

BBPS ROHINI
EDUCATION 4.0
Safe Sustainable Societies
Experion Chemistry
Concept, Pedagogy, Assessment
As per CBSE aligned with
NEP 2020

07.09.2021



Ms Geeta Gangwani , Principal
Bal Bharati Public School, Rohini

**SUSTAINABLE
DEVELOPMENT GOALS**
(adopted by India-
2015)

SDG₄

**Goal No 4 for Sustainable
Development seeks to
“Ensure inclusive and
equitable quality education
and promote lifelong
learning opportunities for all”
by 2030**

**4 QUALITY
EDUCATION**



PRINCIPLES OF NEP 2020

NEP 2020 aims at building a global best education system rooted in Indian ethos, thereby transforming India into a global knowledge superpower. The purpose of the education system is to develop good human beings capable of rational thought and action, possessing



Recognizing , identifying & fostering unique capabilities of each child

Cognitive

Social

Ethical

Emotional

Foundational
(Literacy &
Numeracy)

Higher Order Capacities
Critical Thinking &
Problem Solving

HIGHLIGHTS OF NEP 2020

**Curriculum
Reconstruction**

**Pedagogical
Innovation**

**NEP
2020**

**Assessment
Reforms**

CURRICULUM RECONSTRUCTING-

synergy in curriculum across all levels of education





PEDAGOGICAL INNOVATION

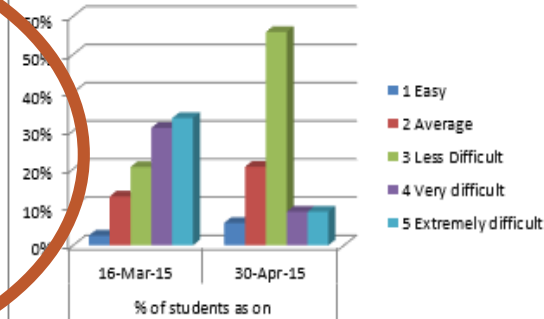
Traditional Classroom to Engaging Classroom



FEEDBACK ANALYSIS OF THE INTERVENTION GROUP BEFORE AND AFTER THE USAGE OF FLIPPED CLASSROOM

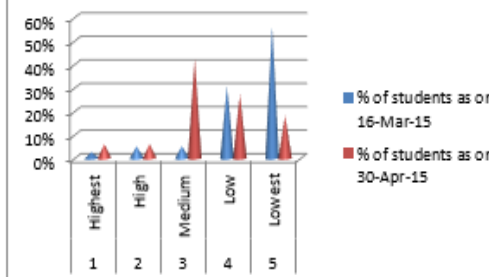
Rate the difficulty level of subject Chemistry on a scale of 1 to 5 (1-easy, 5-extremely difficult)

Level	Description	% of students as on	
		16.3.15	30.4.15
1	Easy	3%	6%
2	Average	13%	21%
3	Less Difficult	21%	56%
4	Very difficult	31%	9%
5	Extremely difficult	33%	9%



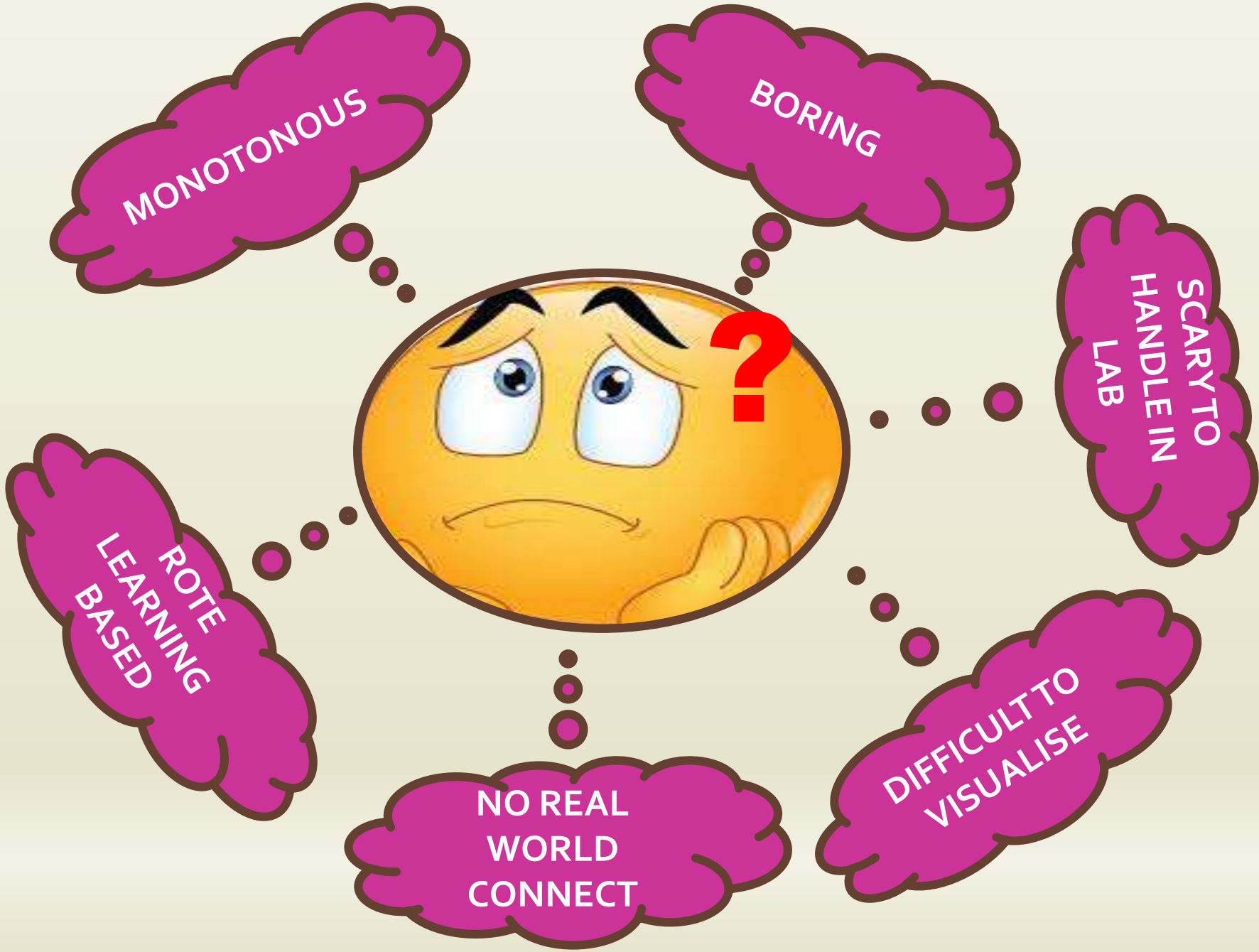
Rate the preference of the subject Chemistry on a scale of 1 to 5 (1- Highest, 5-Lowest)

Level	Subject	% of students as on	
		16.3.15	30.4.15
1	Highest	3%	6%
2	High	5%	6%
3	Medium	5%	42%
4	Low	31%	27%
5	Lowest	56%	18%



Feedback from the intervention group after the action research project indicated enhanced preference towards the subject.

Level	Description	% of students
1	Easy	3%
2	Average	13%
3	Less Difficult	21%
4	Very Difficult	31%
5	Extremely Difficult	33%



MONOTONOUS

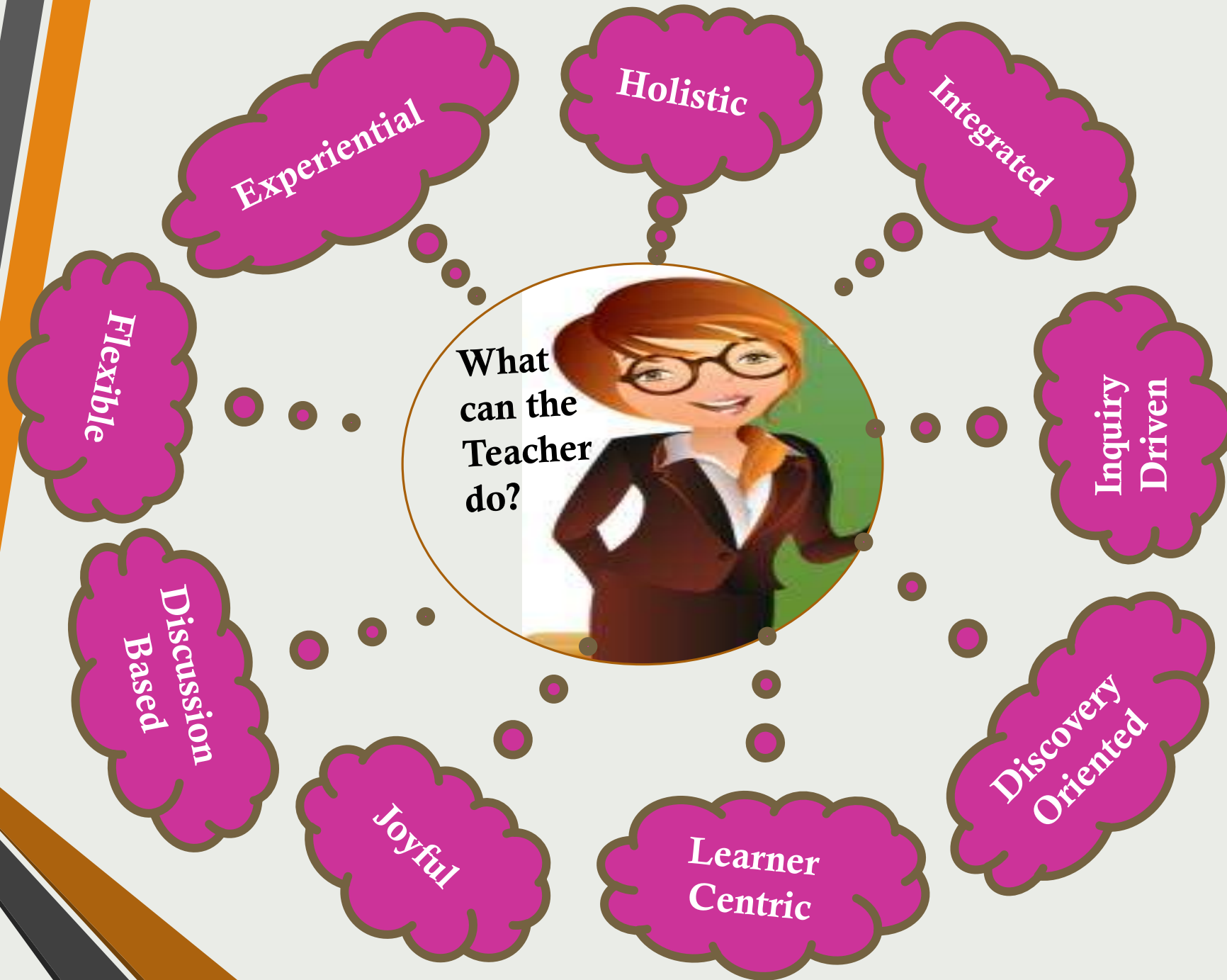
BORING

SCARY TO
HANDLE IN
LAB

DIFFICULT TO
VISUALISE

NO REAL
WORLD
CONNECT

ROTE
LEARNING
BASED



ONUS OF LEARNING
"On the child"

- ✓ *Self directed Learning*
- ✓ *Peer learning*
- ✓ *Collaborative learning*
- ✓ *Cooperative learning*

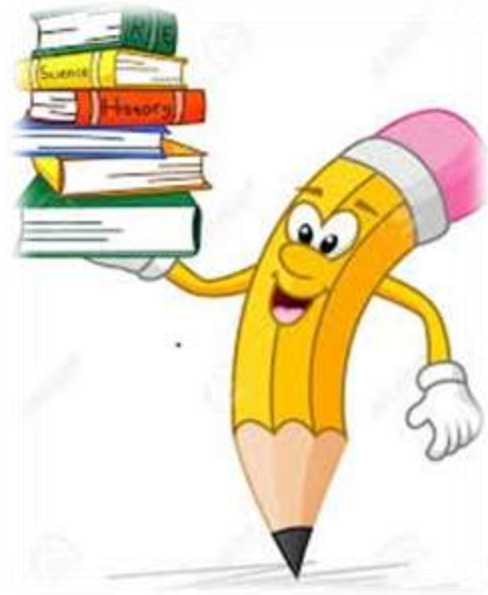
TEACHER DRIVEN TO STUDENT DRIVEN PEDAGOGY

