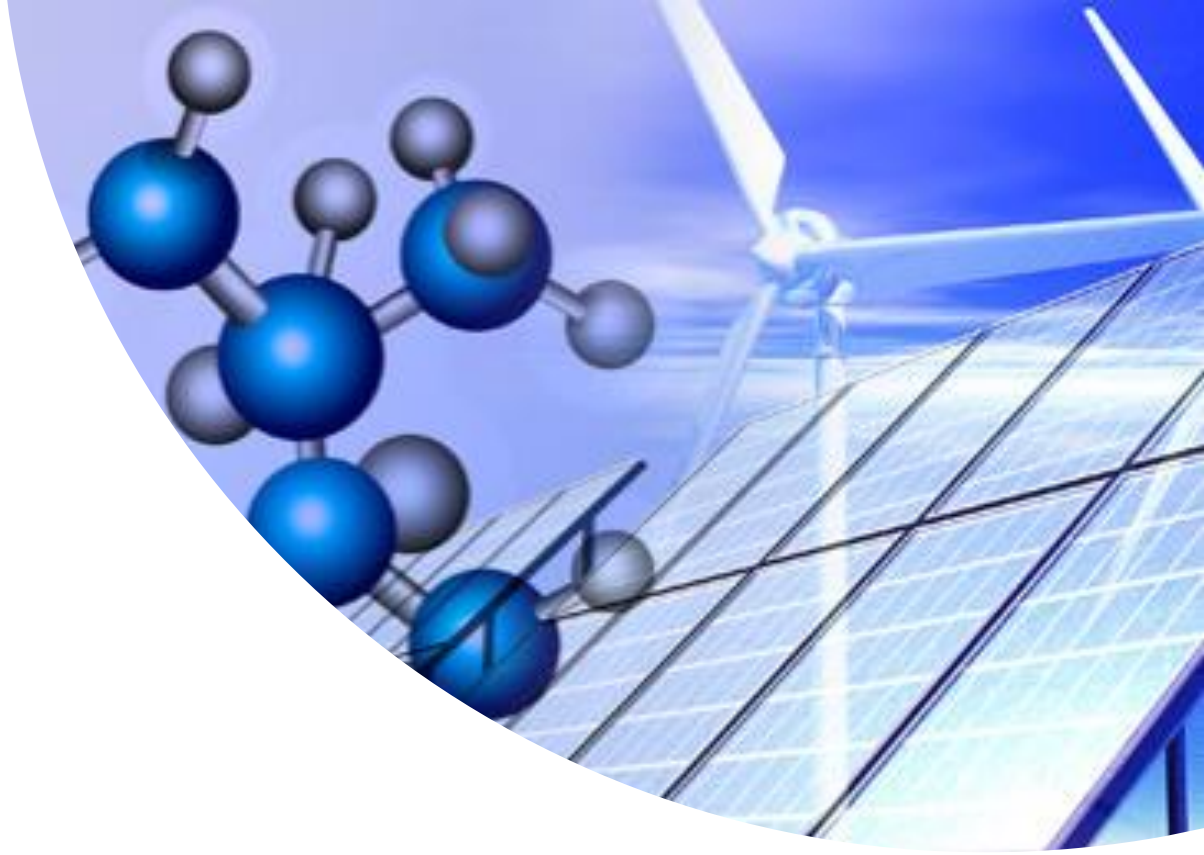


Engineering and Technology Cluster

Sander T. Sedano, MIT

Lesson Exemplar

Lesson Title:

Binary Number System Conversions

Course:

Computer Fundamentals and Programming

Level: **First Year**

Duration: **1.5 hours**

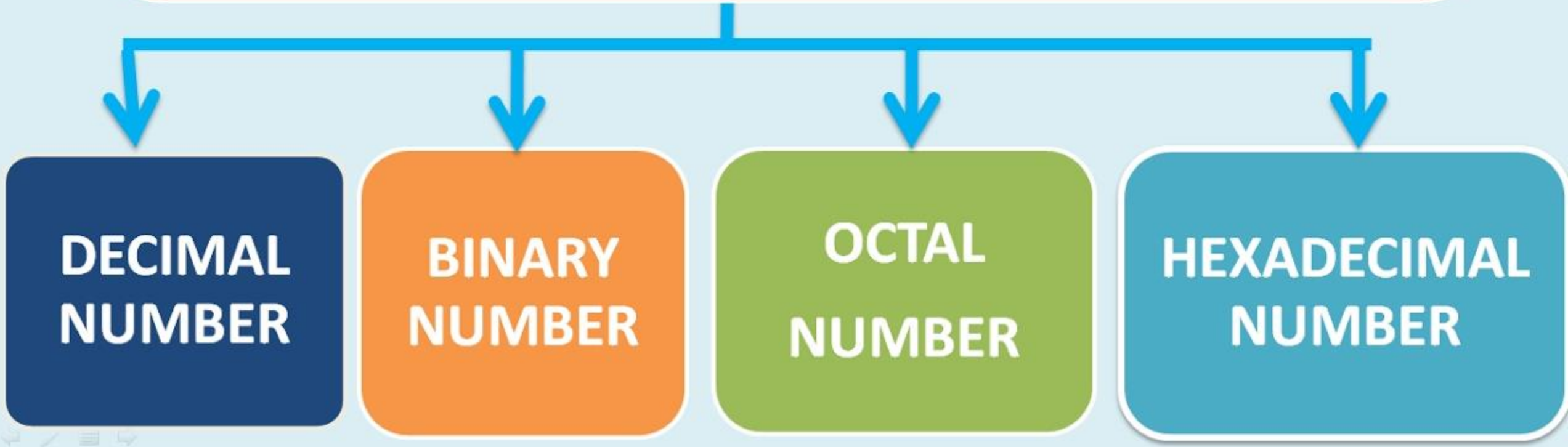
Background

Data and information
are simplified into binary numbers when used in computing.

The computer does not have a large number of symbols for representing data and information.

It has only two states represented by 0 and 1 called the binary digits.

BASIC CONCEPTS NUMBER SYSTEMS



Learning Outcomes

- Identify the base and range of each number system.
- Determine the validity of given numbers with respect to their bases.
- Convert binary numbers to decimal, octal and hexadecimal numbers.
- Explain the process of communication between the computer and the user.

Target Audience

The target audience are the first-year engineering and technology students with various learning styles. In this lesson, the instructor should be mindful of the following learners:

[illegible] learners (Visual)

[illegible] on.

The Binary Number System can be best taught using varied teaching and learning strategies. These strategies can be supplemented using flashcards, worksheets, board work and PowerPoint Presentations.

The strategic integration of technology and good activities will enrich the knowledge of students on Binary Numbers.

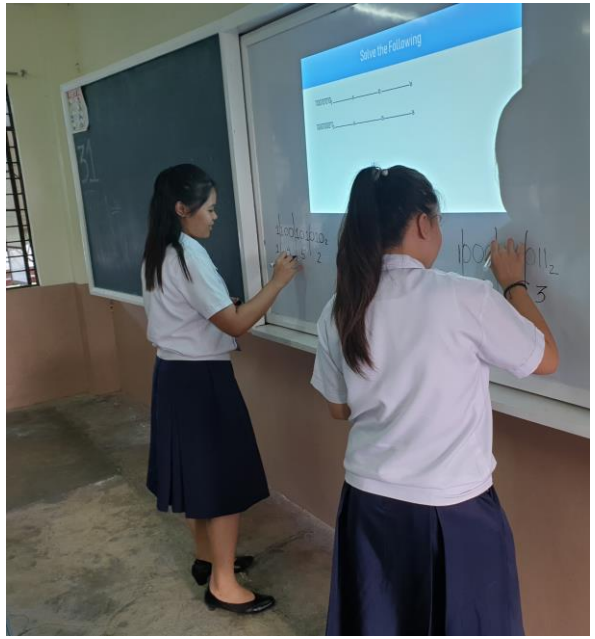
specifically the use of the Learning Management System and Gamification ensures the utmost attention from students

Technology Being Used by Students

- Board and Marker/Chalk
- Pen and Paper
- Flash Cards
- Learning Management System
- Mobile Device
- Internet Connectivity
- Worksheets

Technology Being Used by Teacher

- Laptop
- PowerPoint Presentation
- LCD Projector/TV
- Board and Marker/Chalk
- Flash Cards
- Learning Management System
- Mobile Device
- Internet Connectivity



Lesson Strategy and Required Materials

Estimated Duration:

5-10 Minutes

Materials Required:

Codes composed of 0’s and 1’s written in a flash card.

