XXXVII Reunión Bienal de la Real Sociedad Española de Física
Zaragoza, 15-19 de julio de 2019
R.S.E.F. Real Sociedad Española de Física

INNOVATIVE NETWORKING FOR OPTICS AND PHOTONICS ACTIVE LEARNING

P. García-Martínez[1], I. Fernández[1], I. Moreno[2], M. M. Sánchez-López[3] , D. Mas[4], J. Espinosa[4], C. Ferreira-Gauchía[5], A. Esteban-Martín[1], E. Roldán[1] and F. Silva[1]

[1] Department d'Òptica i d'Optometria i Ciències de la Visió, Universitat de València, 46100 Burjassot, SPAIN
[2] Departamento de Ciencia de Materiales, Óptica y Tecnología Electrónica, Universidad Miguel Hernández, 03202 Elche, SPAIN
[3] Instituto de Bioingeniería, Universidad Miguel Hernández, 03202 Elche, SPAIN
[4]Departament d'Òptica, Farmacologia i Anatomia. Universitat d'Alacant. 03690 Alicante, SPAIN
[5]Departamento de Matemáticas, C. Naturales y C. Sociales aplicados a la Educación. Universidad Católica de Valencia, 46001, València, SPAIN

ABSTRACT

Networking means to **interconnect people sharing** an interest in the success of a particular enterprise. We present our **Innovative Education Networking** which develop learning tools for Optics and Photonics. The network is composed by **University of Alicante**, the **University of Miguel Hernández in Elche, Valencia Catholic University** and the **University of Valencia**. The academic networking staff is expert in Optics and Photonics teaching. Other student **demands multimedia applications**, in that sense we are developing several online materials based on video-tutorials of laboratory experiences, also different activities of outreach to enhance students creativity and interest in Optics and Photonic. That will result in **interesting educational synergies** between universities and promote student autonomy for learning Optics and Photonics.

MOTIVATION

This picture summarized very well our motivation. Students are demanding changes in the way of teaching. Now due to Higher Education European program, academic methodology focuses o the **student autonomous learning** rather than in the role of mere information receptors

1. INTRODUCTION

Bologna process has transformed teaching methods and structures in **Spanish Higher Education** in the last years. In that sense, students **need many new tools and teaching material** to accomplish such **autonomous learning process**, because there is some evidences that traditional approaches are **ineffective in teaching physics concepts**, including **light and optics** concepts. Electronic Learning or e-learning is a type of technology-supported education **learning using computer technology** such as online classrooms, however one of the main drawbacks is the lack of social interaction. In that sense, blended learning (b-learning) combines both technology and regular teaching methods (face to face lessons, lab sessions, guidance and coaching).

A "network" according to the meaning here is a **web of interconnected** people sharing an interest in the success of a particular enterprise. Photonics educators can benefit from being better connected to each other, not just to information. In that sense, the department of Policy Training and Educational Quality of the University of Valencia, in Spain, has bet **on innovative education networking**. The requirements to apply for that kind of innovative project is to be minimum ten teachers and **four universities from Spanish territory**. The aim of our network is to develop b-learning tools for Optics and the network is composed by University of Alicante, the University of Miguel Hernández in Elche, Universidad Católica de Valencia and the University of Valencia. We are a consolidated network and the University has granted with innovation projects since last five years. In Fig. 1 we show our home web page where all those learning tools are linked together.

