Differentiated Classroom for STEM teachers

D.UTHRA

ASSOCIATED PROF. & HEAD

DEPARTMENT OF PHYSICS

DWARAKA DOSS GOVERDHAN DOSS VAISHNAV COLLEGE

ARUMBAKKAM, CHENNAI

11, August, 2021

Take a Moment, Please….Answer yourself…

Activity 1

- Have you removed possible stumbling blocks in each part of the lesson?
- Are all/ most of the students engaged? % please
- Are there any barriers to learning for the slow learners in your class? What about the high achievers?
- Will active kinaesthetic learners feel stifled or excited by your lesson?

- Do Tamil / Tamil/ Telugu …medium learners have the tools to understand and meet your expectations?
- Are gifted students bored?
- Could every student describe what they have learned in some way?
- Are your learning goals intact for **each student**?
- Am I moving towards CAS format that will come after five years?
- Is my teaching path as per NEP ?

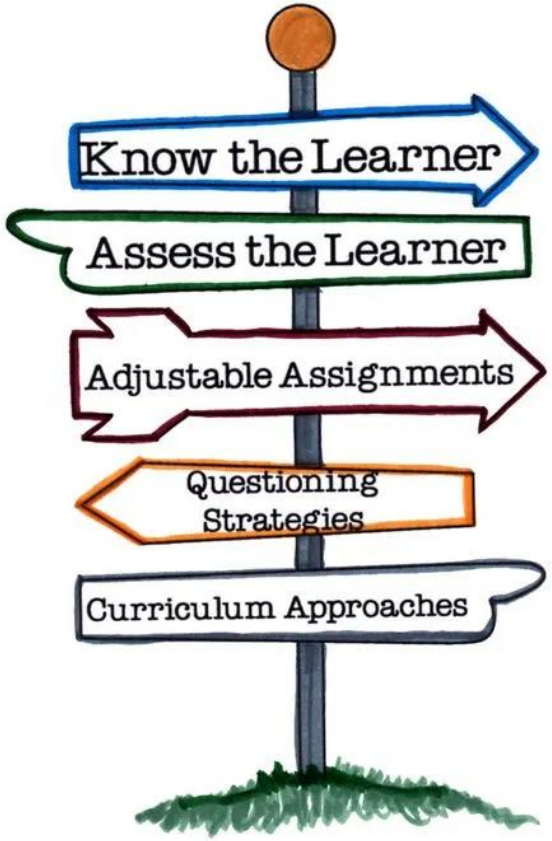
- OBE- Outcome based Education questionnaire?

- This session is all about making us do whatever we have been passionately doing, **but with a twist…**

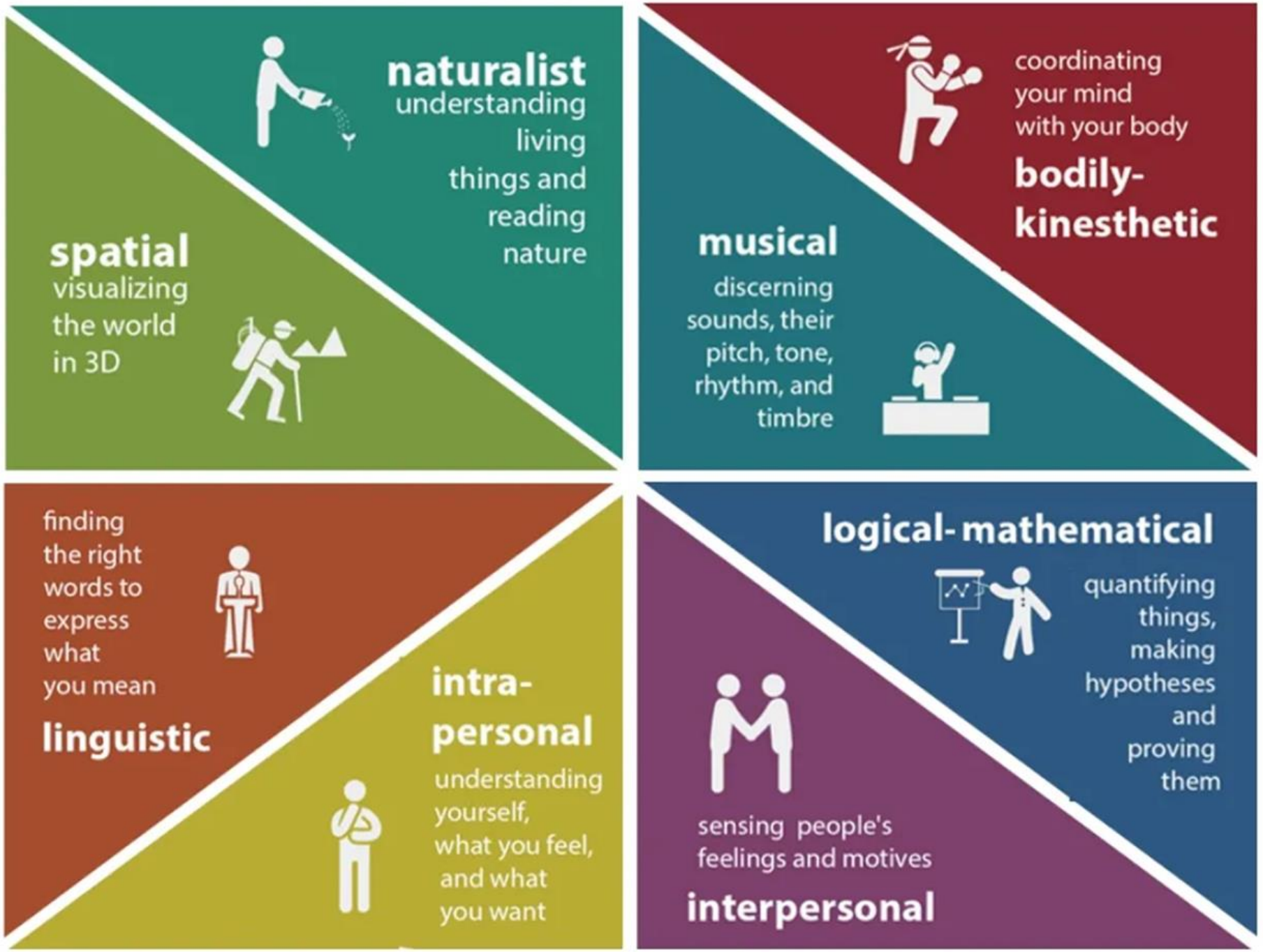
Come…
Let US

LEARN
UNLEARN
RELEARN

What is Differentiation?



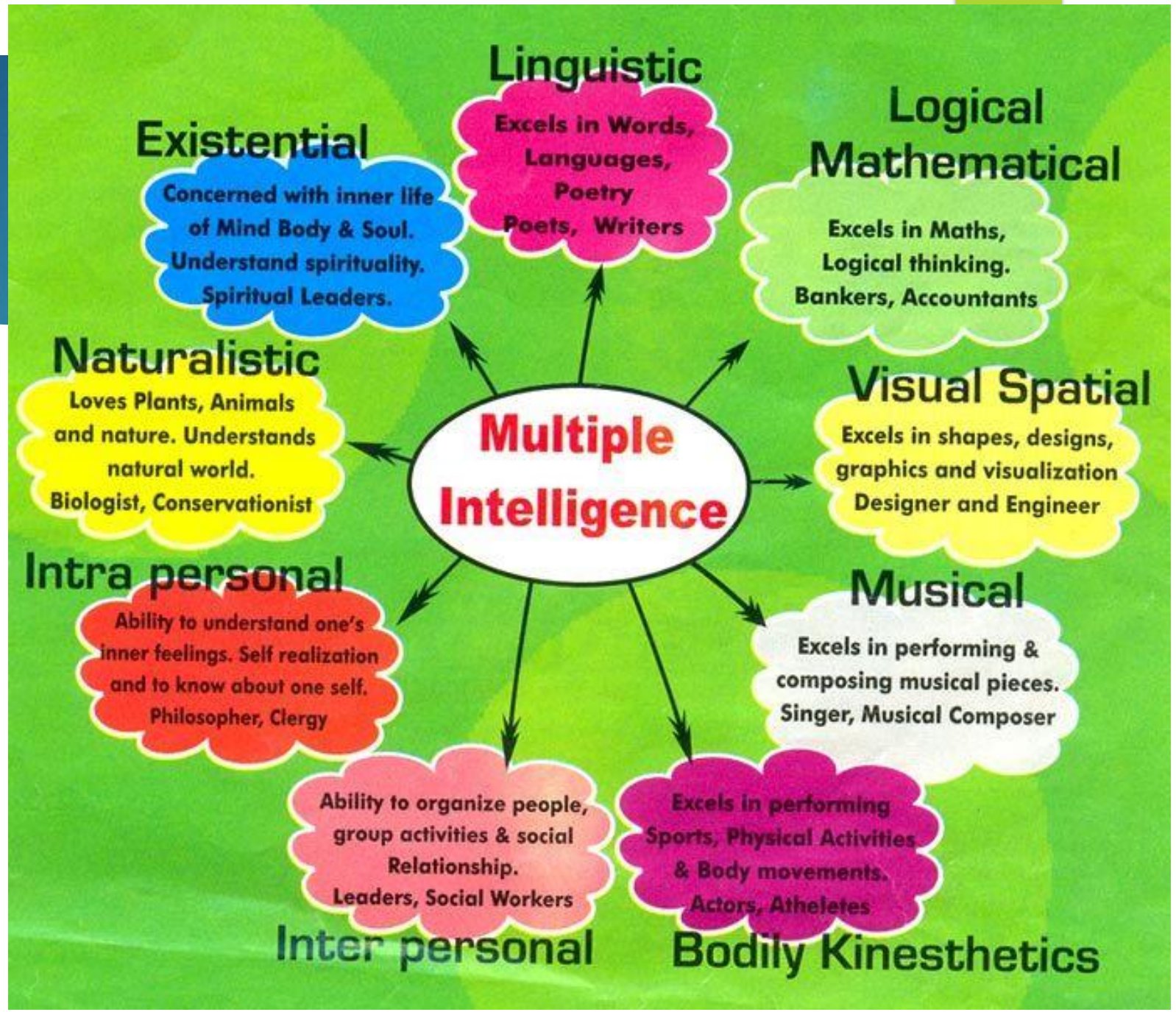
Differentiation is utilizing different approaches to what students learn, how they learn it, and how they demonstrate what they have learned. Approaches are built into the lessons giving students voice and choice in their learning

