

# AUDIOVISUAL RESOURCES AS A USEFUL TOOL TO IMPROVE THE TEACHING OF COASTAL ENGINEERING (MARINE SCIENCE BSC DEGREE)

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## **Abstract**

Lessons for a technical subject were explained in videos which were later uploaded to YouTube and to a virtual classroom within the Marine Science BSc degree. In this way, these files, complemented with ppt slide presentations, were also useful for the Erasmus students with a low level of Spanish. Finally, some online questionnaires were also uploaded in order to allow the users check by themselves their knowledge. The different steps of the followed methodology are explained and screenshots of the virtual are also displayed. The use of Moodle was therefore highly encouraged and the results of a survey conducted by the teachers of the course showed the utility of the technique proposed herein.

Keywords: Innovation, Technical subject teaching, Coastal Engineering course, audiovisual resources, Active Presenter, Moodle.

## **1 INTRODUCTION**

Numerous graduates from American Universities apply for their degree homologation for the Marine Science certificate in Spain. The Spanish Ministry of Education supports this application as long as they pass an exam based on several subjects including Coastal Engineering at the University of Cadiz. In addition, it may be difficult for foreign students to properly prepare the subject because they cannot attend the lessons at the campus. On top of that, there is a lack of Coastal Engineering knowledge in the marine-terrestrial field, despite Cadiz is one of the Spanish provinces that invests more money on the coast and in the beach and dune systems maintenance [1] [2] [3].

The aforementioned subject is currently being taught in the third year of the BSc degree. This is a very specific topic and some innovative educational projects have already been performed to improve mentoring of students [4] and success on increasing number of students who pass the final test [5]. Unfortunately there is no adequate bibliography for this kind of technical subjects that allows for the breadth of knowledge needed to pass the final exam. Furthermore, not all of the enrolled students are able to attend the classes as they have clashing schedules. On the other hand, some students are incoming an Erasmus grant and their Spanish is quite poor. Therefore, the use of this Information and Communications Technology (ICT), by using these audiovisual resources, would be very useful for their studies, not only from a technical but also from a linguistic point of view. Furthermore, this project will allow to partially fulfilling the requirements of the new European Higher Education Area (EHEA).

Hence, the aim of this paper is to present an innovative e-teaching project based on the explanation of the lessons on videos which are later uploaded to a virtual classroom and to YouTube.

## **2 METHODOLOGY**

The virtual learning platform used to make available the information recorded on the videos was Moodle (acronym for Modular Object-Oriented Dynamic Learning Environment). In June 2013, this free software had a user base of 83,008 registered and verified sites, serving 70,696,570 users in over 7.5 million courses with more than 1.2 million teachers [6]. This virtual scenery was specially developed to help educators in the creation of online courses with a focus on interaction and collaborative construction of content, which is precisely one of our objectives.

The performance of the audiovisual resources was facilitated by the free software Active Presenter [7] which is a screen casting and eLearning software for Microsoft Windows. It is worthy to remember that a screencast is a digital recording of computer screen output, a video screen capture that often contains voice cover. The best way to start with this program is to spend a few hours reading through the User Manual. It does not only provide a clear picture on how Active Presenter works but also gives a more detailed explanation of all the features and their settings or parameters [8].

The utilization of this free and relatively easy-to-use software enables us to deal with the ICT handicaps: too expensive to accomplish and difficult to use by professors. On the other hand, one of the most important advantages of ICT to learn technical subjects is that images can easily be used in teaching and improving the retentive memory of students. Secondly, complex instructions can be easily explained ensuring the students' comprehension. Finally, ICT allow creating interactive classes and making lessons more enjoyable, which in most cases meliorate the attendance and concentration of the undergraduates [9].

These audiovisual resources consist of a sequence of PowerPoint slides commented by the professor of the course. Once the videos are edited and corrected, the files are uploaded to YouTube and linked to the virtual class which is available in the Moodle platform. The index of the web page (Fig. 1) shows the different chapters: presentation and preliminaries, slides of the various issues, solved exercises, indicative example of a final test, videos and questionnaires, and the folders that are enabled to submit the homework [5].



