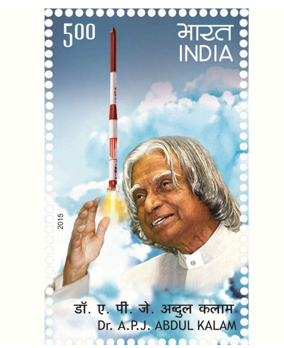
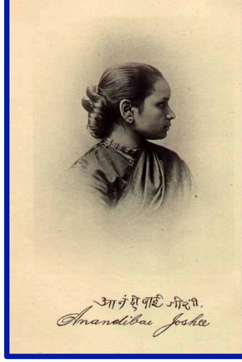


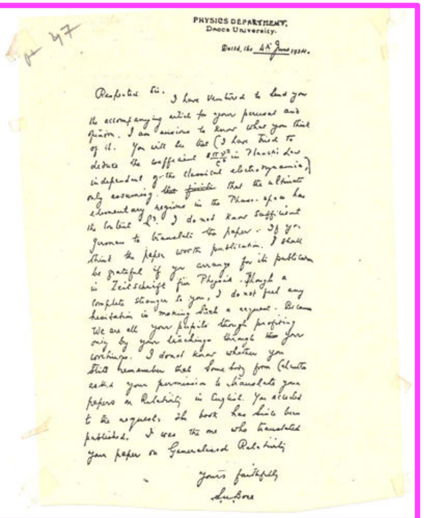
A Computer Away : Teaching Science under Resource Challenges

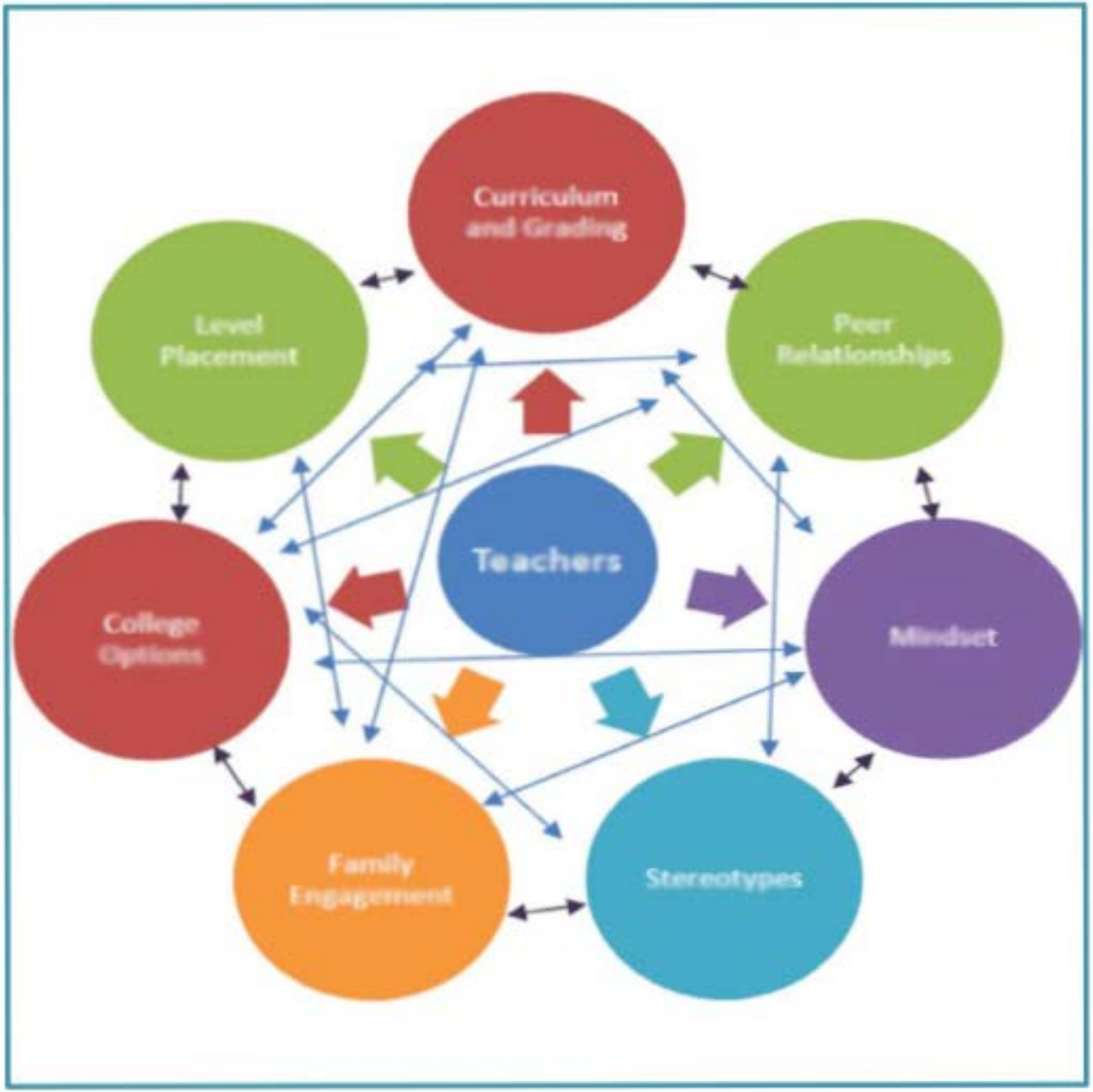


Sandeep S Ghugre

UGC DAE Consortium for Scientific Research, Kolkata Center,
Sector III, LB-8, Bidhan Nagar, Kolkata 700 106.

