

**IISME Educational Transfer Plan
2002**

**Exploring Analog and Digital Tools:
A Project-Based Investigation**

Sponsored by

Natl

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**Exploring Analog and Digital Tools:
A Project-Based Investigation**

GRADE LEVEL: 3 - 5

SUBJECTS: Technology / Language Arts / Math
LENGTH: 2-3 weeks

ABSTRACT:

Students today live in the information age, or, as some would say, the digital age. In fact, the tools we use to communicate continuously change over time. Are students aware of past and present communication tools? Do students understand the different characteristics of common analog communication tools still used today, such as tape recorders, record or phonograph players, dial telephones, and clocks? How do digital communication tools differ? It is the intention of this unit of study to increase students awareness of both analog and digital tools, and the importance they play in American culture, both at home and school. Students will identify common analog and digital tools found inside and outside the classroom environment, conduct internet and library research on a chosen tool, and finally, share the results of their research by creating a class video.

NOTE: This lesson also includes a math extension with manipulatives related to digital processing and how computers convert analog information to digital through binary code.

NATIONAL BOARD STANDARDS:

Students in this lesson will collaborate independently and with other classmates throughout the course of this project as they collect information related to research. With enlisted support from a member of the business community, students will gain increased knowledge and awareness of analog and digital communication devices, how they function, and the role they play in the world around them. There is a math extension which introduces the Binary Code concept.

NB Standard III. Learning Environment

Accomplished teachers establish a caring, inclusive, stimulating, and safe school community where students can take intellectual risks, practice democracy, and work collaboratively and independently.

NB Standard V. Instructional Resources

Accomplished teachers create, assess, select, and adapt a rich and varied collection of materials and draw on other resources such as staff, community members, and students to support learning.

NB Standard VI. Meaningful Applications of Knowledge

Accomplished teachers engage students in learning within and across the disciplines and help students understand how the subjects they study can be used to explore important issues in their lives and the world around them.

OBJECTIVES:

In this unit of study, students will:

1. Gather, inspect and discuss a variety of analog and digital tools.
2. Verbally identify common analog and digital tools found in school and at home.

3. Describe the physical similarities and differences of analog and digital tools.
4. Write a research report about ONE analog or digital communication tool which includes the following information:
 - a. List of features
 - b. Description of how it works
 - c. Description of how people use it in their daily lives
 - d. Explanation of why its important
5. Provide an oral presentation
6. Complete worksheet
7. Create a class video about analog and digital tools.

RESOURCES / MATERIALS:

- ~~✍~~ Internet "Hot List" of analog and digital tools
- ~~✍~~ Magazines, newspapers, etc.
- ~~✍~~ Library
- ~~✍~~ Examples of Analog tools: *camera, VHS tape, clock (with hands), telephone (with cord)*
- ~~✍~~ Examples of Digital tools: *digital camera, CD, clock (with numbers only), cell phone,*
- ~~✍~~ Computer
- ~~✍~~ Video camera
- ~~✍~~ iMovie or related video editing software

VOCABULARY:

1. ANALOG = Refers to electronic transmission accomplished by adding signals of varying frequency to waves with electromagnetic current. It is a transmission process that continually changes, fluctuates and evolves.
2. DIGITAL = Describes electronic technology that generates, stores, and processes data in terms of two states: positive and non-positive (**on or off**). The number 1 represents positive, and the number 0 represents non-positive. Data is transmitted as strings of 0's and 1's. Each digit (0 or 1) is referred to as a *bit*. A string of 8 bits is called a *byte*.

PROCEDURE:

1. Send note home to parents with information about the project. Request that their child bring an electronic communication device to school, i.e., old cell phone, pager, etc.
2. Contact the manager at a local communications store, i.e. Fry's, Best Buy, Circuit City, Good Guys, etc. and request that s/he bring a few devices to your classroom to demonstrate to students.

NOTE:

If gathering authentic digital or analog communication tools is not possible, collect discarded magazines from home, neighbors, professional offices, staff members, etc., so students can locate and cut out analog and digital communications tools.