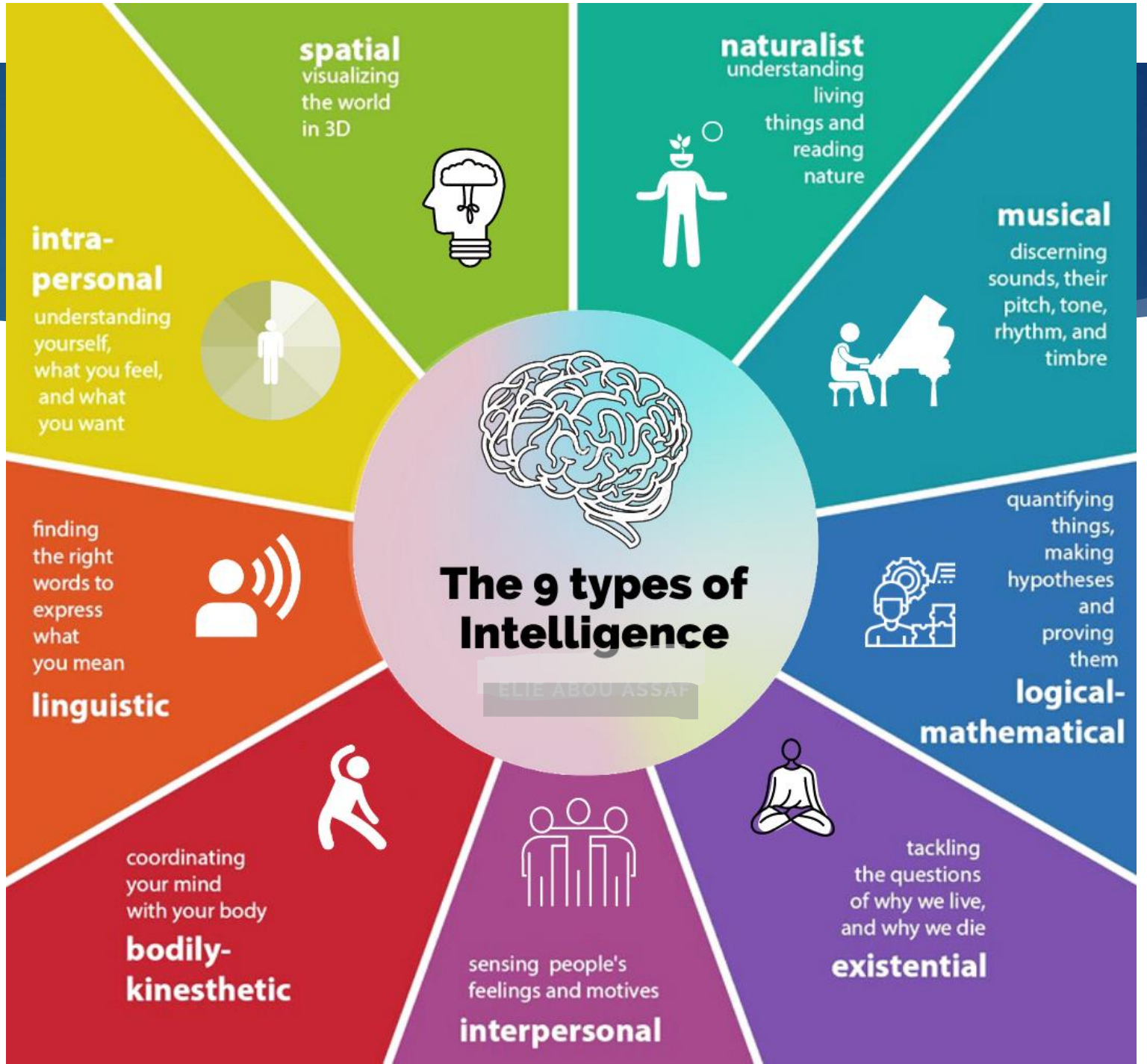

naturalist
understanding living things and reading nature
spatial
visualizing the world in 3D
coordinating your mind with your body
bodily-kinesthetic
musical
discerning sounds, their pitch, tone, rhythm, and timbre
finding the right words to express what you mean
linguistic
intra-personal
understanding yourself, what you feel, and what you want
logical-mathematical
quantifying things, making hypotheses and proving them
sensing people's feelings and motives
interpersonal

But Why?

Note Down

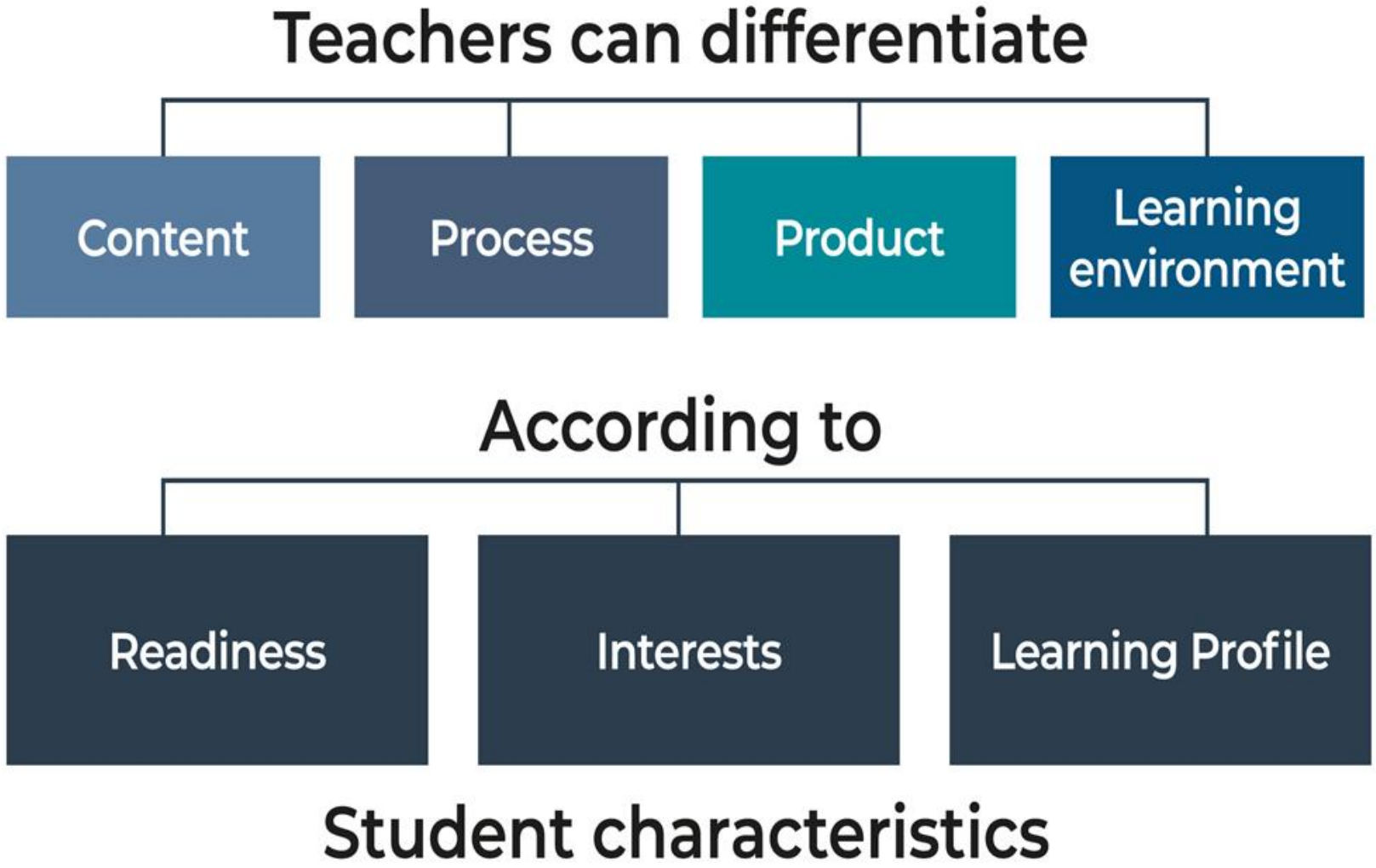
Howard Gardner's Multiple Intelligence




spatial
visualizing the world in 3D
naturalist
understanding living things and reading nature
musical
discerning sounds, their pitch, tone, rhythm, and timbre
intra-personal
understanding yourself, what you feel, and what you want
The 9 types of Intelligence
finding the right words to express what you mean
linguistic
quantifying things, making hypotheses and proving them
logical-mathematical
coordinating your mind with your body
bodily-kinesthetic
sensing people's feelings and motives
interpersonal
tackling the questions of why we live, and why we die
existential

Activity 3

Can you think of your students and can you try to categorise them in multiple ways?


Teachers can differentiate
Content
Process
Product
Learning environment
According to
Readiness
Interests
Learning Profile
Student characteristics

Content

Examples of differentiating content:

1. Using reading materials at varying readability levels;
2. Putting text materials on tape; Audi books, PPTs
3. Using spelling or vocabulary lists at readiness levels of students;
4. Presenting ideas through both auditory and visual means;
5. Using reading buddies; and
6. Meeting with small groups to re-teach an idea or skill for struggling learners, or to extend the thinking or skills of advanced learners.

- **Helping the students to assess their own level – New gen teachers**

- **Peer reviews help**
- **Teach Introspection where they need to go back- class 8, 9,10 is OK, I Repeat this always, even as teachers**

Most of us already do – different textbooks, notes at different levels

videos, Animations, gifs- STEM films biopics

Process

Examples of differentiating process:

1. Using tiered activities;
2. Providing interest centers;
3. Developing personal agendas (task lists written by the teacher and containing both in-common work for the whole class and work that addresses individual needs of learners);
4. Offering manipulatives or other hands-on supports; and
5. Varying the length of time a student may take to complete a task.

CIA/FA don't help, instead go for Microsoft courses, TRY LEARN – Tier is a lot of work for us, but, GREAT

NAAC- Learner Centric- Needs TRUST- takes time- Mentoring helps -

EXAMPLES

My REQUEST- IT is OK To have our OWN speeds- RESPECT – We need to believe, Practice, and then try- Leave Insecurity- Concessions – Believe – Story of a topper who lost memory!

Product

Examples of differentiating product:

1. Giving students options of how to express required learning;
2. Using rubrics that match and extend students' varied skills levels;
3. Allowing students to work alone or in small groups on their products; and
4. Encouraging students to create their own product assignments as long as the assignments contain required elements.

First Things, First

- It will be overwhelming to create a rubric for every assignment in a class at once, so start by creating one rubric for one assignment. See how it goes and develop more from there!
- Do not reinvent the wheel. Rubric templates and examples exist all over the Internet, or simply ask colleagues if they have developed rubrics for similar assignments.

Fast Facts: Getting Started with Rubrics

Why You Should Consider Rubrics

Rubrics help instructors:

- Provide students with feedback that is clear, directed and focused on ways to improve learning.
- Demystify assignment expectations so students can focus on the work instead of guessing "what the teacher wants."
- Adapt your approach to teaching aspects of a course based on thematic gaps in student learning that are easily identified by reviewing rubrics across a class.
- Develop consistency in how you evaluate student learning across students and throughout a class.
- Reduce time spent on grading; Increase time spent on teaching.

Rubrics help students:

- Focus their efforts on completing assignments in line with clearly set expectations.
- Self and Peer-reflect on their learning, making informed changes to achieve the desired learning level.

Lets go for a trip to Berkeley
https://teaching.berkeley.edu/resources/improve/evaluate-course-level-learning/rubrics

https://teaching.berkeley.edu/news/know-your-teaching-patterns-sometimes-simple-changes-have-biggest-impact

Learning Environment

Examples of differentiating learning environment:

1. Making sure there are places in the room to work quietly and without distraction, as well as places that invite student collaboration;
2. Providing materials that reflect a variety of cultures and home settings;
3. Setting out clear guidelines for independent work that matches individual needs; Labs gives us opportunities
4. Developing routines that allow students to get help when teachers are busy and cannot help them immediately; and
5. Helping students understand that some learners need to move around to learn, while others do better sitting quietly

SEP

Learning Environment

Caring the disadvantaged students sufficiently

Discovery-based Learning

Simplified Curriculum; fun & activities aplenty

L I F E Skills

Special focus on sports & games, all-around Health

Machine Learning, AI, Smart Apps, Computational skills development

Scientifc temper

Knowing India

Nurturing gifted kids; supporting special skills

Vocational Training

Multidisciplinary, holistic learning

Peer-tutoring

Role models

Teachers can differentiate
content
process
product
according to the student's
readiness
interests
learning profile
to increase
growth
motivation
efficiency
Differentiated Instruction

Ensuring INCLUSIVE and Equal Opportunity to All

MHRD | Government of India
Ministry of Human Resource Development

Ensuring Universal Access to Education at all levels

Tel.: +41.22.555.06.00
Fax: +41.22.555.06.46
Email

Curriculum differentiation

The process of modifying or adapting the curriculum according to the different ability levels of the learners in the classroom. It is a strategy that teachers can use with a view to providing meaningful learning experiences for all learners. Differentiation takes account of learner differences and matches curriculum content and teaching and assessment methods to learning styles and learner needs and characteristics. It may focus on input, task, outcome, output, response, resources or support. (Source: UNESCO 2004b).