Pedagogy



**Teaching
sage on the stage**

Andragogy



**Facilitating Guide on
the side**

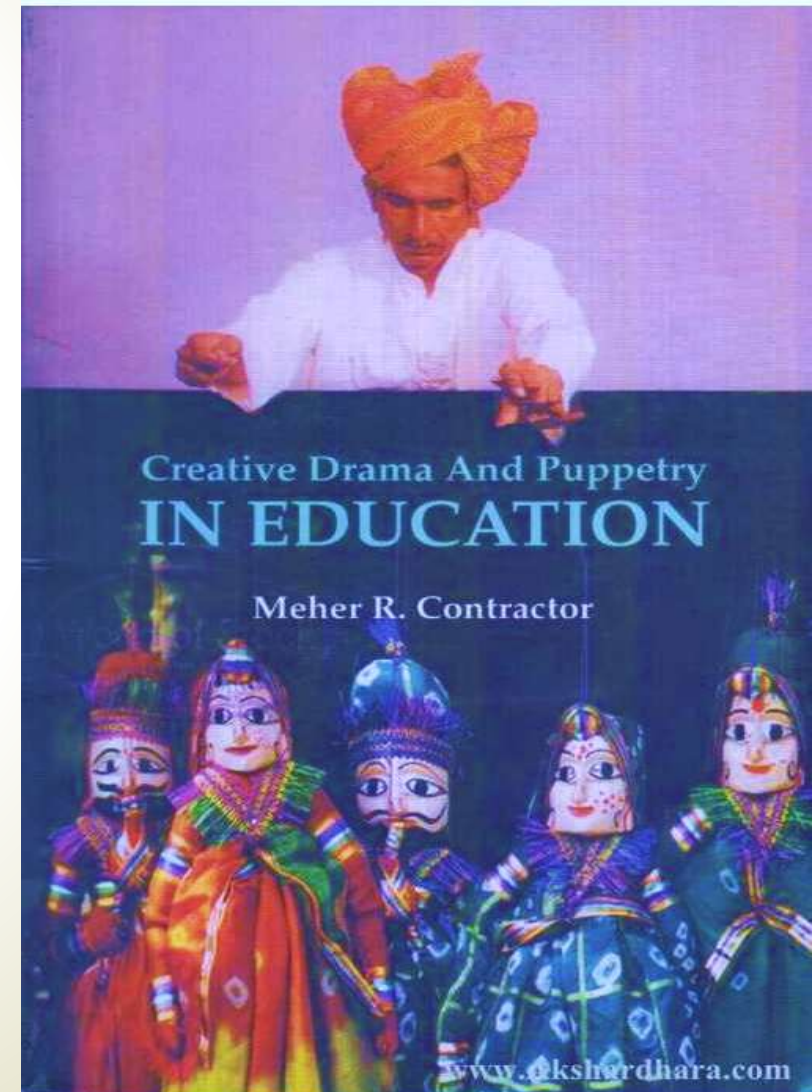
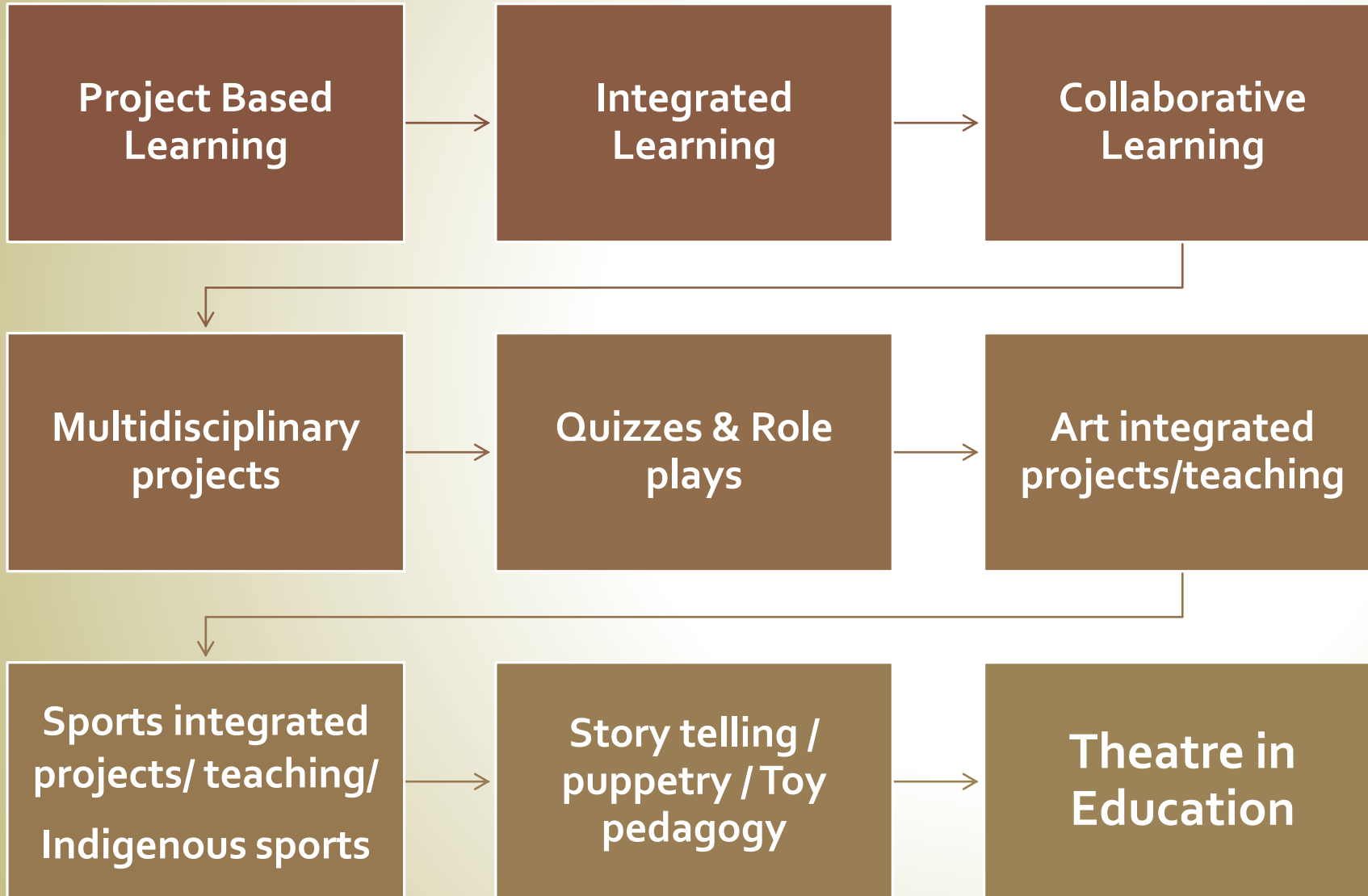
Heutagogy



**Self-directed learning
Searching & Reflecting**

PEDAGOGICAL INNOVATIONS

(Indian & local context)



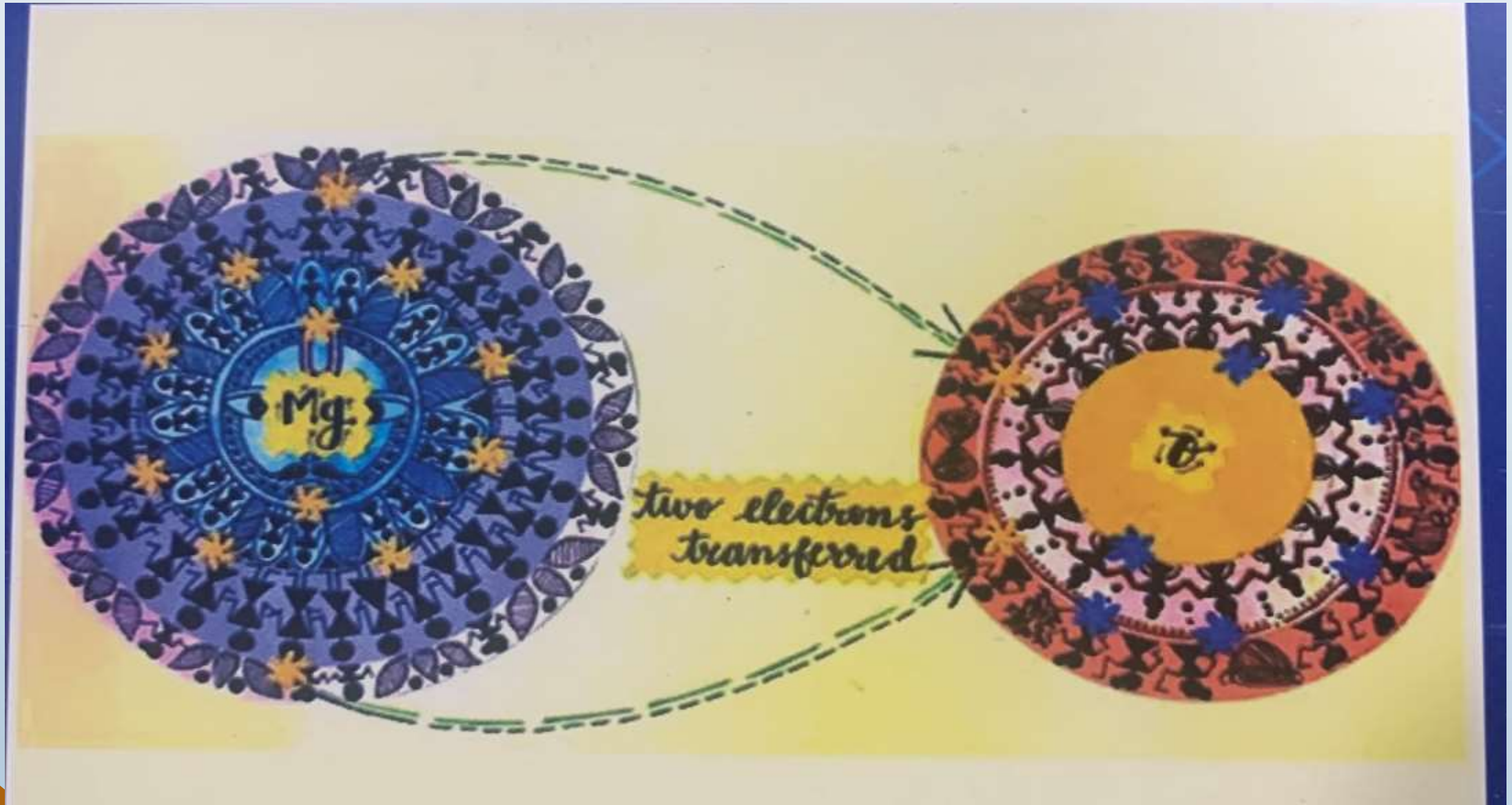


ART INTEGRATED PEDAGOGY

ART INTEGRATED PEDAGOGY: VISUAL ART



ART INTEGRATED PEDAGOGY: VISUAL ART



T-Shirt Designing



IN A LAND
FAR AWAY
THERE WAS
AN
ABANDONED
NITROGEN



NITROGEN WAS POOR
AND SAD BECAUSE HE
HAS 3 LESS
ELECTORNS



THEN THERE WAS ALUMINUM
WHO WAS RICH, BUT SAD
BECAUSE HE WAS TOO RICH AND
HAD 3 MORE LCTRONS

IN 1862...



THEY FELL IN LOVE
AND WERE MARRIED
BECAUSE THEY COULD
STAY STABLE AT HIGH
TEMPERATURES

VOWS:

I PROMISE TO
GIVE YOU 3
ELECTRONS MY
BELOVED SO WE
CAN FORM AN
IONIC BOND THAT
WILL LAST
FOREVER
LOVE ALWAYS,
ALUMINUM

ONE DAY WHEN THEY WERE
COOKING THE
TEMPERATURE WAS 2200
DEGREES CELSIUS



OH NO IM
MELTING

ILL LOWER
THE
TEMPERATU
RE

ART INTEGRATED PEDAGOGY (Integration with Performing Arts)



METAPHORS OF CHEMISTRY- STORYTELLING WITH CHEMICALS

Electronegativity/polarity of Bonds/type of bonds

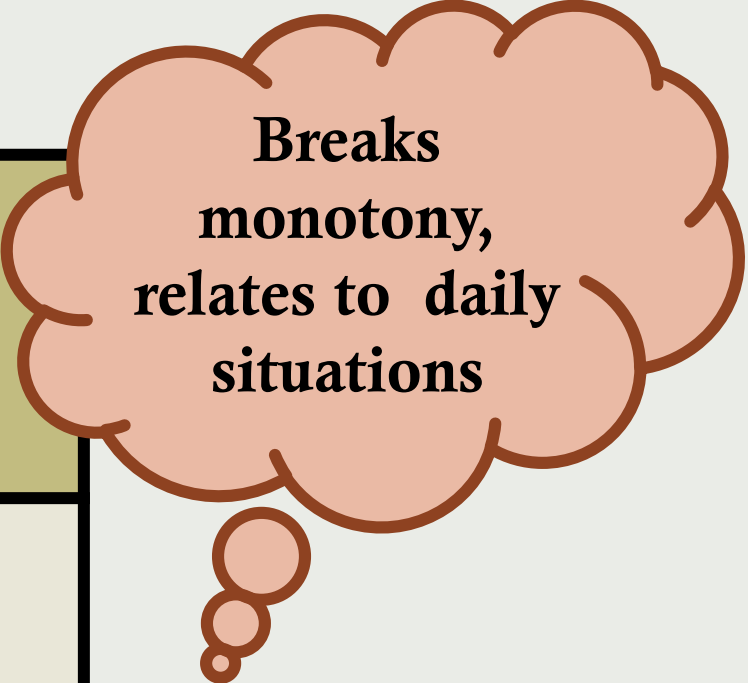
Sharing of Lunch by two students in recess

Spatial Crowding

Students around water coolers in recess

Activation energy in presence of catalyst

Purchase of a household commodity under discount scheme



Breaks
monotony,
relates to daily
situations

Tete-a-tete in Chemistry

Hones
creativity,
breaks
monotony

- Letter writing from E to E
- Dialogue between two Es
- Face 2 Face between Es
- Coffee with E
- Autobiography of E

E- Any entity-
Atom/Molecule/Ion/Process/Phenomen

a



Graphic Novel
SCIENCE - Class IX
Chapter 4: Structure of the Atom

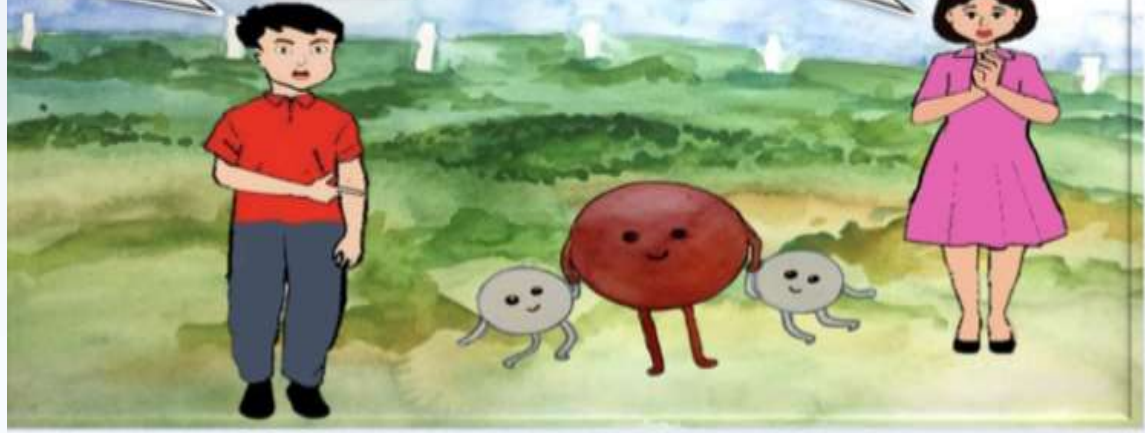


VALENCY

(Art Integrated Learning)

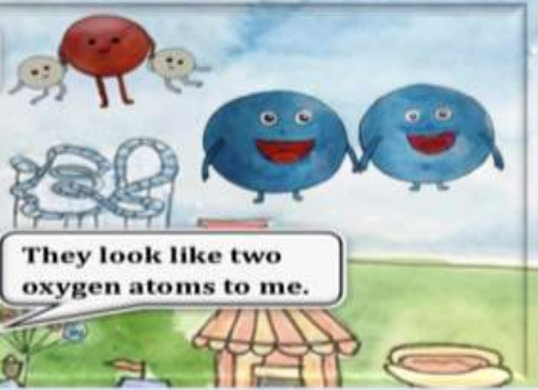
Friends, look at those atoms walking hand in hand. How cute they look!