3. Introduce, define and discuss analog and digital vocabulary.
4. Introduce graphic organizer.
5. Guide students around the classroom and ask them to identify objects that are analog or digital.
6. Insert student response into graphic organizer.
7. Ask them to identify analog and digital tools at home.
8. Insert student response into graphic organizer.
9. Have students describe the physical characteristics of the digital/analog tool they brought to school.
10. Using a second graphic organizer, organize information into two categories: similar or different.
11. Sort tools into analog and digital groups.
12. Inform students that they are expected to research ONE analog or digital communication tool of their choice and that they will have access to LIBRARY and INTERNET resources.
13. By the end of the day, each student must choose the tool they are going to research. (Provide list of tools they may select from).
14. Student reports are required to include the following information about the tool:
 - a. A list of the features
 - b. Description of how it works
 - c. Description of how people use it in their daily lives
 - d. Explain why it's important
15. Presentation requirements include use of visual aid, i.e. photo, drawing or authentic representation of tool.
16. PRESENTATION DAY ! Student research presentations will be captured on video.
17. Teacher will edit project and present to students.
18. Students will complete analog and digital worksheet.

EVALUATION / ASSESSMENT:

- ~~✍~~ Teacher observation
- ~~✍~~ Worksheet / exercise completion
- ~~✍~~ Research Rubric
- ~~✍~~ Oral Presentation Checklist

RELATED EXTENSIONS / ACTIVITIES:

I. CURRICULUM AREA: MATHEMATICS

INTRODUCTION:

Since a computer is a digital tool, it “talks” and “thinks ” in terms of binary digital information or data. In fact, all information or signals going into a computer is *analog*, but

with the help of an inside device called a microprocessor, *analog* information is converted into a *digital* form so that the computer can make sense of it.

The simplest digital impulses or signals only have two states (on or off), and are called "binary". Binary describes a numbering system in which there are only two possible values for each digit: 0 and 1. A *bit* (short for binary digit) is the smallest unit of data in a computer and has a single value, either 0 or 1. In most computer systems, there are 8 bits in a single *byte* strand. The Egg Carton exercise will teach you how to create Binary Code.

VOCABULARY:

Binary, bit, byte

A. Egg Carton Binary Code Exercise (Grade 2)

Materials needed:

Egg cartons

Color Markers

White casino chips

Blue casino chips

DIRECTIONS:

Give one empty egg carton to each student. Cut the egg carton in half. Set aside half a carton or SIX egg cups. From the remaining half, cut TWO egg cups. Attach both pieces together with tape to create a total of EIGHT egg cups. On the bottom of each cup (LEFT to RIGHT) write: 128, 64, 32, 16, 8, 4, 2, 1,

Before Playing:

Explain to students that one egg cup can contain, at most, one chip. If a BLUE CHIP is in the cup it represents a **one**, if a WHITE CHIP is in the cup it represents a **zero**.

Play:

1. Beginning on the far LEFT, insert the markers in this pattern: W, W, W, W, B, W, and W. (Write pattern on board).
2. Ask students if they know what NUMBER is under the BLUE CHIP. Ask children look under the BLUE CHIP to find number.
ANSWER: 4. (Write answer on board).
3. Tell students to look at all the egg cups. Ask: If W equals 0 (zero) and B equals 1 (one), then what is the BINARY CODE for number 4?
ANSWER: 0000100 (Write code on board).

Congratulations! You and the children have successfully determined the binary representation of a decimal number!

4. Repeat above as necessary.
5. Continue by creating the BINARY CODE for numbers 1-10 using same process. (See Conversion Table).
6. Remember to ADD the digits!

B. The Binary Decoder Detective Exercise (Grade 3)

Write the following numbers on the board: 0 1 2 3 4 5 6 7 8 9 10. Using the chart below, have students determine the BINARY CODE for each number. Remember to ADD the digits!

EXAMPLE: What is the BINARY CODE for the number 4?