Book navigation

- GEQAF
- Glossary of Curriculum Terminology
  - Introduction
  - A
  - B

What Differentiation Is

- Student centered
- For all students
- For heterogeneous groups
- A change in philosophy about how learning should take place
- Multiple approaches or options for content, process, and product
- A mix of whole-class, group, and independent learning
- More about quality than quantity

What Differentiation Is

- Flexible and varied
- Proactive in the planning stage
- Rooted in assessment
- Based on continual reflection and adjustment to help students learn well
- A belief system that says all learners come to the classroom with potential ready to be accessed

Traditional Classroom vs. Differentiated Classroom

TRADITIONAL

- Differences are acted upon when problematic.
- Assessment is most common at the end of learning to see "who got it"
- A relatively narrow sense of intelligence prevails
- Coverage of curriculum guides drives instruction
- Whole class instruction dominates
- A single text prevails

DIFFERENTIATED

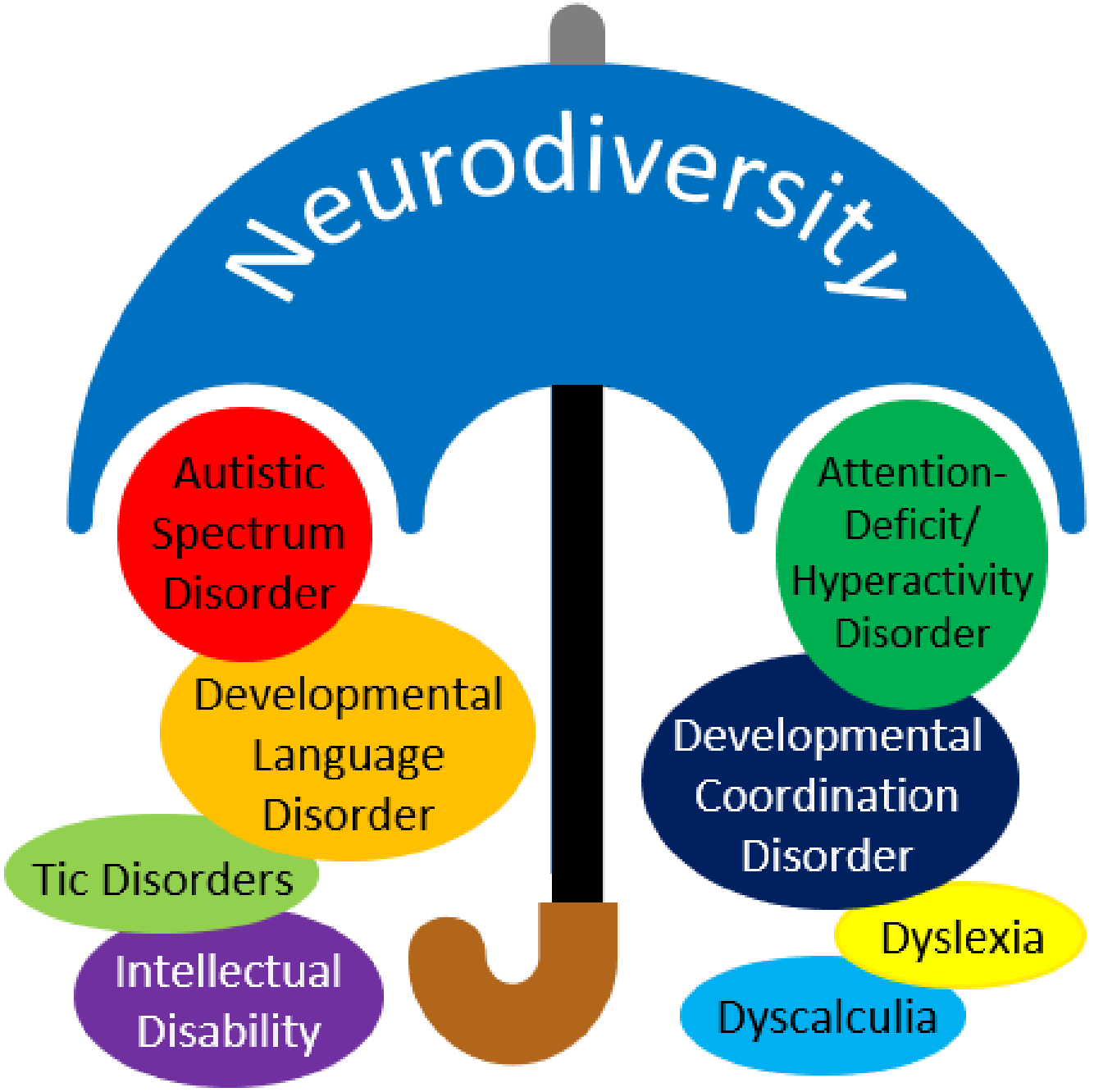
- Differences are studied as a basis for planning.
- Assessment is on-going and diagnostic to to make instruction more responsive to learner needs
- Focus on multiple forms of intelligences is evident
- Student readiness, interest, and learning profile shape instruction
- Many instructional arrangements are used
- Multiple materials are provided

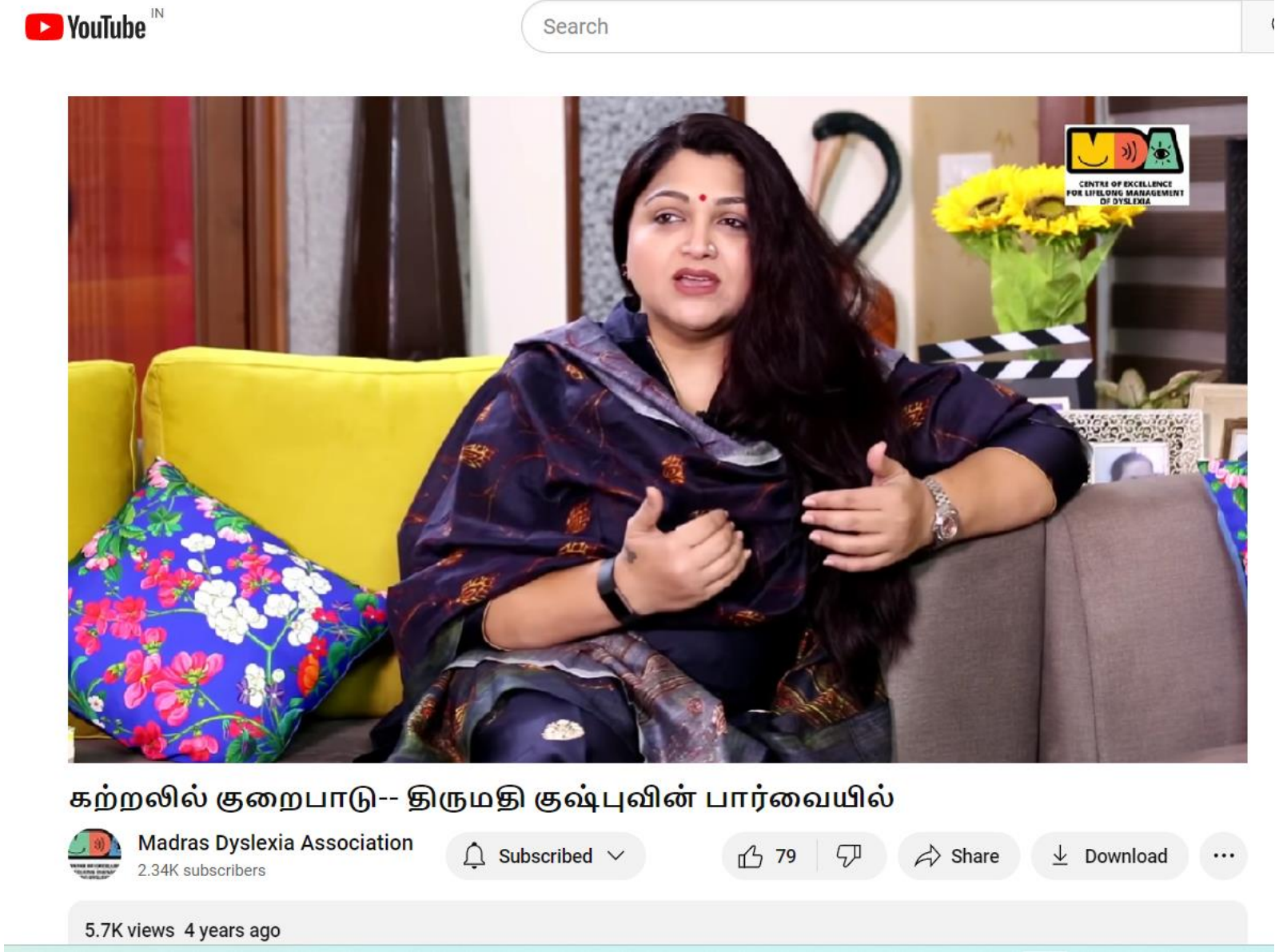
Adapted from "The Differentiated Classroom: Responding to the Needs of All Learners," by Carol Ann Tomlinson, 1999, p.16

Assessment – alternate not lower !

