The 4th African Conference on Fundamental and Applied Physics (ACP2025)

Theme:

Practical Work in Contemporary Physics at High School: Integrating Modern Science into the Classroom in a Meaningful Way

Presented by

Dr. Kokou AGBOSSOU

(ASSISTANT LECTURER)

I - Introduction

Contemporary physics represents a major turning point in our understanding of the world:

- it explores the infinitely small with mechanics quantum,
- the infinitely large with relativity,
- and the mysteries of matter with physic of particles.

Today, it is essential to introduce these concepts to students not only through theory, but also through accessible (TP) practical work, in order to give them meaning, spark curiosity, and open a window onto modern science.

I - Introduction

Practical work (TP) in contemporary physics plays a crucial role in students' education by preparing them to approach scientific questions in a rigorous and methodical way.

Objectif général

Propose concrete and accessible activities to help teachers integrate practical work (TP) into the teaching of contemporary physics at the high school.

I - Introduction

Objectifs spécifiques

- Show the value of integrating contemporary physics into lab work (TP),
- Present examples of practical activities (TP) that can be done in high school,
- motivate students with experiments connected to modern science,
- Encourage an approach interdisciplinary and experimental.

II - Why Teach Contemporary Physics?

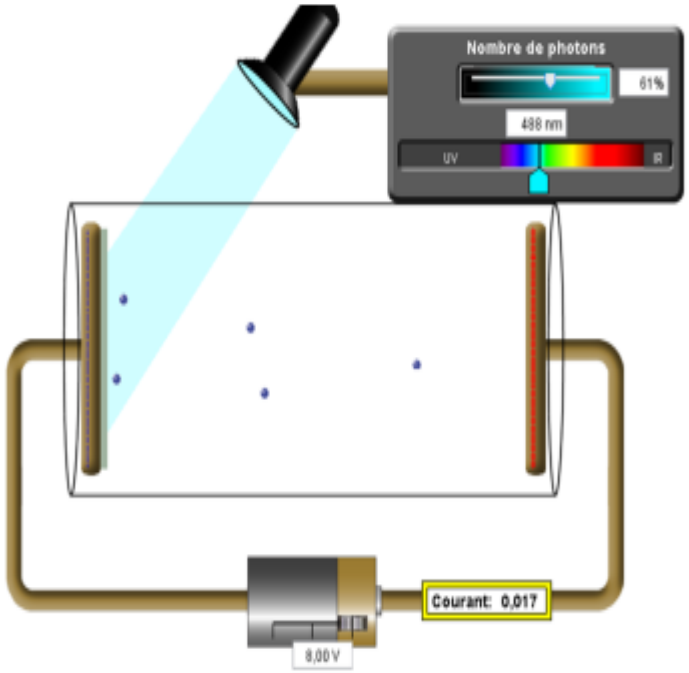
- Part of the official programs (relativity, quantum physics, particles),
- Responsed current scientific challenges,
- Stimulates students' curiosity and critical thinking,
- Gives meaning to the technologies they use (GPS, lasers, IRM, etc.)

III - Examples of Practical Work

TP : Dualité onde-corpuscule

TP proposé : Effet photoélectrique (simulation)

- Outil : Simulateur PhET (Physics Education Technology)
- Objectif : comprendre que la lumière transporte de l'énergie quantifiée (photons)
- Lien avec la théorie : $E = h\vartheta$
- Activité complémentaire : calcul de l'énergie minimale pour éjecter un électron

