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## Report Teacher Seminar at Murcia

**The main objective of this seminar is to develop documents, by own teachers, to guide students in his process of active learning using animations, simulations, videos, experiments.**

The MOSEM<sup>2</sup> teacher seminar, at the University of Murcia, was organized coordinated by the CPR (Centro de Profesores y de Recursos) of Lorca, responsible for the training of the secondary school teachers of the South-East of Murcia's Region. Twenty one teachers had participated. The group of the Faculty of Education was in charge of the evaluation.

## SCHEME

The seminar was divided in four sessions, each one lasts for two hours and a half. The first session was divided in two parts; the first one was dedicated to present the Teacher Seminar and his goals, to inform about the EFQM Model and to make a questionnaire to test the abilities of teachers with TICs and their use in the classroom and about their expectative in this seminar. In the second part of the first day, teachers worked with the animations of the computer application and videos of the MOSEM channel at YouTube. To do this they had been divided in four groups, one group worked with the module conduction, other one worked with the module magnetism, and another one with electromagnetic induction, finally the fourth one worked with videos of the Mosem channel at YouTube. They are asked to make a report about the subjects they had revised. The three following sessions had a totally different configuration. We have selected three topics to work on them, in the second session the subject was Magnets, the subject of the third session was Magnetism of the Electric Current and the fourth one was about Electromagnetic Induction and Eddy Currents. We have ended with a demo of superconductor levitation.

## METHODOLOGY




As our paradigm is "*Active Learning*", we have planed the Teacher Seminar with this methodology, we have prepared the materials and teachers will be the protagonist of the Seminar. We have selected three topics, Magnetism of Permanent Magnets, Magnetism of Electric Currents and Electromagnetic Induction and Eddy Currents. We did not put emphasis on the subjects but in the methodology, not all our teachers have these three subjects as topics for their lectures. Neither the materials are the most important thing to improve the teaching-learning process; we can have lots of animations, simulations, videos, experiments and to play with them without improving our teaching. Our proposal is to experience how to program our material to provoke an active learning in the students.

## MATERIALS

A web to have all the main information about the Seminar ready to ease the teachers to find the material was designed: <http://webs.um.es/jmz/mosem2/>. In this web you can find the agenda, the presentation of the Seminar, documents to be used in the Seminar, documents produced at the Seminar, links to the computer application, to the Moodle MOSEM and MOSEM2 media / file repository and to the YouTube channel. Then you have access to the material separated by subjects: Magnets, Magnetism of Electric Current and Electromagnetic Induction and Eddy Currents. In Figure 1 you can see the look of the page with information



about the *Induction in a coil by a magnet that moves: Faraday law*, within the subject: Electromagnetic Induction and Eddy Currents.

We use some icons to identify at a glance the kind of materials. The icon  links to a video,  links with the animations, and  to a photo with the experiment. In this particular case shown at figure 1, some text about the phenomenon and also a video of a lecture are also available.

The screenshot shows a website interface with the following elements:

- Header: MOSEM logo, "INDUCCIÓN ELECTROMAGNÉTICA y CORRIENTES de EDDY", and "UNIVERSIDAD DE MURCIA" logo.
- Navigation bar: "VIDEOS" (with video icon), "ANIMACIONES" (with animation icon), and "Y EXPERIMENTOS" (with photo icon).
- Main content area:
  - **Inducción en una bobina por un imán en movimiento: Ley de Faraday**
    - 
    - Animaciones 4-5, módulo Inducción Electromagnética 
    - Experimento 
    - Notas de clase
    - Descargar vídeo clase: 100113\_2.avi 228 Mb (33 m) 

Figure 1.- Links to videos, animations, experiment, text and video of a lecture related with the *Induction in a coil by a magnet that moves: Faraday law*.

## IMPLEMENTATION AND DEVELOPMENT

In the first session we explained what we expect from this Seminar, we will not explain how to teach some topics of Physics, but we will provide materials, and teachers will decide how to use them with their students in order to get an *Active Learning*. They will experience what is more effective, to receive a talk or to do it by oneself. The next three sessions are planned to produce a document to help the teacher to plan the lesson with their students to ease an active learning.

