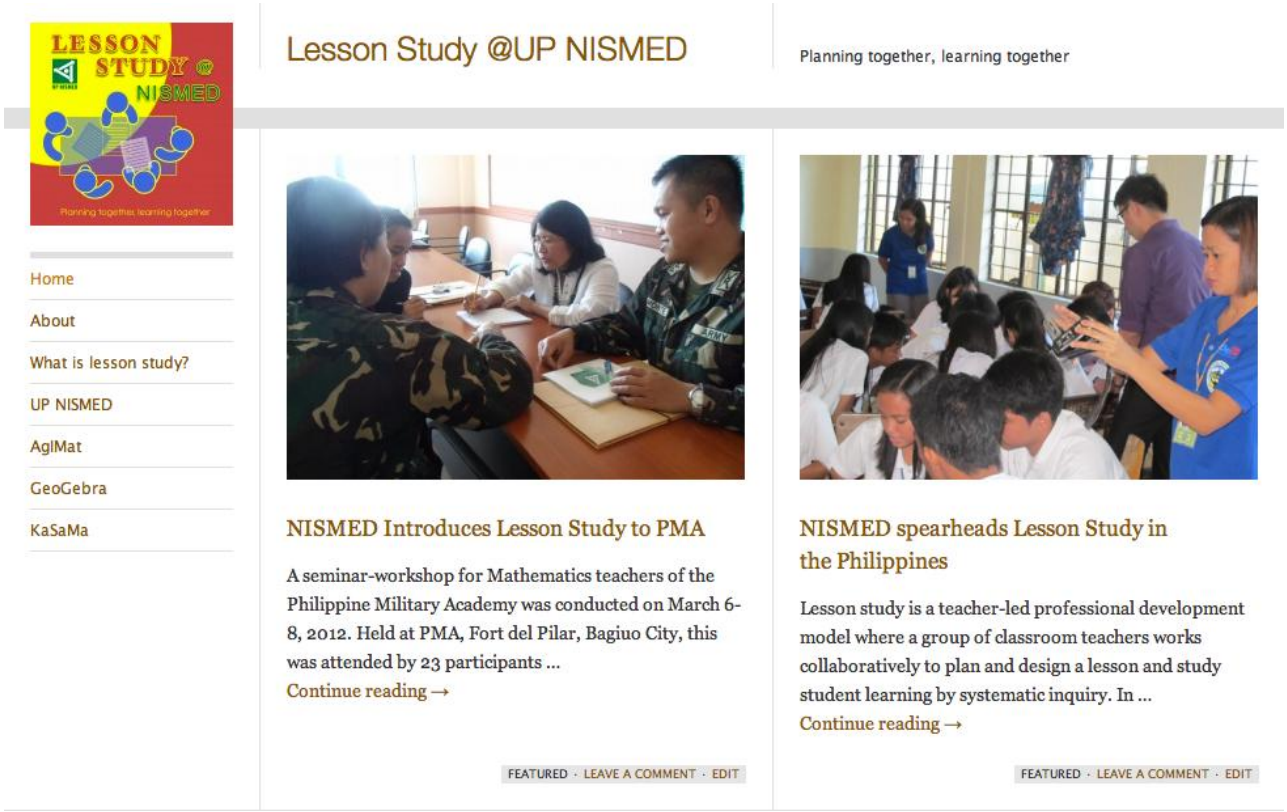
Lesson Study Website

http://nismedlessonstudy.wordpress.com



Dedicated for the promotion of Lesson Study in the Philippines

Lesson study is a school-based , teacher-led continuing professional development model where a group of classroom teachers work collaboratively to plan, design, implement, and improve a lesson and study student learning and thinking by systematic inquiry.

Went live July 2012

Lesson Study @UP NISMED

Planning together, learning together

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What is lesson study?
UP NISMED
AgiMat
GeoGebra
KaSaMa

Uncovering Alternative Conceptions of Diffusion and Osmosis Through Lesson Study

Through lesson study, a research lesson on diffusion and osmosis was developed collaboratively among four Biology teachers of a partner high school in Metro Manila and four NISMED researchers. The group developed a structured inquiry activity on diffusion and osmosis using existing activity sheets of the partner teachers as references. Student learning and alternative conceptions were closely observed during the implementation of the lesson.

Students performing the experiment

Through classroom observations, analysis of accomplished activity sheets, and student interviews, it was revealed that students have difficulties in differentiating diffusion from osmosis, and understanding the terms hypertonic, hypotonic, and isotonic. Students also perceived that there is a directed movement of particles from a higher concentration to a lower concentration. This suggests their inability to integrate random molecular motion and collisions in explaining the movement of molecules. Identification of these alternative conceptions is an important prerequisite to developing appropriate lessons and activities. Appropriate computer animations may be used in conjunction with other instructional strategies to scaffold students' understanding and visualization of random molecular motion and collisions to better understand diffusion and osmosis. To improve the research lesson and address the misconceptions identified, the next step would be going through another cycle: revisiting, revising, and implementing the research lesson.

The full text of the study is one of the chapters of the book titled "BOOK 1. LESSON STUDY: PLANNING TOGETHER, LEARNING TOGETHER" which will be published in print form by UP NISMED this first quarter of 2013.

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Information
This entry was posted on January 4, 2013 by MH de Hitta-Catalan in Science and tagged alternative conceptions, diffusion, lesson study.

Shortlink
http://wp.me/p22Dp1-4K

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National Conference in Science and Mathematics Education 2013