Email : ssg@alpha.iuc.res.in ; ssg.iuc@gmail.com


PHYSICS DEPARTMENT,
Dacca University.


Curriculum and Grading
Level Placement
Peer Relationships
Teachers
College Options
Mindset
Family Engagement
Stereotypes

Learn

Technology

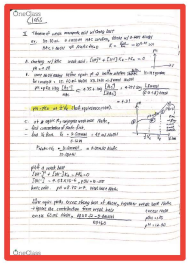
Education

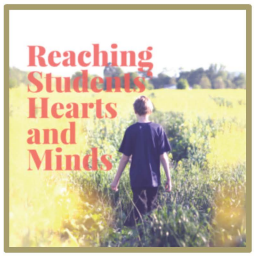
Home

Know

Charles Leadbeater & Annika Wong

	Formal Learning	Informal Learning
Sustaining Innovation	**IMPROVE** Better facilities	**SUPPLEMENT** Enlarge domain
Disruptive Innovation	**REINVENT**	**TRANSFORM** Progressive form



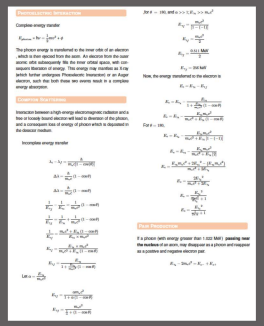


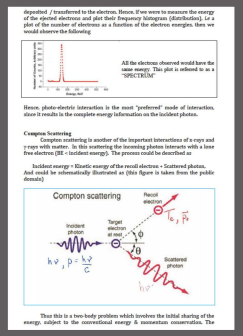
We need to do is embrace technology and modify it as per our needs and exploit it's full potential

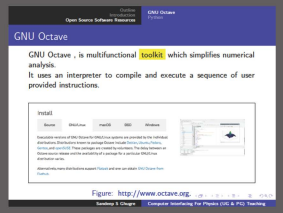
Closed

Open

Open source *toolkits* Windows

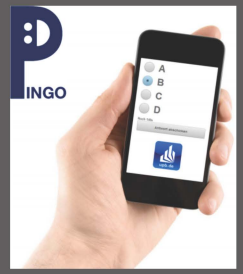






Poll Everywhere

SOCRATIVE



python™

GNU Octave

Audacity®

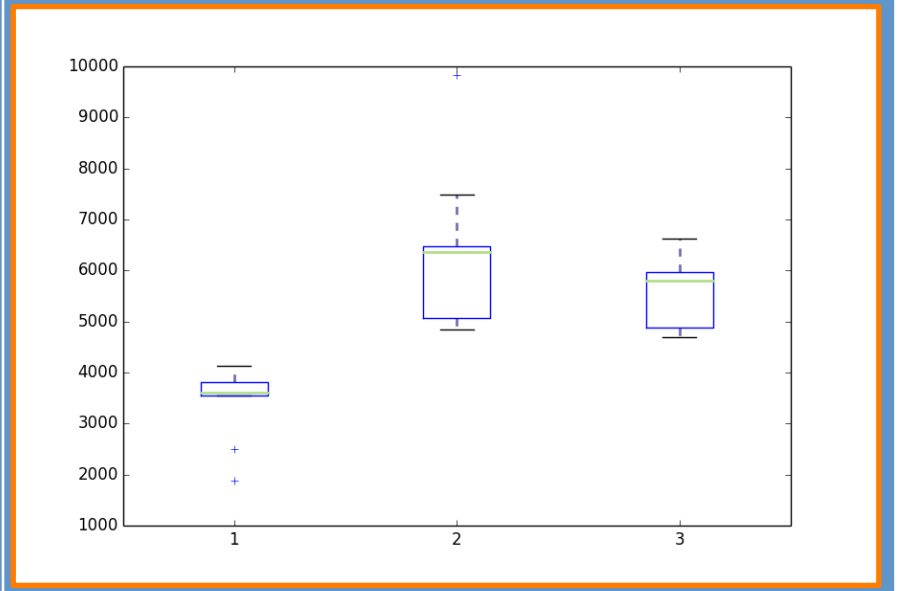
PYTHON for UG & PG curriculum

In the classroom

```
import numpy as np
import matplotlib.pyplot as plt
y0=[30, 26, 26, 36, 48, 50, 16, 31, 22, 27, 23, 35, 52,
28, 37]
data = [y0]
fig = plt.figure(1,figsize=(9,6))
ax = fig.add_subplot(111)

# Create the boxplot
bp = ax.boxplot(data)
for whisker in bp['whiskers']:
    whisker.set(color='#7570b3',linewidth=2)

for median in bp['medians']:
    median.set(color='#b2df8a', linewidth=2)
plt.show()
```



Classroom Response System

Majority **traditional** head-on lecture-style courses are **monologues**

Students develop complex reasoning skills and understand the core concepts most effectively when **actively engaged** with the material they are studying

PEER INSTRUCTION engages students during lectures which are interspread with through activities that encourage students to **apply** the core concepts being presented, and then to **explain** those concepts to their fellow students.