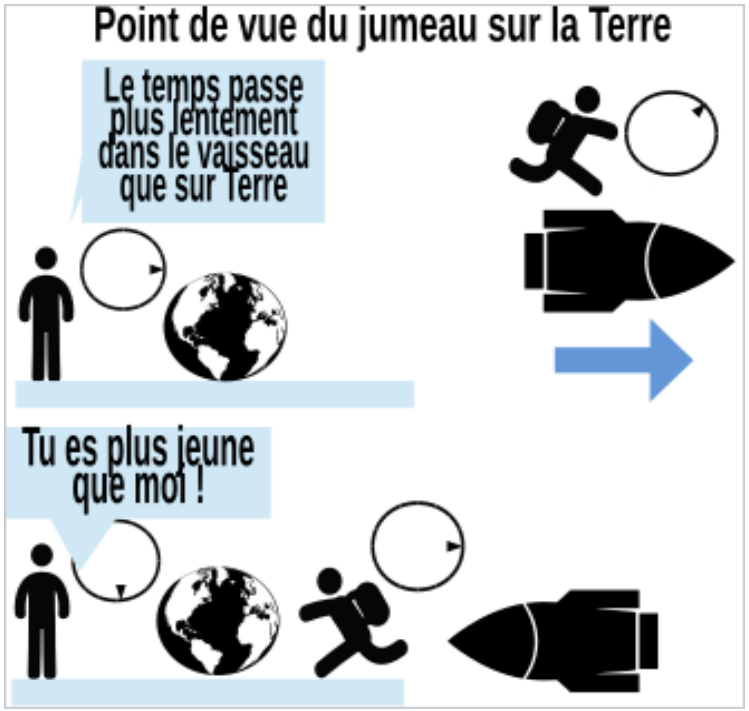


III - Examples of Practical Work

TP : Relativité restreinte

TP proposé : Expérience pensée des jumeaux

- Outil : animation ou tableur
- Objectif : explorer la dilatation du temps à grande vitesse
- Application réelle : GPS (corrections relativistes)
- Activité : comparer le temps mesuré par deux observateurs



III - Examples of Practical Work

TP : Spectroscopie (quantification de l'énergie)

TP proposé : Observation du spectre de l'atome de mercure ou néon

- Matériel : lampe à décharge + spectroscope (CD ou réseau)
- Objectif : montrer les niveaux d'énergie discrets
- Activité : identifier les raies et les relier aux transitions électroniques

Figure 1 - Matériel à rassembler pour la fabrication de ton CD-spectroscope.

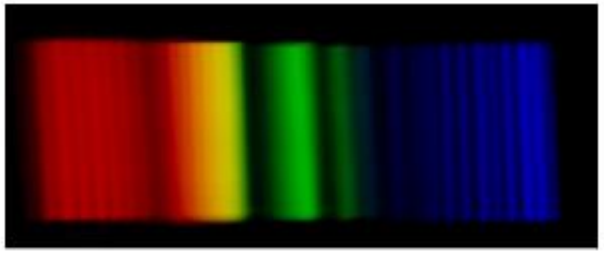


Figure 4 - Raies spectrales observées avec un fluorescent.

III - Examples of Practical Work

TP théorique : Le modèle de Bohr

TP proposé : Calcul des longueurs d'onde des raies de l'hydrogène

- Outil : tableur ou calculatrice
- Formule : relation de Rydberg
- Objectif : relier les modèles quantiques aux résultats expérimentaux

III - Examples of Practical Work

TP : Désintégration radioactive (simulation)

TP proposé : Simulation de décroissance radioactive

- Outil : dés, tableur Excel, simulateur
- Objectif : modéliser la décroissance exponentielle
- Activité : tracer N(t), déterminer la demi-vie

IV- Ressources utiles pour les Enseignants

- PhET Colorado : https://phet.colorado.edu
- Banque de TP (Éduscol, CNRS Jeunes)
- Matériel simple : spectroscope fait maison, simulateurs en ligne
- Applications numériques : GeoGebra, Excel, Python

V - Pedagogy and Assessment

- Skills-Based Approach:
  - Observe
  - Model
  - Analyze
  - Communicate
- Formative assessment during the (TP) lab work
- Group work and scientific approach

V- 1. Conclusion

- Contemporary physics is accessible with simple means.
- Practical work helps students better understand modern concepts.
- It is possible to inspire scientific vocations as early as high school.
- Proposal: create a shared bank of practical activities among teachers.

V- 2. Perspectives

- Contact
- Questions
- Idea sharing

✉ Your name
– Your high school
– Email (if possible)

Thanks