That looks like a water molecule.



Hey, now look at those two elements.

They are also walking together.



They look like two oxygen atoms to me.

Friends, don't miss that one!

You mean the one in front of us? - looks pretty unfriendly.

Well, that's Neon - see it is glowing!



Super Atomic Heroes League

You are tasked with creating a new superhero to be apart of a special force: “The Super Atomic Heroes League.” All of the super heroes in this league received their power from an element on the Periodic Table. You will need to create the super hero and a story with him/her/it as the main character.

Story Process:

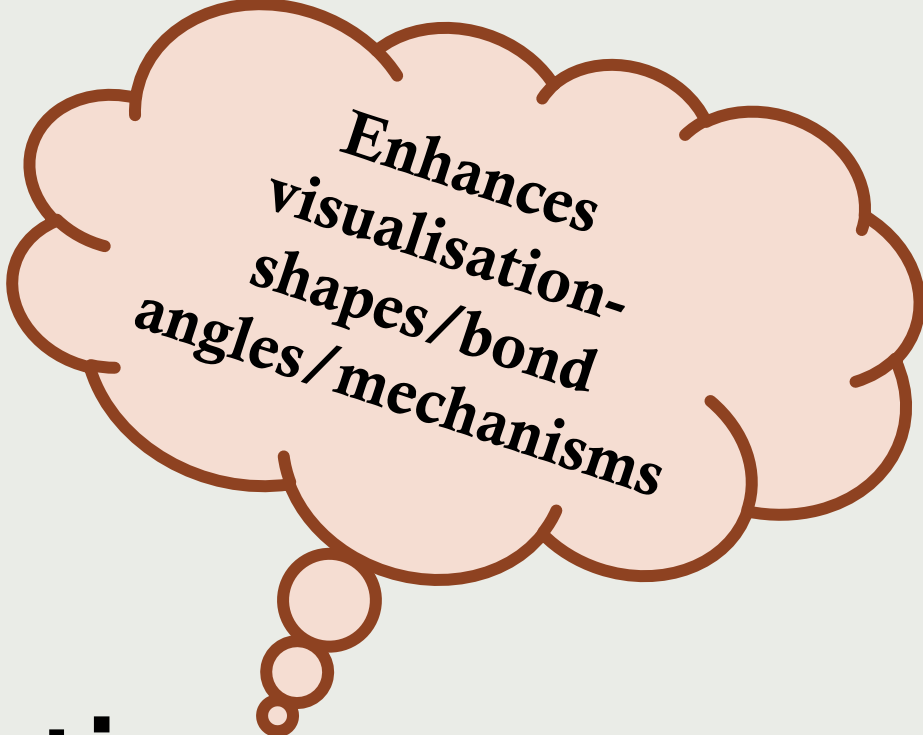
- 1. Choose an element**
- 2. Learn about your element.**
- 3. Find out what combines with that element to make a compound**
- 4. Learn about that compound**
- 5. Decide what super power your character will have based on the element or compound**
- 6. Give your super hero a name based on the element or compound**
- 7. Create a story where the super hero has to solve a problem**
- 8. Make sure your story has a physical and chemical change in it.**
- 9. Present your story as Comic Strip, Movie, skit/play or any other form**