Just before explaining the EFQM Model, a test was proposed to reflect about the different rolls of teachers at their schools. A discussion emerged about the interest of this test and the speaker decided does not make it and to continue with the EFQM Model. After a break, teachers were divided in four groups to work with the Modules Conduction, Magnetism, Electromagnetic induction and videos of the MOSEM YouTube channel. The idea was to become familiar with these materials and to produce a document about their interest, so the other groups could be informed. They worked for one hour but the reports were not very interesting, time was not enough to make a study of the proposed material. The next three sessions were focussed to produce documents about Physics phenomena, to promote an active learning.

*Magnets* were the subject of the second session. The four groups had been provided with the same materials and the same topics: Magnetic materials, Magnetic shielding, Magnetic dog, Study of magnetic field with filings, Magnetic construction sticks and balls, Floating



magnet (Cu-Cu with magnet in between), Repelling force: measurement with a scale, The unwilling magnet and Comparing the Earth magnetic field with the magnetic field of a magnet (static).



Figure 2.- Measuring the repulsive force between two magnets with an scale.

A very open document was provided to each group, and it was expected they select the topics and the materials, completing with questions to guide students in an active learning. The result was that they worked in the majority of the proposed subjects. The produced documents were interesting but their structure does not fit well to a document *ready to be used by students*.

The third session corresponds with the second subject: *Magnetism of Electric Currents*. This time the document supplied to teachers was provided with an example of the desired information that must be in the document, so it could be useful for teachers and for students.

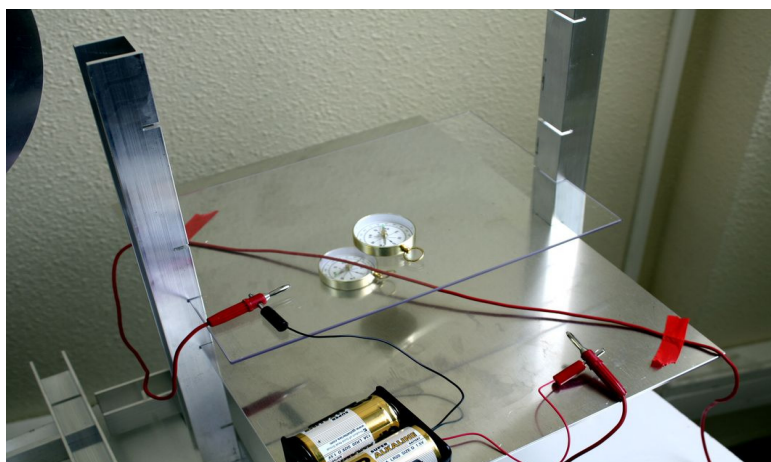


Figure 3.- Setup for Oersted horizontal experiment

The subtopic selected for this example was the *Experiment of Oersted: horizontal version*. In this document there is information for the teacher, the objectives of this unit, the presentation of the subject and the materials to be used by students with some questions to guide them in their process of active learning. These materials are a video, the 4<sup>th</sup> and 5<sup>th</sup> slides of the Module of Magnetism of the computer application, and to perform the experiment shown in figure 3.




Figure 4.- The homopolar motor


After the experience that we had in the previous session about the way teachers had worked, we have selected for this day just two subtopics for each group and they have available only those materials corresponding to these two subtopics. So, each group had only two different experiments to work on them. The first group worked about the *Pohl experiment* and the *Paperclip motor*, the second group had the *Oersted experiment vertical version* and the *Electric motor*, the *Interaction between two coils* and the *Homopolar motor* had been assigned to the third group, and, for the fourth one, *Ampère's interaction between two currents* and the *Electric motor*. This time, three groups elaborate a reasonable document to be used by teachers and students to make an active learning about the magnetism of the electric current.

In the last session we were willing to make a demo with superconductors. To save time, we prepare the documents to work including the links and images that each group needed for his work, so they can be concentrated only writing suggestions, tips and questions to guide students in their way to an Active Learning. In figure 4 we can see the look of part of this document.