Theme: *Empowering Teachers for the K to 12 Curriculum through Lesson Study*

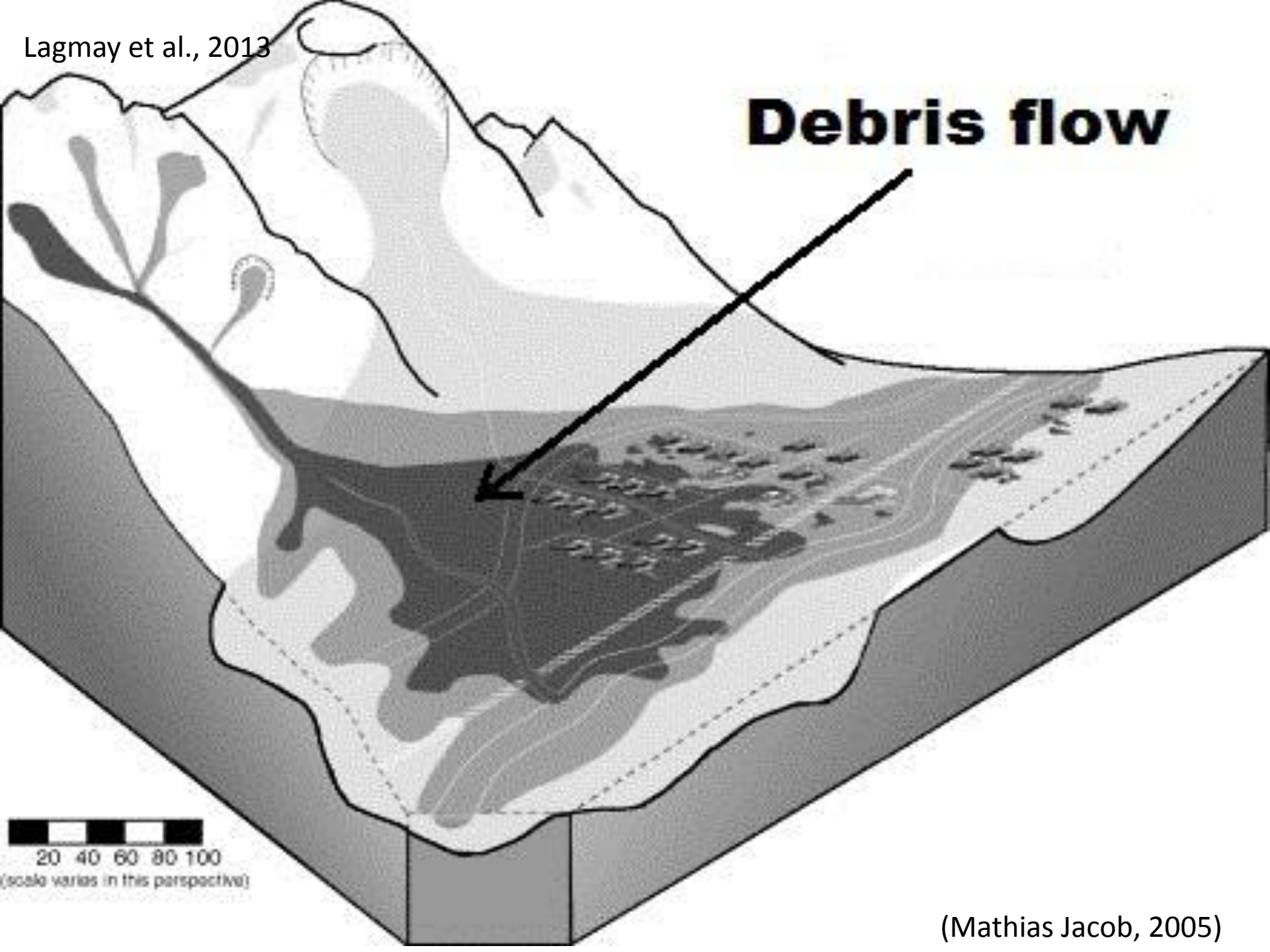
http://ncsme2013.nismed.upd.edu.ph/

Objectives of NCSME 2013

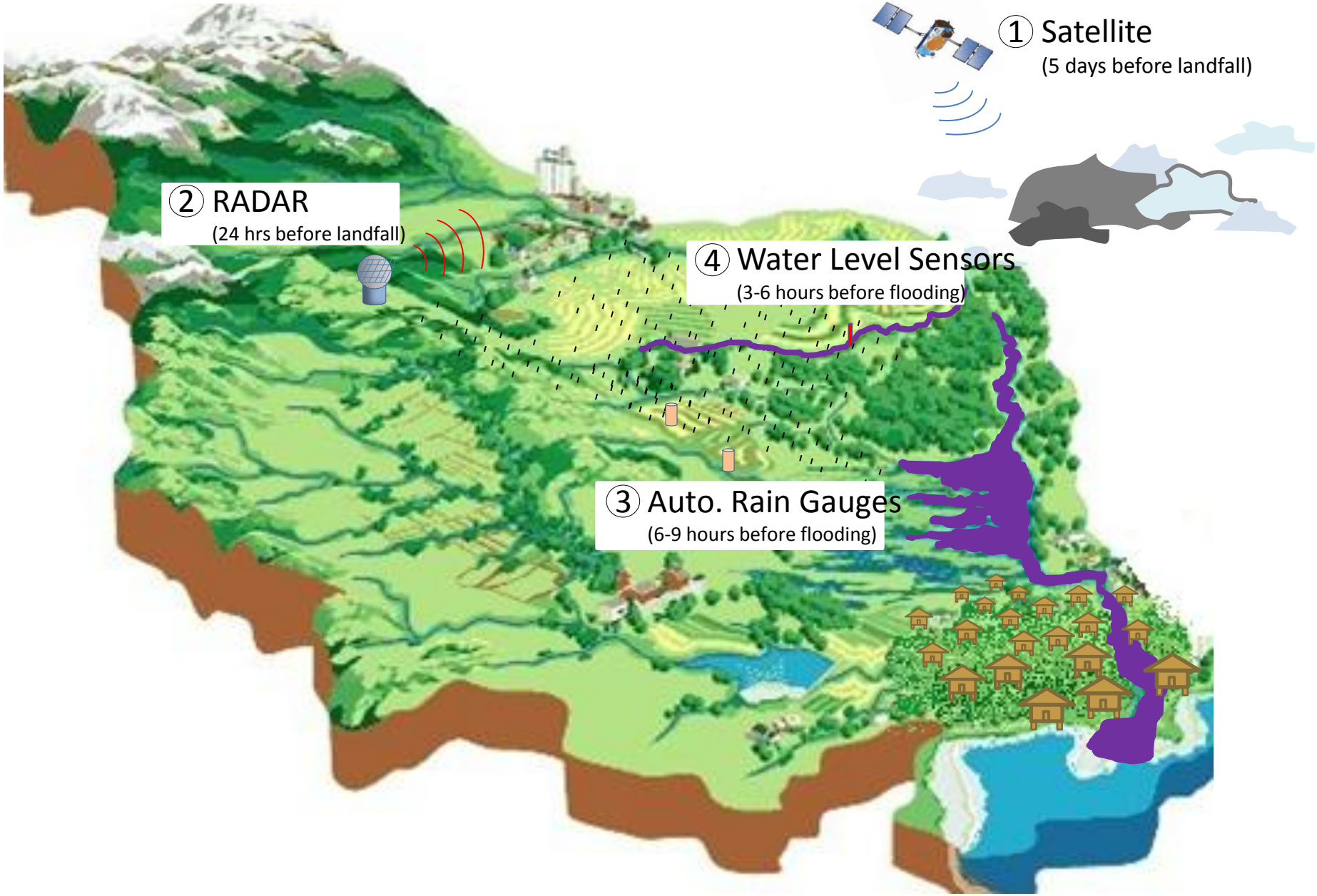
- To promote lesson study as a professional development model to enhance the capability of teachers in implementing the K to 12 curriculum in mathematics and science
- To promote the teaching of science through inquiry and the teaching of mathematics through problem solving in lesson study
- To provide a forum for sharing experiences and research results related to lesson study
- To initiate a local network on lesson study

Lesson Study on Floods and Typhoons

Lagmay et al., 2013



(Mathias Jacob, 2005)


① Satellite
(5 days before landfall)
② RADAR
(24 hrs before landfall)
④ Water Level Sensors
(3-6 hours before flooding)
③ Auto. Rain Gauges
(6-9 hours before flooding)

Mathematical Tasks
(in Tokyo Meeting)

Estimating Area and Volume

Task 1:
Concept: Area of irregular shapes
Skill: Estimating the area of an irregular shape in different ways

Task 2:
Concept: Ratio
Skill: Interpreting scales on maps

Task 3:
Concept: Volume
Skill: Reading a rain gauge and interpreting what mm of rain means

Task 4:
Concept: Volume
Skill: Calculating the height of the flood, given the area of the lowland


STA.LUCIA HIGH SCHOOL

Long-term goal: To develop students' mathematical thinking through problem solving

Sub-goals:

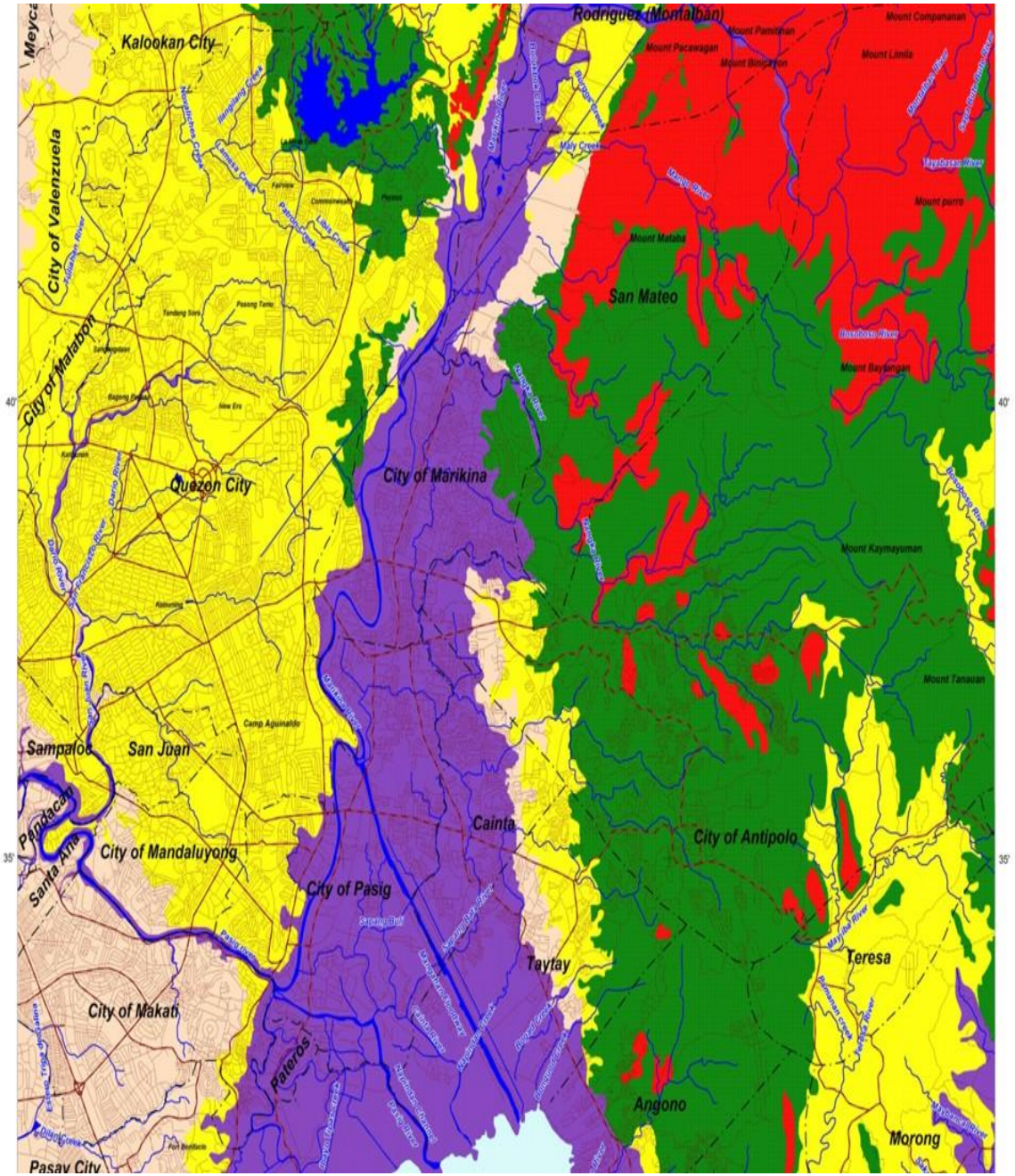
1. To represent real-life and mathematical situations
2. To give meaning to those representations
3. To solve problems in different ways

Our “Collaborators” at Sta. Lucia High School

- Principal
- Mathematics department head
- 4 Grade 7 mathematics teachers

PLANNING


No
U-Turn
EAST BANK RD



LEGEND :

High susceptibility to landslide
Areas with high landslide susceptibility rating have active/recent landslides and tension cracks that would directly affect the community. Those with steep slopes and drainages that are prone to landslide damming are also highly susceptible to landslides.

Moderate susceptibility to landslide
Areas with moderate landslide susceptibility rating have inactive/old landslides and tension cracks which are located away from the community. These areas usually have moderate slopes.

Low susceptibility to landslide
Areas with low to gentle slopes and lacking tension cracks have low landslide susceptibility rating.

High susceptibility to flooding
Areas with greater than 1 meter flood height. These areas are usually flooded for several hours during heavy rains; include landforms of topographic lows such as active river channels, abandoned river channels and areas along river banks; also prone to flashfloods.

Low to moderate susceptibility to flooding
Areas with less than 1.0 meter flood height. These are usually inundated during prolonged and extensive heavy rainfall or extreme weather condition