ICT DRIVEN PEDAGOGY

EFFECTIVE USE OF OERS

- **Videos**
- **Simulations/Gamification**
- **Animations**



Enhances
visualisation-
shapes/bond
angles/mechanisms

SIMULATION IN CHEMISTRY

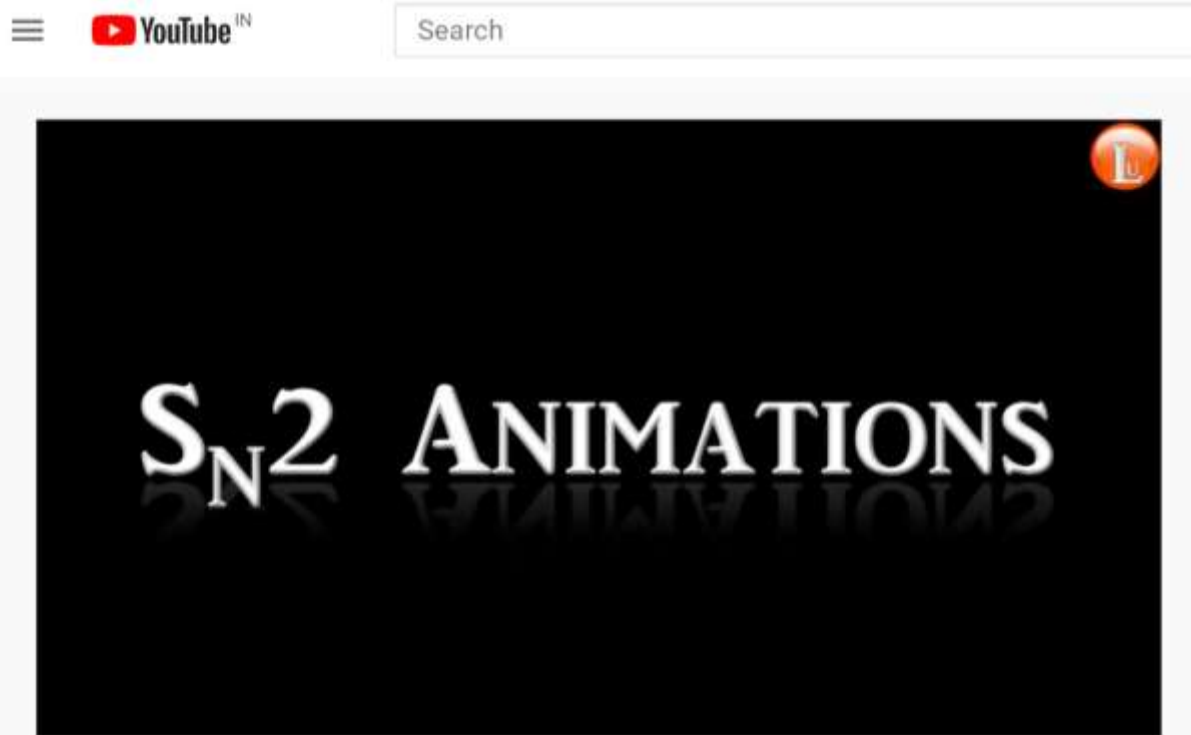


build-an-atom_en.html

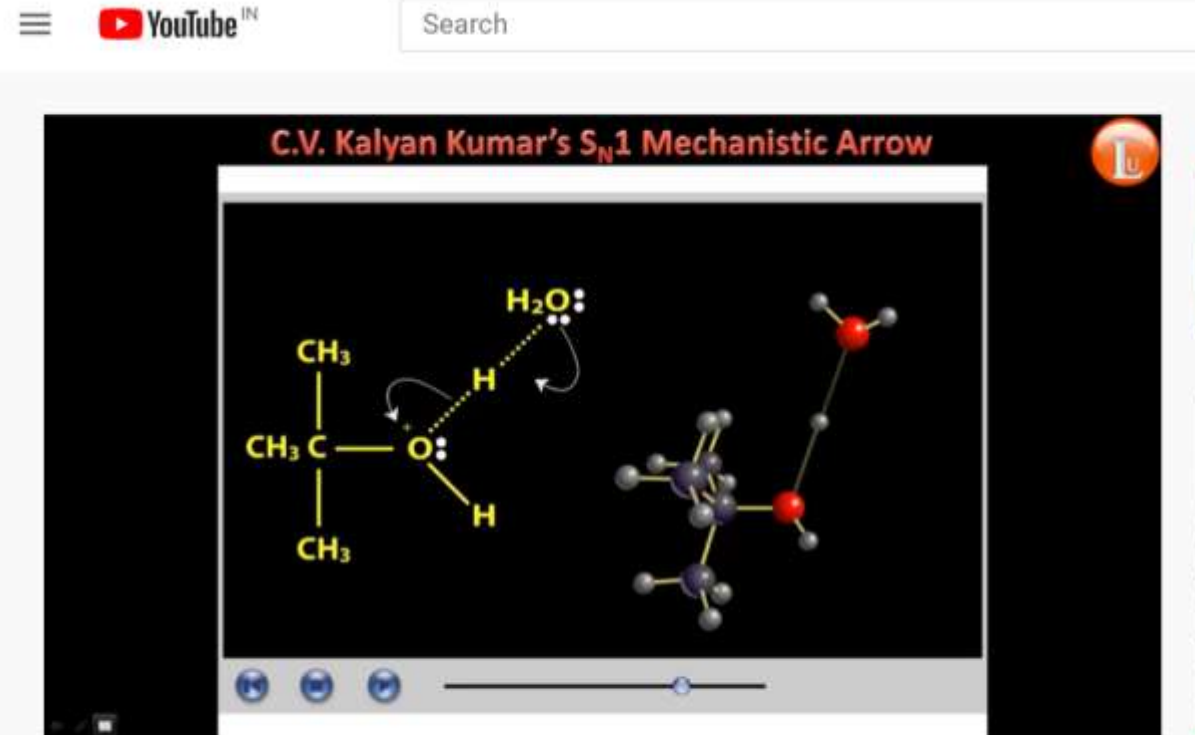


molecule-shapes_en.html

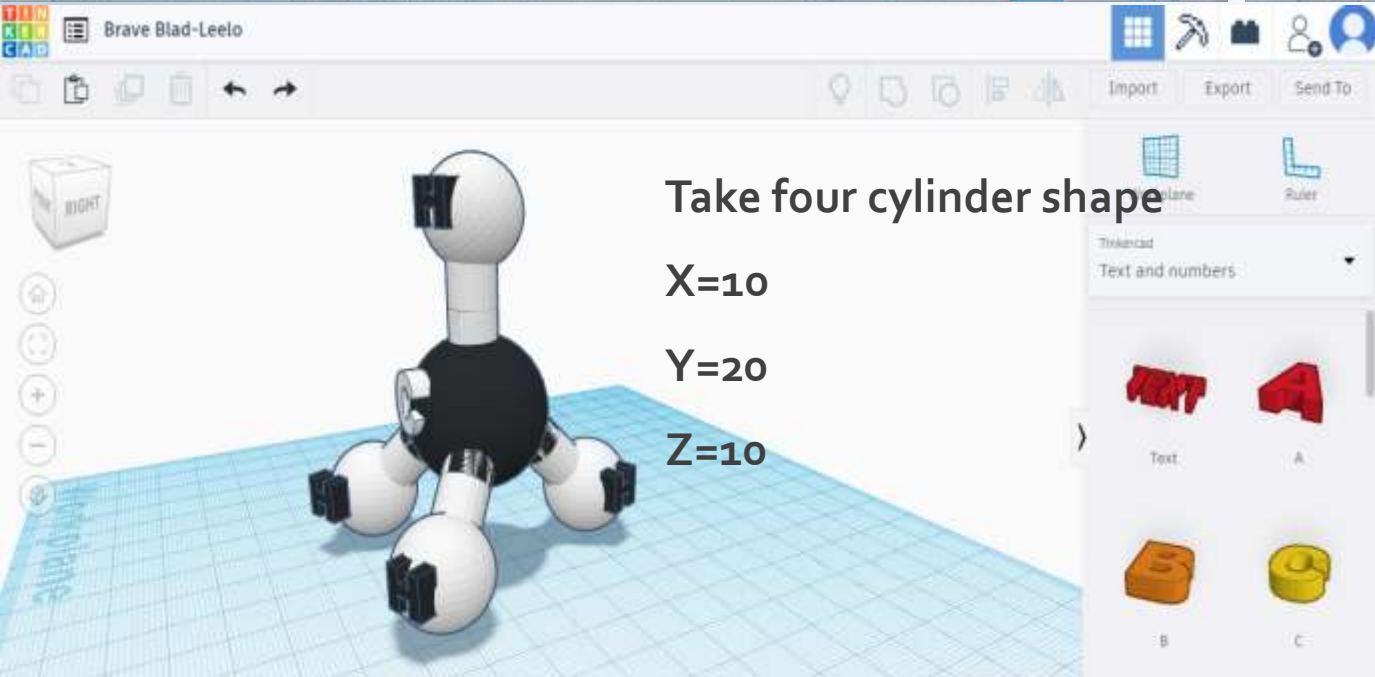
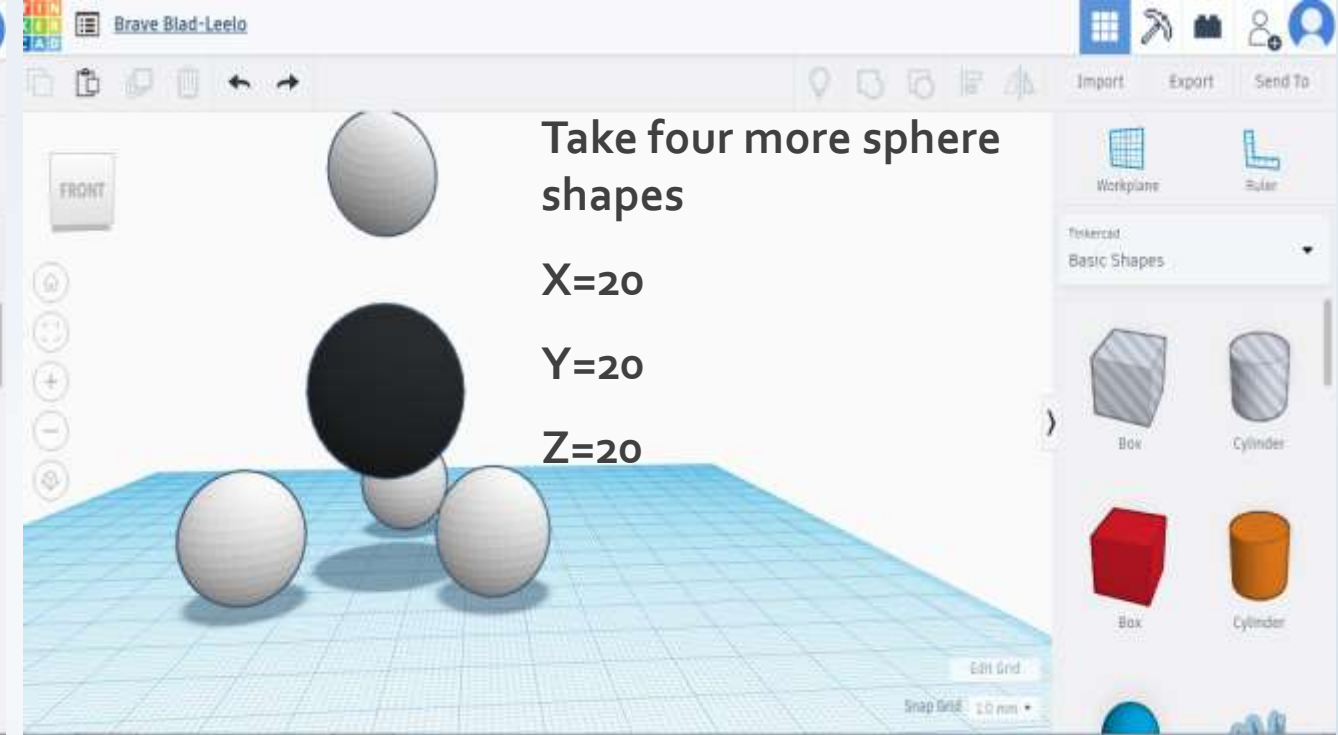
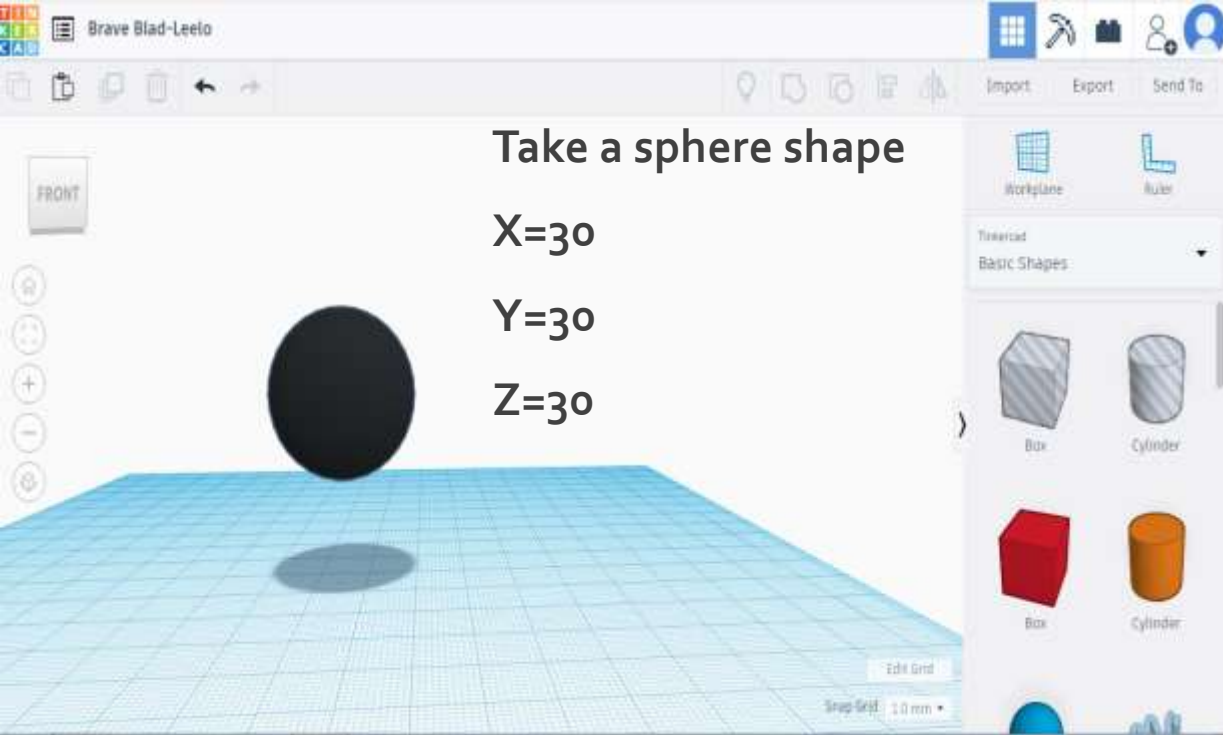
<https://www.youtube.com/watch?v=TnY1S5ldVqI&feature=youtu.be>



Nucleophilic Substitution SN1 and SN2 Reaction Mechanism Animations.



Nucleophilic Substitution SN1 and SN2 Reaction Mechanism Animations.





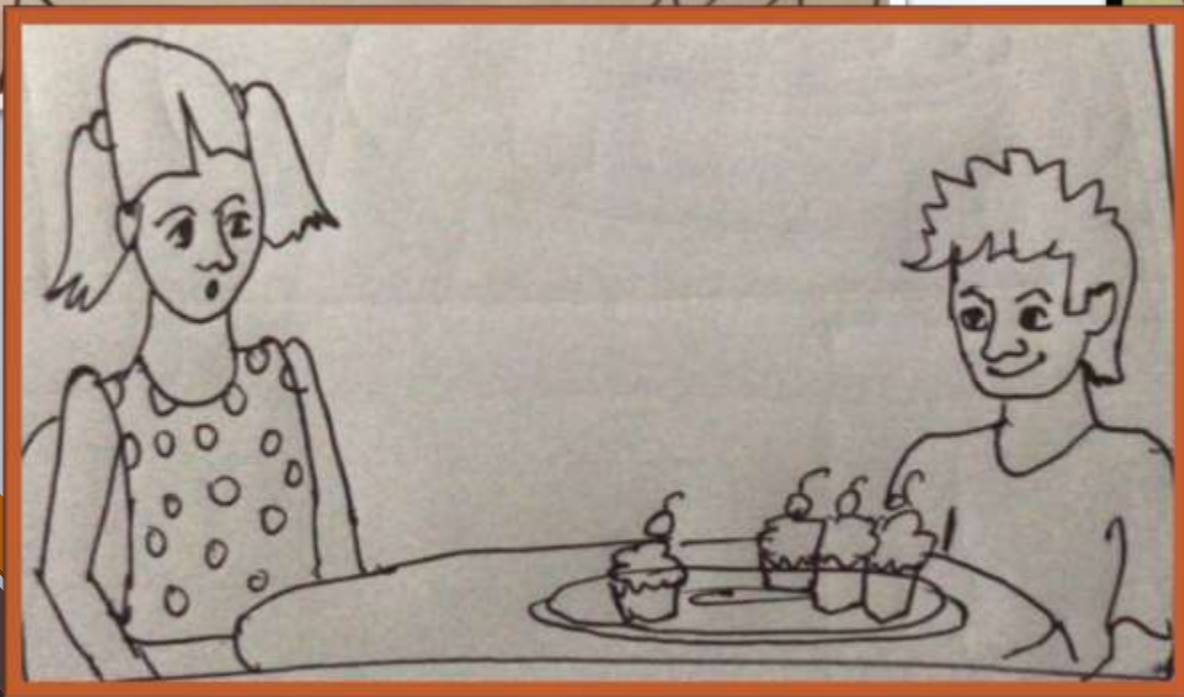
TEXTUAL TINKERING

Through

DOODLES



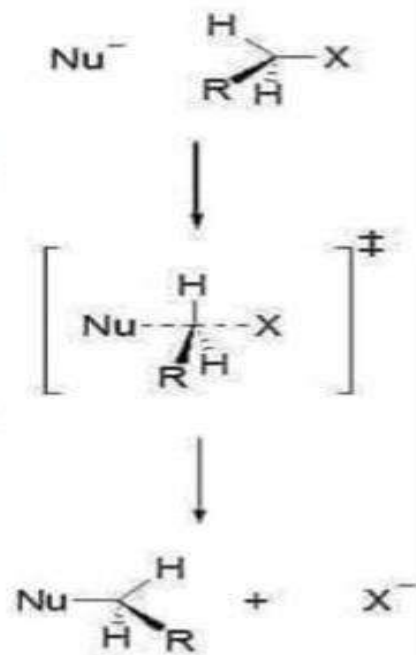
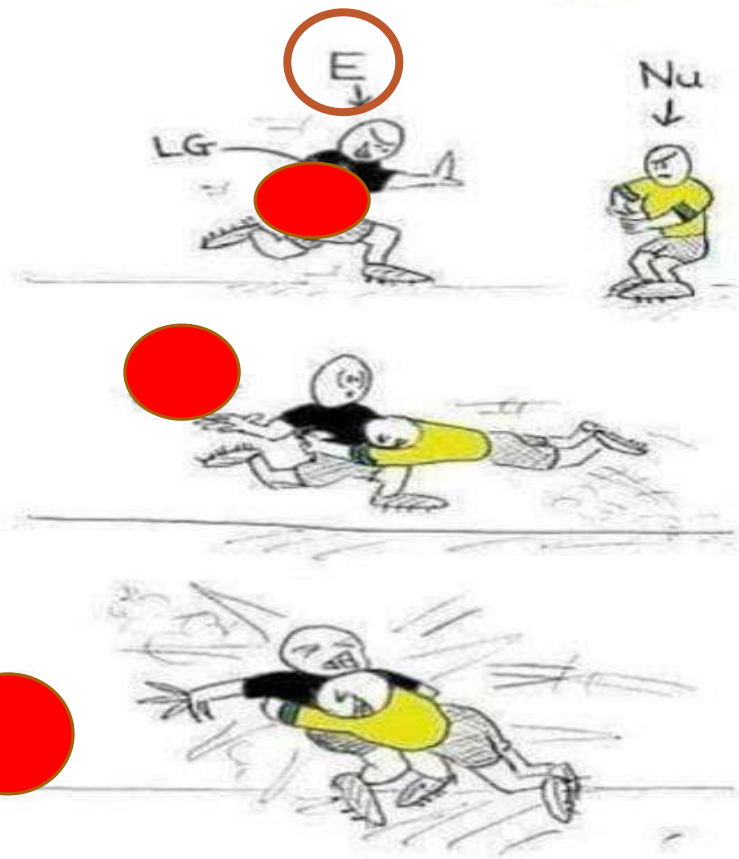
I'M LEAVING YOU
FOR POTASSIUM.



**NON POLAR AND
POLAR BONDS**

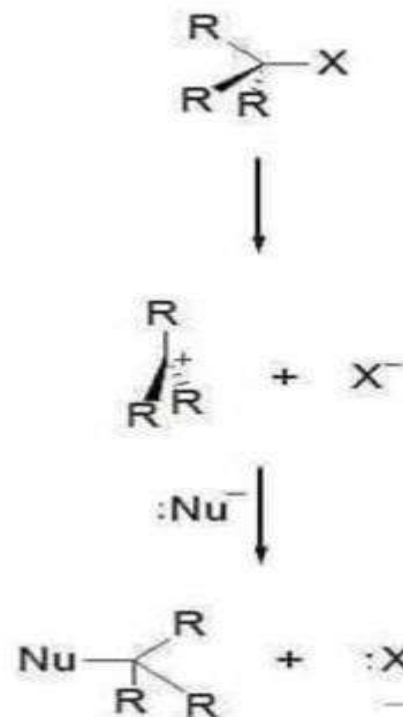
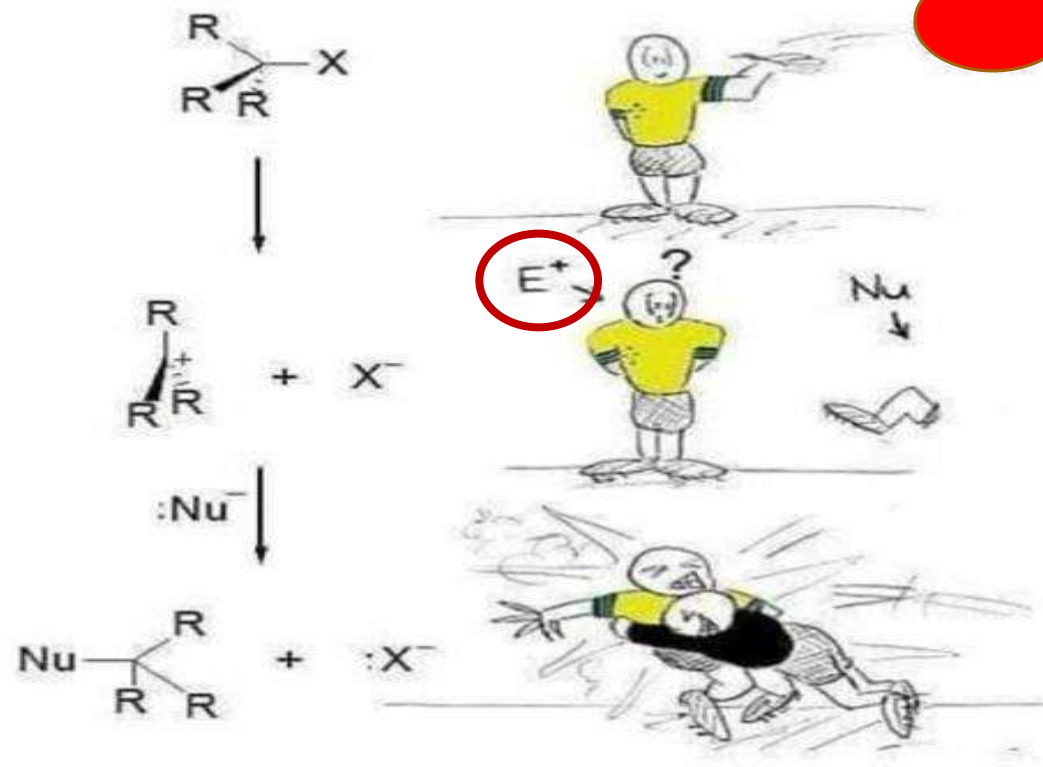
NUCLEOPHILIC SUBSTITUTION

