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# MEMORIA FINAL

# Actuaciones Avaladas para la Mejora Docente, Formación del Profesorado y Difusión de Resultados
# Modalidad C

| Identificación de la actuación | |
|---|---|
| Código: | AAC_12_004 |
| Título: | Ces-Based Teaching Experiences: Online Evaluation And Group Activities |

| Responsable | |
|---|---|
| Apellidos y nombre: | Morales Sánchez, Francisco Miguel |
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| Departamento: | Ciencia de los Materiales, Ingeniería Metalúrgica y Química Inorgánica |

## 1. Describa la contribución a la actuación de cada uno de los participantes. Copie y pegue las líneas que necesite para contemplarlos a todos y disponga del espacio que necesite.

| Apellidos y nombre: | Morales Sánchez, Francisco Miguel |
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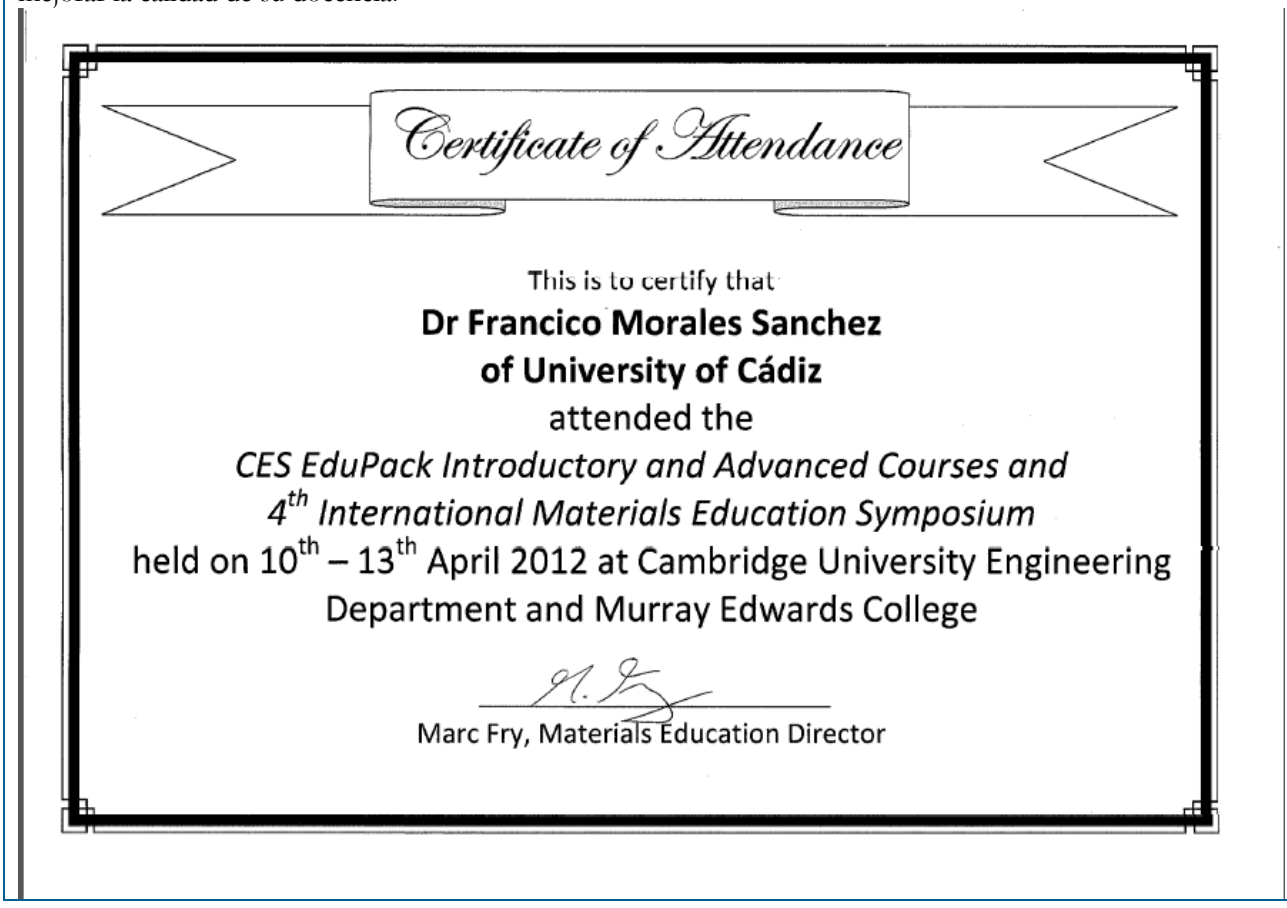
Durante la realización de esta acción, el participante asistió al "4th International Materials Education Symposium" y al "Associated Short Course" (http://www.materialseducation.com/2012/cambridge/index.htm) celebrado los días 4-5 y 2-3 de abril respectivamente en la Universidad de Cambridge.