Main road
Secondary road
Trail road
River
Municipal boundary

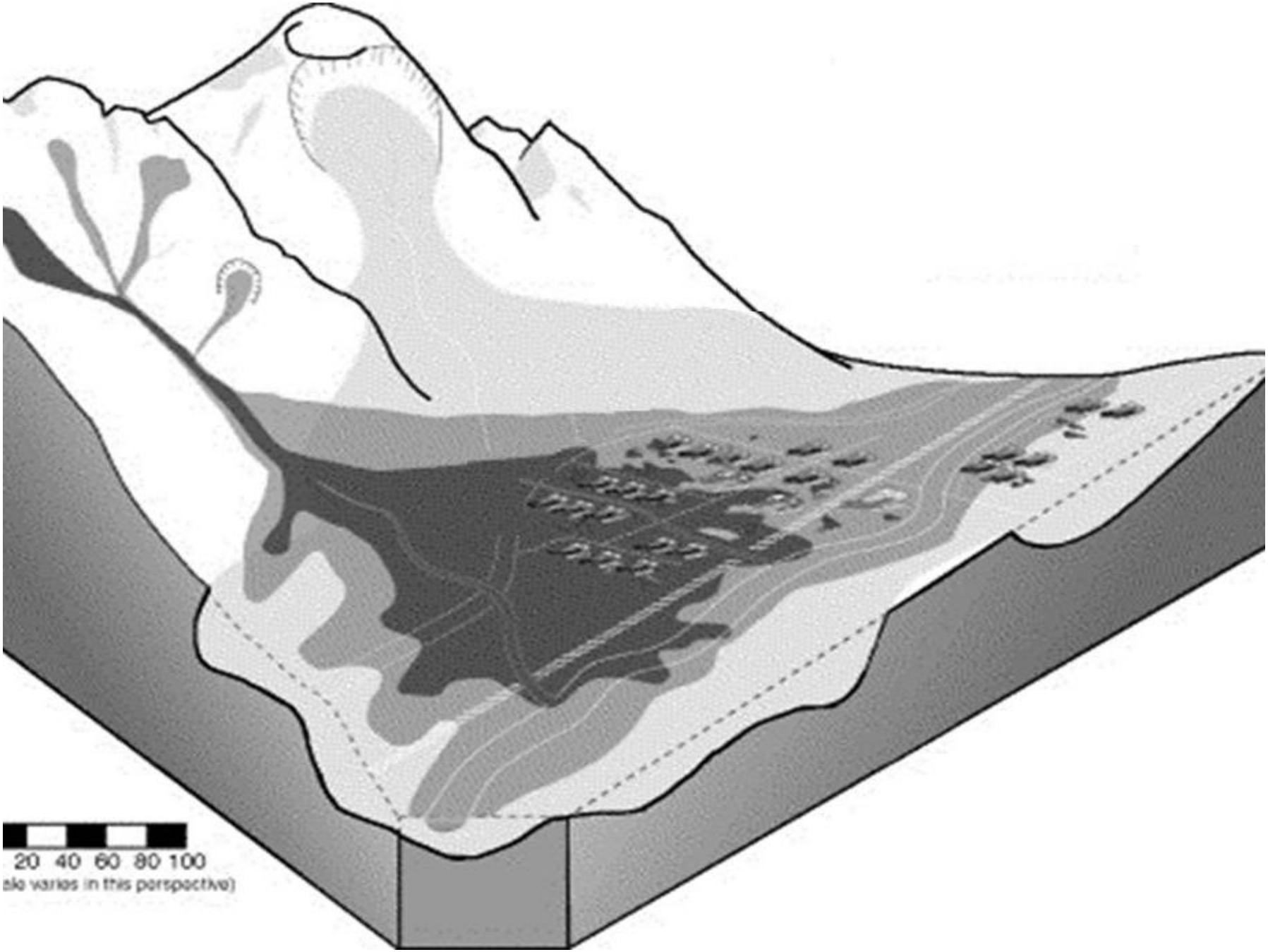
N
W E
S

0 1.5 3
kilometers

TRANSVERSE MERCATOR PROJECTION
MAPPING SCALE 1:50, 000

GIS Processing :
Lands Geological Survey Division

Data Sources:
MGB Geohazard Assessment Team
Geological Database and Information Systems Section
Lands Geological Survey Division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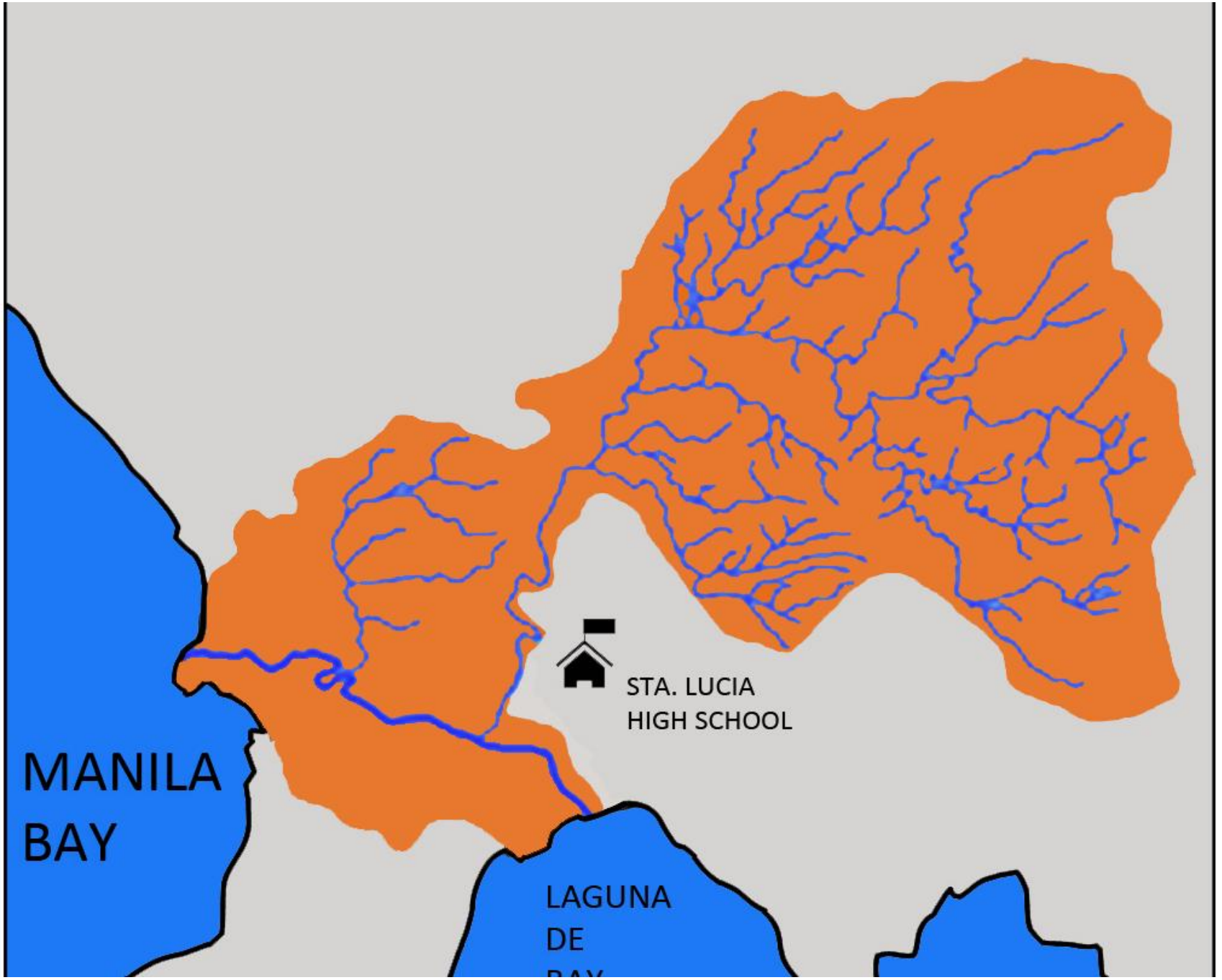
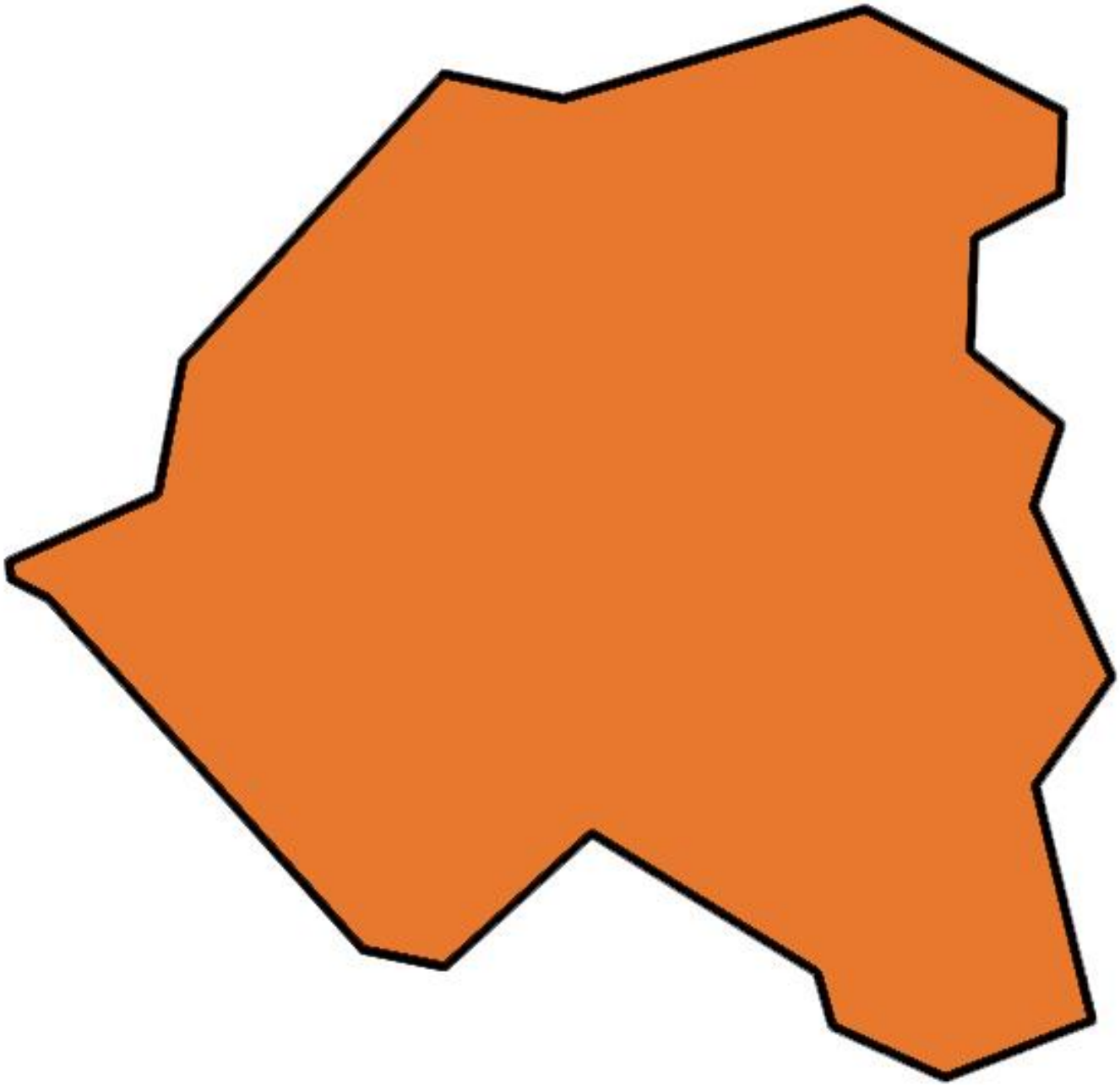

STA. LUCIA
HIGH SCHOOL
MANILA
BAY
LAGUNA
DE



MATHEMATICS VII

SEPTEMBER 9, 2010

SUBJECT MATTER: Area of an Irregular Shape

OBJECTIVES:

- Find the area of an irregular shape
- Determine the volume of an irregular shape
- Appreciate the application of determining areas and volumes

PROCEDURE

MOTIVATION

- Video presentation of typhoon Ondoy.