S_N2



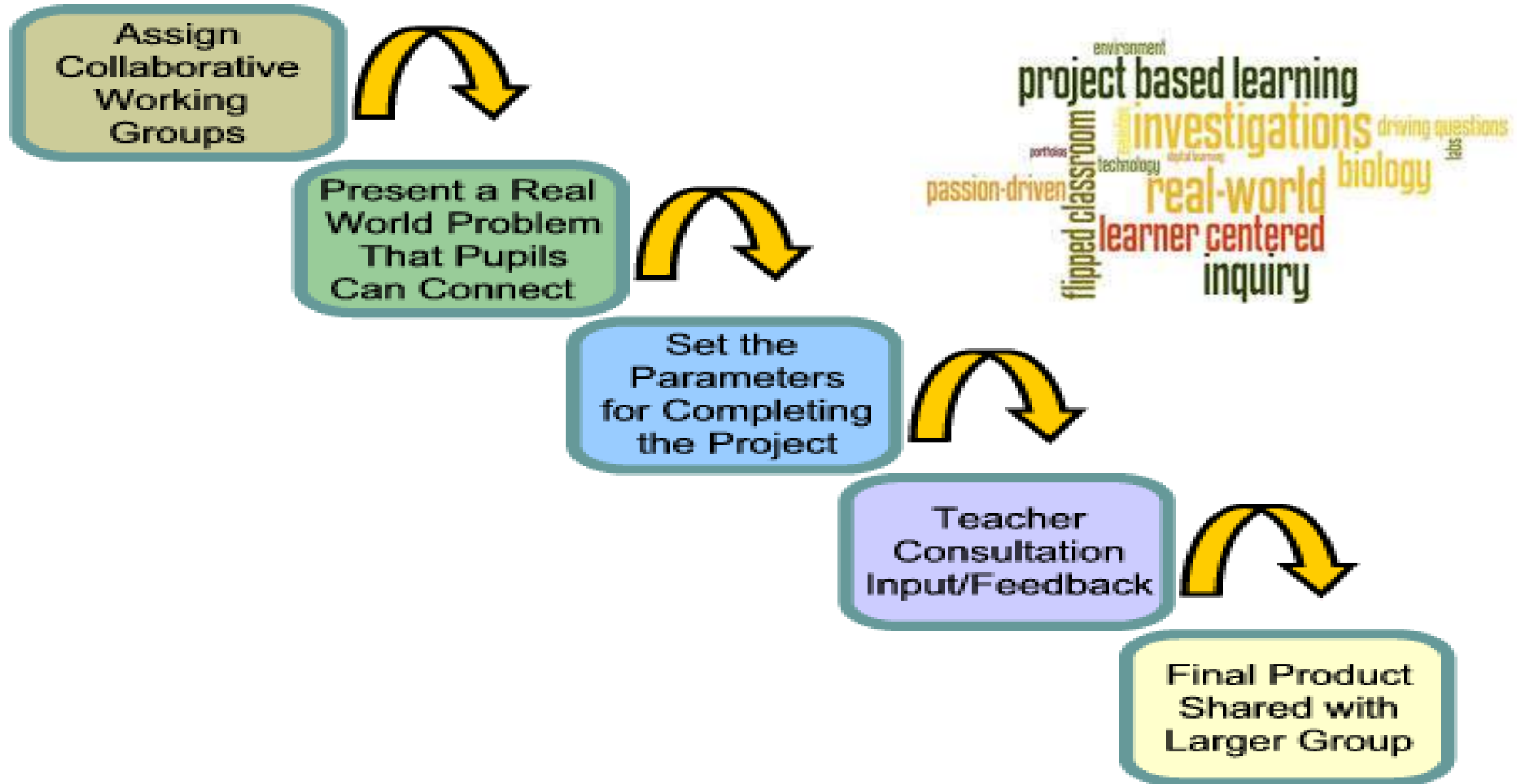
Fair Tackle

S_N1



Late Tackle

Project-based Teaching Strategy



How can we make a cafe exclusively for the elderly people of the society to make them feel special and create a sense of empathy amongst the younger generation for them? :

- Café layout : Maths & Visual arts
- Café Menu : Meal Planning & Biology
- Café Crockery : Chemistry
- Café Light/Sound arrangements : Physics
- Café waste management : EVS
- Café Rate list & Accounts : Maths

PBL

LAYOUT

LAYOUT OF GOLDEN MEMORIES CAFE



GOLDEN MEMORIES CAFE



Menu , Kitchen and Safety Measures (GROUP C)



SOURCES OF ENTERTAINMENT - GAMES

Golden Memories Cafe ENTERTAINMENT AND INTERIOR DECOR (GROUP -)



Respect the old, when you are young. Help the weak, when you are strong. Confess the fault, when you are wrong.

Because one day in life, you will be old, weak and wrong.



TAMBOLA



CARDS



CHESS



BINGO



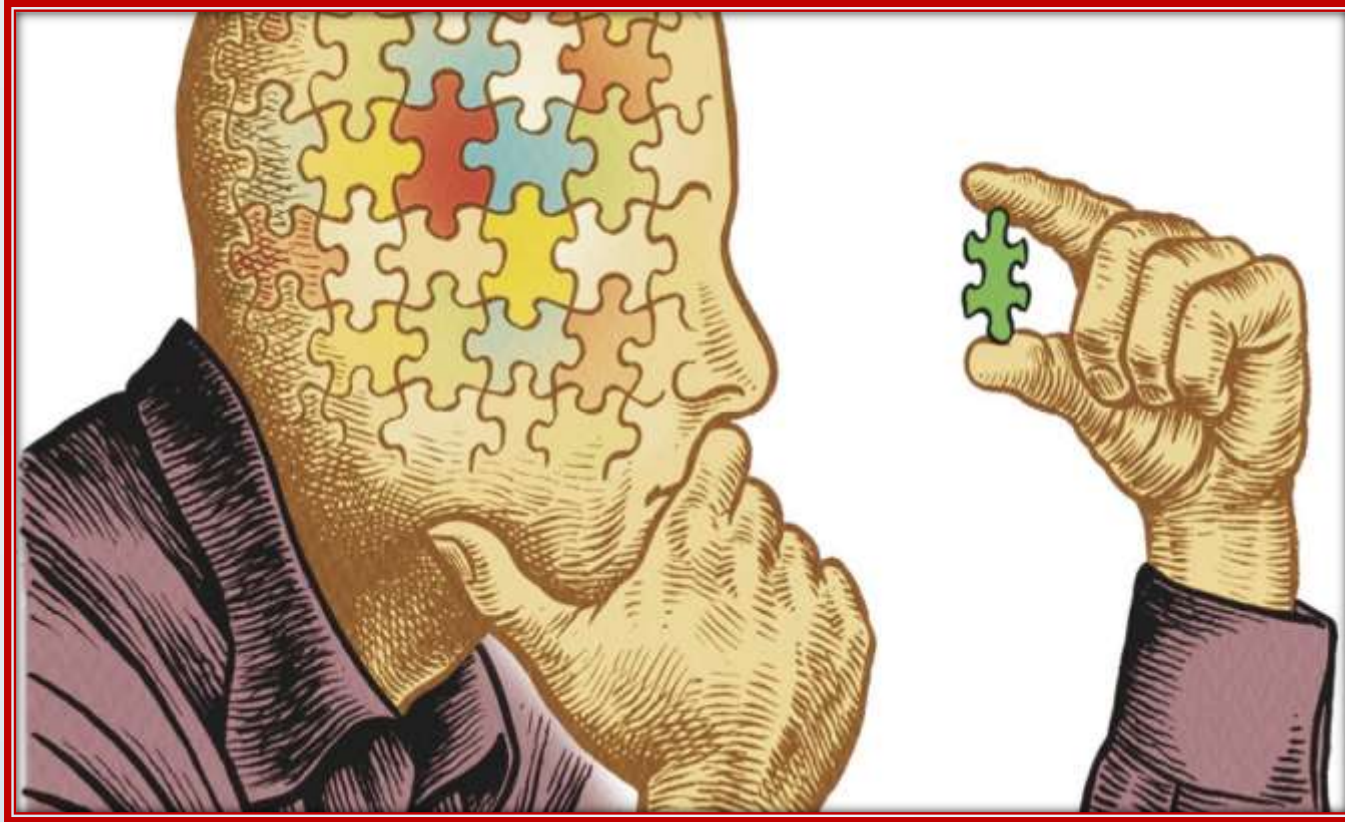
LUDO



SNAKES AND LADDERS



LIBRARY ROOM



METACOGNITIVE THINKERS

Ron Ritchhart • Mark Church • Karin Morrison
FOREWORD BY DAVID PERKINS

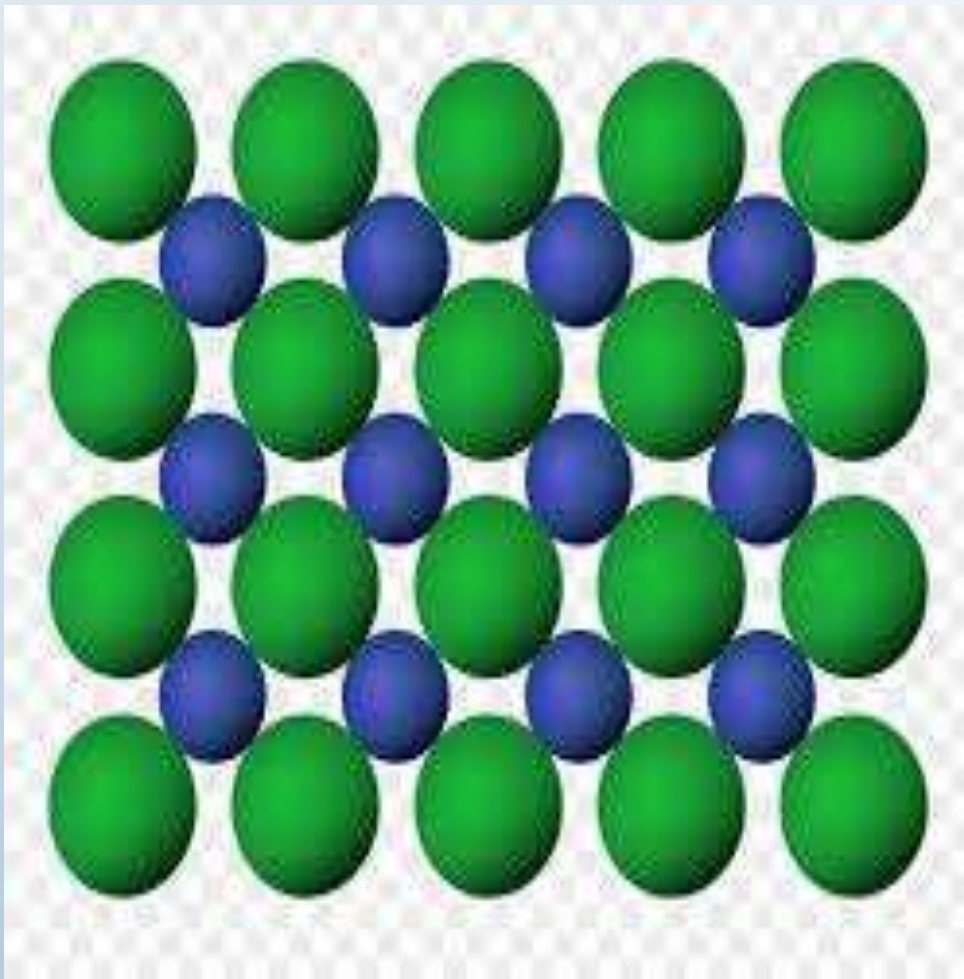


MAKING THINKING VISIBLE

How to Promote
Engagement, Understanding, and
Independence for All Learners



SAMPLE OF STUDENTS' THINKING SEE -- THINK -- WONDER



SEE - I see that sodium and chlorine atoms are different in size and closely placed / touching each other.

Think - I think the bigger green ball is chlorine and smaller blue ball is sodium.

WONDER – Why are there so many atoms /balls ?

Why is each sodium is surrounded by four chlorine ? Why is there is so much empty space in this picture while solids have least inter particle space ?

CHALK TALK

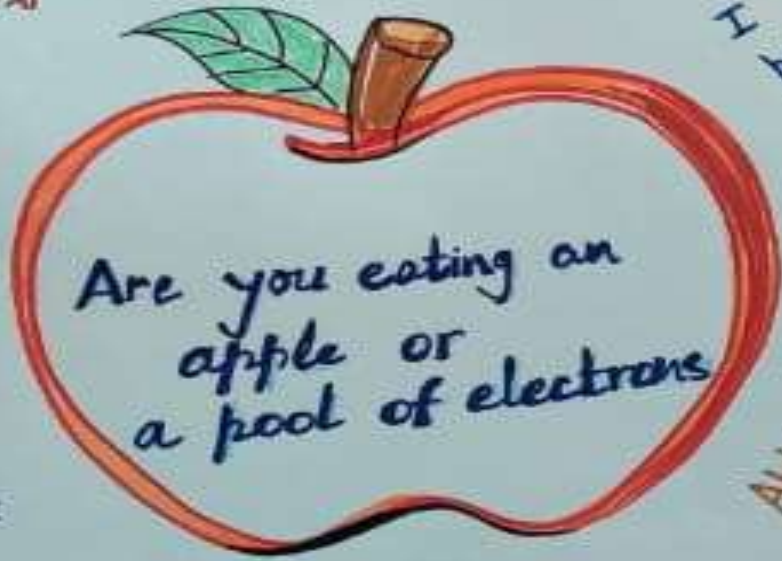
THINKING ABOUT THINKING

SHHH! NO TALKING!