**FOLLOW NEXT STEPS**

- 1.- Look at the video [http://www.youtube.com/v/PZNG8mwLNVU&hl=es\\_ES&fs=1&](http://www.youtube.com/v/PZNG8mwLNVU&hl=es_ES&fs=1&)
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- 2.- Work with animations 4-5 of the module Electromagnetic Induction of the application: <http://online.supercomet.no/>
- 
- 3.- Perform the experiment shown at the image: <http://webs.um.es/jmz/mosem2/unidades/induccion/faraday.jpg>
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**Minds-on questions**

Figure 5.- Document with links to a video, to the computer application and to an image with the setup of the experiment about Electromagnetic Induction





In this session the topic to be covered was *Electromagnetic Induction and Eddy Currents*.

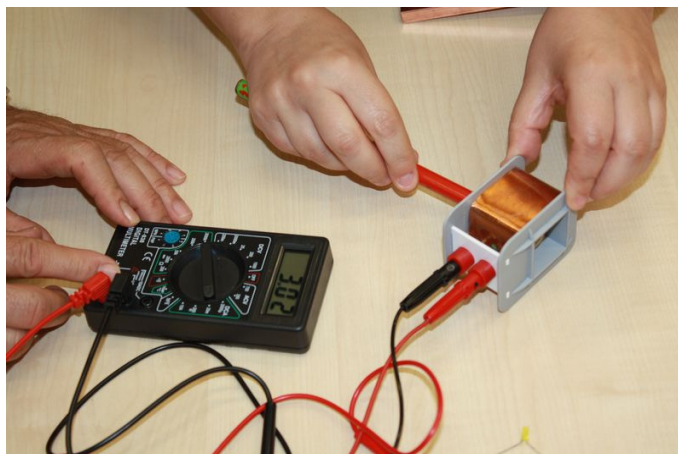


Figure 6.- Setup for Electromagnetic Induction

All groups were provided with similar material to work with *Electromagnetic Induction* but the material to study *Eddy Currents* were different, first group had the *Lazy Pendulum*, second group the *Magnet slalom*, the third one the *Sliding magnet over a copper bar* and the fourth one *Falling Magnet in copper tube*.

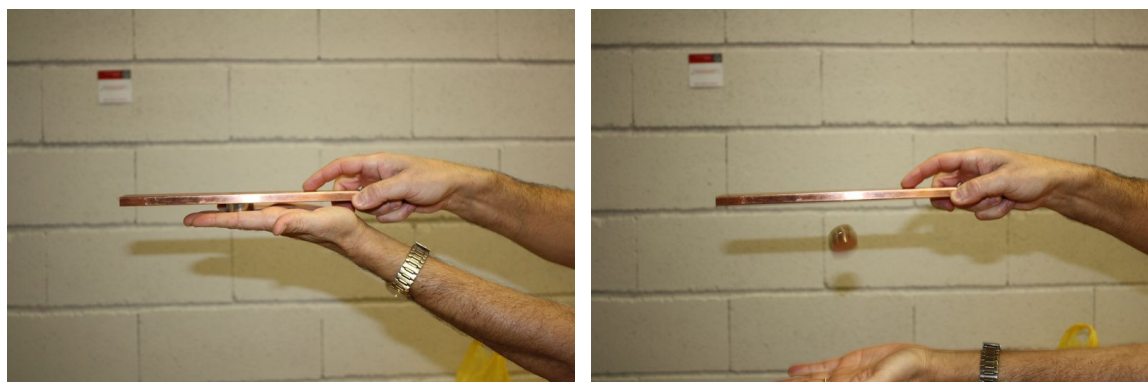


Figure 7.- One can feel the Eddy currents braking the fall of the magnet at the beginning.

Every group produced interesting documents about *Electromagnetic Induction*. All teachers had participated in all the planned experiences about *Eddy Currents*, but this interest was not reflected in the documents they produced.

Finally, a demo of the magnetic levitation using a superconductor was accomplished. In the first session a questionnaire about the use of TICs in their teaching and the expectancy they had with the Seminar was performed, in the last session another questionnaire about the satisfaction with the Seminar was also done.

## CONCLUSIONS

The main objectives of the Seminar were reached. The efficiency of the Seminar was increasing as sessions advanced. The majority of teachers were satisfied with the Seminar, after the Seminar the majority changed their previous attitude about the use of TICs in their lectures, they consider they are now able to make a more active learning.