Enabling Questions

- » Do you remember typhoon Ondoy?
- » What have you experienced during the typhoon?
- » What caused the flood?
- » Where do you think the water came from that caused massive flooding in Pasig and Marikina?

PRESENTATION

- Discussion of watershed.
- Distribution of activity sheet.
  - Think of different ways on how will you measure the area of watershed of Pasig and Marikina?
  - Find the area of this watershed using ruler.

Scale: 1cm = 5km

- Presentation of their activity
- Give the approximate measurement of watershed.
  - If the amount of water in a rain gauge is 1cm, what do you think is the volume of water in watershed that will cause flood in Pasig and Marikina?
  - Which is better the smaller area of watershed or the bigger area of watershed?

- **GENERALIZATION**
  - What have you learned today?
  - What is the importance of finding area?

Highlights of the Planning

- The teachers said that it was their first time to find the area of an irregular shape.
- The teachers used two ways to find the area of the irregular shape: 1) embedding it with shapes that are familiar which they know how to get the area of 2) drawing grid lines to cover the irregular shape and counting the unit squares that cover the shape
- The lesson study group hoped that the students will be able to think of these ways and of other ways as well.
- The teachers decided that they will take up the tasks with their students depending on how the lesson will go.
- The teachers decided that they will show a video of flood during tropical storm Ondoy in September 2009 rather than show pictures of floods.
- They will show a model of a watershed and “simulate” rain using a spray.
- They will discuss disaster awareness at the start of the lesson and disaster preparedness at the end of the lesson.

IMPLEMENTING THE RESEARCH LESSON

9 September 2013

8:20 – 9:20 am Section 2 (Ms. Eflida P. Tesorio)

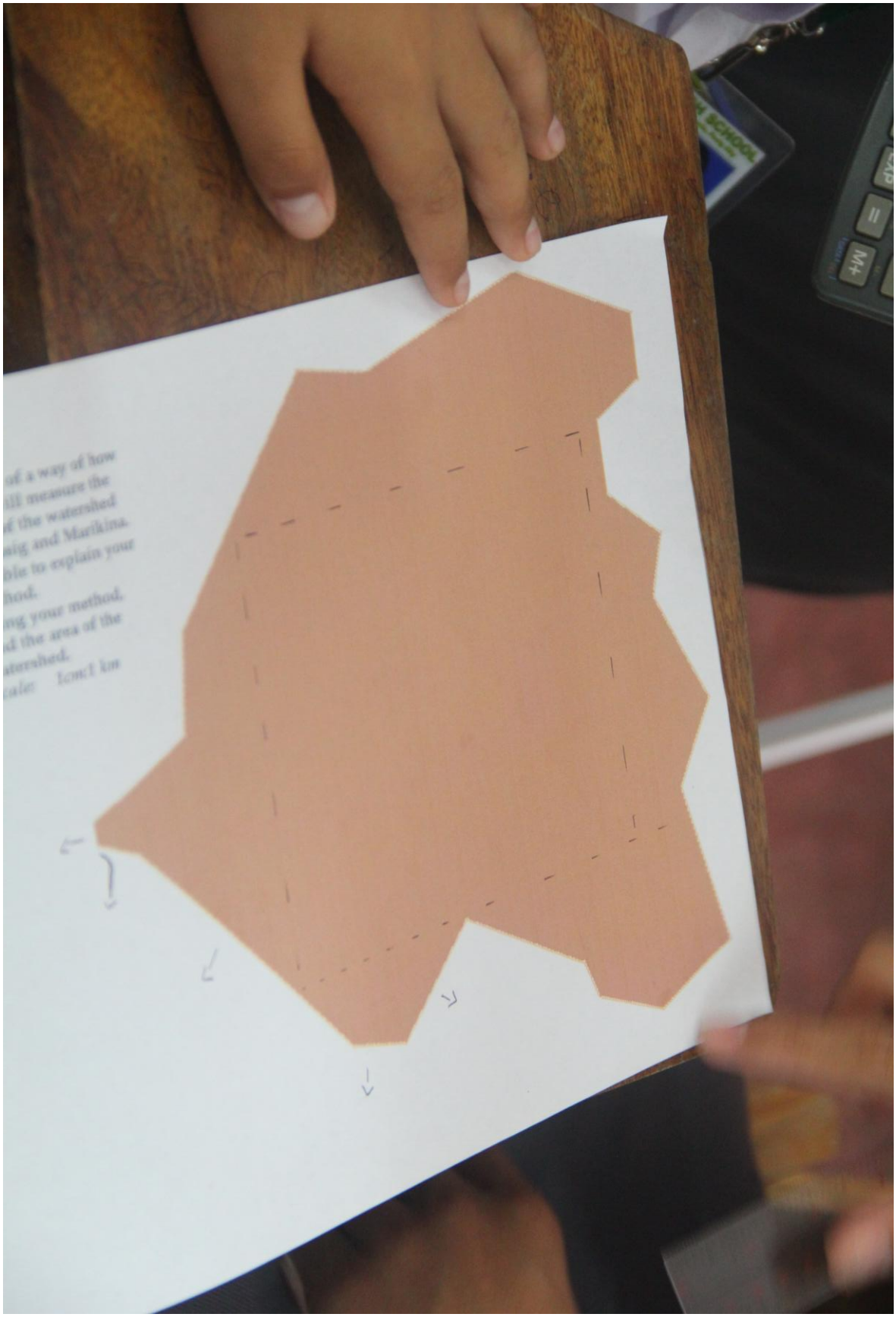
10:20 – 11:20 am Section 14 (Ms. Anabelle N. Fuentes)

11:45 – 12:45 am Section 10 (Ms. Mia Paula G. Mosanto)

12:45 – 1:45 am Section 17 (Ms. Diana P. Sta. Rosa)