Motivation

Motivation

A short introduction about how the computer understands the users will be explained by the teacher.

Motivation

Mechanics

Message Relay through Hand Signals

… are the students seated on the left wing of the classroom and the second group are the students seated on the right wing of the classroom.

… to the group leaders.

… through hand signals (punch for 0 and index finger for 1).

… instructor.

Message Relay Through Hand Signals

Objectives Targeted:

Explain the process of communication between the computer and the user.

Class Discussion

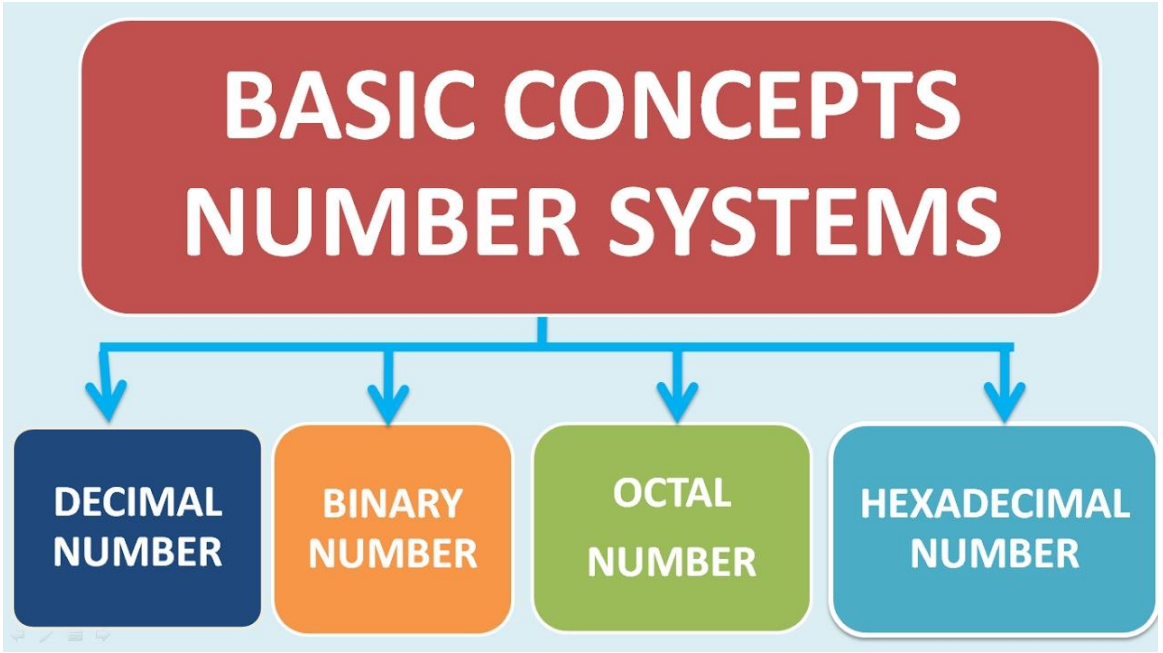
Estimated Duration:

10-15 Minutes

Materials Required:

Laptop, LCD Projector/TV, PowerPoint Presentation on the Introduction to Number System.

Class Discussion



- The Instructor introduces the Number Systems, their bases, ranges and significance through a PowerPoint presentation.
- Based from the discussion, students will be asked to explain how the computer understands the user.

Class Discussion

Class Discussion

Objectives Targeted:

Identify the base and range of each number system.

Determine the validity of given numbers with respect to their bases.

Explain the process of communication between the computer and the user.

