

# Developing Novel Educational Equipment for Optics and Optical Technology



**Kazutaka BABA**

**Professor**

baba@sendai-nct.ac.jp

**Affiliated Societies**

IEEE, SPIE, IEICE

**Keywords**

Optical engineering and photon science-related (30020)  
Electron device and electronic equipment-related (21060)

## Research Topics

- Educational equipment for optical technology using block type optical devices
- Waveguide sensors for liquids using gapped optical fibers
- Application of nanoclusters for novel optical devices

## Research Seeds

At our laboratory, we develop novel educational equipment for optics and optical technology. The educational equipment comprises cubic or rectangular block type optical devices as shown in Fig. 1. Block type optical devices are designed as a laser beam incident at the cube center. Because expensive manipulators and optical bases are unnecessary, the educational equipment is inexpensive; students can study optics and optical technology easily using it in experimental classes. We have developed various block type optical devices including a laser system, an optical detector, a sample holder, a color filter, a polarizer, a wavelength plate, a beam splitter, a grating, and a cell for liquid. We confirmed that various optical experiments can be done using educational equipment with block type optical devices. Results measured using our educational equipment are very accurate: similar to those obtained using commercially available optical devices.

We also investigate a waveguide sensor using a gapped optical fiber as shown on Fig. 2 for measuring the refractive index and absorption of liquid as educational equipment. The gap formed in the single mode optical fiber is filled by a liquid with optical characteristics that to be measured. Because optical loss of the gapped optical fiber depends on the refractive index and absorption of the liquid in the gap, the refractive index and absorption can be measured using two waveguide sensors with different gap widths. We experimentally confirmed the basic operation of this sensor.



Fig. 1 Block type Optical Devices.



Fig. 2 Waveguide sensor using gapped fiber.

## Related Technology

- Educational technology
- Non-destructive Inspection
- Remote sensing and control