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Mathematics Education in Engineering and Applied Sciences

Digital resources in mathematics teaching at university. Experiences and challenges

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Contents









02 Objectives





- Help students to identify the main difficulties of the subject and possible learning errors related to Calculus
- Revise and increase students' knowledge of the subject matter.
- Provide a self evaluation tool for the theory and practice discussed throughout the course.
- Increase students' capacity to form valid opinions about their own competence, regarding both new and existing subject matter.
- Detect specific difficulties which are encountered in the exercises (from the teacher's perspective)
- Identify potentially complex concepts for students (from the teacher's perspective) in order to place more emphasis on them in future sessions

03 Strategies







Strategies



Interactive materials

 Collaborative work among teachers **DESCARTES NETWORK:** The Digital Educational Descartes Network is an NGO which aims to promote methodological change and renewal in the teaching and learning processes of mathematics and other subjects, using interactive digital resources generated by the Descartes Project. To this end, the development and widespread use of the Descartes authoring tool has been proposed.

proyecto descartes

http://proyectodescartes.org/

GIEMATIC UC: Group made up of UC teachers who share common academic interests and produce material for the subjects they teach



Material Interactivo

Sumas de Rieman

 Laboratorio: Representación y cálculo
 Cálculo de primitivas
 Laboratorio: Integración por sustitucion
 Laboratorio: Integración por partes
 Laboratorio: Integración de funciones racionales
 Laboratorio: Integración funciones trigonométricas
 Condiciones de integración funciones trigonométricas
 Condiciones de integrabilidad y propiedades
 Ejercicio 1: Integrabilidad y propiedades
 Ejercicio 2: Integrales de funciones con simetría
 Ejercicio 3: Integrales de funciones periódicas

Menú Principal Inicio Números complejos Funciones de una variable Series Varias variables Integración simple Sumas de Remann Condiciones Integración de Mana Propiedades Teoremas Printhvas Integración múltiple

http://giematic.unican.es



		Summor program	Content information pills
	Interactive activities		The student as a creator of content
		Supplementary	
	Concept visualization	material for resitters	Video has been the first choice
	Teaching units	Automatically corrected tests which provide quick and inmediate tutoring	in the creation of these digital artefacts
	Guided exercises		
	Tests		



Interactive activities

Characteristics

- Concept visualization
- Interactive exercises in which we ask students different questions in order to reach the solution

Objectives

 Revise and increase students' knowledge of the subject matter



https://proyectodescartes.org/Un 100/Variable_compleja.htm

How is it used?

- Initial survey: We used a diagnostic test about basic precalculus concepts
- Practical sessions in visualization and calculus
- These sessions took place in class time



Interactive activities



- Visualization of concepts
- Explanation video
- Self-correcting exercises with random data



Experiences



Interactive activities





Interactive activities

GIF

HTML

HTMLFrame:
 Possibility of sharing information

- Dynamic mathematics software
- Javascript programming

Ejemplo: Función 2π-periódica f(t) = t -π < t <π

Desarrollo en serie

 $2\sum_{n=1}^{\infty} \frac{(-1)^{n+1}sen(nt)}{n}$

Mueve el punto rojo para variar el valor de t= 1.5

Diferencia entre la función y la serie en el punto P

1.5 - 1.995 =

= -0.495





Summer program

Characteristics

Purpose: Help to prepare the September exam Duration: 7 weeks Work: 5 online test and exam (3 points) Self evaluation exercises: step-by-step feedback

- First level: Reproduction of routine procedures
- Second: Connecting and integrating ideas to solve standard problems
- Third: Reasoning, argumentation, intuition and generalization for solving original problems

http://www.giematic.com/PlanRecCl/Info/index.htm#xl_xr_page_index



Summer program

- Analysis of items to detect common errors.
- Principally using incorrect procedures and unsuitable concepts

 $\int \frac{3}{\sqrt{1+356nx}} \cos \frac{3}{\sqrt{1-36nx}} \cos \frac{3}{\sqrt{$ $= \frac{1}{2}$ $= -27 \int \cos x \cos x \, dx = -27 \int \cos^2 x \, dx = -27 \left[\frac{1}{2} + \frac{\cos 2t}{2} \right]$ $\int x \operatorname{arctg} x \, dx$ $\int u = x \longrightarrow \partial u = \partial x$ $\int dv = \operatorname{arctg} x \, dx \longrightarrow t = \frac{4}{4 + x^2}$ 9-4 -> (y⁴+y²= 36 -> y²+y=6 -> y²+y-6=e Has deniced 1 $-\frac{1+5}{2}$ (1) $-\frac{1+5}{2}$ (2) (1)



Summer program



	Pulsa sobre el botón para comenzar a realizar el test	Comenzar
GIF	Test 30 Eurojanes de varias variables	
	Test 2C Funciones de varias variables	
	 Este test consta de 10 preguntas. Cada pregunta solo tiene una respuesta correcta 	
	 Pulsando sobre los números que se encuentran en 	
	la parte superior podrás cambiar de pregunta	
L		

- Links to theory
- Links to practice
- Pause to select between various options
- Pause to solve a problem
- Increase in learning possibilities
- Automatically corrected tests

Content information pills

- As we create, we learn

Activities

05

 In this experiment, the student is responsible for their own learning, a further aim therefore the content created can be used by other students.





Aprendizaje móvil a través de microcontenidos



Content information pills

 In the following academic year, the knowledge generated this course will be used for the students to analyze it, evaluate it critically, discriminate the relevant information, etc.

Experiences

04

The aim is to take advantage of the learning experience of the students of one course to improve the learning of the subjects in the upcoming years.





Summer Program:

- 4 courses completed
- Two o three test for topic, 15 questions for test
- Random questions
- Database with the records of the answers marked to each question
- Effective results: 90%
 of students who pass
 the September exam
 have followed the
 program

Pills of content:

- 84 videos created by students
- Incorporated as a moodle wiki activity and in two web pages
- The 85% of students recognize meaningful learning

Interactive activities:

- 10 topics (theory and practical exercises)
- More than 200 exercises step by step
- 300 test questions
- Over 80 interactive laboratories

06 Conclusions





The design of activities using configurable templates which allow the incorporation of new exercises The creation of learning activities to facilitate autonomous learning. A positive valuation from students who praised the quality of the material and said that it has helped them study.



THANK YOU

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