

A Simple Wavelength Division Multiplexing System for Active Learning Teaching

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The active learning project consists in a series of workshops for educators, researchers and students and promotes an innovative method of teaching physics using simple, inexpensive materials that can be fabricated locally. The objective of the project is to train trainers and inspire students to learn physics. The workshops are based on the use of laboratory work and hands-on activities in the classroom. The interpretation of these experiments is challenging for some students, and the experiments can lead to a significant amount of discussion. The workshops are organized within the framework of the project “*Active Learning in Optics and Photonics*” (ALOP) mainly funded by UNESCO, with the support of ICTP (Abdus Salam International Centre for Theoretical Physics) and SPIE. ALOP workshops offer high school, college or university physics teachers the opportunity to improve their conceptual understanding of optics. These workshops usually run for five days and cover several of the topics usually found in any introductory university physics program. Optics and photonics are used as subject matter because it is relevant as well as adaptable to research and educational conditions in many developing countries [1].

In this paper, we will mainly focus on a specific topic of the ALOP workshops, namely optical communications and Wavelength Division Multiplexing technology (WDM). This activity was originally developed by Mazzolini *et al* [2]. WDM is a technology used in fibre-optic communications for transmitting two or more separate signals over a single fibre optic cable by using a separate wavelength for each signal. Multiple signals are carried together as separate wavelengths of light in a multiplexed signal. Simple and inexpensive WDM system was implemented in our laboratory using light emitting diodes or diode lasers, plastic optical fibres, a set of optical filters and lenses, prism or grating, and photodiodes. Transmission of audio signals using home-made, simple, inexpensive electronic circuits was also demonstrated. The experimental set-up was used during national ALOP workshops. Results are presented and discussed in this paper. Current explorations to further develop these and other closely-related experiments will also be described.

1. M. Alarcon, E. Arthurs, Z. Ben Lakhdar, I. Culaba, V. Lakshminarayanan, J. Maquiling, A. Mazzolini, J. Niemela, and D. Sokoloff, “UNESCO: Active Learning in Physics for Developing Countries of Asia and Africa,” available on line at www.wcpsd.org/posters/education/Mazzolini.pdf
2. A.P. Mazzolini and P.J. Cadusch, “A Simple Low-Cost Demonstration of Wavelength Division Multiplexing”, *Am. J. Phys.* 74., (2006), p. 419-22.