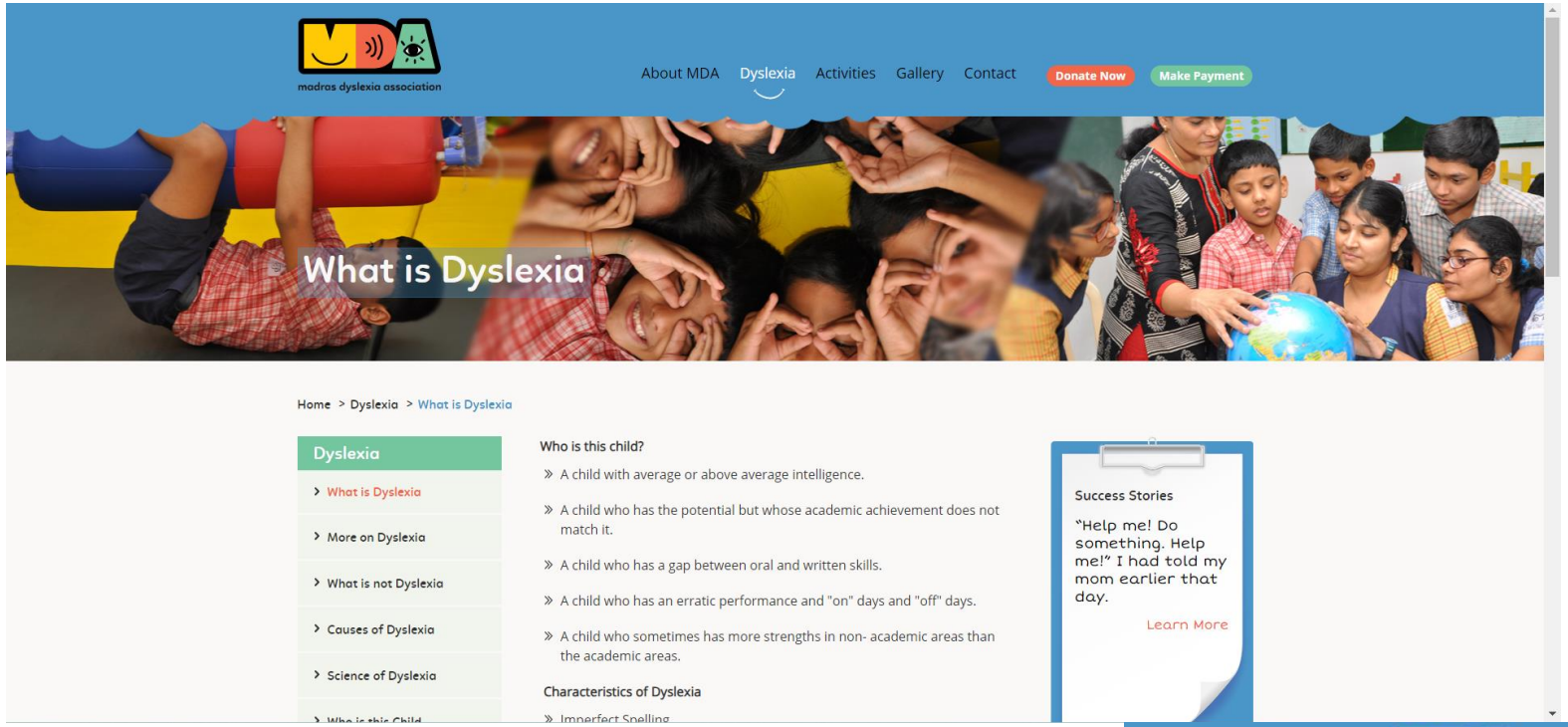
- Always consider alternative forms of assessment where necessary.
- Standards are not expected to be lowered to accommodate students with a disability but rather are required to give them a reasonable opportunity to demonstrate what they have learnt.

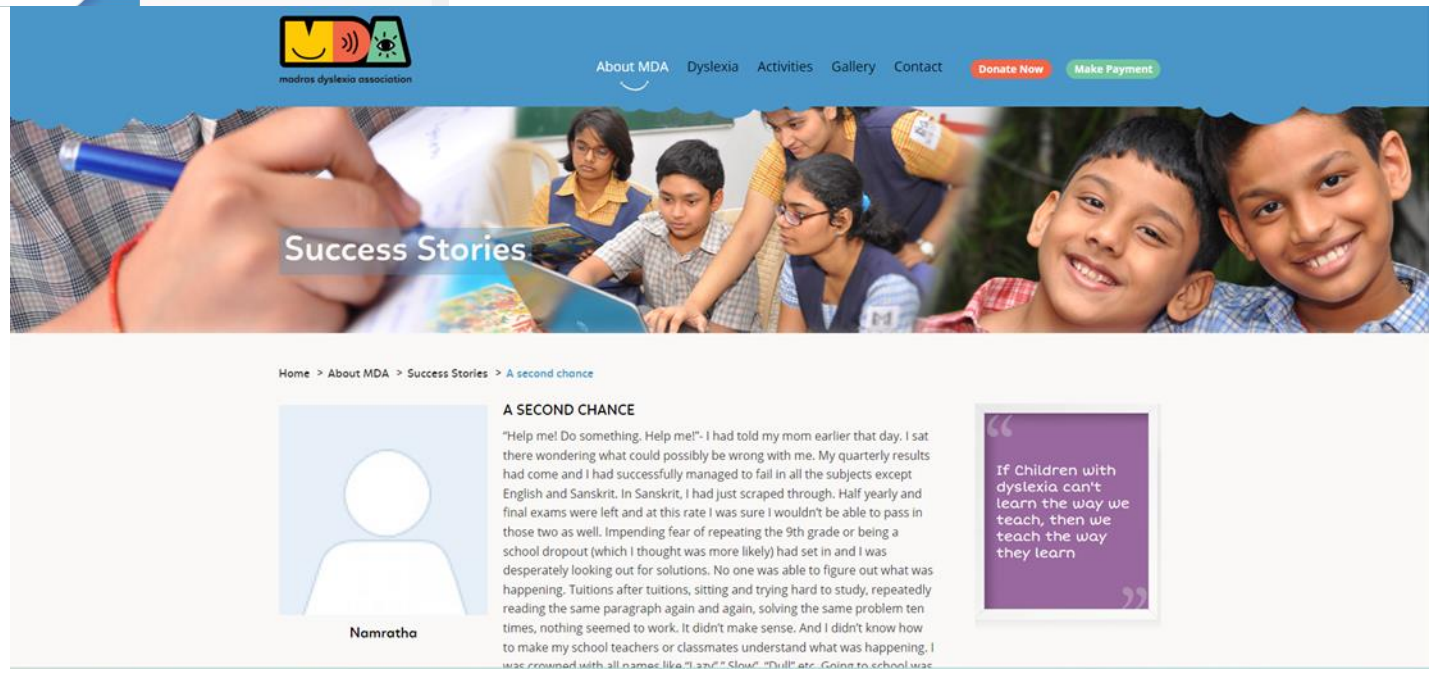
- Once you have a clear picture of how the disability impacts on learning, you can consider alternative assessment strategies.


Neurodiversity
Autistic Spectrum Disorder
Developmental Language Disorder
Tic Disorders
Intellectual Disability
Attention-Deficit/ Hyperactivity Disorder
Developmental Coordination Disorder
Dyslexia
Dyscalculia



Activity 6 watch https://www.youtube.com/watch?v=LfNkV2xt41A


madras dyslexia association
About MDA
Dyslexia
Activities
Gallery
Contact
Donate Now
Make Payment
What is Dyslexia
Home > Dyslexia > What is Dyslexia
Dyslexia
What is Dyslexia
More on Dyslexia
What is not Dyslexia
Causes of Dyslexia
Science of Dyslexia
Who is this child?
A child with average or above average intelligence.
A child who has the potential but whose academic achievement does not match it.
A child who has a gap between oral and written skills.
A child who has an erratic performance and "on" days and "off" days.
A child who sometimes has more strengths in non- academic areas than the academic areas.
Characteristics of Dyslexia
Success Stories
"Help me! Do something. Help me!" I had told my mom earlier that day.
Learn More


madras dyslexia association
About MDA
Dyslexia
Activities
Gallery
Contact
Donate Now
Make Payment
Success Stories
Home > About MDA > Success Stories > A second chance
A SECOND CHANCE
"Help me! Do something. Help me!"- I had told my mom earlier that day. I sat there wondering what could possibly be wrong with me. My quarterly results had come and I had successfully managed to fail in all the subjects except English and Sanskrit. In Sanskrit, I had just scraped through. Half yearly and final exams were left and at this rate I was sure I wouldn't be able to pass in those two as well. Impending fear of repeating the 9th grade or being a school dropout (which I thought was more likely) had set in and I was desperately looking out for solutions. No one was able to figure out what was happening. Tuitions after tuitions, sitting and trying hard to study, repeatedly reading the same paragraph again and again, solving the same problem ten times, nothing seemed to work. It didn't make sense. And I didn't know how to make my school teachers or classmates understand what was happening. I
Namratha
If Children with dyslexia can't learn the way we teach, then we teach the way they learn

Am convinced …

Accommodations

- Accommodations are changes in the learning environment which provide students access to their learning. These are individual ways content or instructions needs to be presented to a student in order to provide equitable and inclusive access to instruction. The overall goal of accommodations is for every individual to learn to access the content independently. Accommodations may include text to speech technology, such as Immersive Reader; speech to text using Dictation, and access to a screen reader such as Narrator.
- *Immersive Reader and Read Aloud* - check materials such as websites to make sure they are compatible with the Immersive Reader
- *Screen reading software such as Narrator* - check that a screen reader will be able to navigate the content
- *Screen magnification* - understand what students will see and assess that it is useable
- *Speech to text* - practice dictating in the document that will be sent to students

Accomodations – SCERT Teachers

- **Reading and Writing**

- Immersive Reader
- Dictation
- Office Lens
- Word Prediction
- Translation
- Narrator
- Magnifier

Differential learning resources

- Can IIT jam books be a resource ? Y
- Differential class rooms- Vigyan Pratibha examples- sensitive to vocabulary, social strata, place – multilinguistic
- Examples from UNESCO book
- Rajendran Tamarapura
- What did u learn in school today – Kamal mukundComics- energytique-
- Elephant story
- Animal story

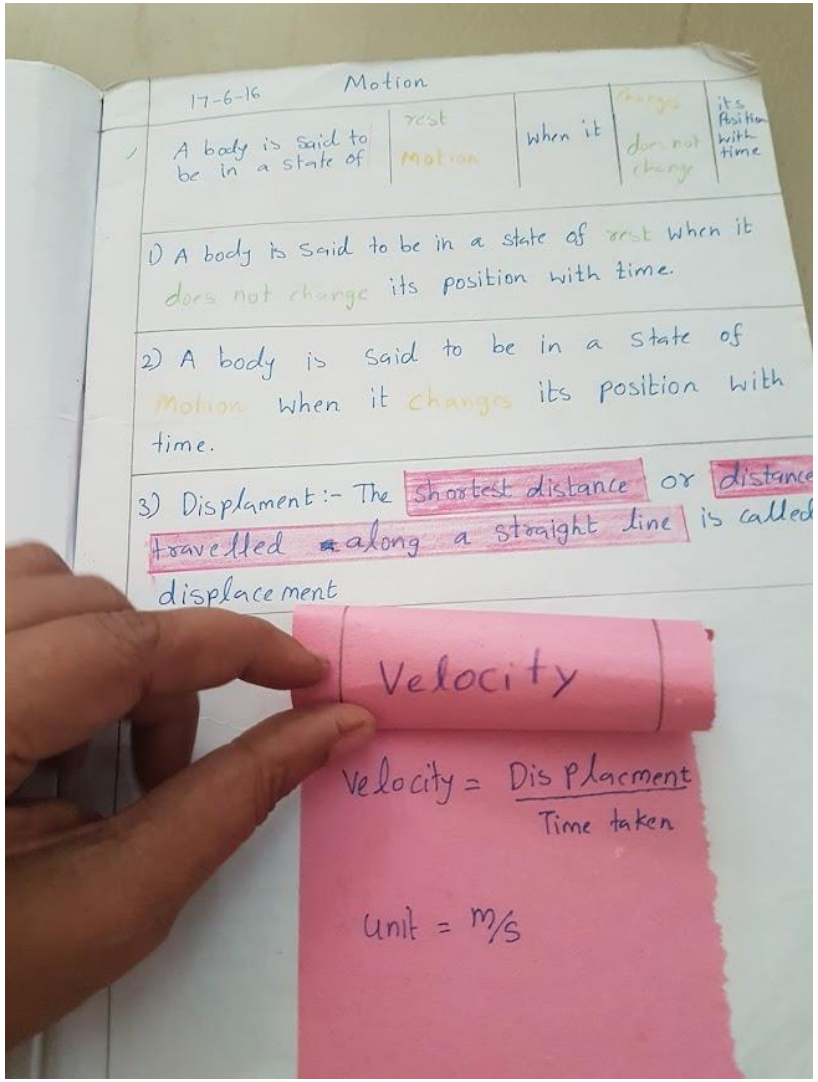
Lets find out where we can learn ?
ACTIVITY 7