Active learning achieved from structured questions followed by discussions helps ***increase the traditional attention span***

Explain a concept
Pose a question for students to reflect upon the concepts and answer
Nurture a discussion among students

10 – 15 minutes

3 - 5 minutes

3 - 5 minutes

Classroom Response System

How it works

1 Ask a question

Prepare your questions before your talk or create polls immediately on-the-fly.

2 The audience responds

Everybody with a device that connects to the internet can take part. No sign-up required.

3 View results

Responses are optimized for the big screen. See them in your browser or in a powerpoint presentation.

PINGO : https://trypingo.com

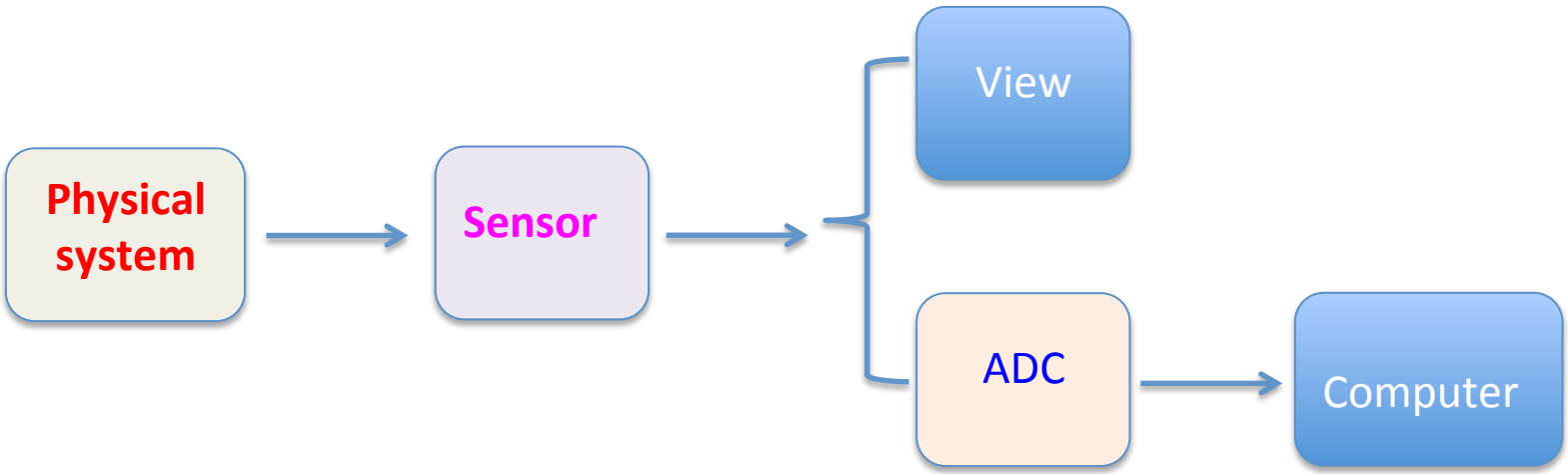
Socrative : https://socrative.com

Poll Everywhere : https://www.polleverywhere.com/

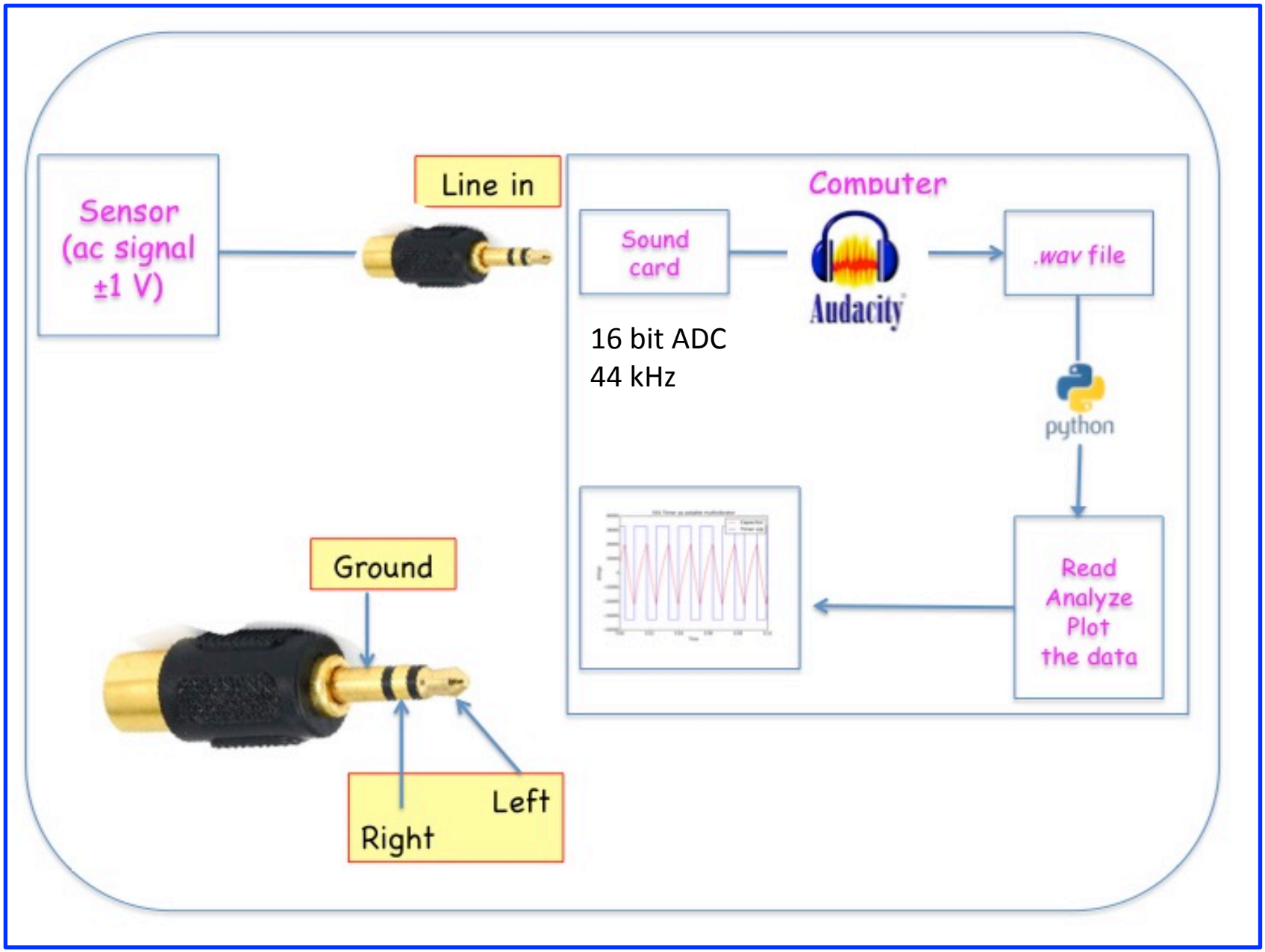
Enhance the Laboratory

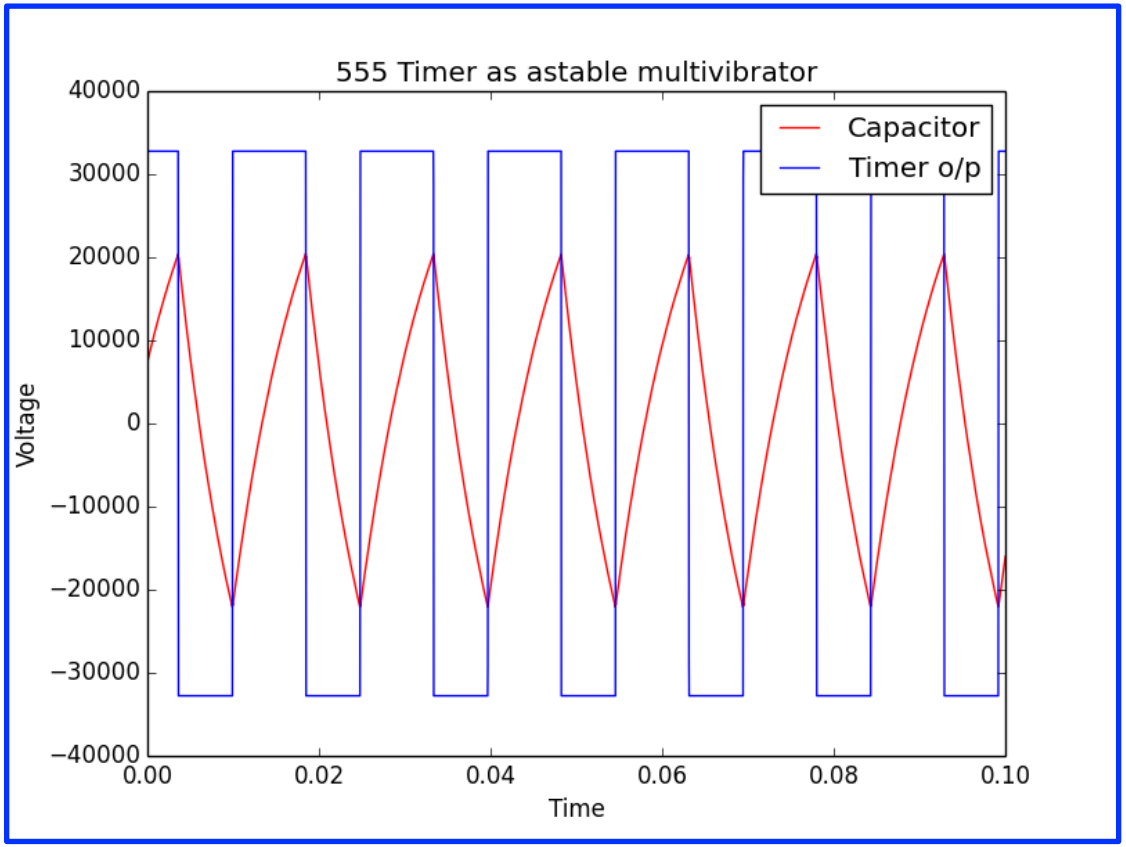
Need to centre laboratory teaching around open ended experiments

- Experiments need to be designed using routine open source hardware
- Possibility to carry out the experiments beyond the walls of the laboratory
- Vizualize the results and analyze the same.



