

INTERNATIONAL CONFERENCE ON PHYSICS EDUCATION, ICPE 2011, MEXICO CITY



Training Physics Teachers and Educational Networks.

August 15 - 19, 2011



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Some Activities on Educational Technology Innovation in Physics, Optics and Telecommunications

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Introduction



INTRODUCTION

□ The use of new technologies in education offers new possibilities [1]:

- To improve the quality of education
- To enhance the performance of students
- To increase the productivity of professors
- To promote the active participation of students in the learning process



INTRODUCTION

- In this context, one of the objectives of universities should be to encourage **educational technology innovation** among their professors and students.



INTRODUCTION

□ GITEs (TEIGs):

- The Vice-rectorate of Technology and Educational Innovation of the University of Alicante (UA) created the Technological and Educational Innovation Groups, (GITEs)
 - ✓ <http://cvnet.cpd.ua.es/gite/quees.aspx>

□ GITE-FOT (TEIG-POT):

- GITE about Physics, Optics and Telecommunications
- Later on GF

INTRODUCTION

The screenshot shows the GITE - UA portal interface. At the top, there is a banner with the GITE logo, the text "Vicerrectorat de Tecnologia i Innovació Educativa" and "Universitat d'Alacant / Universidad de Alicante". Below the banner, the main content area is divided into several sections:

- GRUPOS**:
 - Qué son los GITE
 - Catálogo GITE
 - Estadísticas
- GESTIÓN**:
 - Guía de Gestión
 - Formación
 - Sugerencias
- ÚLTIMA HORA**:
 - Convocatoria de Ayudas GITE 2010
 - Nuevos cursos de formación
- Catálogo Gite >> Todos los GITE >> Descripción del GITE:**

GITE-09006-UA: GITE-FOT. Física, Óptica y Telecomunicaciones

Coordinador/a: BELENDEZ VAZQUEZ, AUGUSTO
Descripción: Innovación educativa en asignaturas de Física de la Escuela Politécnica Superior y de Óptica de la Facultad de Ciencias, así como en diversas materias de la titulación de Ingeniería Técnica de Telecommunicación, especialidad Sonido e Imagen

Líneas de Actuación:

 - 1. Incorporación de tecnología en el proceso enseñanza+aprendizaje
Uso de herramientas de virtualización (Campus Virtual, Moodle, etc.)
Tutorías virtuales
Blogs
Wiki
 - 2. Generación de contenidos didácticos digitales
Grabación de videos
Grabación de audio
Generación de gráficas animadas
Generación de presentaciones
Textos digitales
 - 3. Generación de recursos digitales interactivos
Laboratorios Virtuales

[Ver Web](#) [Ver Blog](#)

Figure 1. Information about the GF on the GITE portal of the University of Alicante

II. LINES OF ACTION OF THE GITE-FOT



LINES OF ACTION OF THE GITE-FOT

□ 1.- Technology in the learning/teaching process:

➤ Use of virtualization tools

- ✓ virtual campus
- ✓ virtual tutorials
- ✓ Moodle, etc

➤ Use of Blogs

- ✓ EduBlogs
- ✓ WebBlogs

➤ Use of interactive remote response systems or "clickers"



LINES OF ACTION OF THE GITE-FOT

□ 2.- Creation of digital didactic material:

- Create animated graphics and presentations.
- Digital texts.
- UA-OCW (*OpenCourseWare* of the UA)



LINES OF ACTION OF THE GITE-FOT

- 3.- *Creation of interactive digital resources:*
- **Virtual laboratories**
 - ✓ Films of physics experiments
 - 18 videos



III. INCORPORATION OF TECHNOLOGY IN THE TEACHING- LEARNING PROCESS



INCORPORATION OF TECHNOLOGY IN THE TEACHING-LEARNING PROCESS

□ III.1. Use of virtualization tools

- Virtual campus [2] is a tool enabling each professor to interact with his students.
- This tool allows professors to
 - post material relating to the subjects they teach
 - take part in virtual tutorials
 - give tests
 - perform all the academic administrative tasks



III.2. Blogs

- Blogs have great potential as tools for making innovations in university curricula [3, 4], since they may be used in the classroom, in particular, to teach transversal content in an interactive way as well as basic skills [3].
 - This project is part of the free-knowledge strategy of the UA called **COPLA** (<http://blogs.ua.es/copla/>).



INCORPORATION OF TECHNOLOGY IN THE TEACHING-LEARNING PROCESS

The screenshot shows a web browser window with the URL <http://blogs.ua.es/fisicateleco/>. The page title is "FUNDAMENTOS FISICOS DE LA INGENIERIA" and the subtitle is "Grado en Ingeniería en Sonido e Imagen". The main content features an article titled "Una revolución per a l'Òptica: cinquanta aniversari del làser" dated December 25, 2010. The article discusses the 50th anniversary of the laser, mentioning Theodor H. Maiman's 1960 achievement. It includes a sidebar for "Universitat d'Alacant" and "Holografia: Ciencia, Arte y Tecnología". Below the article is a calendar for April 2011 and a link to "II CONCURSO BLOGS.UA.ES". The footer includes links to "Mètode.cat" and "XarxaVives.com".