First Implementation


MATH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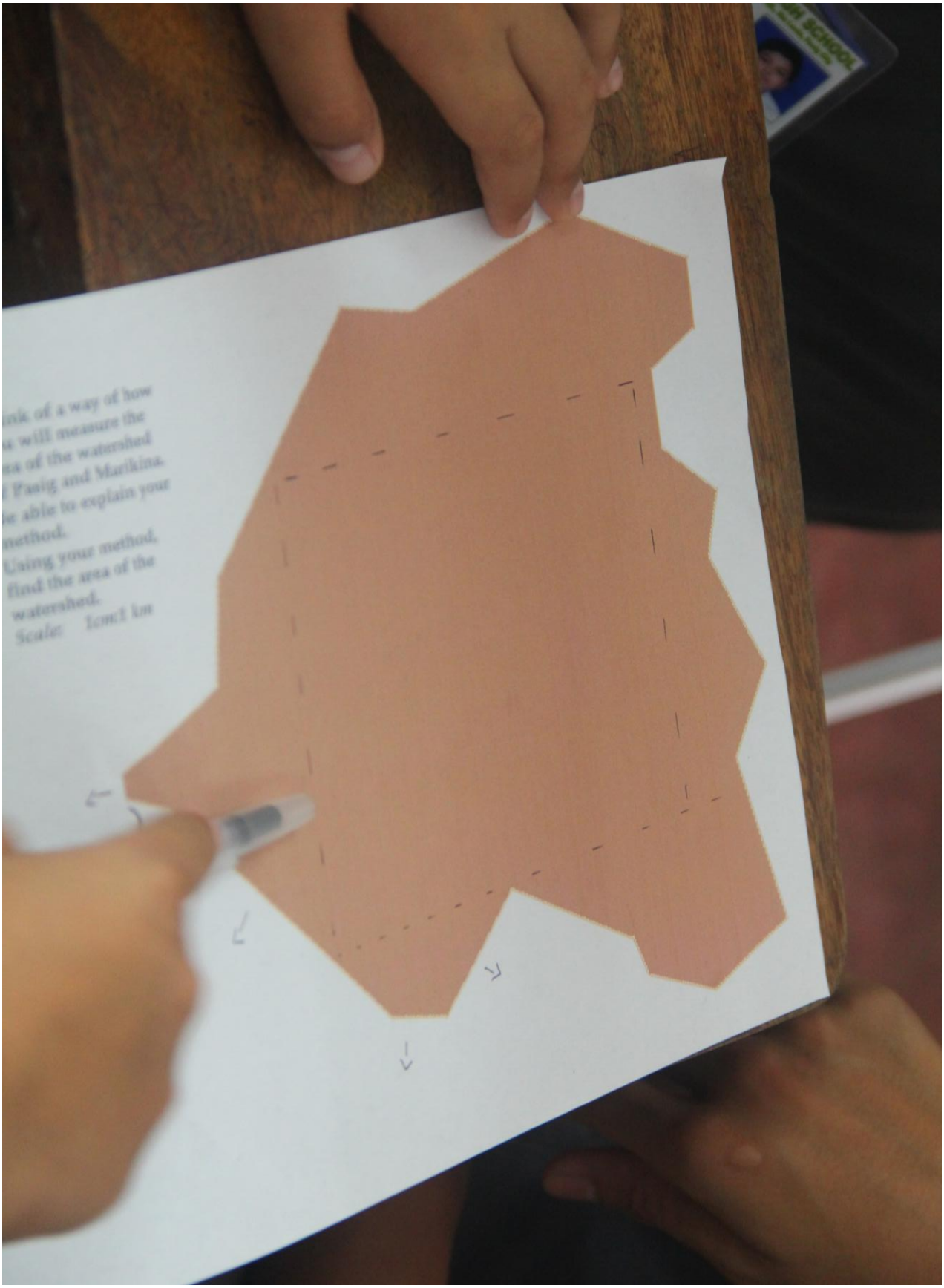
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Pasig and Marikina.
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