Laboratory beyond the Laboratory





We have been able to **make available** advanced experimental tools and techniques to the students,

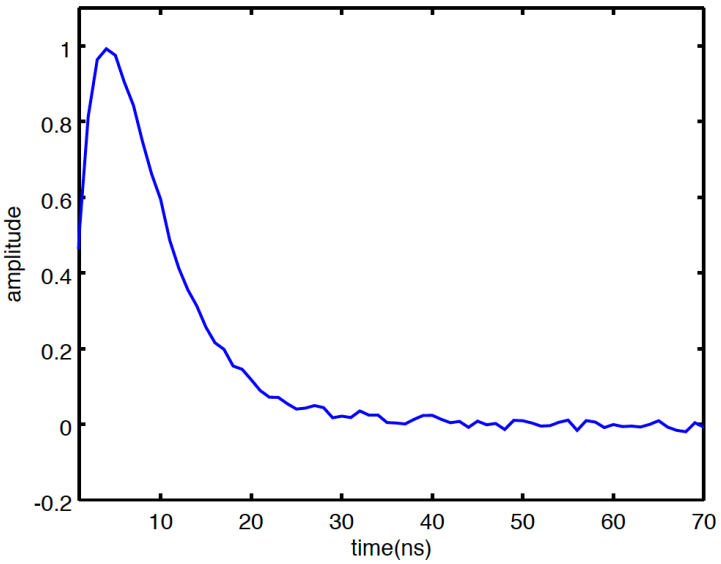
Experiments can **be performed beyond the conventional laboratory**

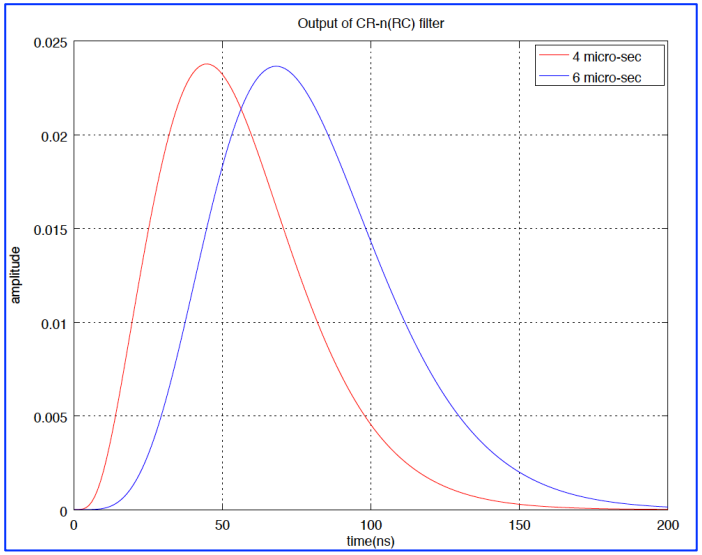
Students can acquire data, critically analyze the same, modify the operational parameters, thereby creating a truly ***cognitive ambience***

Nuclear Laboratory In Your Computer

The pursuit of experimental nuclear physics in undergraduate and postgraduate laboratories is, at times, prohibitively difficult owing to the required resources and allied expenses

The software simulations to replace the processing and the counting setup has been developed using open source tools, to help the students have an insight into the underlying philosophy