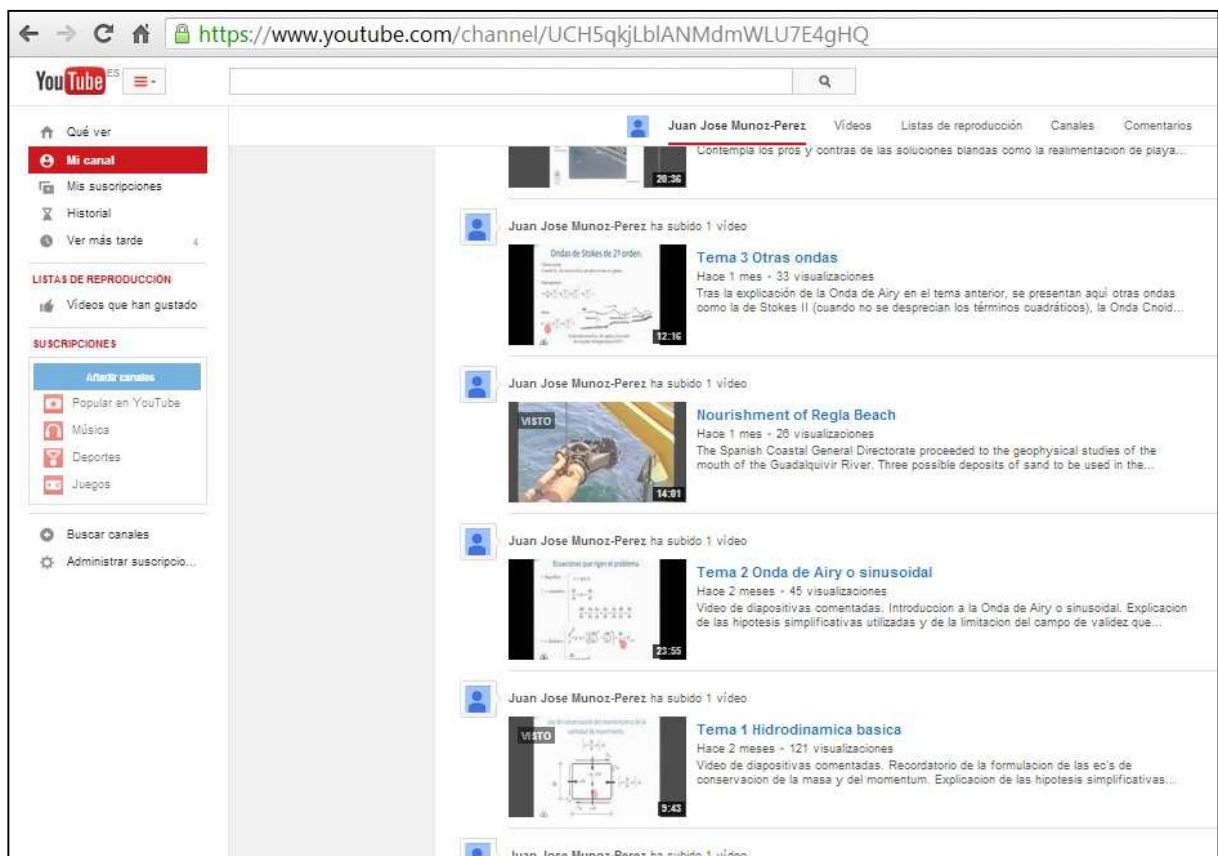
**Fig. 1.** Index of the moodle page showing the different sections

Various topics covered in the course can be seen in the presentation sheet, as well as an example of the kind of research papers [10] that the students usually have to look for in order to expand their knowledge (Fig. 2).

A list of the videos, accessible not only at the Moodle page but also in YouTube, can be checked in Fig. 3 and an example of one of them is showed in Fig. 4. Moreover, one of the videos was translated into English to conduct an experiment and check the acceptance of this teaching material not only for the foreign students but also for Spanish students (see Fig. 5).



