

Virtual Experimental Activity of the *Bouncing Ball*



Marcelo Rodrigues
Paulo Simeão Carvalho



Department of Physics and Astronomy, FCUP, Portugal

Effectiveness of a computer Simulation

The 3 A's model (Redish, 2001)

Authentic

- **True educational topics.** Allows teaching contents that students are able to understand.

Adoptable

- **Easy to implement** by teachers, and **easy to explore** by students.

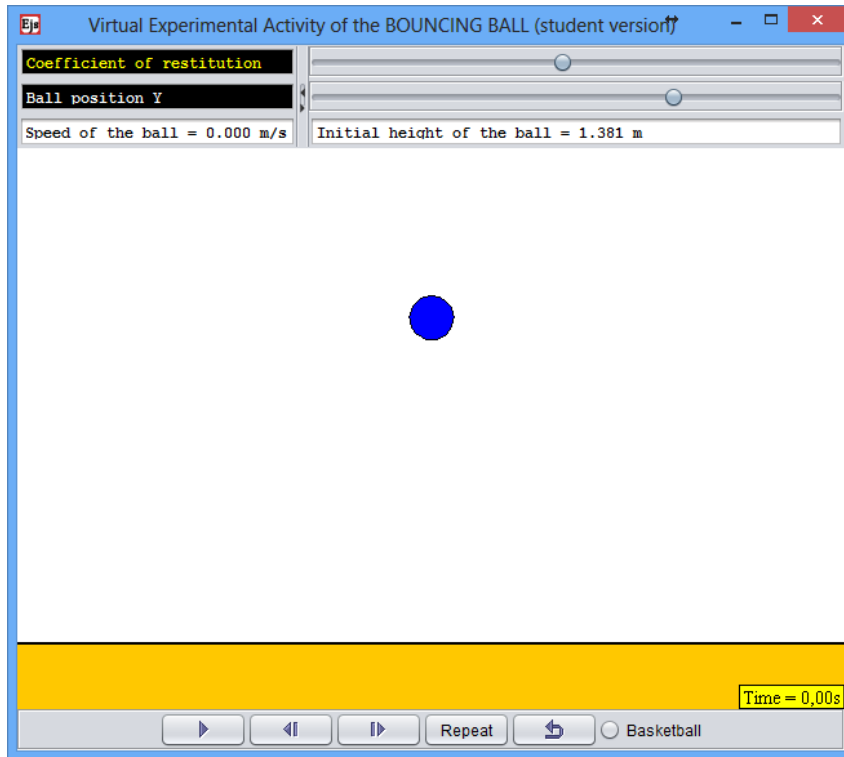
Adaptable

- **Easy to modify, flexible** and **integrable** in different contexts, to accomplish a certain didactic purpose.

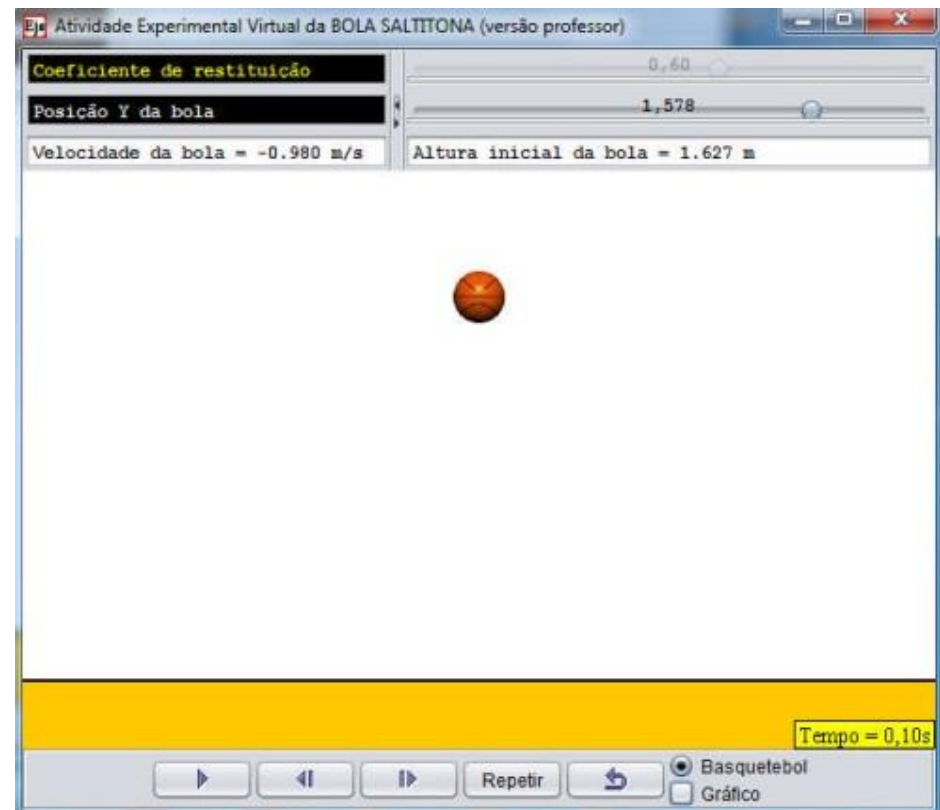
Characteristics of a VEA

- ✓ **Identification** of relevant physical quantities
- ✓ **Interactive Engagement** (Heads-on , Hands-on)
- ✓ Involves **Variable Control**
- ✓ Allows **Data Collection** and/or **Graph Analysis**
- ✓ Use of **Virtual Measuring Tools**
- ✓ Recognition of **Uncertainties** in virtual measures; use of standard error theory
- ✓ **Exploration** can be extended outside the classroom

Student version



Teacher version



- 1. INTRODUCTION / THEORY**
- 2. Measurements & Uncertainties**
- 3. ACTIVITY 1: Training Data Acquisition and Graphs**
- 4. ACTIVITY 2: Kinematic study of a basketball's COR**
- 5. ACTIVITY 3: Energetic study of a ball's rebound**
- 6. ACTIVITY 4: Dynamic approach of a ball's free fall**
- 7. Glossary**
- 8. Help**



Coefficient of restitution

0,60

Ball position Y

1,525

Speed of the ball = 0.000 m/s

Initial height of the ball = 1.525 m



Time = 0,00s



Repeat



Basketball
 Graph

CONCLUSIONS

- ✓ Students can use VEAs **when they want, where they want** and **as many times as they want**
- ✓ VEAs promote **laboratory skills** like in real experiments (variable control, measuring tools, data collection, tables and graphs, critical reasoning)
- ✓ VEAs **complement** real experimental activities (do not replace them!)
- ✓ Can **substitute** real activities (danger, malfunction, ...)
- ✓ Helps the **bridge** between physical phenomena and the understanding of physics

Thank You !