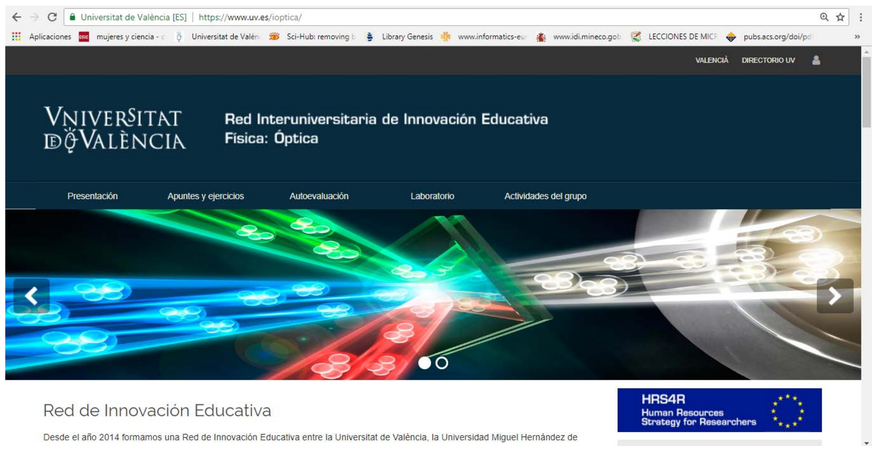

Figure 1: Snapshot of the Innovative Education Group home page (www.uv.es/ioptica)

2. VIDEO-TUTORIALS FOR SELF ASSESMENTS

The video format is **familiar to students**, contains a wealth of spatial and temporal data, and provides a bridge between direct observations and abstract representations of physical phenomena. Video-tutorials enhance and **speed up the learning process** due to the visually easy followed procedures step by step. In fact, we started to work on video-tutorials due to the **insistent student demands**.

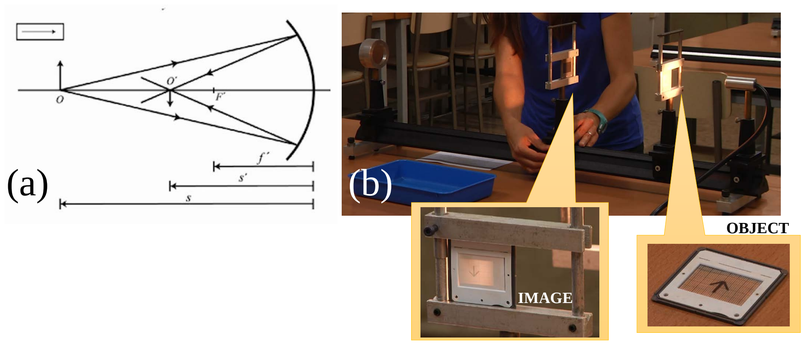

Figure 2: Different snapshots of Geometrical Optics Lab video-tutorials

Video-tutorials have a duration of **ten minutes** approximately. At the beginning of the video-tutorial we review the theory and we clarify the objective of the practice. Then, we show the different optical components that are needed and we implement the experiment putting special attention in recording the relevant parts of the experiment.

3. CELEBRATING INTERNATIONAL DAY OF LIGHT

We organized a photographic contest around 16th may, the international day of light, for all members of the faculty, based on illustrating physical phenomena of optics and photonics, that makes students being much more involved in learning by discovering optical phenomena into their domestic and everyday environments as well as develop their creativity.

4. PHOTONIC EXPLORER KIT AND OUTREACH ACTIVITIES

We also develop several outreach activities using Photonic Explorer Kit

5. CONCLUSIONS

- An **innovative education networking** involving academic staff from four Spanish universities linked together around **Optics and Photonics** has created thanks to the department of Policy Training and Educational Quality of the University of Valencia
- This possibility is a **real synergies between universities** to share materials and facilities for **improve teaching** around Optics and Photonics.

REFERENCES

[1] García-Martínez, P., Zapata-Rodríguez C. J., Ferreira, C., Fernández, I., Pastor, D., Nasenpour, M., Moreno, I., Sánchez-López, M. M., Espinosa, J., Mas, D., and Miret, J. J. (2015) Proc. SPIE 9793, Education and Training in Optics and Photonics: ETOP 2015, 97930L

[2] M. M. Sánchez-López, I. Moreno y P. García-Martínez, "La divulgación como instrumento de innovación educativa: el caso de la fotónica" I Jornadas de Innovación Colaborativa UMH, 20 de junio de 2017

ACKNOWLEDGMENTS:

This work was supported by the Vicerectorat d'Ocupació i Programes Formatius de la Universitat de València (Project UV-SFPIE_GER18-846540).