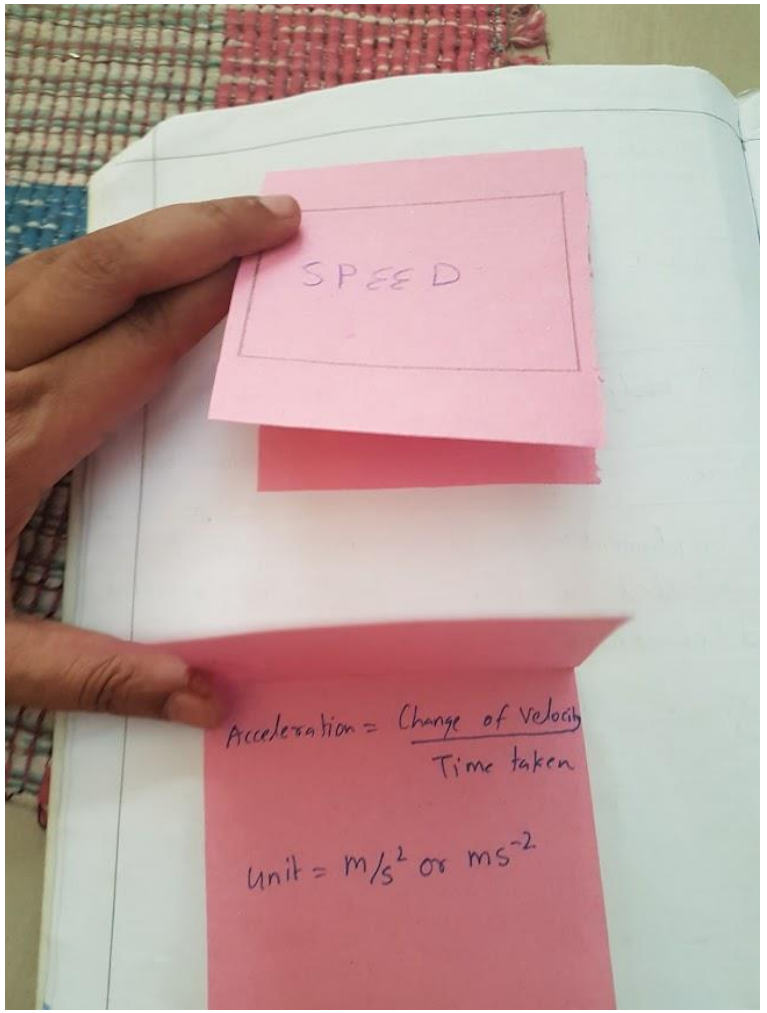
- Microsoft Innovative Educator Platform
- Leaning Paths
- Search – based on age, class, subject…higher education, INCLUSIVE, For ALL
- Come on, Lets Try ☺

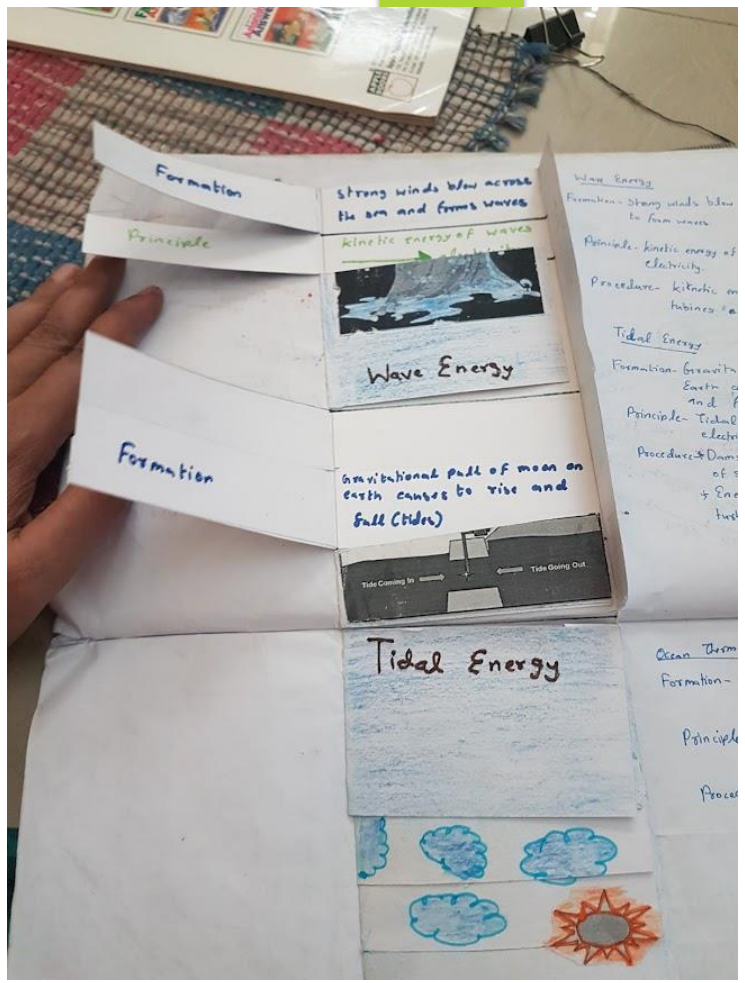
- https://education.microsoft.com/en-us/resource/1703c312

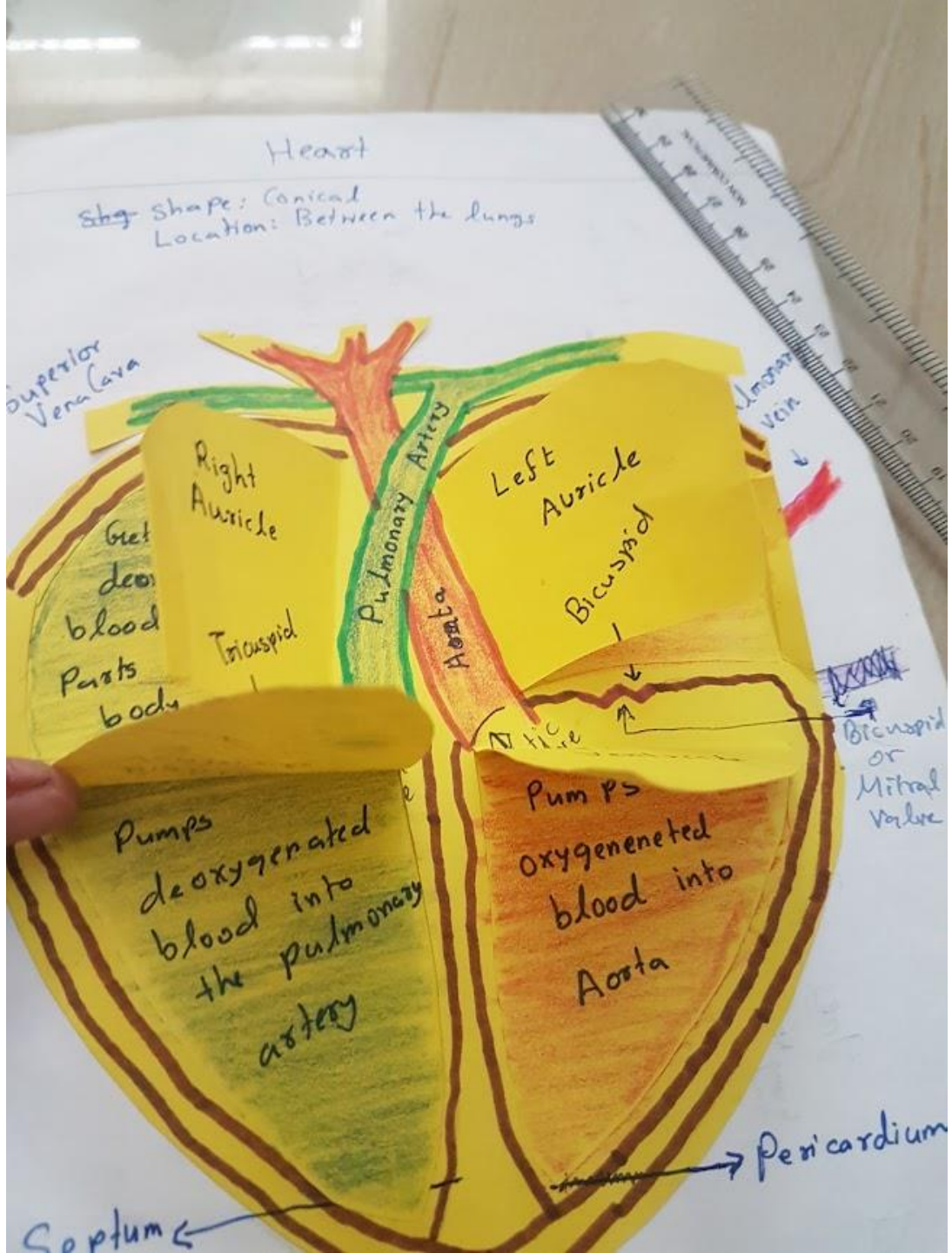
CAN Your Instruction be Differentiated?
Take a Moment, Please…. ACTIVITY 8