En el curso previo, el profesor Mike Ashby y otro gran número de doctores que conforman su equipo dentro de la empresa Granta Design, pusieron en conocimiento de los profesores de universidades de todo el mundo las espectaculares herramientas y nuevos recursos disponibles en el software CES-Edupack para la docencia en campos como la Ciencia y la Ingeniería de Materiales. En este caso el curso estuvo enfocado a "los Materiales y en Medio ambiente". El curso incluyó charlas, pequeñas demostraciones, tiempos de discusión, sesiones de toma de contacto y ejercicios, etc. Como puede apreciarse en la siguiente figura fue alto el número de participantes teniendo en cuenta el coste del mismo:

Los dos siguientes días se participó en el simposio, contribuyendo al mismo con un póster. A este congreso asistió personal docente universitario y preuniversitario de 28 países y tenía como objetivo dar a conocer las últimas tendencias en la docencia de la Ciencia e Ingeniería de Materiales. Este evento fue una oportunidad excepcional para el debate y el fomento del intercambio de ideas y experiencias relacionadas con las actividades didácticas innovadoras asociadas a la CIM. Durante los dos días de congreso se desarrollaron exposiciones orales y presentación mediante poster de trabajos, acciones puestas en marcha e ideas innovadoras en la docencia teórica y práctica, tanto presencial como no presencial.

Un claro ejemplo de la incentivación de contactos para el fomento de la actividad docente son las reuniones que allí se mantuvieron con el resto de los componentes de la red idM@ti, la cual es una red inter-universitaria de innovación docente en ciencia e ingeniería de materiales, que se creó el año 2010 por iniciativa de profesores de siete universidades españolas (Universitat Politècnica de València, Euskal Herriko Unibertsitatea, Universidad Jaime I, Universidad de Cádiz, Universidad de Málaga, Universitat de Barcelona, Universidad Politècnica de Catalunya) y la empresa Granta Desing y que se mantiene abierta al resto de la comunidad universitaria de habla castellana. Dentro de la red se comparten experiencias y recursos con el objetivo de mejorar la calidad de su docencia.



Certificate of Attendance

This is to certify that

**Dr Francico Morales Sanchez**

**of University of Cádiz**

attended the

*CES EduPack Introductory and Advanced Courses and*

*4th International Materials Education Symposium*

held on 10th – 13th April 2012 at Cambridge University Engineering Department and Murray Edwards College

Marc Fry, Materials Education Director

## 2. Aporte el producto final generado para la difusión.

### Abstract de la contribución:

| | |
|---|---|
| **Tipo de comunicación (oral o póster):** | **PÓSTER** |
| **Título:** | **CES-based teaching experiences: online evaluation and group activities** |
| **Autores:** | **Francisco M. Morales, David L. Sales, Teresa Ben, Francisco J. Pacheco, Miriam Herrera, Rafael García** |
| **Resumen de la comunicación:** | The European Space for Higher Education requires adapted teaching structures towards student-focused learning, giving the students an active role in their own curriculum. This demands higher interactivity of the learning process. On this purpose we have created a series of tools for training concepts of Materials Science and Engineering based on the CES-EduPack software. This work shows, on one hand, auto-assessed activities built under the Moodle virtual learning platform, consisting of (i) quizzes (with calculated, multiple choices, matching, true/false and numerical questions); and (ii) self-directed lessons. On the other hand, some teamwork experiences are described. Among them, (iii) cooperative learning seminaries using the jigsaw or puzzle method to solve simple materials selection exercises; and (iv) the arrangement of a glass-cabinet displaying engineering materials within common 'everyday' objects and a card with their main properties, classified by material families. We can conclude that all these tasks were fruitful and some statistics are added concerning the results obtained by students. |