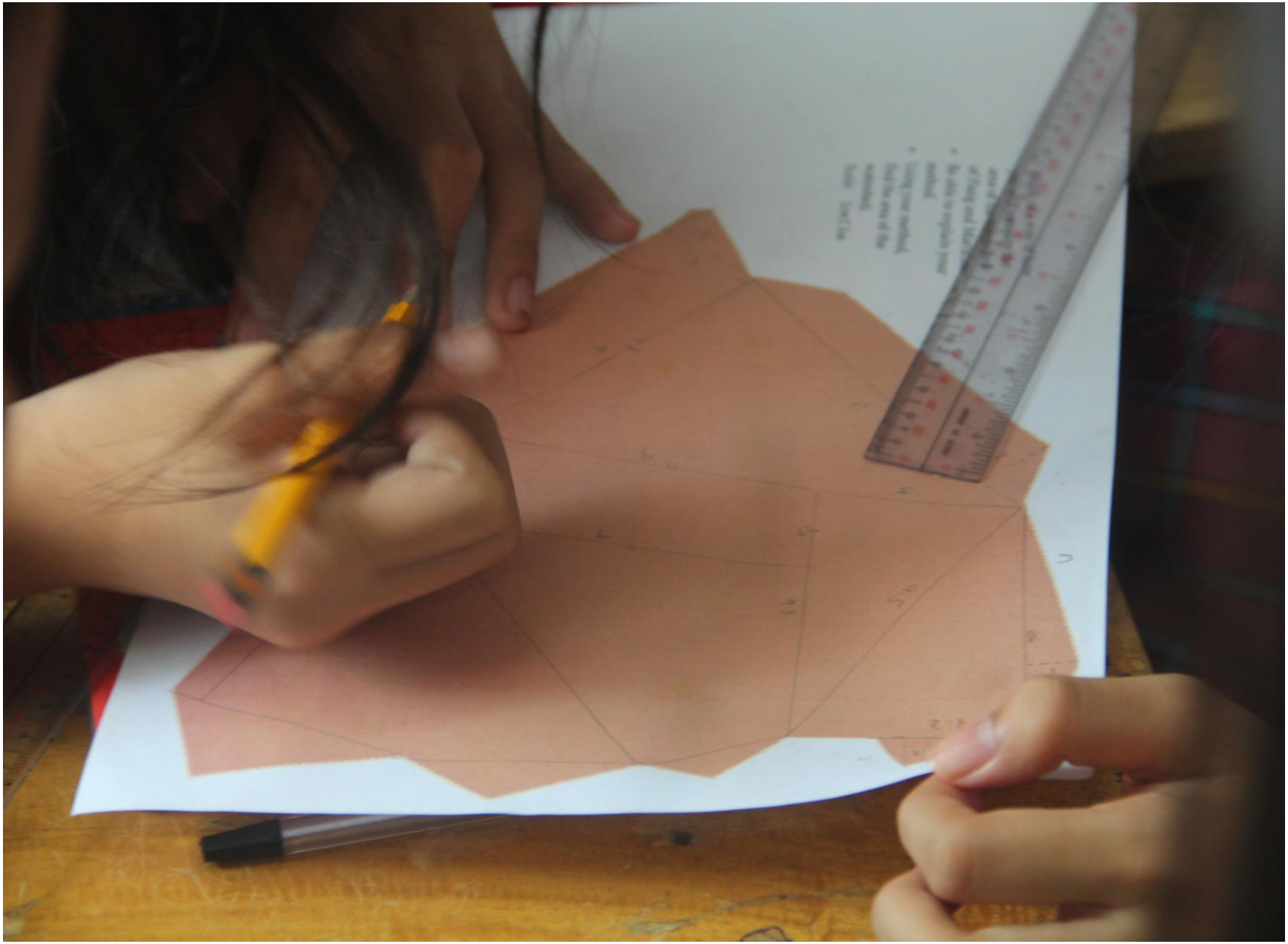
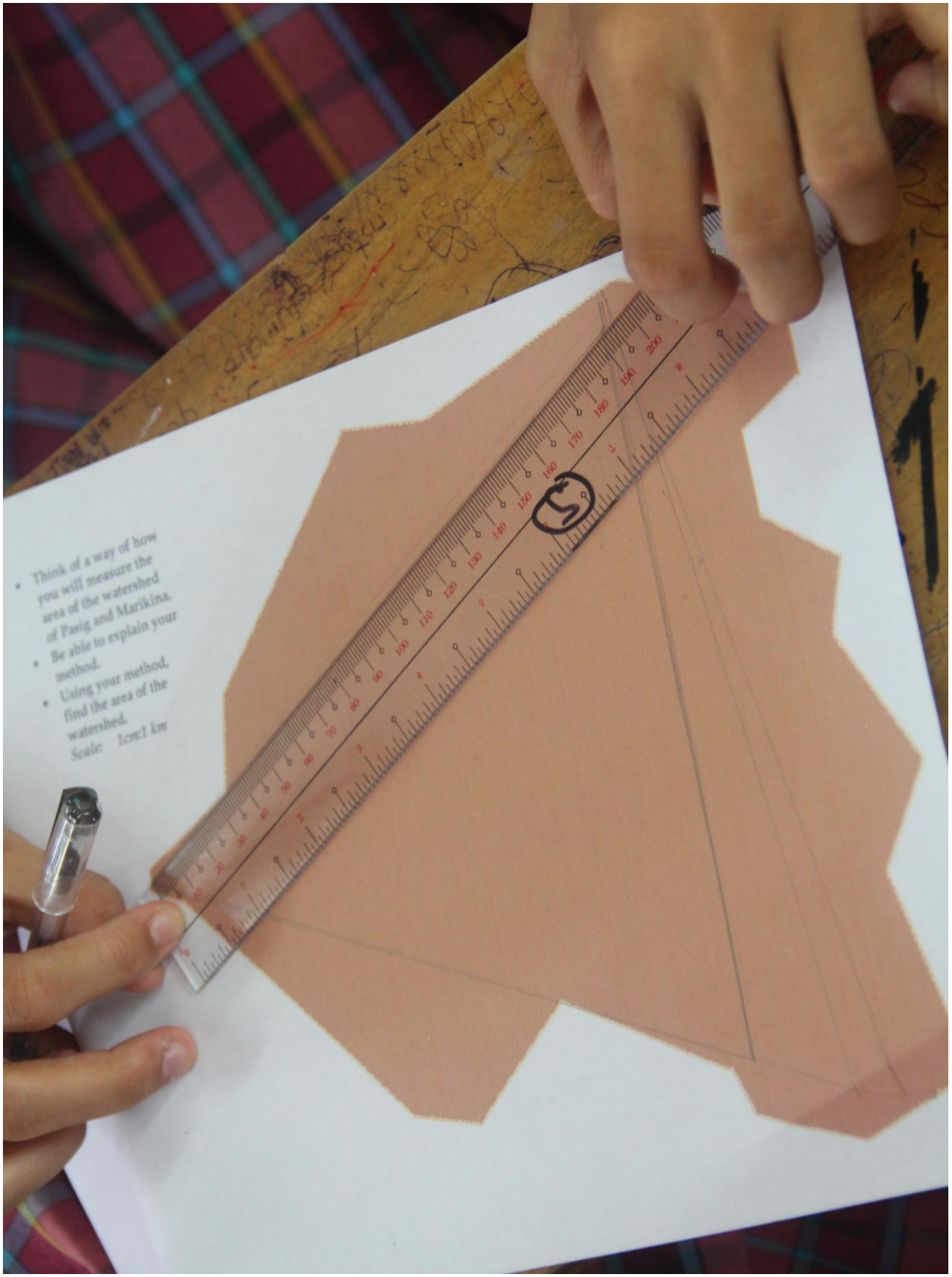
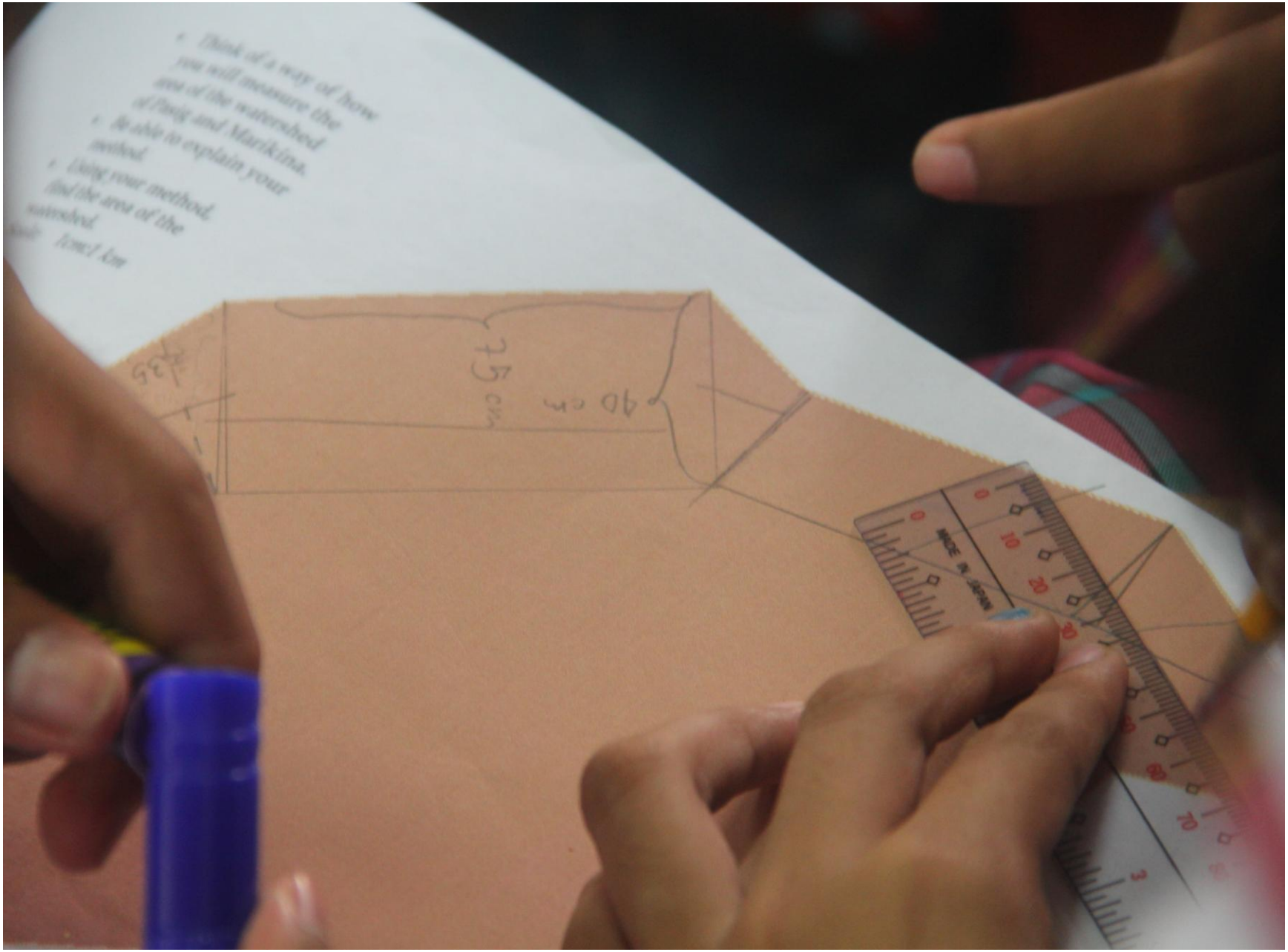
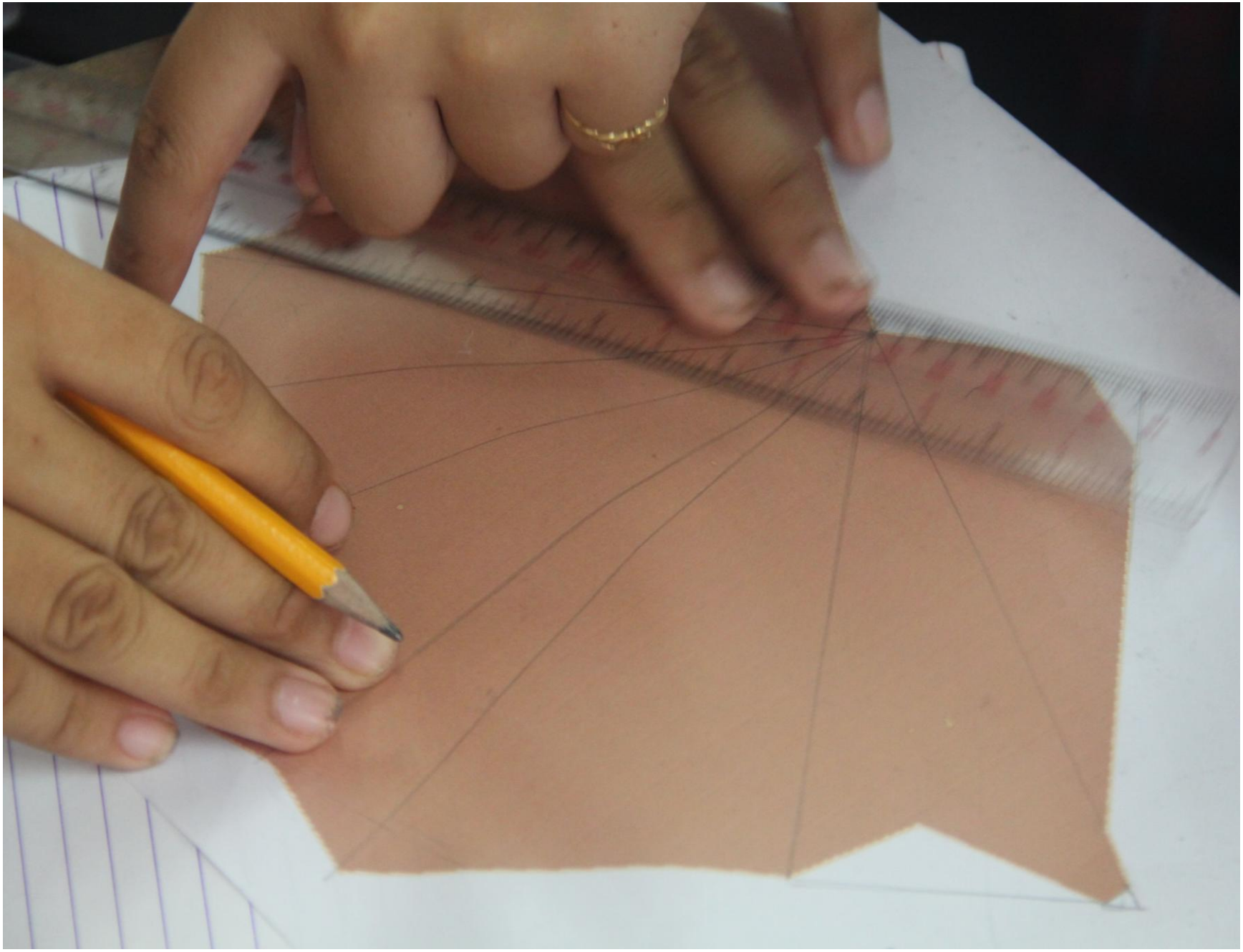
method.
Using your method,
find the area of the
watershed.
Scale: 1cm:1 km