YOU ARE IN A THINKING ONLY ZONE!

YOU CAN...

- ◆ write down what you are thinking or wondering about.
- ◆ circle interesting ideas.
- ◆ write a question or add a comment to other people's comments.
- ◆ draw a line connecting your comment or question to a similar one.



Are you eating an apple or a pool of electrons

I feel like eating a pool of atoms and molecules.

Since e are on the outer side of an atom, therefore they are mobile. So when we eat apple e enter our body
Pooja Gupta

Apple is a matter and has electrons which are very large in number
Pooja Gupta

Agree
Every single thing in universe is made of atom and they do contain electrons, so we consume e when we eat an apple.
Jyoti

Apple is a matter, basic fundamental particle of matter is atom, of which e is a subparticle.

Food has carbon compounds which consist of not only e but also H & O

DISAGREE

Apple is made up of atoms that consist of e, p, n
We would be eating pool of ions or subatomic particles rather than just e
Kavyansh Sinha

Disagree with Kavyansh
We don't eat ions

Apple has mass and occupies space so its matter of e, p & n
Matter is made up of e, p & n in chemical reaction...
But e participate

Claim
SUPPORT

Question



Make a **claim** [*explanation, interpretation*] about the topic.

Identify **support** [*things you see, feel, know*] for your claim.

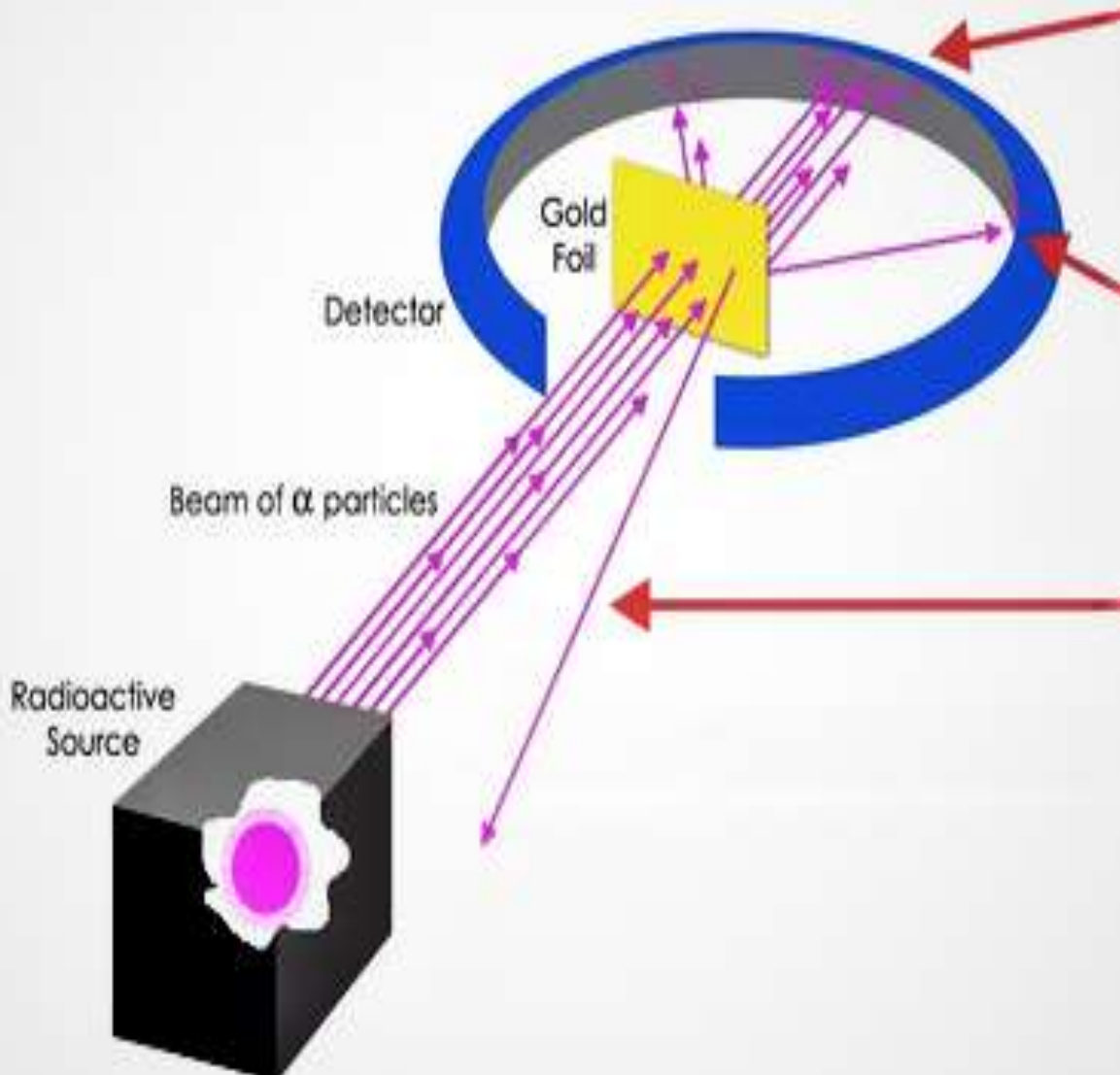
Ask a **question** related to your claim. What isn't explained?

CLAIM / SUPPORT / QUESTION

A routine for clarifying truth claims



Rutherford's Gold Foil Experiment



SAMPLE OF STUDENTS' THINKING

CLAIM - SUPPORT- QUESTION ON STRUCTURE OF ATOM

CLAIM – Most of the space inside the atom is an empty space.

Support- Most of the alpha rays are able to pass through suggesting that they are not being obstructed by any other particle inside the gold atom.

Question- If most of the space is empty where are the electrons inside an atom?

ZOOM IN

- Zoom In Thinking Routine
- Looking Closely at the Small Bit of Image That IS Revealed. What do you see or notice? ...
- Reveal More of the Image. What new things do you see? ...
- What new things are you wondering about? Repeat the Reveal and Questioning Until the Whole Image Has Been Revealed.
- What Lingering questions remain for you about this image?



ZOOM IN

A **routine** for introducing and exploring ideas... and **close looking**.



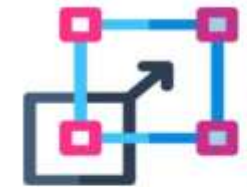
Making It Work

Find a provocation image or source.
Gradually uncover the image, with students noticing, noting & wondering based on their close observations.



First Look

- What do you **notice**?
- What do you **wonder**?
- What is your **hypothesis** about what might be happening here?
- *What makes you say that?*



As More Is Revealed...

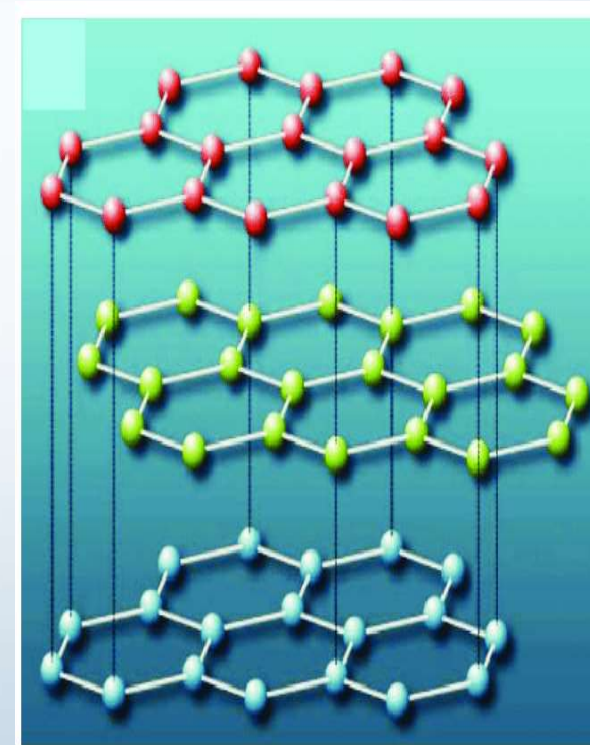
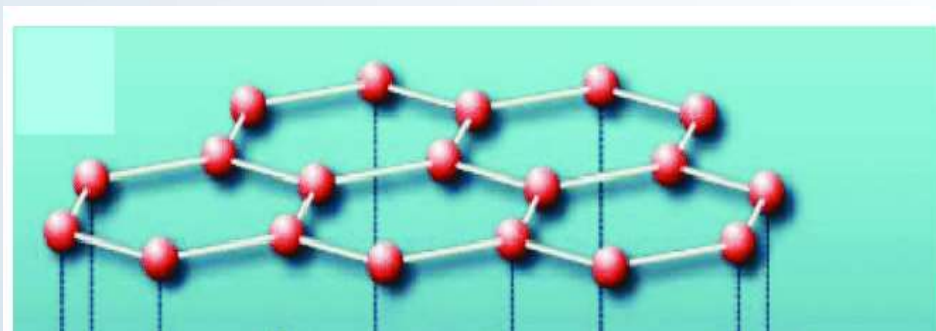
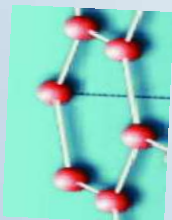
- What do you **notice**?
- What do you **wonder**?
- How is your **hypothesis** changing?
- *What makes you say that?*

Let's debrief...

- What do you finally see or **notice**?
- How was your **thinking** changing?
- What do you still **wonder**?
- What **connections** can you make?

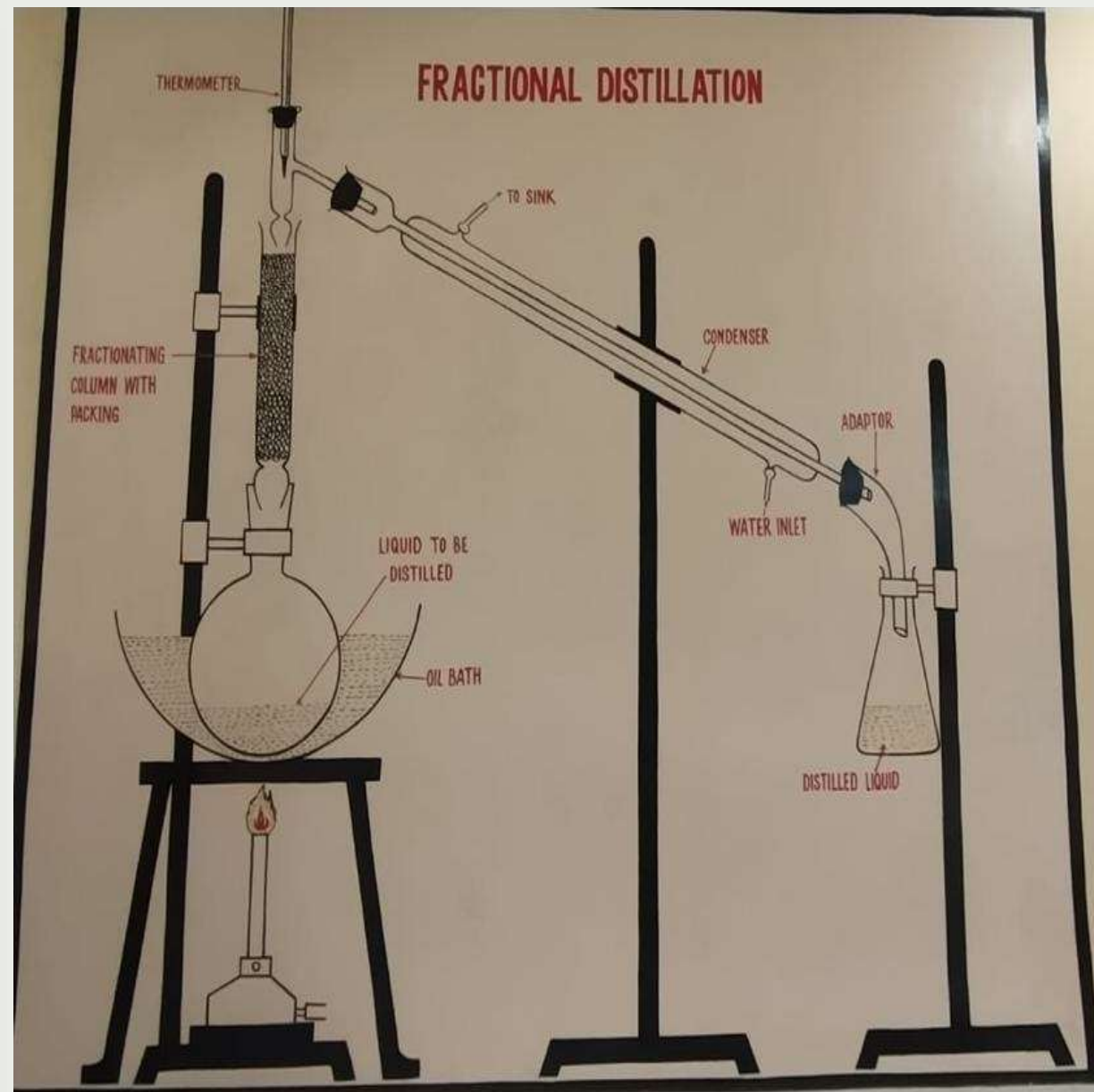
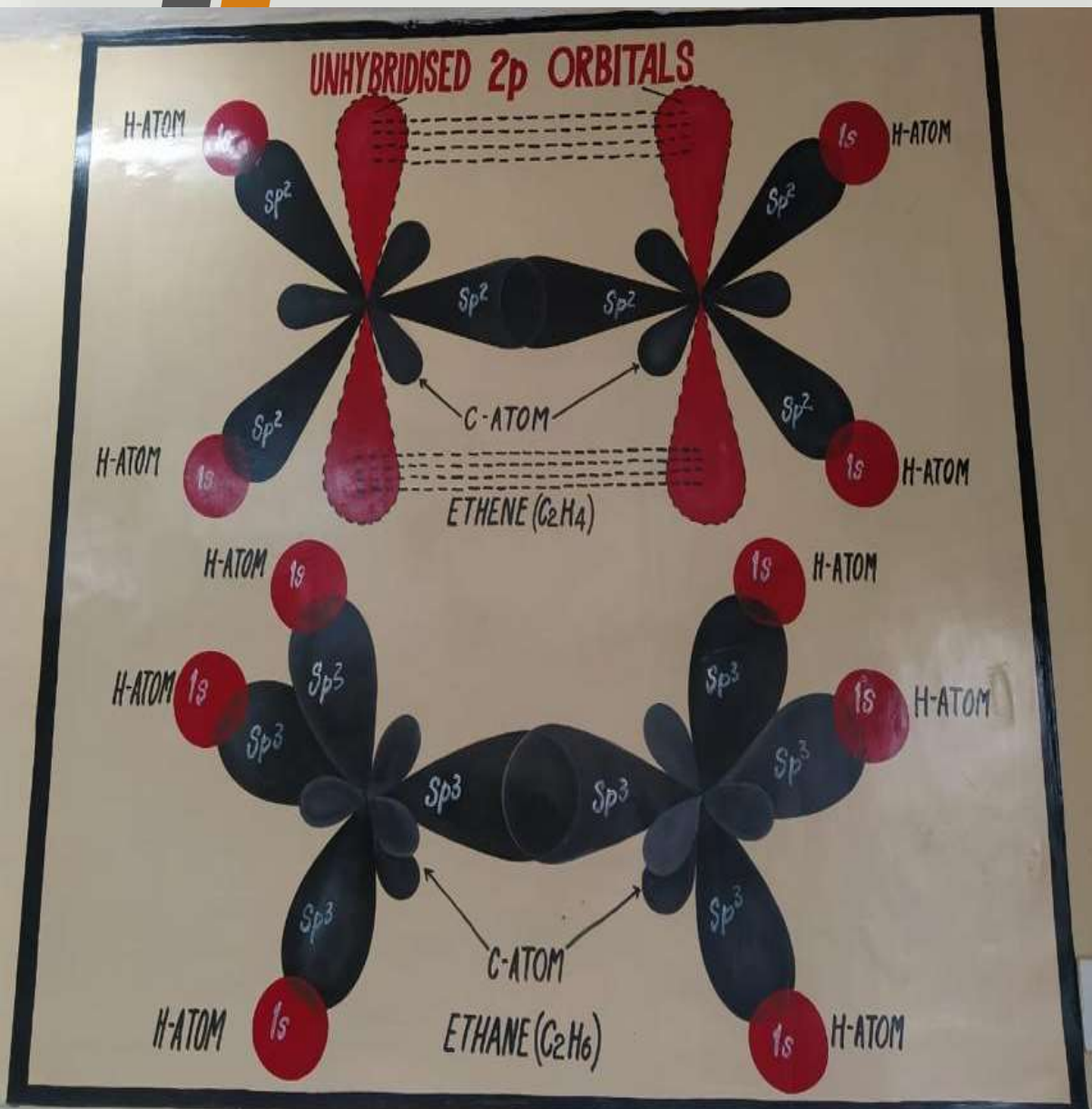