Class Discussion

Raise your Cards

Estimated Duration:

10 Minutes

Materials Required:

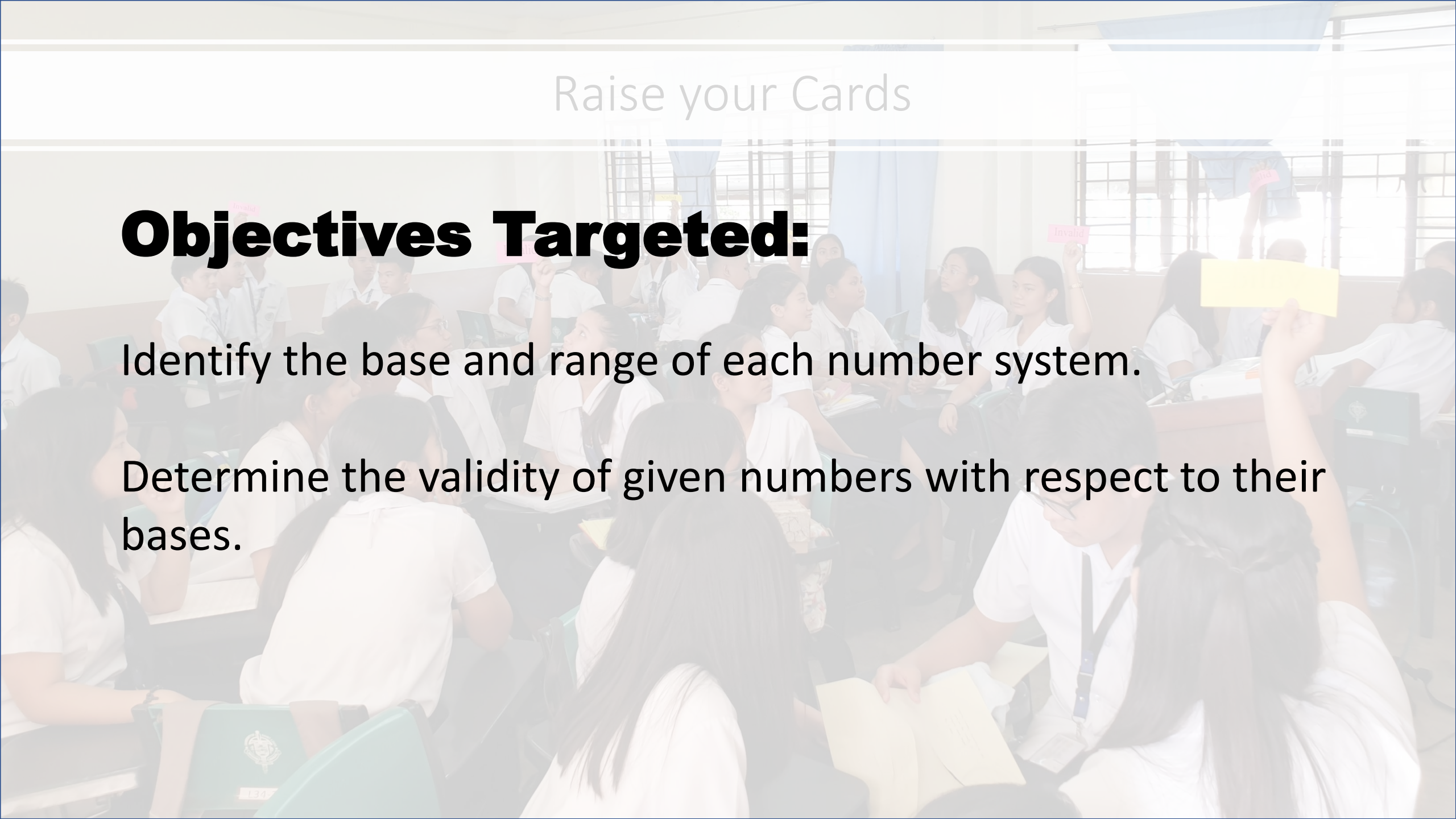
Laptop, LCD Projector/TV, PowerPoint Presentation of the Enrichment Activity.