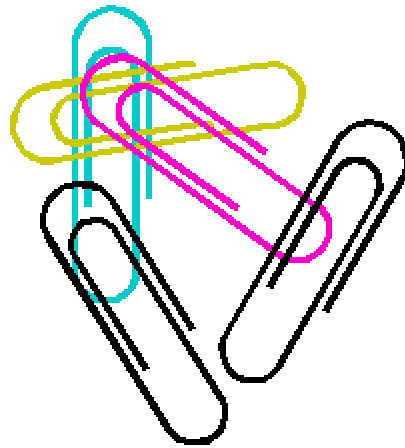
DIGIT ✍	128	64	32	6	8	4	2	1
BINARY CODE ✍	0	0	0	0	0	1	0	0

ANSWER: The BINARY CODE for number 4 is 0000100

Decimal Number to Binary Number Conversion Table:

DECIMAL	BINARY CODE	DECIMAL	BINARY CODE
0	00000000	5	00000101
1	00000001	6	00000110
2	00000010	7	00000111
3	00000011	8	00001000
4	00000100	9	00001001
		10	00001010

Instructional Resources



Internet Research Hot List

Teacher Directions:
BOOKMARK the following links onto computers for students to access.

Telephone

<http://inventors.about.com/library/inventors/bltelephone.htm>

Computer

http://inventors.about.com/library/blcoindex.htm?PM=ss12_inventors

Cell Phone

<http://inventors.about.com/library/weekly/aa070899.htm>

Radio

<http://inventors.about.com/library/inventors/blradio.htm>

Digital camera

<http://inventors.about.com/library/inventors/bldigitalcamera.htm>

Compact Disk

<http://inventors.about.com/library/inventors/blcompactdisk.htm>

Camera

<http://inventors.about.com/library/inventors/blphotography.htm>

Phonograph / Record Player

<http://inventors.about.com/library/inventors/bledison.htm>

Clock

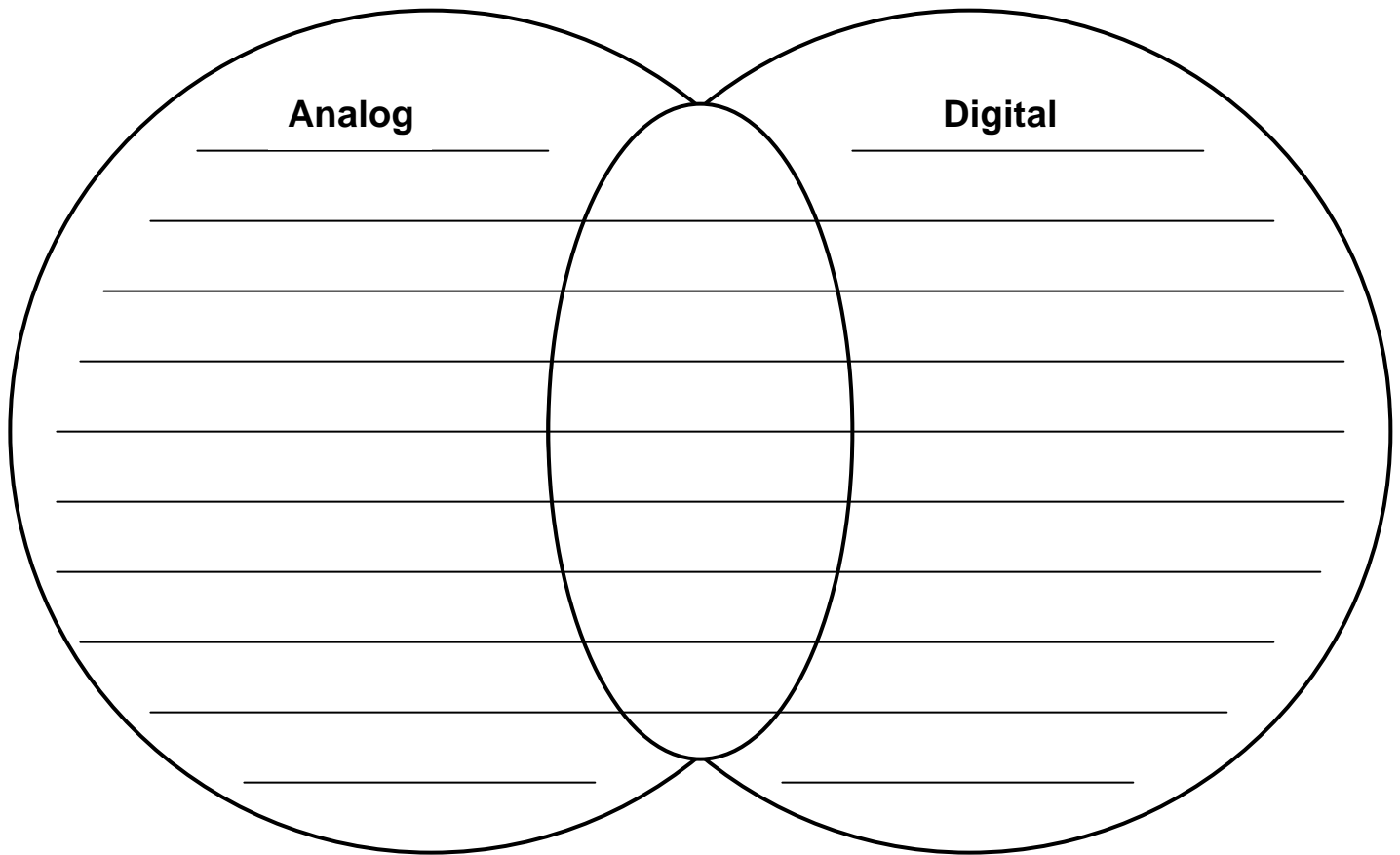
<http://inventors.about.com/library/inventors/blclock.htm>

