

ELECTROMAGNETIC WAVES: DEVELOPMENT OF MODELS TO FACILITATE PHYSICS TEACHING

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1. Introduction

The teaching of physics in schools is becoming increasingly difficult due to the lack of understanding of the contents and the lack of interest in the subject by the students. The lack of understanding and the lack of interest in physics are mainly due to four factors: abstraction, mathematical complexity, non-perception of applicability, impression of distance from the scientific world. This project consists in the development of a methodology and materials to facilitate the teaching of Physics, based on the solution of the above factors, starting from the study of the electromagnetic waves.

The objective of this project is to use models that facilitate the teaching and learning of physics in schools.

2. Search Methods

Starting from the objective of facilitating the teaching and learning of physics, it was first necessary to understand what makes physics difficult to learn and to be taught, through a bibliographical research on science teaching and teaching methods. Based on the research, the following conclusions were reached:

The teaching and learning of physics in schools has become increasingly difficult because of the lack of understanding and the lack of interest by the students. The lack of understanding and the lack of interest in physics are mainly due to four factors, the first two being associated with the lack of understanding, and the last two associated with the lack of interest:

Abstraction - use of abstract ideas and concepts, theoretical models, which require imagination and immersion

Mathematical complexity - the involvement of mathematics, which from a certain point becomes extremely complex

Non-perception of applicability - not being aware of applications for that content and hence seeing the content as useless

Impression of distance from the scientific world - believing that science is far from its reality, that scientific knowledge is built in the past by a narrow group of people

So, in order to facilitate the teaching of Physics, the three dynamic teaching methodologies were thought to solve these four factors, which are:

Practical demonstrations - concrete demonstrations, with passive student participation

Interactive experiments - interactive experiments, with active student participation

Examples of applications - examples of practical applications, associations with everyday life

After the systematization of the research, to test and prove this methodology, the methodology was applied in a class on electromagnetic waves. For this, two things were necessary: a bibliographical research on the electromagnetic waves; and the development of models to give the class, based on the three dynamic teaching methodologies. For each lesson content, a different material was created, with a different methodology.

Finally, the qualitative analysis of the class was made, based on "personal comments" made by the students themselves.

3. Results

As a result, a methodology that facilitates the teaching and learning of physics was developed, based on the use of practical demonstrations, interactive experiments and examples of applications. This methodology was tested in a class on electromagnetic waves at school, and as a result, students gained a greater understanding and interest in the subject.

4. References

[1] MOREIRA, M. A. MASSONI, N. T. *Noções Básicas de Epistemologias e Teorias de Aprendizagem*. São Paulo: Livraria da Física (2016).

[2] WIEMAN, C. *Improving How Universities Teach Science: Lessons from the Science Education Initiative*. Cambridge: Harvard University Press (2017).