**Fig. 2** Heading of an example of the kind of papers which have to be found at the online library



**Fig. 3** List of the videos uploaded to YouTube

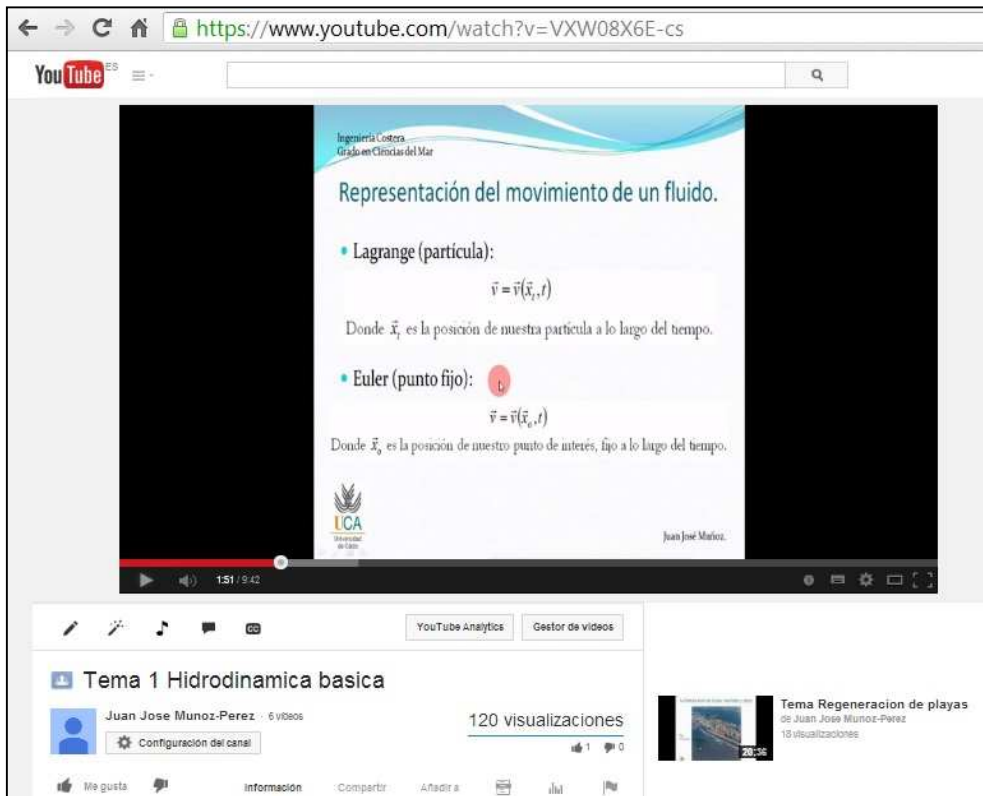


Fig. 4 Screenshot with an example of one of the videos uploaded to YouTube

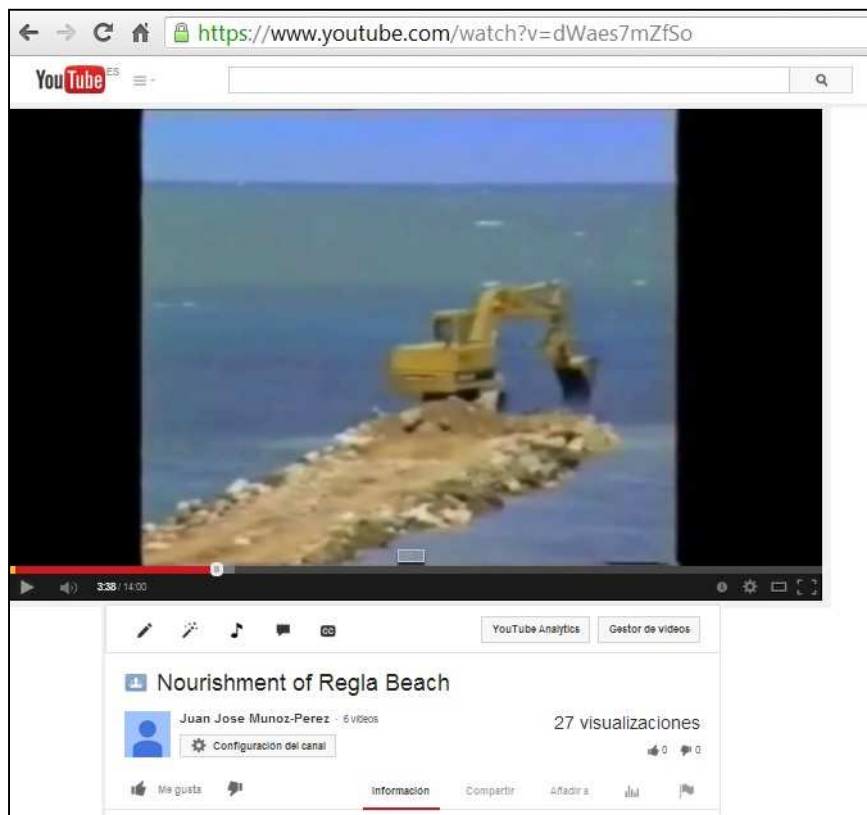




Fig. 5 Screenshot of the didactic video translated into English

The questionnaire related to each video is about eight multiple choice questions. An example can be consulted in Fig. 6. These tests are useful for students to check whether their understanding of the subject is correct or needs improvement. Besides, their resolution is mandatory but they are available throughout the entire course and can be solved as often as desired.



In addition, the resolution of some exams from the last years is explained in documents included into the Virtual Classroom in order to facilitate the study of the subject.

**Pregunta 2**  
Sin responder aún  
Puntúa como 1,00  
 Marcar pregunta  
 Editar pregunta

El movimiento de las partículas...

Seleccione una:



- a. En aguas someras describen una trayectoria elíptica.
- b. En aguas profundas, no hay movimiento en el fondo ( $z \approx \infty$ ), las velocidades vertical y horizontal son nulas.
- c. Todas las respuestas son ciertas.
- d. En aguas someras, se produce un movimiento de vaivén en el fondo ( $z = -h$ ).

**Pregunta 3**  
Sin responder aún  
Puntúa como 1,00  
 Marcar pregunta  
 Editar pregunta

En relación con la celeridad de grupo o velocidad con la que se desplaza la energía...

Seleccione una:



- a. G o número generador vale  $\frac{2kh}{sh(2kh)}$
- b. Varias respuestas son correctas.
- c. En aguas someras  $c_g = c = \sqrt{gh}$
- d.  $c_g = \frac{c}{2} \cdot \left( 1 + \frac{2kh}{sh(2kh)} \right) = \frac{c}{2} \cdot (1 + G)$

**Pregunta 5**  
Sin responder aún  
Puntúa como 1,00  
 Marcar pregunta  
 Editar pregunta