What do you see ???
Clue – red ball is Carbon and white lines are single covalent bonds



Structure of Graphite

BALA (Building as Learning Aid)



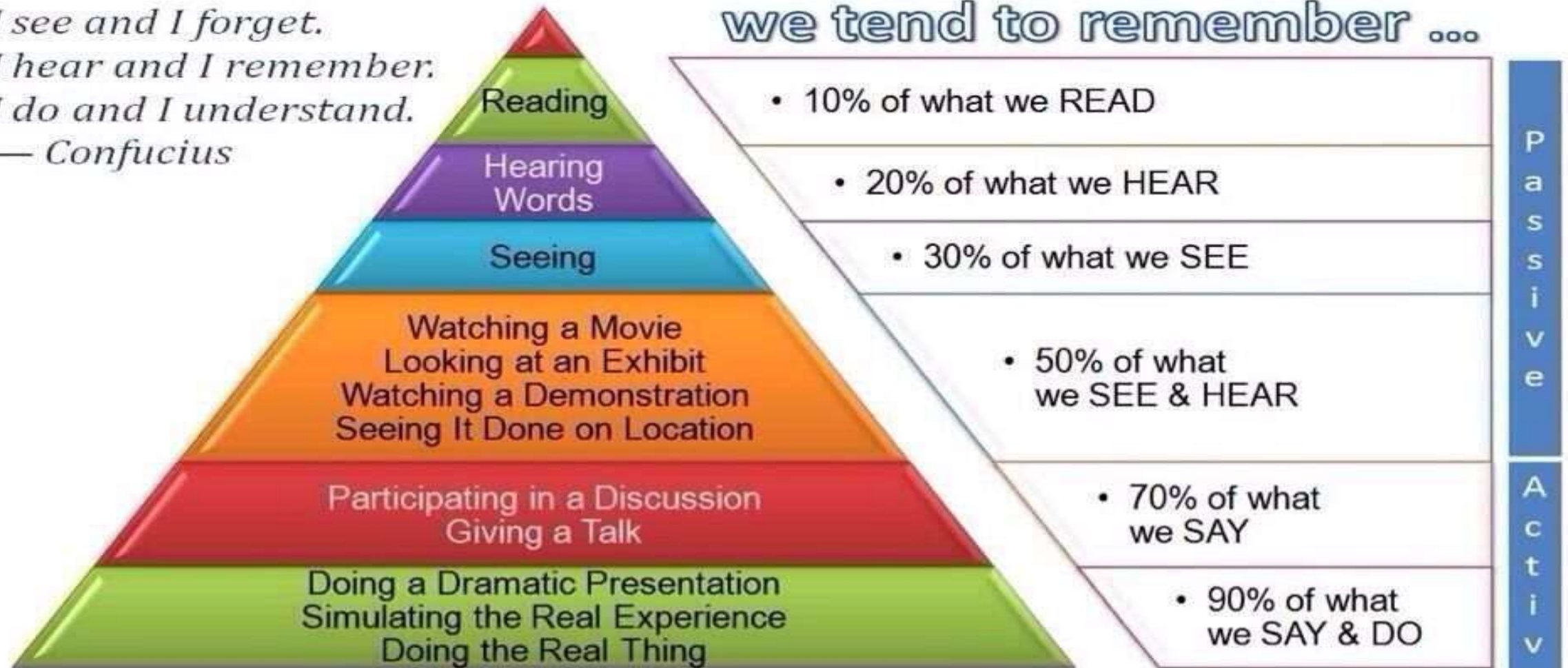


ASSESSMENT REFORMS

The Cone of Learning

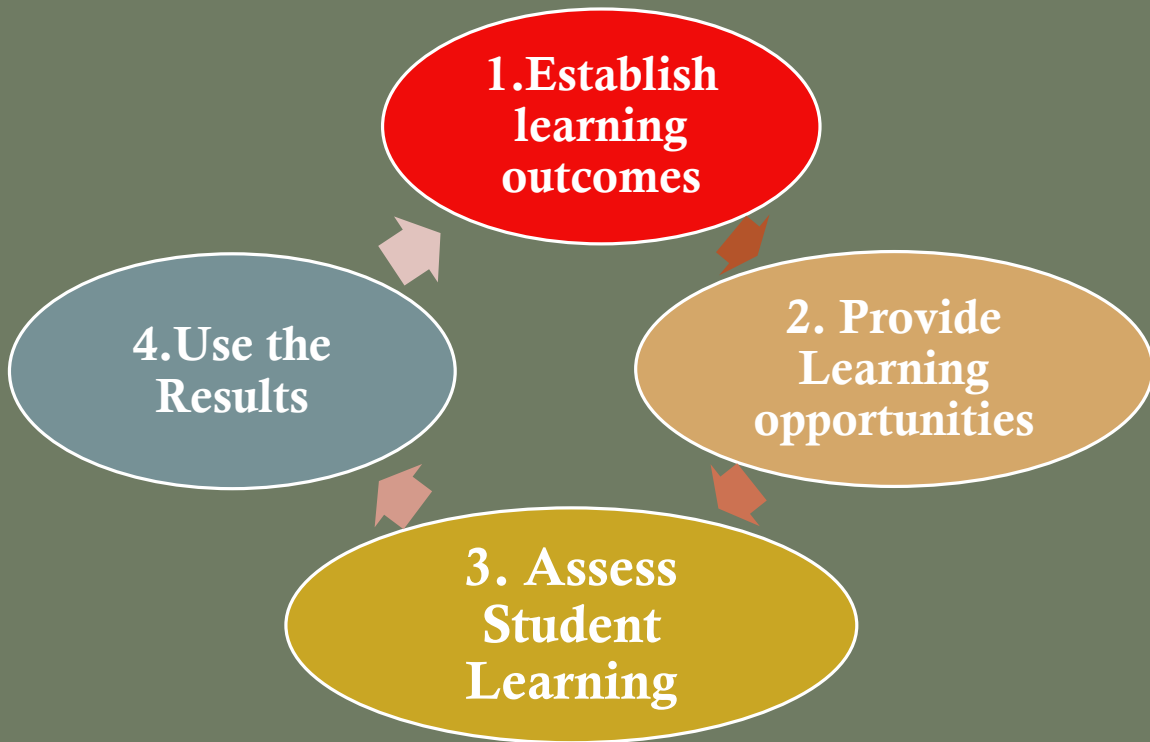
*I see and I forget.
I hear and I remember.
I do and I understand.*
— Confucius

After 2 weeks,
we tend to remember ...



Source: Edgar Dale (1969)

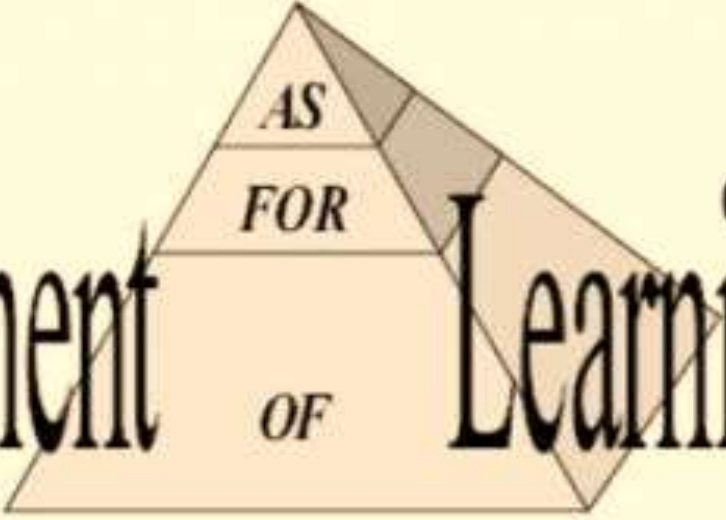
AIM OF ASSESSMENT



Primary Purpose of Assessment is to continuously revise teaching learning process to optimize learning and development of learners

Shift from summative and primarily rote memorization skill based testing to one that is-

- * Regular , continuous and formative
- * Competency-based
- * Tests higher order thinking like analysis , critical thinking, conceptual clarity & application of knowledge to real world problems,,,,,,,,,,,,,,,,,,,,,,,,,,,,,POLL

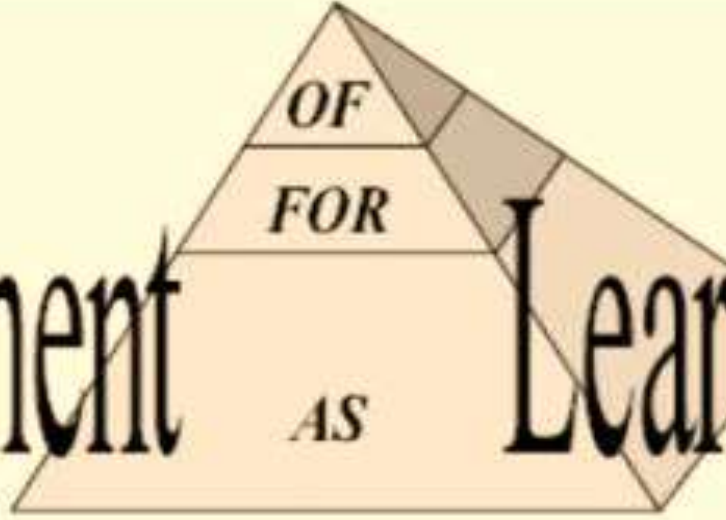


AS
FOR
OF

Assessment Learning

The diagram shows a pyramid divided into three horizontal sections. The top section is labeled 'AS', the middle section is labeled 'FOR', and the bottom section is labeled 'OF'. The words 'Assessment' and 'Learning' are written in a large, stylized font on either side of the pyramid.

Traditional Assessment Pyramid



OF
FOR
AS

Assessment Learning

The diagram shows a pyramid divided into three horizontal sections. The top section is labeled 'OF', the middle section is labeled 'FOR', and the bottom section is labeled 'AS'. The words 'Assessment' and 'Learning' are written in a large, stylized font on either side of the pyramid.