Raise your Cards

Mechanics

- Students will be grouped by five.
- Each group will be provided with two flash cards. Each flash card is labeled with VALID and INVALID.
- Values with given bases will be flashed on screen.
- The group will determine whether each flashed value is VALID or INVALID.

Raise your Cards



Raise your Cards

Objectives Targeted:

Identify the base and range of each number system.

Determine the validity of given numbers with respect to their bases.

Guided Discussion and Drills

Estimated Duration:

25-30 Minutes

Materials Required:

Laptop, LCD Projector/TV, PowerPoint Presentation on the conversion of binary number system to other number systems

Guided Discussion and Drills

The instructor discusses the Power of 2 then the class proceeds to the discussion of the following conversions.

- Binary Number System to Octal Number System
- Binary Number System to Decimal Number System
- Binary Number System to Hexadecimal Number System

Guided Discussion and Drills

Guided exercises through worksheets and board works will be provided for the class after the discussion.

Guided Discussion and Drills

Guided Discussion and Drills

Objectives Targeted:

Identify the base and range of each number system.

Determine the validity of given numbers with respect to their bases.

Convert binary numbers to decimal, octal and hexadecimal numbers.

Guided Discussion and Drills

NEO Quiz Bee

Estimated Duration:

15 Minutes

Materials Required:

LMS, Internet Connectivity, Laptop, LCD Projector/TV, Mobile Devices

NEO Quiz Bee

Mechanics

1. Before going to class, the instructor should have prepared the grouping of students on the Learning Management System.
2. Once the grouping is done by the instructor, students are automatically notified of their group composition via LMS.
3. The instructor should also have prepared 10 quiz items on the Learning Management System.

NEO Quiz Bee

Binary Number System Conversion

Assessment | Teams 8 | Grades | Not submitted | Analytics | Grading scale | Use rubric | Completion | Score rules | Personalize

Teams

− Remove

Team	Select members	Members
 Team 1		3
 Team 2		3
 Team 3		3
 Team 4		3
 Team 5		3
 Team 6		3
 Team 7		4
 Team 8		3

+ Add team

NEO Quiz Bee

Binary Number System Conversion

Assessment | Teams | Grades | Analytics | Grading scale | Use rubric | Completion | Score rules | Personalize

Instructions

Convert the following Binary numbers to their given bases. You have 2 minutes to convert each item. This is a group work so your scores will be counted as a group and the system automatically tallies and computes for your group average.