Una de las hipótesis simplificativas de la onda de Airy es...:

Seleccione una:



- a. La profundidad h es variable.
- b. Se trabaja en un medio bidimensional (2D) y sólo puede ser utilizada para oleajes tipo SEA, excluyendo las olas tipo SWELL.
- c. Se trata de un fluido incompresible. Esto significa que la densidad ( $\rho$ ) es siempre constante.
- d. El peralte es mucho mayor que uno:  $\beta \gg 1$ .

**Pregunta 7**  
Sin responder aún  
Puntúa como 1,00  
 Marcar pregunta  
 Editar pregunta

Elija la opción correcta:

Seleccione una:

- a. Las aguas profundas (off-shore o deep water) corresponden a profundidades  $h > L/20$
- b. Ninguna respuesta es cierta.
- c. Para aguas profundas y someras la celeridad de onda se puede expresar como  $c = \sqrt{g \cdot h}$
- d. Las aguas someras (shallow water) serán aquellas para las que  $h/L < 1/20$

**Pregunta 8**  
Sin responder aún  
Puntúa como 1,00  
 Marcar pregunta  
 Editar pregunta

De las condiciones de contorno establecidas para la Onda de Airy...:

Seleccione una:

- a. En la superficie, la condición cinemática asume una función continua en el espacio-tiempo  $\frac{dz}{dt} = w = \frac{d\eta}{dt}$
- b. En la superficie, la condición dinámica supone que la presión atmosférica es constante.
- c. Todas las anteriores son ciertas.
- d. En el fondo, la componente vertical (w) de la velocidad es igual a 0.

**Fig. 6** Example of a questionnaire showing some multiple choice questions

Finally, the survey will be conducted according to the good practice and adapting it to a standard model employed by the University of Cadiz in its quality controls. Some of the questions related to

personal information as well as the utility of the audiovisual resources are shown in Fig. 7. A section where the students can propose changes to improve the presentations and their use was included in order to assess the level of interest and success that were achieved.