Figure 2. EduBlog of “Fundamentals of Physics in Engineering” (<http://blogs.ua.es/fisicateleco/>).

INCORPORATION OF TECHNOLOGY IN THE TEACHING-LEARNING PROCESS

- III.3. Use of interactive remote response systems or "clickers"
- This experience was carried out by professors of the GF from the Albacete campus of the UCLM who teach the subject "Physical Basis of Medicine" in the first year of the medical degree grade.
- Personal remote response systems or "clickers" were used
 - not only to encourage participation in class but also
 - to enable the students to evaluate themselves [5]
- The next Thursday (August 18th) we will talk about the clickers.

INCORPORATION OF TECHNOLOGY IN THE TEACHING-LEARNING PROCESS



Figure 3. TurningPoint clicker

IV. CREATION OF DIGITAL DIDACTIC MATERIAL



CREATION OF DIGITAL DIDACTIC MATERIAL

IV.1. Presentations

- Professors of the GF have presentations for almost all the topics they teach.

IV.2. Digital texts: RUA and OCW

- One of the most significant contributions made by our group has been the creation of digital texts which are auto-filed in the RUA-Repository and publication of subjects in OpenCourseWare.

CREATION OF DIGITAL DIDACTIC MATERIAL

The RUA
(<http://rua.ua.es/>) provides free access to the documents created by members of the UA as a result of their research and teaching work.

The RUA is divided into four sections:

1. RUA-Teaching
2. RUA-Institutional
3. RUA-Research
4. RUA-Journals and congresses

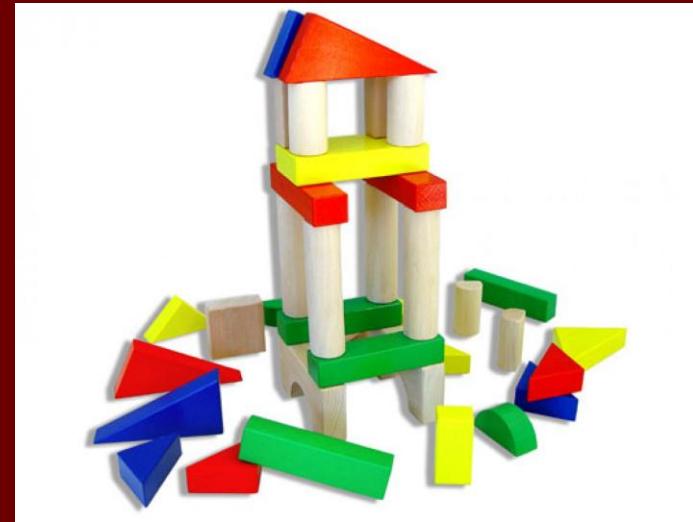
The screenshot shows the front page of the RUA (Repository of the University of Alicante). The page has a dark blue header with the RUA logo and the text "RUA: Repositorio Institucional de la Universidad de Alicante". Below the header is a sidebar with various links. The main content area includes a search bar, a section titled "Áreas en RUA" with four sub-links, and several logos at the bottom. On the right side, there is a graphic of a triangle composed of blue, yellow, and orange lines, a link to "Blog de RUA", and a section titled "¿Cómo depositar documentos en RUA?" with information about depositing documents.

Figure 4. Front page of the Repository of the UA (RUA)

CREATION OF DIGITAL DIDACTIC MATERIAL

□ GF portal (<http://rua.ua.es/dspace/handle/10045/11260>):

- A total of 378 documents are available
- Journal articles: 43
- Book chapters: 24
- Communications in Congresses, Conferences, etc.: 76
- Exercises/Practical work/Exams: 61
- Course Descriptions: 33
- Manuals/Topics: 114
- Presentations: 7
- Audiovisual Resources: 21



CREATION OF DIGITAL DIDACTIC MATERIAL

- OpenCourseWare (**OCW**) is an international program for the e-publication of university courses, created in 2001 by the MIT.
- Over 200 universities and other higher education institutions form the OpenCourseWare Consortium.
- On May 2011 the GF won the “Site of reference” award at the “Awards for OCW Excellence 2011” in Boston.



CREATION OF DIGITAL DIDACTIC MATERIAL

The GF participates in the OCW-UA with the subject
“*Fundamentals of Physics in Engineering I*”
(http://ocw.ua.es/ingenieria-arquitectura/fundamentos-fisicos-de-la-ingenieria/Course_listing)
in the “Sound & Image Engineering” degree course.