**Poster presentado:**

# CES-EduPack-based teaching experiences at UCA: *online evaluation and group activities*

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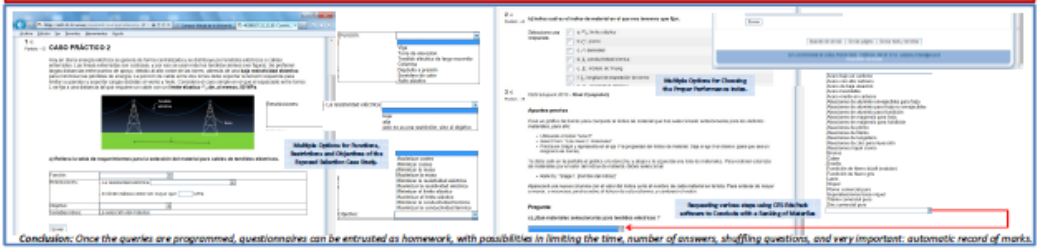
The European Space for Higher Education requires adapted teaching structures towards student-focused learning, giving the students an active role in their own curriculum. This demands higher interactivity of the learning process. On this purpose we have created a series of tools for **training concepts of MS&E based on the CES-EduPack software**. This work shows, on one hand, auto-assessed activities built under the Moodle virtual learning platform, consisting of **(i) quizzes** (with calculated, multiple choices, matching, true/false and numerical questions); and **(ii)** self-directed **lessons**. On the other hand, some teamwork experiences are described. Among them, **(iii) cooperative** learning **seminaries** using the jigsaw or puzzle method to solve simple materials selection exercises; and **(iv)** the arrangement of a **glass-cabinet displaying engineering materials** within common 'everyday' objects and a card with their main properties, classified by material families.

## SELF-DIRECTED LESSONS

A *self-directed Moodle lesson* consists of a number of pages. Some of them end with a question and a number of possible answers. Depending on the student's choice of answer they either progress to the next page or are taken back to a previous page. Navigation through the lesson can be straight forward or complex, depending largely on the structure of the material being presented. A mark is given to the student at the end.

*Conclusion: It is a self-learning activity, very useful for short lessons with non-complex theoretical content.*

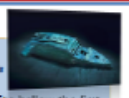
## ONLINE QUESTIONNARIES



*Conclusion: Once the queries are programmed, questionnaires can be entrusted as homework, with possibilities in limiting the time, number of answers, shuffling questions, and very important: automatic record of marks.*

## COLLABORATIVE TASKS AND TRUE-FALSE TESTS

### Group Seminar, 56 students:

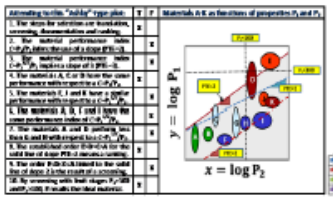


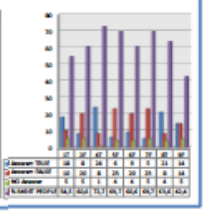
By using the **puzzle technique** our students are guided to solve The selection of the **proper material for ship hull building**: LA-Steels (being just toughness the parameter to control) by training with the *CES-EduPack* 2010 during **2 hours** in **14 groups of 4 people**. See bellow the first of seven consecutive tasks and their solutions. Before finishing the students must **send by e-mail** to the teacher the answers and the saved *CES* e-file.

**A.** Draw a $K_{IC}$ vs $\sigma_y$ plot for all materials, select E<20 Gpa and $\sigma_y$>250 Mpa and for the index $C_1=K_{IC}/\sigma_y$ say how many materials behave like "Ni-Cr alloys"?: 20

**B.** Draw a $K_{IC}$ vs E plot, add the restriction $K_{IC}$>45 Mpa·√m to the previous one and for the index $C_2=K_{IC}/E$ select the best behaving material: Zn alloys for injection

### A True-False Test on Selection, statistics for 33 students:



## GLASS CABINET WITH ENGINEERING MATERIALS

### Cooperative learning activity for 30 students:

Everything is made out of materials, but **which** are used in each case? **what** are their properties? These questions were to be answered in this activity. A glass cabinet was installed in the lecturer room, and students were asked to contribute with two different objects each (everyday life objects), find out of which materials are made, catalogue them and find their properties using CES.

**Abilities to be developed with this activity:**

- Arouse interest about what things are made of.
- Differentiate between the four material families.
- Link material properties with design requirements.
- Find out materials selection criteria.


## CONCLUSIONS

*We can conclude that all these experiences were fruitful for groups between 20 and 100 students in MS&E education of Chemistry; and Chemical-, Naval-, Industrial- Engineering.*

## ACKNOWLEDGEMENTS

*We are grateful to 2nd year Chemical Engineering* ***UCA students*** *for their work on the cabinet, specially to P. Peralta, R. Rodríguez and G. García for leading the students group. The economic support by the "**Unidad de Innovación Docente**" of UCA is also to be acknowledged.*