Think of a way of how you will measure the area of the watershed of Pasig and Marikina.
Be able to explain your method.
Using your method, find the area of the watershed.
Scale: 1cm:1 km


• Think of a way of how you will measure the area of the watershed of Pasig and Marikina.
• Be able to explain your method.
• Using your method, find the area of the watershed.
Unit: [cm] / km
25 cm
40 cm

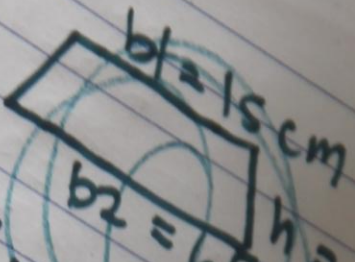


Highlights of the Post-lesson Discussion

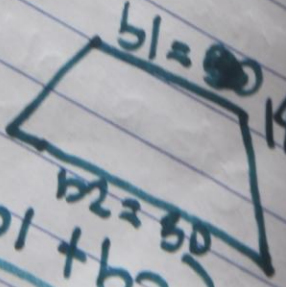
- Ask students to use fine pentel pen or chalk.
- Give time limit for the activity so that students will think first of a method that will enable them to get the area in a short time.
- Explain to the students that they are to measure the area of the watershed and not the area of the lowland.
- Ask why it is important for them to know the area of the watershed.

Second Implementation


15 cm
15 cm
15 cm²
= 225



$$= \frac{(b1 + b2) \times h}{2}$$

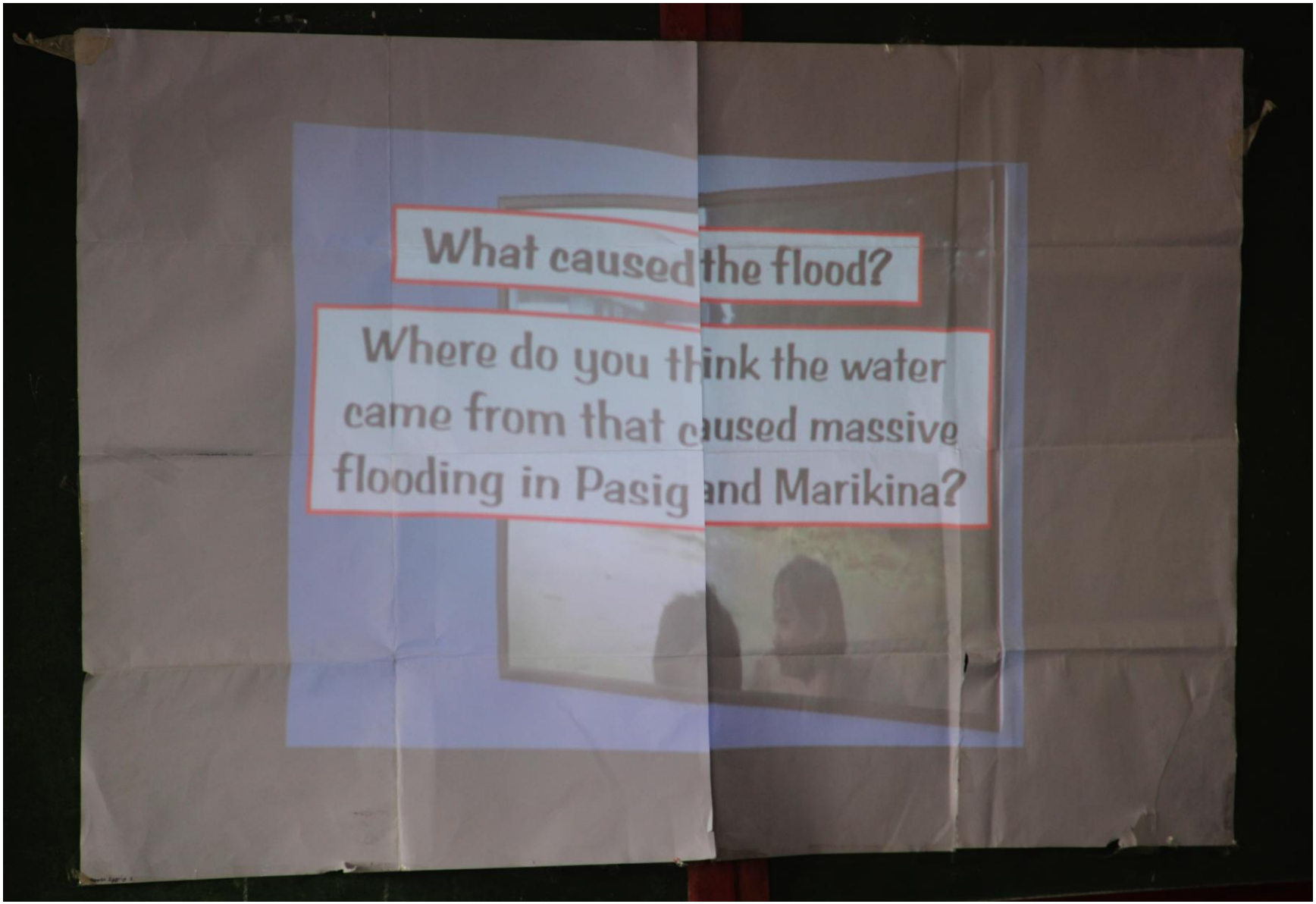


$$A \square = \frac{(b1 + b2) \times h}{2}$$

CASIO
FRACTION
4.5cm
3cm
5cm
2.0cm
3cm
2cm


Think of a way of how you will measure the area of the watershed of Pasig and Marikina.
Be able to explain your method.
Using your method, find the area of the watershed.
Scale: 1cm = 5km
Area
- is the region enclosed by a plane figure. The units of an area is the square of the unit like cm², ft², m² and km²
Rectangle
A = lw
Square
A = s²
Circle
A = πr²

Fourth Implementation




What caused the flood?
Where do you think the water came from that caused massive flooding in Pasig and Marikina?
Male
Female
TOTAL
WELCO
Grade VII


Ramirez

Students' ideas on how to prepare for typhoons and floods

- Always listen to the radio for weather and situation updates.
- Move to a higher place.
- Secure important documents.

Highlights of the Post-lesson Discussion

- Discuss again with the students
  - how to use and read the ruler
  - how to use the formulas of the area of familiar shapes
  - difference between perimeter and area
- Ask students to summarize the methods of finding the area of an irregular shape (partitioning, use of grid, enclosing the shape with a familiar shape), compare them and determine which is better/best and why
- Show a picture of the watershed and lowland and emphasize that the area of the watershed and not the lowland was being determined.
- Process incorrect responses of students and “push students to the limits of their undrstanding.”

Thank you!