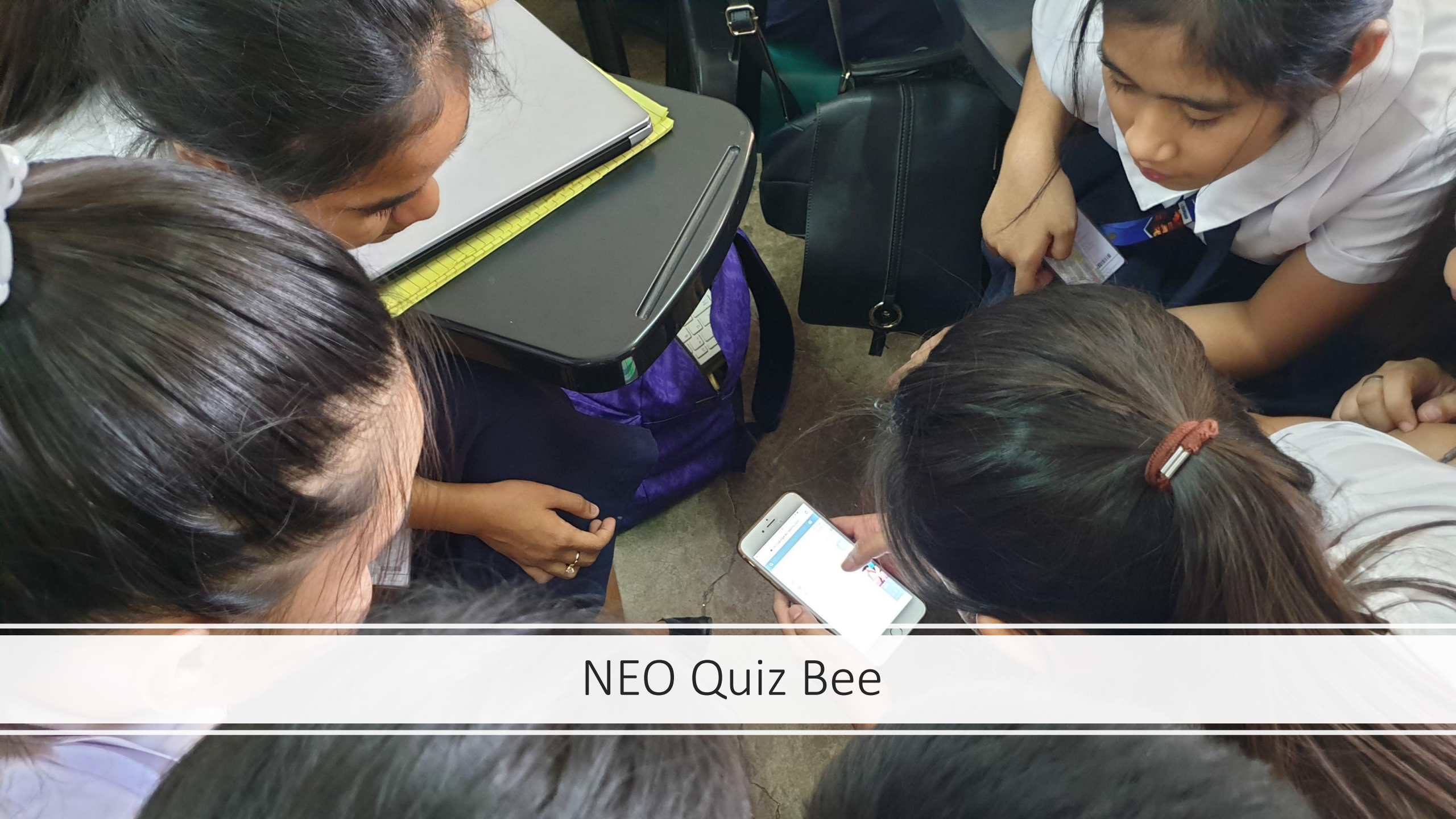
1. 11000101010_2 _____ 10
2. 10001101011_2 _____ 8
3. 11110001010_2 _____ 16
4. 10101010111_2 _____ 10
5. 11101001000_2 _____ 8
6. 11111000000_2 _____ 16
7. 100001000011_2 _____ 10
8. 1010101011111_2 _____ 8
9. 101011110000_2 _____ 16
10. 101111111100_2 _____ 10

Edit

NEO Quiz Bee

Mechanics Continued

Students begin converting Binary numbers to their given bases. Once they're done computing, they input their final answer on their platform.

