Touch a metal knife and a piece of wood with your thumbs for two minutes. What is the temperature pattern of the two objects?

"If pupils were able to ‘see’ this phenomenon in terms of a transfer of energy from their body to the object, this sort of situation would likely be less of a problem than it seems to be at present" (Erickson & Tiberghien, 1985)

Heat conduction

Heat convection

Convection forms when an ice cube melts in water (left beaker), but not in saturated table salt solution (right beaker)

Dissipative phenomena

Heat mark from a metal ball dropped onto asphalt from 2 m

Heat streak from an eraser rubbed on a table

Temperature increase at pendulum suspension

Engineering applications

11th graders’ solar-driven air preheater

Heat-pump lab (Melander, Gustavsson, & Weiszflog, 2014)

Chemical reactions

Ice cubes in a cup at room temperature

Table salt decreases the surface temperature and melts the ice

References


Educational research with IR cameras


Grade 7 students (Schönborn, Haglund & Xie, 2014) did not see heat transfer through a metal knife, but a temperature increase, due to lack of a heat-flow model (Linn & Eylon, 2011).

A heat-flow model was introduced to grade 4 students, who took initiative to ‘instant inquiry’ of blowing on hot water (Haglund, Jeppsson & Schönborn, in press).

10-12-graders studied heat conduction and dissipation, and designed air preheaters. IR cameras were found to provide disciplinary affordance (Fredlund, et al., 2012) to thermal science, and induce negotiations of framing (Hammer, et al., 2005).

Development and implementation of open-ended laboratory exercises in university physics and engineering thermodynamics (Melander, Gustavsson, & Weiszflog, 2014). IR cameras induced relevant questions for inquiry, and investigation of the emissive and reflective properties of different surfaces.