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The Impact of Consumer Multi-homing on Advertising Markets and Media Competition.

This particular study is part of a research programme on the difficulties encountered by students when learning about wave phenomena in a three-dimensional medium in the absence or presence of obstacles. It focuses on how students reason in situations in which wave optics needs to be used: diffraction of light by an aperture, imaging in the presence of diffraction, and coherent illumination imaging. Paper and pencil questionnaires were designed and two hundred French students (aged 19 to 23) were questioned after lessons on wave optics. Tendencies towards geometrical reasoning are shown to recur. Students reason at a macroscopic level, following the rays of the incident light, instead of reasoning at an elementary waves level in using the phase concept and the Huygens-Fresnel principle. Consequently, for them, the image of a point source located at infinity is behind the image focus plane of the lens when diffraction has to be considered. It is not possible to have the image of the source and of an illuminated diaphragm behind one lens: these images cannot exist simultaneously or are merged. Some remarks are made on the way waves are taught in France and some pedagogical implications are discussed.