**INFORMACIÓN PERSONAL Y ACADÉMICA**

Edad (años)

<19  20-21  22-23  24-25  >25

Sexo

Hombre  Mujer

Veces que te has matriculado en esta asignatura

1  2  3  >3

¿En qué situación está como alumno de esta asignatura?

Primera vez en el Grado.  
 Repetidor en el Grado.  
 Repetidor en la Licenciatura.  
 Erasmus.  
 Homologación de título.  
 Otro.

Tu asistencia a clase (% de horas lectivas)

Nunca  
 Menos del 50%  
 Entre 50 y 80%  
 Más del 80%

**SOBRE LOS RECURSOS DIGITALES**

Para el estudio de la asignatura ¿te han servido los apuntes en powerpoint? (1 Nada. 5 Mucho.)

1  2  3  4  5

¿Y los test de cada tema?

1  2  3  4  5

¿Y los videos explicativos?

1  2  3  4  5

Para estudiar el examen final ¿te han sido útiles los ejercicios resueltos?

1  2  3  4  5

¿Sería conveniente completar el resto de la asignatura con estos apuntes, videos explicativos y tests? ¿Por qué?

Como opinión global, ¿estás contento con los recursos contenidos en el campus virtual de la asignatura? ¿Mejorarías algo? ¿Quitarías algo?

¿Te ha gustado la asignatura? 1 Nada. 5 Mucho

1  2  3  4  5

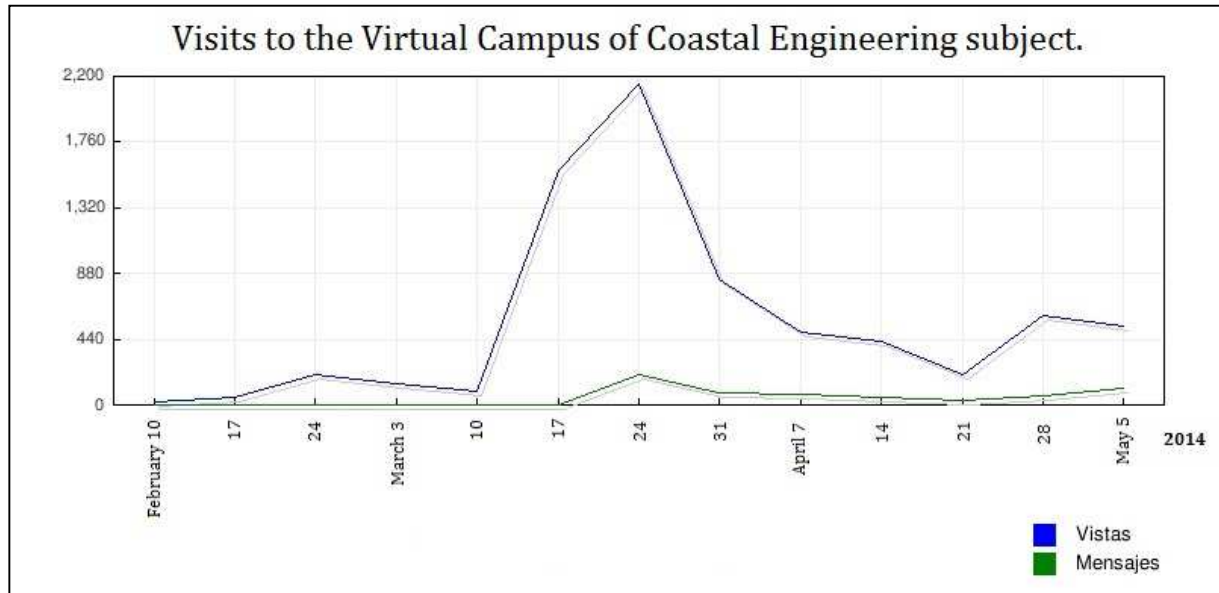
Fig. 7 Some of the questions included in the survey

### 3 RESULTS AND DISCUSSION

Despite the fact that the application of the method is still in course, the authors are aware of some results that can be presented and discussed.