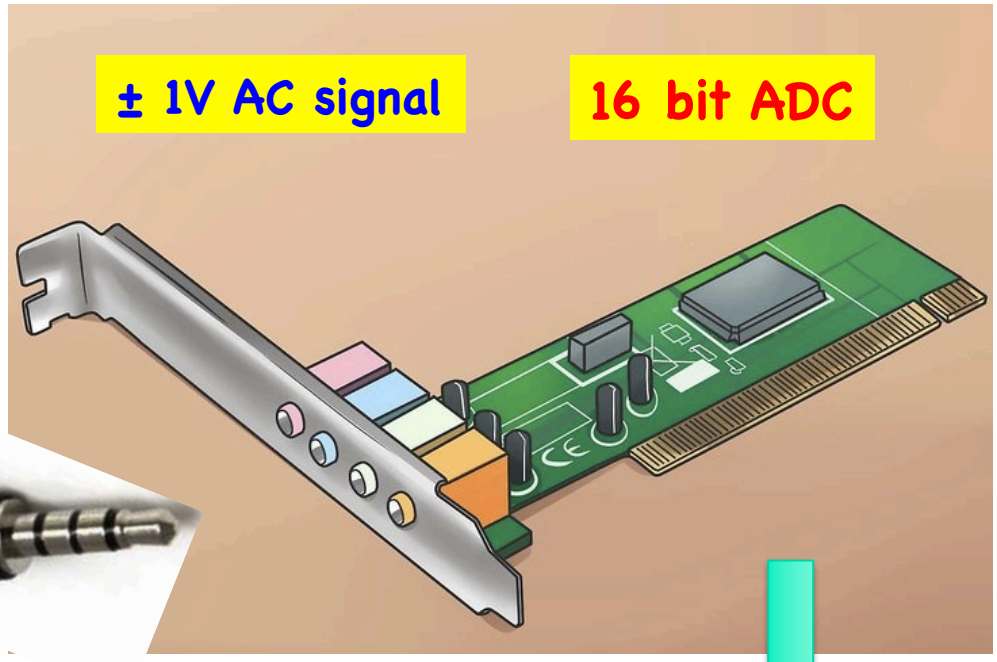


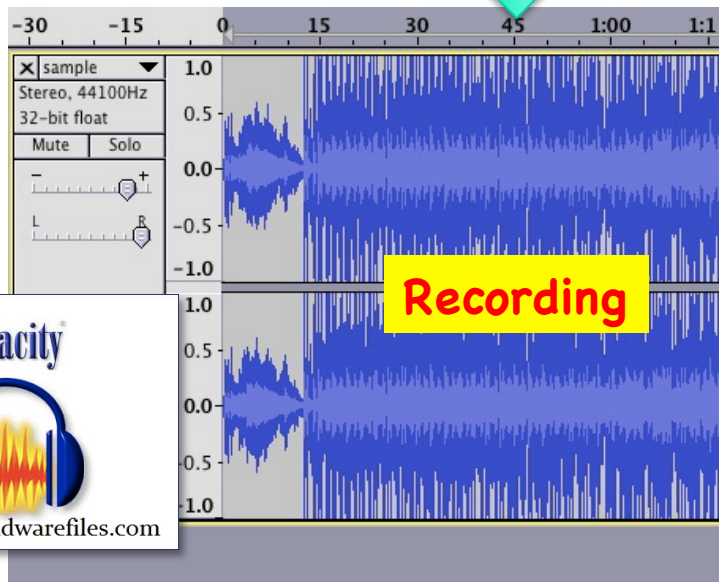


Simulated Scintillator Pulse & the effect of pulse shaping using CR-n(CR) filters

Sound card as an efficient DAQ system

With this approach, the basic representations of nuclear phenomena, such as spectrum of a radioactive source, can be conveniently accomplished for an illustrative training of the students pursuing nuclear physics in their UG/PG curriculum

