The present study investigated indoor climate and window opening behaviour by pupils, as well as their perceptions and symptoms in classrooms with different types of ventilation systems. Four classrooms were selected in the same school in suburban Denmark. Classroom ventilation was achieved either by manually operable windows, or by automatically operable windows with and without an exhaust fan in operation, or by a balanced mechanical ventilation system. Indoor air temperature, relative humidity, carbon dioxide (CO₂) concentration and window opening were continuously monitored for one month in non-heating and heating seasons; CO₂ concentration was used to estimate average classroom ventilation rates. At the end of each measuring period, the pupils were asked to report their perceptions of the indoor environment and their acute health-related symptoms. The classroom in which ventilation was achieved by manually operable windows had the highest air temperatures and CO₂ concentrations during both non-heating and heating season; the estimated average air-change rate was lowest in this classroom. The classroom with mechanical ventilation had the highest estimated average air-change rate. Windows were frequently opened in all four classrooms in the non-heating season but very seldom in the heating season. Automatic operation of the windows had a marked effect on CO₂ concentration and classroom temperature in the heating season. Perceptions of the indoor environment were more positive in the classroom that was ventilated by automatically operable windows with an exhaust fan in operation: fewer symptoms were reported in this classroom compared with classrooms with other systems. Present results and approach can be used as the basis for rational selection of systems that ensure adequate classroom ventilation. © 2014 Elsevier Ltd.