An increased interest of the students is appreciated based on: i) the number of downloads from the Moodle platform or from internet (YouTube); ii) the answers of the tests that accompany the explanatory videos and iii) the amount of on-line questions and the personalized tutorials. Likewise, it is expected that students will soon make a massive use of the solved exercises to study the final exam.

The number of students visiting the virtual campus and messages sent to the teachers are shown in Fig. 8. Despite the requirement of periodic homework, the highest peaks in messages and visits coincide with the date of a midterm exam in both number of messages and visits. Therefore, an even higher peak is expected as the final exam date approaches, estimating an increase in the number of downloads by the students (solved exercises, videos and consults).



**Fig. 8** Number of students visiting the virtual campus and messages sent to the teachers

According to the obtained results, these audiovisual resources can be considered of great interest, to be uploaded to the University of Cadiz repository for public domain. In order to disseminate the utility of the project in academia, several lectures will be given to explain its methodology, results and conclusions, not only in our faculty but also in international forums like this Conference to further its application to other courses.

## 4 CONCLUSIONS

Awaiting for the final results of the survey, it can be concluded that such initiatives should continue to encourage the students' interest. Videos explaining the lessons have provided an appropriate material to students, who, due to diverse circumstances, cannot attend regular classes, e.g., students living abroad or students whose schedules do not fit with the official timetable.

The methodology presented herein has also demonstrated its usefulness in the case of foreign students whose level of Spanish does not allow them to properly follow the explanations given in the class.

## ACKNOWLEDGEMENTS

This study was partially funded by the University of Cadiz through its Teaching Innovation Programme.

## REFERENCES

[1] Muñoz-Perez, J.J., Roman-Sierra, J., Navarro-Pons, M., Neves, M.G. and Del Campo, J.M. (2013). Comments on "Confirmation of Beach Accretion by Grain-Size Trend Analysis: Camposoto Beach, Cádiz, SW Spain" by E. Poizot et al. (2013) *Geo-Marine Letters* 33(4), pp 75-78.

- [2] Navarro, M., Muñoz-Perez, J.J., Roman-Sierra, J., Tsoar, H., Rodriguez, I. y Gomez-Pina, G. (2011). Assessment of Highly Active Dune Mobility in the Medium, Short and Very Short Term. *Geomorphology*, 129 (1-2), pp 14–28.
- [3] Roman-Sierra, J., Muñoz-Perez, J.J. and Navarro-Pons, M. (2014). Beach Nourishment Effects on Sand Porosity Variability. *Coastal Engineering* 83, pp 221–232.
- [4] Nebot E, Muñoz-Perez JJ, García-Morales JL, Arufe I and Rubio JA (2013). Proyecto de mejora de la tutorización de los alumnos del master de Gestión Integral del Agua. In *Evaluación de la Calidad de la Investigación y de la Educación Superior (X Foro)*. Ed. AEPC, ISBN: 978-84-695-8376-0 pp 126, <http://www.ugr.es/~aepc/XFORO/LIBRORESUMENESXFORO.pdf>
- [5] Navarro-Pons M., Muñoz-Pérez J.J., Anfuso G., Roman-Sierra J., Moreno L. (2014). Success on Increasing Number of Students that Pass the Coastal Engineering Subject. *EDULEARN 2014 Proceedings*, ISBN: 978-84-617-0557-3, pp. 4443-4448
- [6] Moodle oficial web site <https://moodle.org/>
- [7] Active Presenter official site (<http://atomisystems.com/activepresenter/>).
- [8] Active presenter free tutorials <http://atomisystems.com/tutorials/>
- [9] Regueras, L. M., Verdú, E., Muñoz, M. F., Pérez, M. A., de Castro, J. P., & Verdú, M. J. (2009). Effects of competitive e-learning tools on higher education students: a case study. *Education, IEEE Transactions on*, 52(2), pp 279-285.
- [10] Muñoz-Perez JJ, R Medina (2010). Comparison of long-, medium-and short-term variations of beach profiles with and without submerged geological control. *Coastal Engineering* 57 (3), pp 241-251. <http://dx.doi.org/10.1016/j.coastaleng.2009.09.011>