An Inquiry Based Approach to the study of energy exchange by thermal radiation

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A teaching-learning sequence regarding the investigation of energy exchange by thermal radiation, conduction and convection is under development within the context of “Establish”, a FP7 European Project aimed at promoting and developing Inquiry Based Science Education in European Secondary Schools. Here we present some relevant laboratory activities of this inquiry-oriented teaching/learning sequence for secondary school level students (or even first-level university ones), aimed at investigating the physics of energy transmission by thermal radiation. In traditional laboratory work, the focus of students activities is mostly dedicated on verifying information previously transferred by the teacher. Our teaching-learning sequence is instead organized by firstly engaging students by scientifically oriented questions about real life situations, such as thermal insulation of houses and the use of energy saving materials. This introductory phase of topic exploration, mainly based on students’ prior knowledge, is followed by a discussion about the relevant physical quantities which should be taken into account in a contest of a laboratory activity of measurements. A scientific investigation on the energy exchange between a powered resistor and its surrounding environment during the heating and cooling processes is proposed. Students are stimulated to design and carry out their own laboratory activity by collecting, processing and analysing data, in order to discover new concepts or laws and obtain more meaningful conceptual understanding of the physics underlying the process of energy exchange by thermal radiation.

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