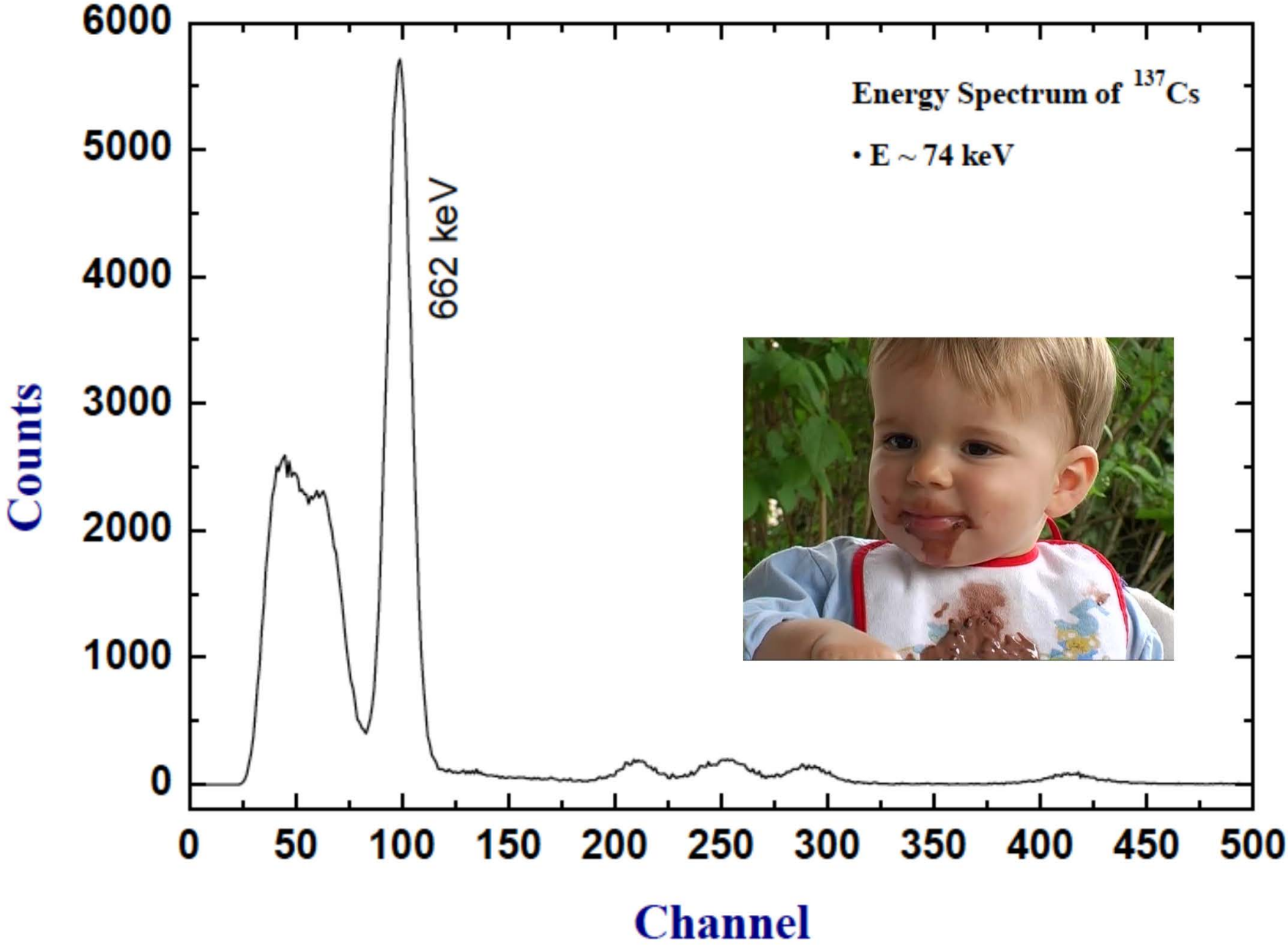




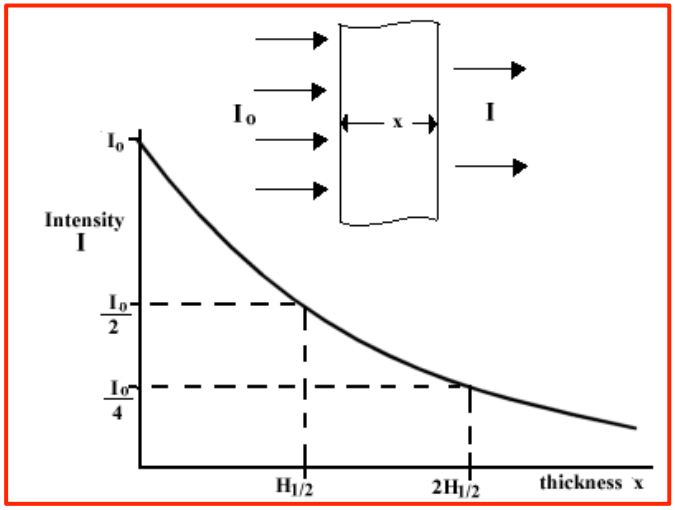
Audacity
hdwarefiles.com

Analysis

GNU Octave

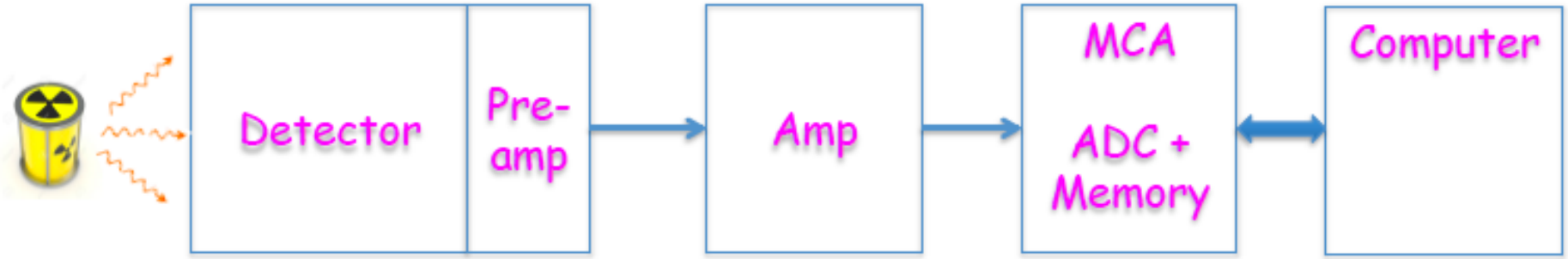

Energy Spectrum of ^{137}Cs
• E ~ 74 keV
662 keV
Counts
Channel
6000
5000
4000
3000
2000
1000
0
0
50
100
150
200
250
300
350
400
450
500

Study of Attenuation of a beam of electromagnetic radiation in matter.