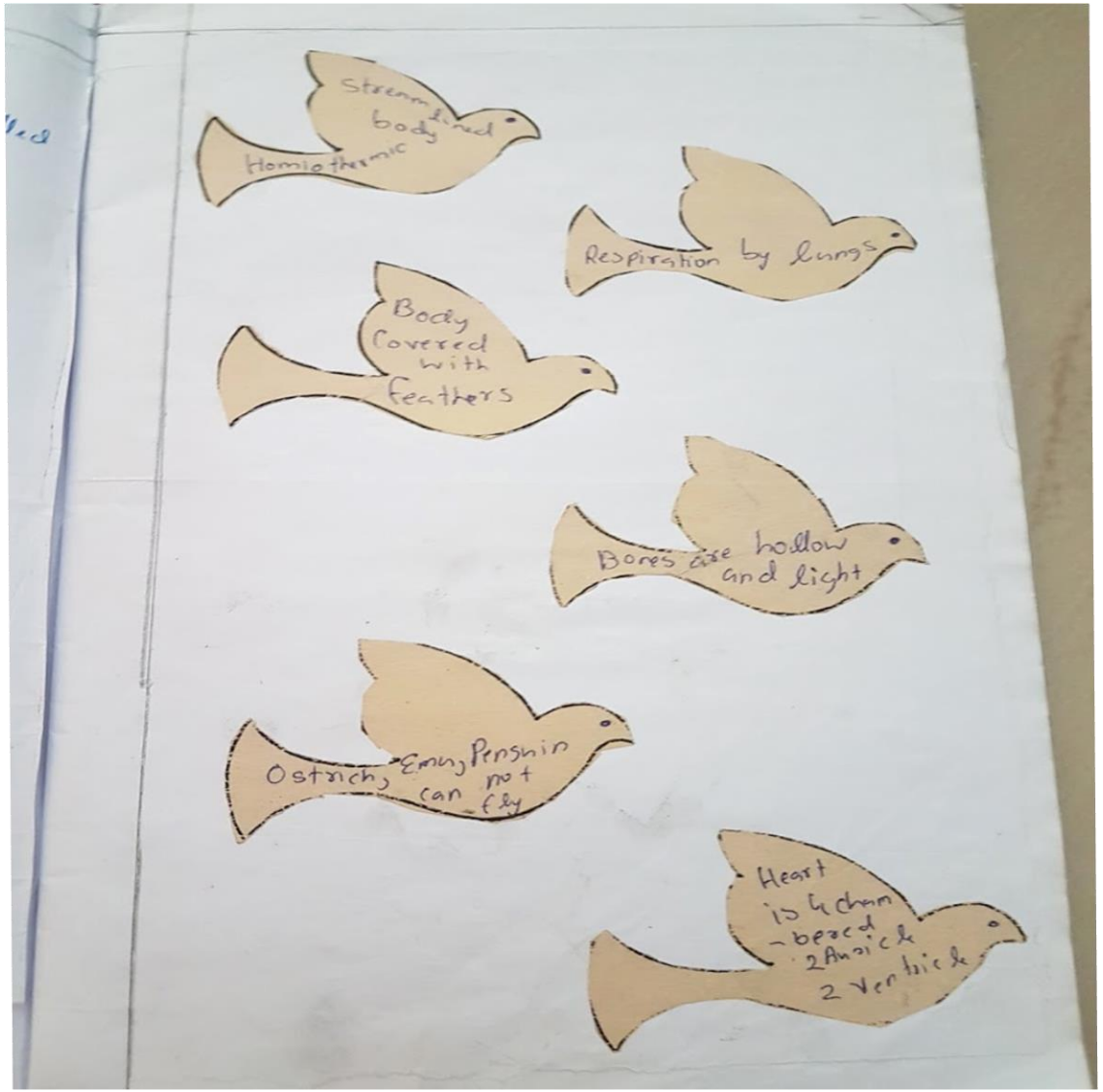
- Do you think you are creative enough to remove possible stumbling blocks in each part of the lesson?
- Do you think you can find out if all students are engaged?
- Can you find if your learning goals intact for each student?
- Are there any barriers to learning for the lowest readers in your class? What about the highest readers? – Do you think YOU CAN Spot
- Can u make your class comfortable for kinesthetic learners?
- Tamil/ Hindi, Telugu… medium learners – is it possible somewhere after five years atleast that you will be able to find tools to help and meet your expectations
- gifted students – will you be able to help them or **help them to seek help**
- Some day, everyday, will every student be able to describe what they have learned **in some way**

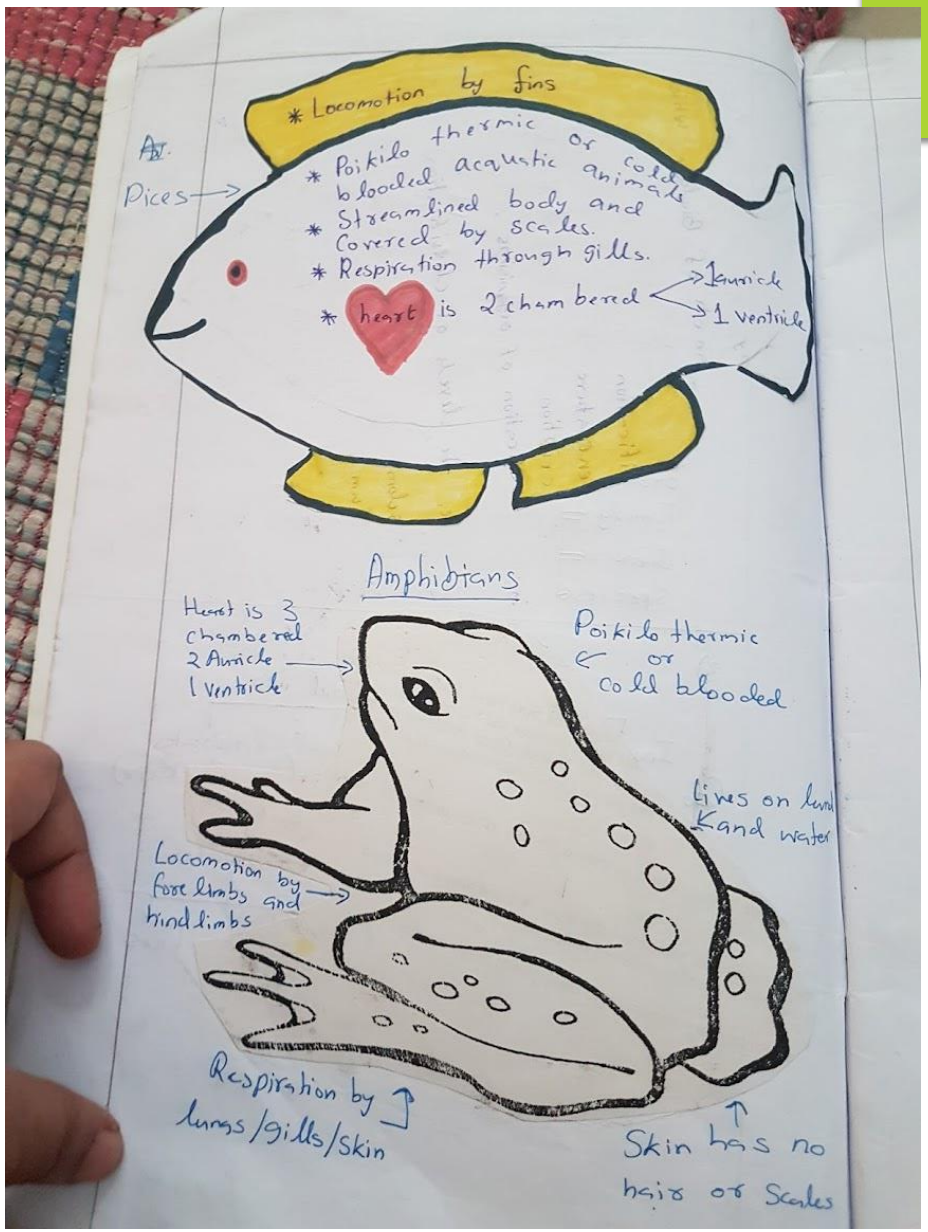

17-6-16
Motion
A body is said to be in a state of
rest
Motion
when it
does not change
its position with time
1) A body is said to be in a state of rest when it does not change its position with time.
2) A body is said to be in a state of Motion when it changes its position with time.
3) Displament :- The shortest distance or distance travelled along a straight line is called displacement
Velocity
Velocity = Displacment / Time taken
Unit = m/s

