

MODULE 6

Elementary particle physics in early physics education

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DESCRIPTION

Elementary particle physics is a fundamental topic in science, and in particular in science education. Indeed, current physics education is faced with the important question of how best to introduce elementary particle physics in the classroom early on. Hence, in this module documented students' conceptions of particle physics will be discussed and teachers will gain insight into how to appropriately address them within a model-based curriculum.

LEARNING OBJECTIVES

Throughout the workshop participants will:

- learn about current results in high-energy physics
- gain insight into instructional strategies to introduce elementary particle physics in the classroom
- recognise the value of taking students' conceptions into account
- relate cutting-edge science topics to the physics curriculum
- understand the notion of models and their value for physics education

THEORY

Participants will achieve the above learning objectives by:

- discussing documented students' conceptions in the field of elementary particle physics
- identifying obstructive terms and phrases, which are commonly used in physics education
- trying out low-cost classroom activities
- designing specific instructions strategies for their own classroom
- tracing the connection between theoretical physics and experimental physics

PRACTICAL/HANDS-ON

- *Group Discussion:* activities used throughout the workshop to strengthen knowledge and understanding of elementary particle physics
- *Hands-on Experiments:* activity to try out and discuss various low-cost classroom activities
- *Unit Plan:* consolidation activity to introduce elementary particle physics in early physics education

USEFUL RESOURCES

CERN S'Cool LAB: cern.ch/scool-lab

Wiener, G. J., Schmeling, S. M. & Hopf, M. (2017). Introducing 12-year-olds to elementary particles. *Physics Education*, 52(4), 1-8

Woithe, J., Wiener, G. J., Van der Veken, F. (2017). Let's have a coffee with the Standard Model of particle physics! *Physics Education*, 52(3), 1-9

Wiener, G. J., Schmeling, S. M. & Hopf, M. (2017). An alternative proposal for the graphical representation of anticolor charge. *The Physics Teacher*, 55(8), 472-474

Wiener, G. J., Woithe, J., Brown, A. & Jende, K. (2016). Introducing the LHC in the classroom: an overview of education resources available. *Physics Education*, 51(3), 1-7