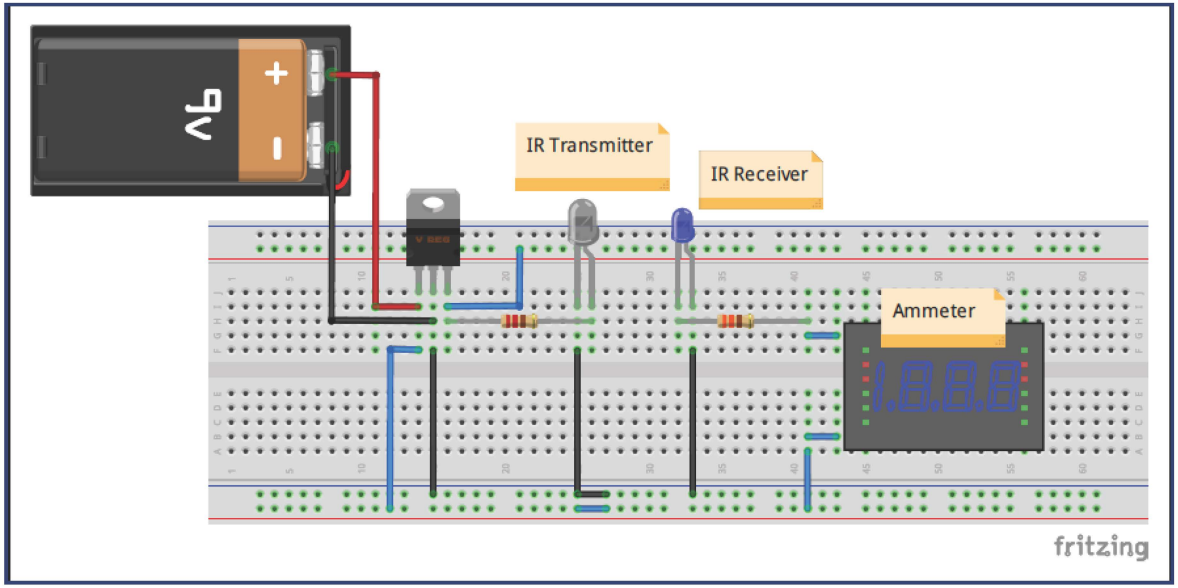
$$I = I_0 \times e^{(-\mu x)}$$

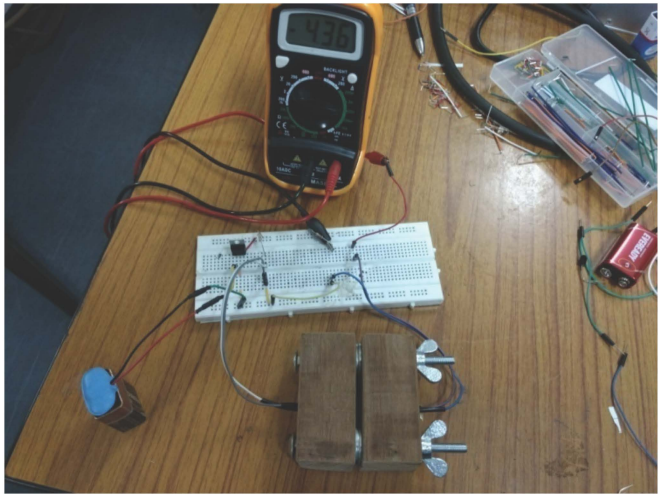
परमाणु ऊर्जा नियामक परिषद
पऊनिप
ATOMIC ENERGY REGULATORY BOARD
AERB

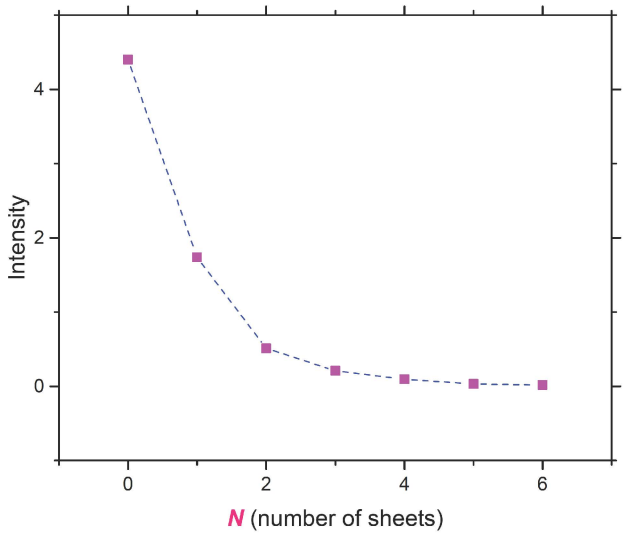


Not a just a solution but : the solution

IR LED & Receiver







Take Home

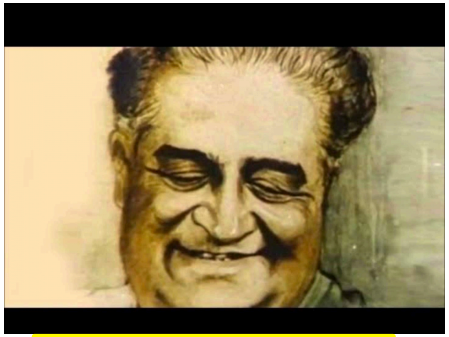
It is envisaged that the development presented herein harness the transparency, simplicity and versatility of open source resources

This would naturally facilitate young minds with tools for visualization and consequent understanding of the theories and concepts being addressed in the curriculum.

The minimal requirements underlying the techniques warrant their widespread deployment.

In the process, it is aspired that teaching of science would evolve from "**words**" to "**practice**" and adapt an empirical approach to nurture a scientific perspective / perception in the generation that is "**tomorrow**"

Ushering in a **technology enabled innovative educational ecosystem**.



G D MADGULKAR

नाही खर्चीली कवडी दमडी, नाही वेचला दाम

naahi kharchali kavadi damadi, naahi vechala daam

Did not spend a cowrie or a quarter of a penny, did not pay a price