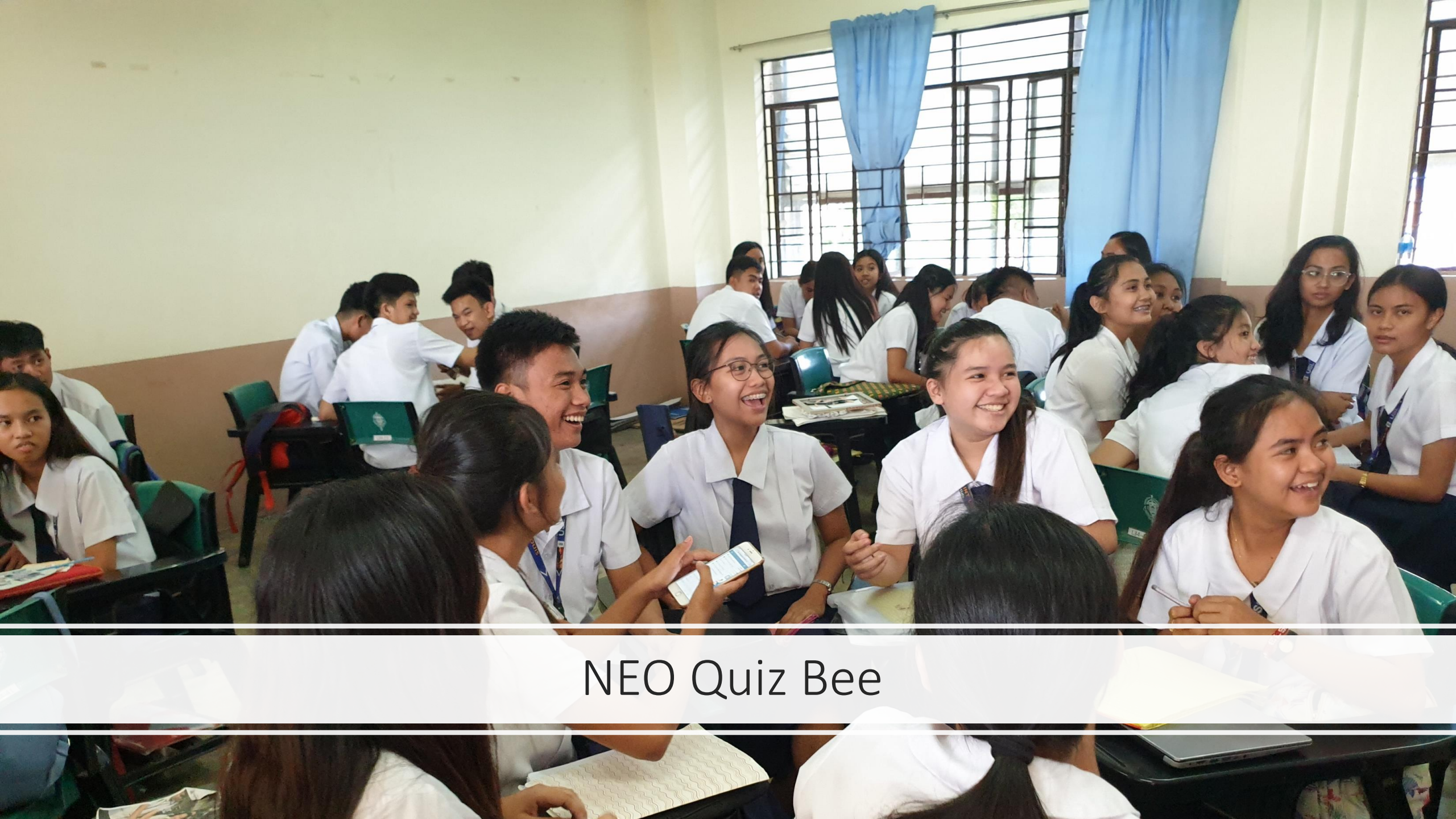


NEO Quiz Bee

NEO Quiz Bee

Mechanics Continued

Students are automatically notified of the result.



NEO Quiz Bee

Objectives Targeted:

Identify the base and range of each number system.

Determine the validity of given numbers with respect to their bases.

Convert binary numbers to decimal, octal and hexadecimal numbers.

Alternative LMS Quiz Bee

The instructor prepares Quiz Bee items on a PowerPoint presentation and students write their answers on slate.

The instructor can also write Quiz Bee items on the board in case of power interruption.

Assessment for Learning

Small Group Activity- Raise your Cards

Drill (Guided Exercises)

NEO Quiz Bee

Assessment of Learning

Accomplishment of Worksheets

Quiz (Number System Conversion with integrated Scenarios and Mathematical Problems)

Assignment (LMS Problem Set with gamification)

Reflection

Assuming that the LMS did not work well, alternative methods should be applied.

If certain number of students did not pass the assessment, enrichment activities should be prepared by the instructor.

1.5 hours is not enough for the learning activities. 2 meetings or 3 hour equivalence should be allotted to deliver this exemplar.

Enrichments

- Improved the Learning outcomes.
- Restated the pedagogies.
- Added technologies to be used by both students and instructors.
- Completed learning strategies in such a way that it conforms to: before, during and after.