Pager

<http://inventors.about.com/library/inventors/blpager.htm>

Venn Diagram Worksheet

Compare and Contrast Analog and Digital Tools



What did you find out ?

1. Which objects had one similar attribute or quality?

2. Which objects had more than one similar attribute or quality?

What Am I ?

Language Arts Exercise Student Worksheet

Student Name : _____

Date: _____

DIRECTIONS:

Test your knowledge ! READ the clue and identify the object.

CLUE:

WHAT AM I ?

1. I have two hands and they both point at numbers.
2. You can hold me in the palm of your hand.
3. When I ring, you can hear music play.
4. I am round, silver and very thin.
5. I have an arm with a needle and I have a round table that spins.
6. I have numbers that change all the time and light up at night.
7. I have a long handle. You can pick me up with one hand. You can hear things from one end and speak into the other end.
8. I look like a small TV. I can type into it, create movies, and play music from it.

Write your own clue (Extra Credit)

9. _____

10. _____

Student Oral Presentation Checklist Grade 2 / 3

Student Name: _____

Date: _____

CATEGORY	RESPONSIBILITIES
How I Found and Used Information	
	I used library books to find information
	I used newspapers or magazines to find information
	I used recommended internet sites
	I said things in my own words
	I wrote down where I got my information
	TOTAL POINTS
How I organized My Presentation	
	I used a storyboard or graphic organizer to organize my ideas
	I had a clear introduction
	I put main ideas at the beginning
	I explained each main idea
	I told or showed how to do something step-by-step
	TOTAL POINTS
How I Spoke to Others	
	I stood up straight
	My voice was easy to hear
	I did not talk too fast
	I used my hands, face and eyes to communicate
	I looked at my classmates and not at the floor
	I did not use empty words like, "uhm, ah, mm, like".
	TOTAL POINTS
Presentation Aids	
	I used art, objects, or pictures to show information
	TOTAL POINTS
What I Talked About	
	I mentioned the name of my tool.
	I mentioned whether it was analog or digital
	I described how it works
	I described how people use it in their daily lives
	I explained why it's important
	TOTAL POINTS
	TOTAL ORAL PRESENTATION POINTS

**Student Research Rubric
Grade 2 / 3**

Student Name: _____

Date: _____

Rating Scale: 1 = LOW 5 = HIGH

1. The student demonstrated understanding of topic.

1 2 3 4 5

2. The student gathered information from a variety of electronic and print sources.

1 2 3 4 5

3. The student cited information sources.

1 2 3 4 5

4. The information is well organized, and demonstrates logical sequencing and sentence structure.

1 2 3 4 5

5. Punctuation, capitalization, and spelling are correct.

1 2 3 4 5

6. The student completed the research report on time.

1 2 3 4 5