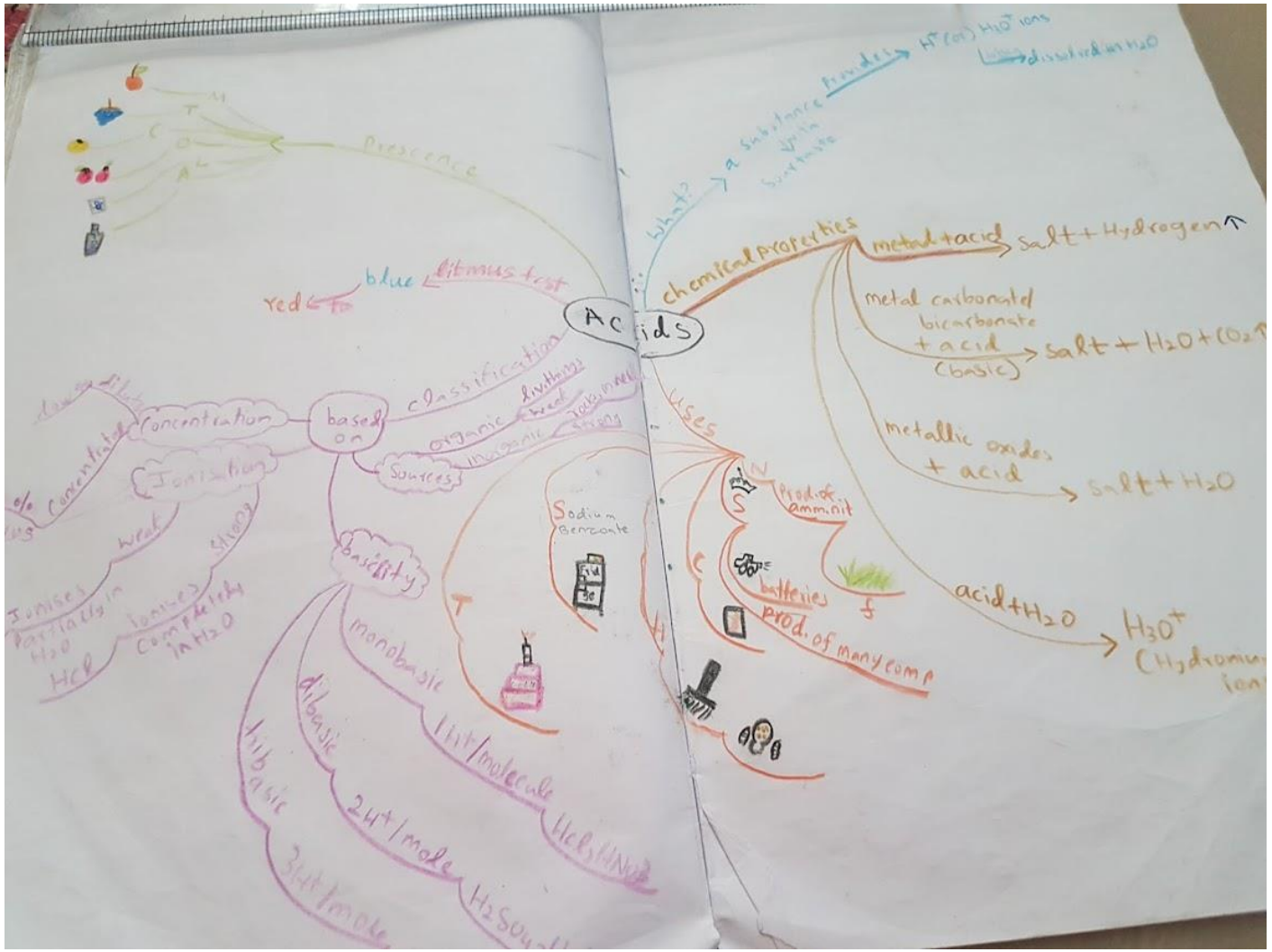

SPEED
Acceleration = Change of Velocity / Time taken
Unit = m/s² or ms⁻²

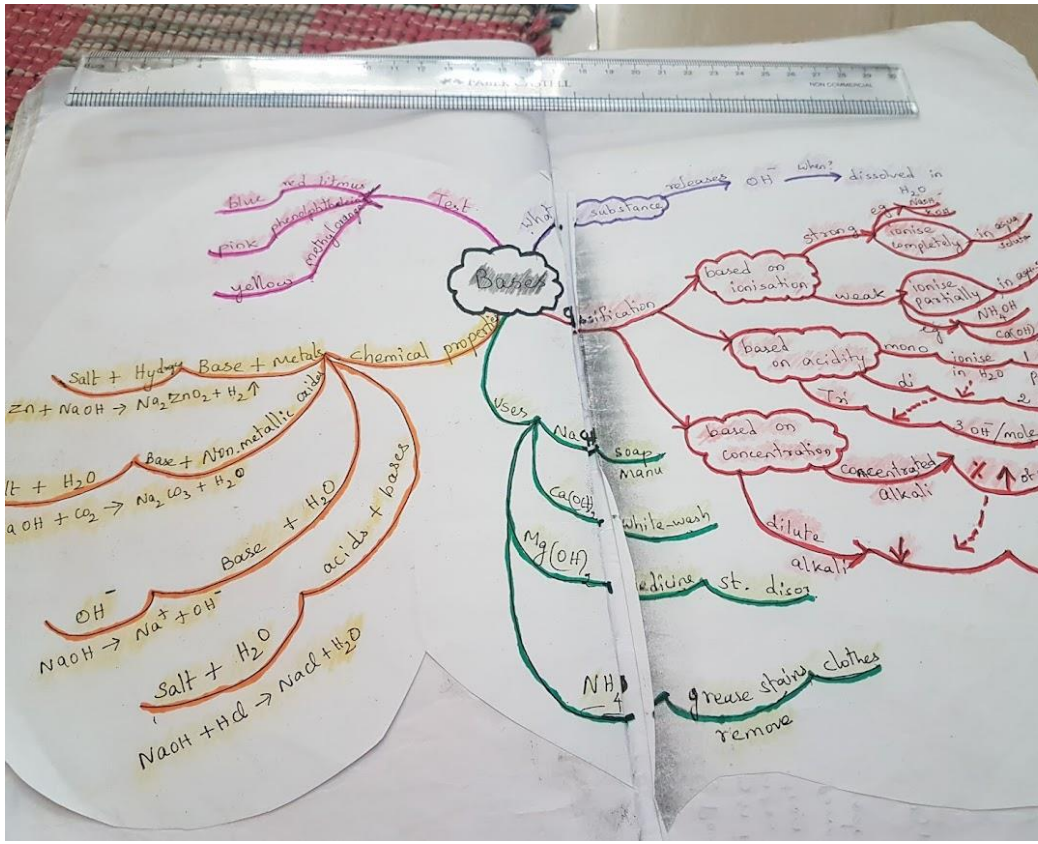

Formation
Principle
strong winds blow across the sea and forms waves
kinetic energy of waves
Wave Energy
Formation
Tidal Energy
Tide Coming In
Tide Going Out


Heart
Shape: Conical
Location: Between the lungs
Superior Vena Cava
Right Auricle
Tricuspid
Pulmonary Artery
Aorta
Left Auricle
Bicuspid
Pumps deoxygenated blood into the pulmonary artery
Pumps oxygeneneted blood into Aorta
Bicuspid or Mitral Valve
Pericardium
Septum


Streamlined body
Homiothermic
Respiration by lungs
Body covered with feathers
Bones are hollow and light
Ostrich, Emu, Penguin can not fly
Heart is 4 chambered
2 Auricle
2 Ventricle


* Locomotion by fins
Ex.
Pices
* Poikilo thermic or cold blooded acquatic animals
* Streamlined body and
* Covered by scales.
* Respiration through gills.
* heart is 2 chambered
1 auricle
1 Ventricle
Amphibians
Heart is 3 chambered
2 Auricle
1 Ventricle
Poikilo thermic or cold blooded
Lives on land and water
Locomotion by fore limbs and hind limbs
Respiration by lungs/gills/skin
Skin has no hair or Scales


Acids
chemical properties
metal + acid
salt + Hydrogen
metal carbonate/bicarbonate + acid (basic)
salt + H2O + CO2
metallic oxides + acid
salt + H2O
acid + H2O
H3O+
uses
Prod. of amm. nit
batteries
prod. of many comp
Sodium Benzoate
classification
based on
Concentration
Ionisation
Sources
basicity
monobasic
dibasic
tribasic
Prescence
blue
litmus test
red
Ionises Partially in H2O
Ionises completely in H2O
weak
strong
HCl
organic
livthings
weak
inorganic
strong
Concentrated
dilute
what?
a substance
provides
H+ (or) H3O+ ions
dissolved in H2O


Bases
Test
Blue
red litmus
pink
yellow
chemical properties
Base + metals
Salt + Hydrogen
Zn + NaOH → Na2ZnO2 + H2
Base + Non-metallic oxides
Base + H2O
acids + bases
Salt + H2O
NaOH + HCl → NaCl + H2O
OH-
NaOH → Na+ + OH-
Uses
NaOH
soap
Manu
Ca(OH)2
white-wash
Mg(OH)2
medicine
st. disor
NH4
grease stains
clothes
remove
substance
releases
OH-
when?
dissolved in H2O
strong
ionise completely
in aqua solute
based on ionisation
weak
ionise partially
based on acidity
mono
ionise in H2O
Tri
based on concentration
concentrated alkali
dilute alkali

11. Suggest a reason for each observation given below.

i) In fireworks, powdered magnesium is used rather than magnesium ribbon.

ii) Zinc and dilute H_2SO_4 react much more quickly when a few drops of copper sulphate solutions are added.

iii) The reaction between magnesium carbonate and dilute hydrochloric acid speeds up when some concentrated HCl is added.

i) Powdered magnesium
→ has a larger surface area.
→ reaction is faster

ii) Copper sulphate solution
→ acts as a catalyst
→ increases the rate of reaction

iii) The rate of reaction Increases when the concentration of reactants Increases

12. Sodium hydroxide and hydrochloric acid react as shown in this equation.

$NaOH_{(aq)} + HCl_{(aq)} \longrightarrow NaCl_{(aq)} + H_2O_{(l)}$

i) Which type of chemical reaction is this?

ii) The reaction is exothermic. Explain what that means.

iii) Differentiate exothermic reaction and endothermic reaction.

iv) What happens to the temperature of the solution as the chemicals react?

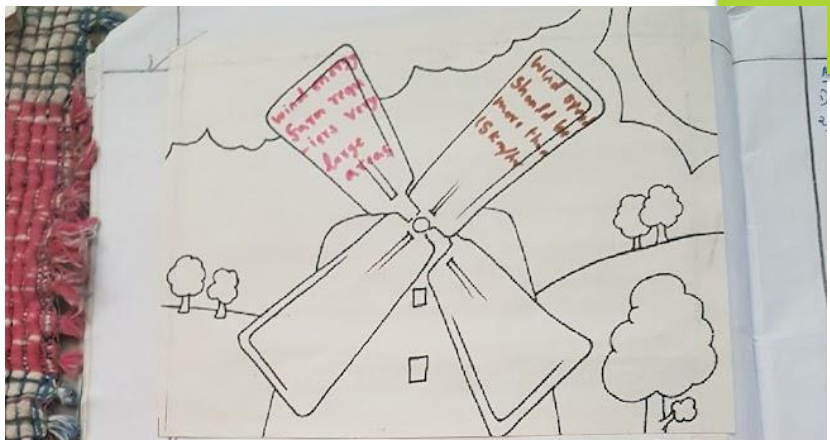
i) Neutralisation Reaction

ii) An exothermic reaction is one in which heat is evolved (given out)

iii)

Exothermic reaction	Endothermic reaction
• Heat energy liberated during the reaction	• Heat energy absorbed during the reaction
• $N_2 + 3H_2 \rightarrow 2NH_3 + Heat$	• $2NH_3 + heat \rightarrow N_2 + 3H_2$

iv) Temperature of the solution increases as heat is evolved.



25. What is biomass? What can be done to obtain bioenergy using biomass?

Biomass is biological material.
eg: Cow dung, Vegetable waste and sewage.
Biomass is decomposed in the absence of oxygen is and burnt in limited supply of air to give biogas.

26. Which form of energy leads to the least amount of environmental pollution in process of harnessing and utilization? Justify your answer.

Result you will get from a Differential Classroom is evident from

- Our students feedback at DGVC Physics Youtube channel , that you can check later

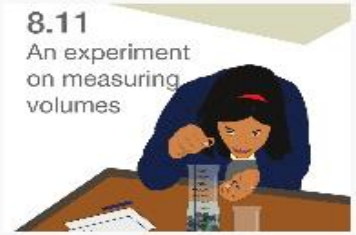
Class 8 Learning Units

Credits

Mathematics

Science

Local Context



An Experiment on Measuring Volume

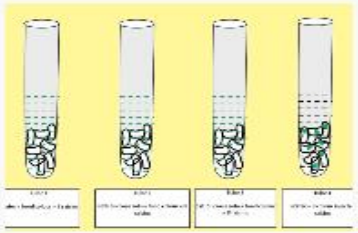
Bringing Back Shine to Copper

Components of Wood-ash

Force between magnets

Looking through a microscope

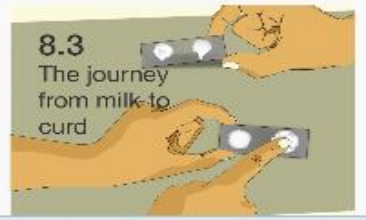
Moon and its shape



Osmosis in raisins

Parallax

Pinhole Camera



VIGYAN PRATIBHA
विज्ञान प्रतिभा

HOMI BHABHA CENTRE FOR SCIENCE EDUCATION
TATA INSTITUTE OF FUNDAMENTAL RESEARCH

Home | About Us | People | Research | Academic | Vigyan Pratibha | Olympiads | NIUS | Outreach | Get Involved

Announcements

Result For Work Assistant

Result For Clerk-A (EWS)

Welcome to HBCSE, TIFR

Homi Bhabha Centre for Science Education (HBCSE) is a National Centre of the Tata Institute of Fundamental Research (TIFR), Mumbai. The broad goals of the Centre are to promote equity and excellence in science and mathematics education from primary school to undergraduate college level and encourage the growth of scientific literacy in the country.

Today's Events

No public events scheduled for today!

Collaboratively Understanding Biology Education (CUBE)

"Education should not be something we (teachers) do to our students, it should be something we do in collaboration with our Students." **Brewer C.A. & Smith D. (2011)**

Science as Culture

An alternative paradigm of science education to expand the participatory base of science in the country. CUBE engages students from KG to PG with activities, experiments, field work, meetings, presentations, online discussions etc. to inculcate science as a culture, an ongoing close-to-life practice.