Reconfigured Assessment Pyramid



- **DOMAINS OF LEARNING TO BE ASSESSED**

- Cognitive
- Affective
- Psychomotor
- Holistic, 360-degree

- **TYPE OF ASSESSMENTS**

- Self-assessment
- Peer assessment
- Teacher assessment

- **PROGRESS OF THE LEARNER TO BE ASSESSED ON**

- Project-based and inquiry-based learning
- Quizzes
- Role plays
- Group work
- Portfolios etc



Visual-Spatial



Linguistic-Verbal



Interpersonal



Intrapersonal



Logical-Mathematical



Musical



Bodily-Kinesthetic



Naturalistic

Elements/Compounds/Mixtures

Type of Intelligence	Activities
Visual	Cartoon strip depicting dialogue between compound & mixture ,element & compound , cation & anion etc
Music	Songs on periodic table
Logical-mathematical	Crossword , design a crossword using https://www.armoredpenguin.com/crossword/ Or construct a Tarsia on the topic
Interpersonal	Loop card game
Kinesthetic	Model making for compounds, use Ball & stick or clay and matchsticks Puppets show between two entities

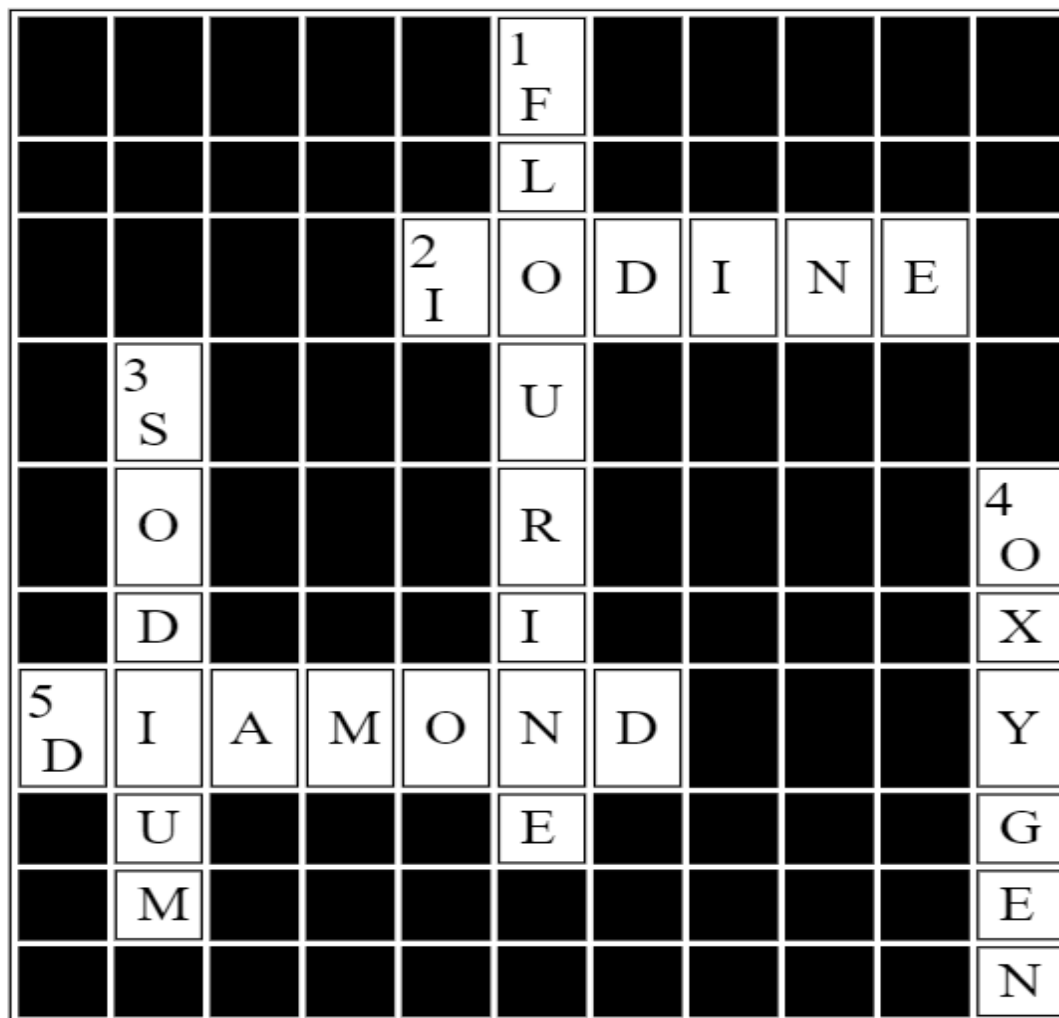
Cross word

Please enter your words and clues. Words without clues, and clues without words, are ignored. You need both for this program.

<https://www.armoredpenguin.com/crossword/>

Word	Clue
sodium	shiny soft metal that can be cut with a knife
oxygen	essential for Combustion
Diamond	Hardest natural substance known
Iodine	violet coloured gas
Flourine	Most electronegative element

<https://www.armoredpenguin.com/crossword/>



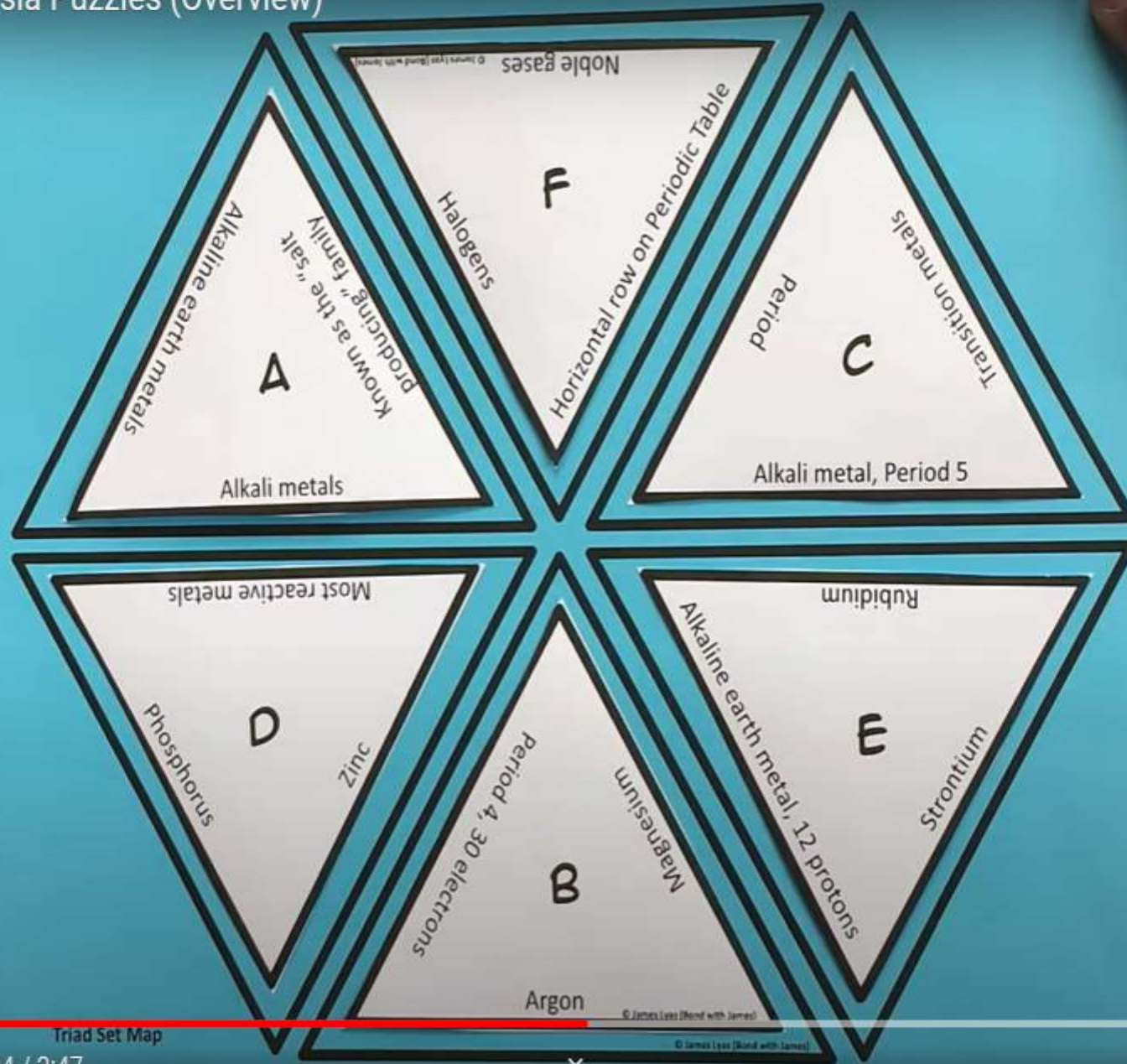
Across

- 2. violet coloured gas
- 5. Hardest natural substance known

Down

- 1. Most electronegative element
- 3. shiny soft metal that can be cut with a knife
- 4. essential for Combustion

Periodic Table Tarsia Puzzles (Overview)



TARSIA PUZZLE

Tarsia - [Tarsia1]

File Edit View Style Size Window Help

Presentation Content

\neq ab $\times \div$ \leftarrow \notin λ ρ β Ω || (=) $\frac{\text{=}}{\text{=}}$ \square Σ \int \int \int Π = = =

2moleHe

STAGE 1

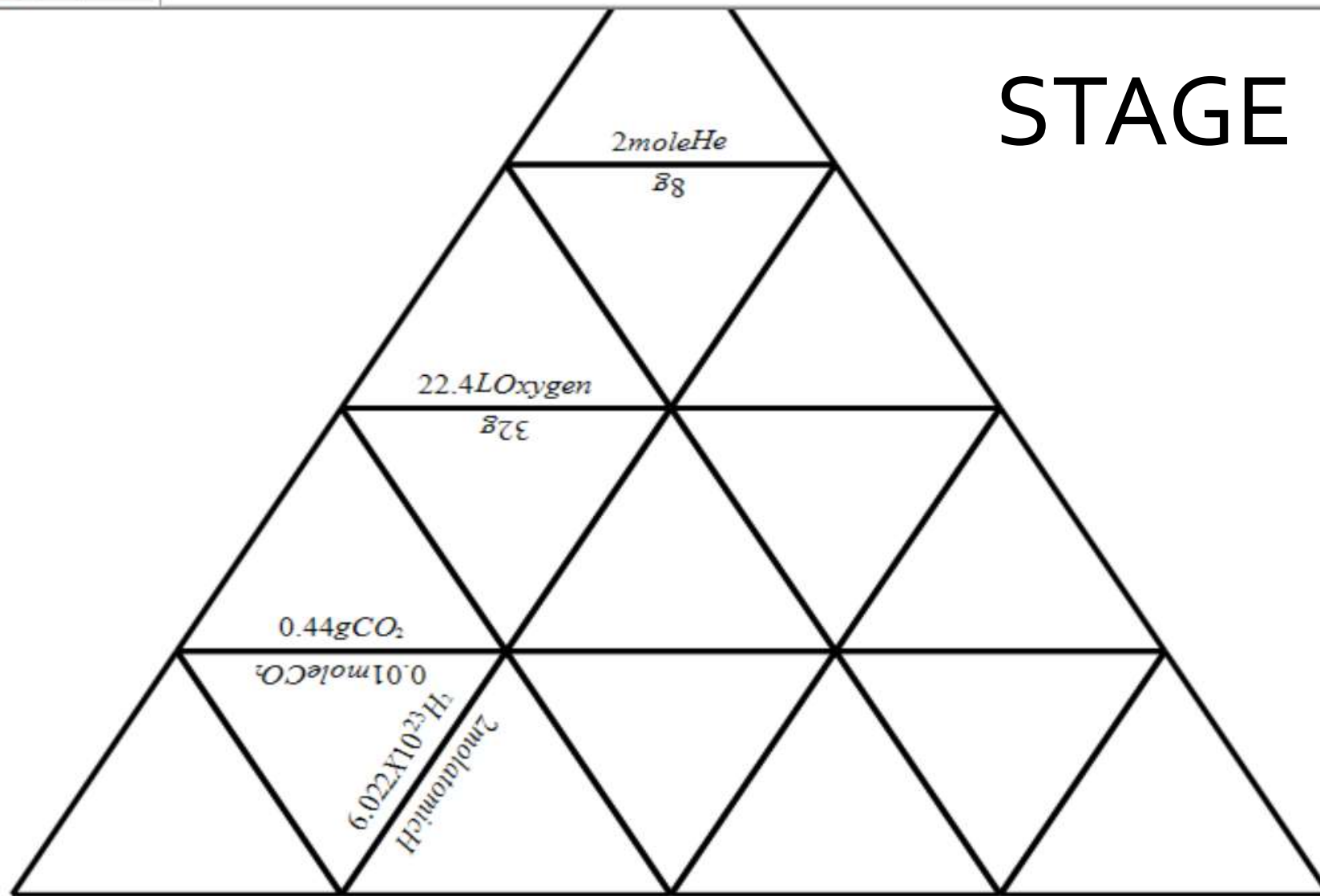
8g

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 Back

Input Table Output Solution Back Side



STAGE 2



Loop Cards

I₂ A noble gas filled in balloons

D A gaseous non metal violet in colour

N An element with
e = 1 n = 1 p = 1

O An element whose one mole weighs 14g

S The element essential for combustion

C An element whose allotrope is in crown shape

He Shiny metal that starts dancing when added to water


Na The most electronegative element of periodic element

F An acids commonly called 'King of Chemical'

**Concⁿ
H₂SO₄** An element whose allotrope is the hardest natural substance known

ANILINE- Benzene Diazoniumchloride

Type of Intelligence	Activities
Visual	Make a rangoli depicting structure of Aniline
Linguistic	Aniline has been declared the "winner of the Benzene derivative family" after knocking out chlorobenzene , nitrobenzene , Benzaldehyde , benzoic acid and Acetophenone. Aniline is now being interviewed at the Republic channel by Mr Arunab Goswani. Write the interview
Kinesthetic/ Interpersonal	Do the Role play of the Talk show for the above
Logical Mathematical	Organise the following entities in form of a concept map. Benzene diazonium chloride, chlorobenzene . Iodobenzene...



CHOICE BOARDS

TIC- TAC- TOE

VISUAL-SPATIAL

Draw the anomers of glucose to show its existence in cyclic structure and inability to show some of its chemical reactions.

LINGUISTIC

Write a notice for the missing Glucose molecule in about 50 words.

LOGICAL MATHEMATICAL

Calculate the number of aldehydic group, ketonic group and hydroxyl group by drawing the structure of glucose and fructose.

INTERPERSONAL

Make a team of two, one will play the role of glucose and other will acts as fructose and will discuss the difference between two in terms of structures and chemical properties.

INTRAPERSONAL

Make a two sided brochure on Glucose highlighting its structural determination, anomers and how it differs from fructose.

EXISTENTIAL

Make a project report on what happens when glucose breakdown in the absence of oxygen in human body and what are its effect.

SPATIAL

Using Tinkercad, draw the structure of glucose and fructose.

BODILY KINESTHETIC

Using matchsticks and coloured balls/rangoli colours or any other craft material as bonds and atom, represent the alpha and beta glucose on a sheet of paper.

MUSICAL

Compose a song for different steps involved in structural determination of glucose/ difference in the structure and chemical properties of glucose and fructose



**NEP IS NOT A POLICY
BUT A MISSION**



THANK YOU