Figure 5.“Fundamentals of Physics in Engineering I” course published in the OCW of the UA

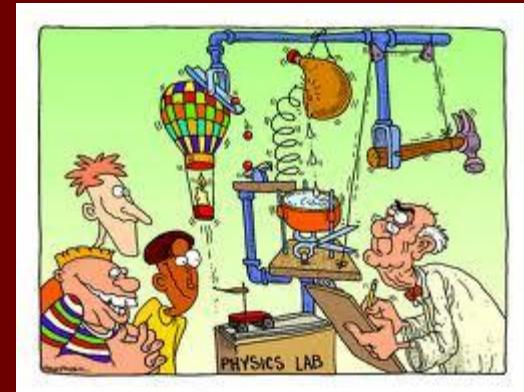
V. CREATION OF INTERACTIVE DIGITAL RESOURCES



CREATION OF INTERACTIVE DIGITAL RESOURCES

□ V.1. Virtual laboratories

- Laboratory work is a fundamental part of Physics [6, 7].
- Films of physics experiments can make the educational process
 - more productive
 - speed up the learning process
 - increase the students' motivation [8, 9]



CREATION OF INTERACTIVE DIGITAL RESOURCES

□ In addition, current technology allows these films to be viewed on:

- TV
- conventional DVD player
- PC
- iPod
- iPhone
- iPad
- PDA
- ...



CREATION OF INTERACTIVE DIGITAL RESOURCES

- Professors of the GF created complementary teaching material in video format
 - a total of 18 videos of physics experiments
 - lasting 5-15 minutes each one

- This material was developed to help students understand **first year physics** subjects by merging the possibilities offered by information & communication technologies with teaching activities.

CREATION OF INTERACTIVE DIGITAL RESOURCES

- The material developed is based on **real** (not simulated) experiments recorded with a digital video camera, transferred to a computer and then edited using video editing software.
- There are two types of films:
 - Demonstrations
 - Practical laboratory work

CREATION OF INTERACTIVE DIGITAL RESOURCES

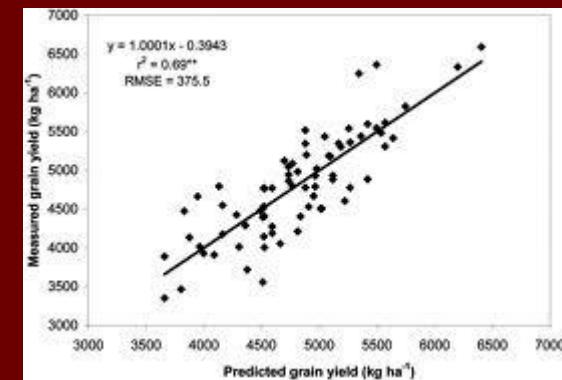
□ In the first (**demonstrations**)

- no notes are taken
- the intention is basically to demonstrate a physical phenomenon
- the student is able to reproduce the demonstration as often as he likes
 - ✓ Pausing, Rewinding, etc
 - ✓ search something in a book
 - ✓ etc



CREATION OF INTERACTIVE DIGITAL RESOURCES

- On the other hand, the practical laboratory work in the films is similar to the experiments that students perform in the laboratory.
- The student is required to perform activities like:
 - obtain and process data
 - calculate errors
 - get certain physical magnitudes related to the experiment
- This work is available on
 - multimedia files
 - a DVD with the 18 experiments
 - an Internet portal



CREATION OF INTERACTIVE DIGITAL RESOURCES



Figure 6. Front page of the Physics Experiments portal

CREATION OF INTERACTIVE DIGITAL RESOURCES

- The UA recently created an application called **iUA** [10] compatible with iPhones, iPod Touch, iPads and other systems that allow access to physics videos in real time without the need to download, if you have **3G** access or Wi-Fi connection.
- Likewise, on the UA webpage in the section **iTunes U** at the **iTunes shop** of Apple, you can also freely access and download these videos of physics experiments.



CONCLUSIONS



CONCLUSIONS

- One of the main objectives of our group is to promote open knowledge.
- Thus, all the material created by its members is available not only for staff and students of UA and UCLM, but also for those of other universities.



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CONCLUSIONS

- The material created and technologies used are intended to support and complement the teaching-learning process of subjects taught by members of the GF in accordance with a model in which the possibilities offered by **information and communication technologies** are combined with **traditional teaching activities**.



ACKNOWLEDGEMENTS

- This work was financed by the Vice-rectorate of Technology and Educational Innovation of the University of Alicante (Spain), under project GITE-09006-UA.
- This work has been also partially supported by grants from Fundación Cajasol-Banca Cívica (Spain).



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QUESTIONS
& ANSWERS