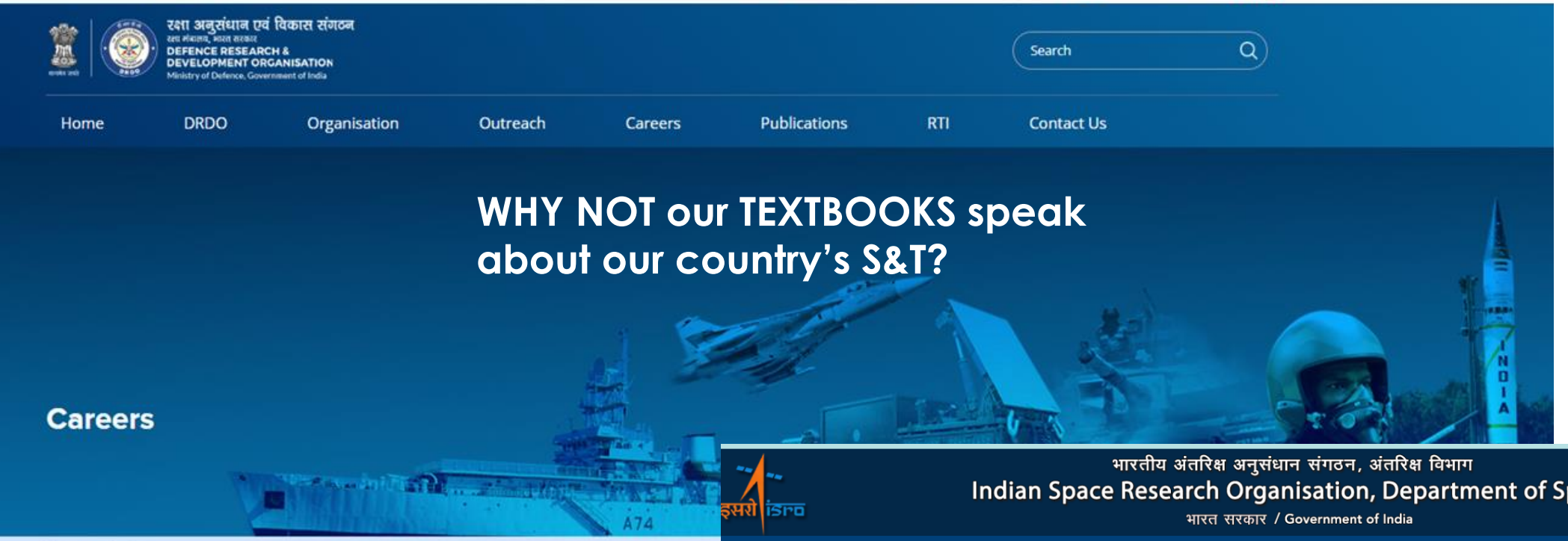
This is an inclusive program open to all irrespective of your background, experience, graduation or grades. It is best captured by one of our slogans: ***"Weak, Meek and Geek all are Welcome!".***

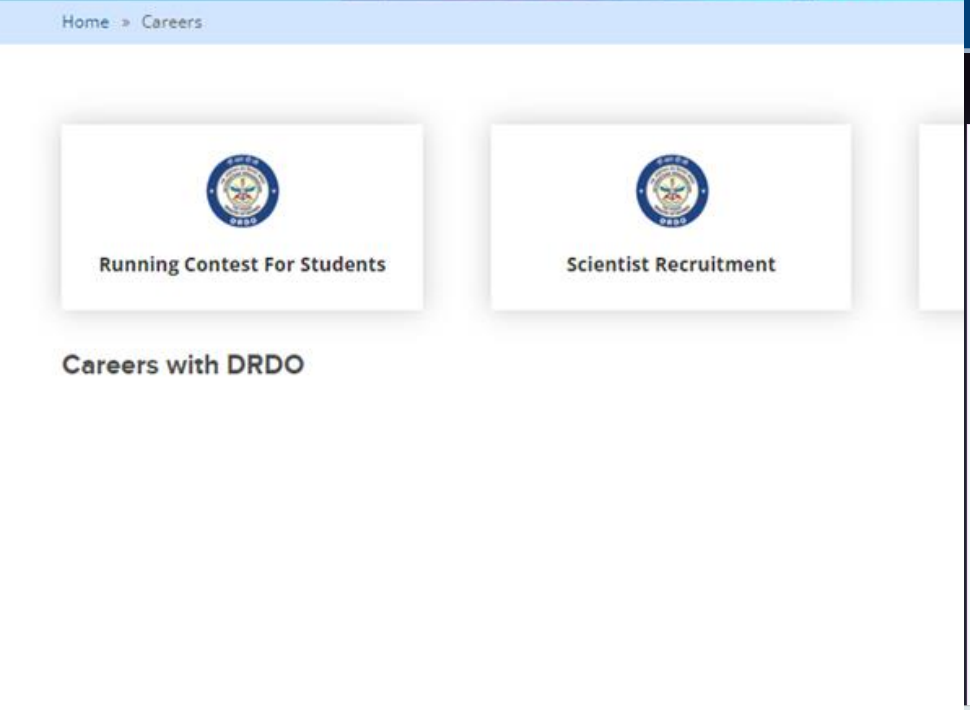
We believe in Obaid Siddiqi's inspiring thoughts: ***"Sophistication is required in the mind, not in the laboratories".***

CUBE is an initiative of the **Gnowledge Lab** of **HBCSE** (Homi Bhabha Centre for Science Education), a national centre of **TIFR (Tata Institute of Fundamental Research).**

CUBE Website Register on CUBE Mailing List Register on MetaStudio.org

CUBE Winter Meet, 22 January 2017, HBCSE, Mumbai. College students from Elphinstone, KBP, VES, CHM, Ruia, D Y Patil; and school students from Adarsh Vidyalaya, Chembur Naka School, Deonar Colony School.


रक्षा अनुसंधान एवं विकास संगठन
DEFENCE RESEARCH & DEVELOPMENT ORGANISATION
Ministry of Defence, Government of India
Search
Home
DRDO
Organisation
Outreach
Careers
Publications
RTI
Contact Us
WHY NOT our TEXTBOOKS speak about our country's S&T?
Careers
INDIA
A74


Home » Careers
Running Contest For Students
Scientist Recruitment
Careers with DRDO

भारतीय अंतरिक्ष अनुसंधान संगठन, अंतरिक्ष विभाग
Indian Space Research Organisation, Department of Space
भारत सरकार / Government of India
सत्यमेव जयते
Home
About
Activities
Services
Programmes
Resources
Engage with Us
search
Careers
Home / Careers
About Current Opportunities
Current opportunities
Career Progression
Live Registration for Ph.D Scholars
FAQs on Careers
Old question papers
Fellowships
Recruitment Notice
Advt.No.URSC:01:2024 - The date of opening / receipt of online application and closing date of receipt of online application will be published on 10.02.2024 in respect of Advertisement No.URSC:01:2024 dated 27.01.2024 published in Employment News / Rozgar Samachar.
Advt.No.NRSC-RMT-1-2024 - Recruitment to the posts of Scientist/ Engineer 'SC', Medical Officer 'SC', Nurse 'B' & Library Assistant 'A'.
Last Date of Submission : 12.02.2024
Advt.No.ISRO:ICRB:02(EMC):2023 - Candidates willing to raise

राष्ट्रीय नवप्रवर्तन प्रतिष्ठान – भारत
विज्ञान एवं प्रौद्योगिकी विभाग, भारत सरकार का स्वायत्तशासी संस्थान
National Innovation Foundation - India
Autonomous Institute of the Department of Science & Technology, Govt. of India

Azadi Ka Amrit Mahotsav

विज्ञान एवं प्रौद्योगिकी विभाग
DEPARTMENT OF SCIENCE & TECHNOLOGY

Submit Your Idea

For students of class VI to X, schools can submit nominations for INSPIRE Awards MANAK competition by visiting the web portal - **https://www.inspireawards-dst.gov.in/** or through app which can be downloaded from **Play Store**

The grassroots innovators, outstanding traditional knowledge holders and others may visit

tstanding Traditional

News

11 APR

President of India presents 11th Biennial National Grassroots innovation and outstanding traditional knowledge awards of NIF and inaugurates fine-2023

INDIA INTERNATIONAL SCIENCE FESTIVAL 2023

ABOUT | MEMBERS | EVENTS | MESSAGES | OUTREACH | PROMO VIDEOS | NEWS | GALLERY | BROCHURE | CONTACT | LOGIN

Students Science Village

More Info >>

Face to Face with New Frontiers of Science & Technology

More Info >>

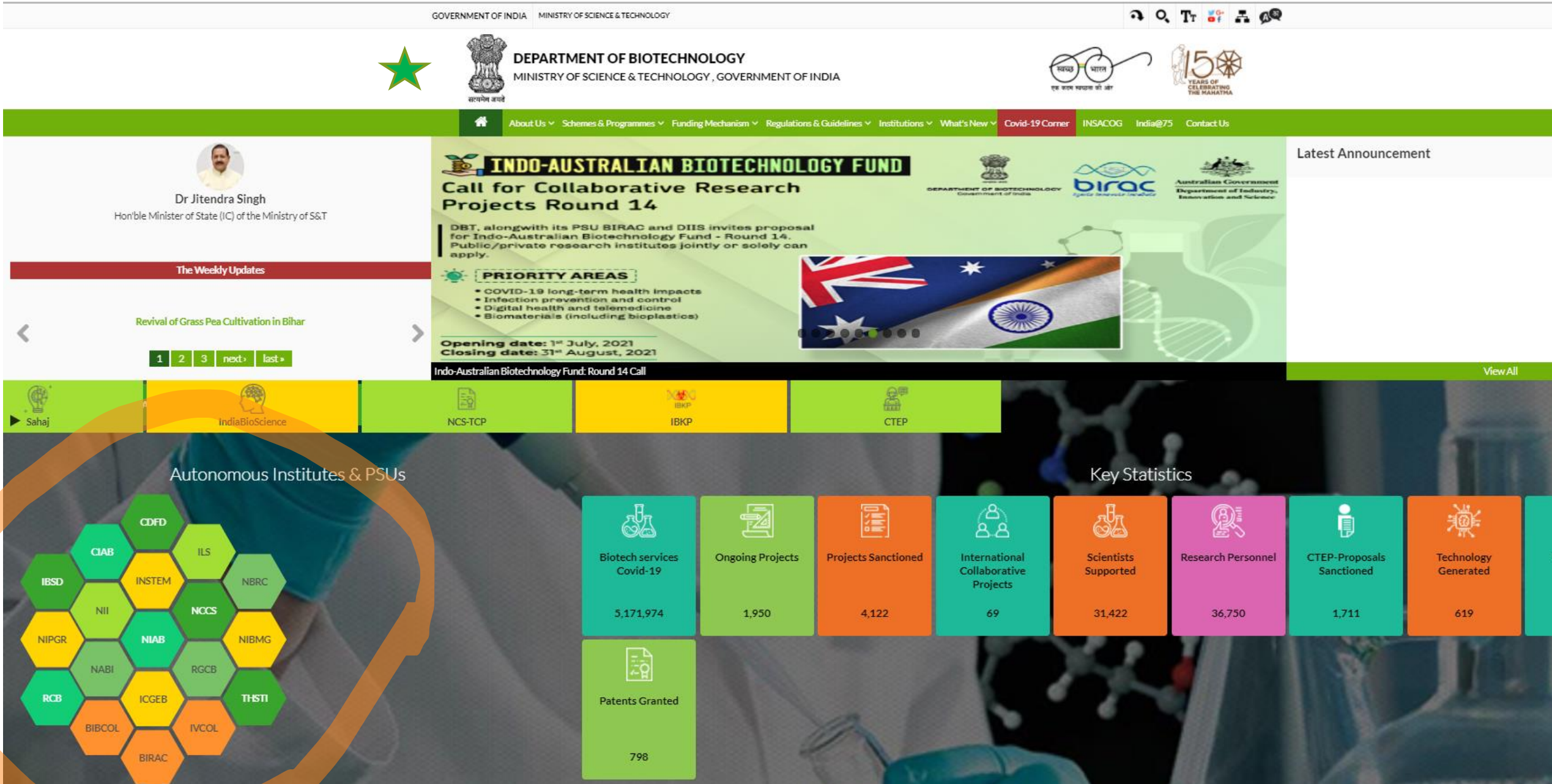
Science through Games & Toys

More Info >>

Students Innovation Festival - Space Hackathon

More Info >>

Bioengineering, BioTechnology, BioEngineering, BioInformatics – B.Tech /B.Sc. ??



Masters in Wildlife Biology & Conservation

Login | Register

Search....

HOME ABOUT ACADEMIC PUBLICATIONS ALUMNI ADMISSION NEWS CONTACT US

ncbs
National Centre for Biological Sciences
Tata Institute of Fundamental Research

About Us Research Academic News & Events People Careers Outreach and Funding

tifr

Home / Academic / Admissions

COVID-19 Response: Local Logistics National Effort

Thank You