Application of ICT supported learning in fluid mechanics

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This paper focuses on the application of ICT, Information & Communication Technology, supported learning in the area of fluid mechanics education. Taking a starting point in a course in Ventilation Technology, including room air flow and contaminant distribution, it explains how ICT may be used actively in the learning environment to increase efficiency in the learning process. The paper comprises past experiences and lessons learnt as well as prospect for future development in the area. A model is presented that describes a high efficiency learning environment where ICT plays an important role. Traditionally, education in Ventilation Technology has been a combination of teacher performance at the blackboard combined with student exercises by paper and pencils. Sometimes a visit to a building has been included to see how things look like in the real world. In order to increase learning efficiency it has been tried to make use of several tools for knowledge transfer ranging from the traditional blackboard over physical demonstrations of air flow in a full-scale laboratory mock-up to virtual reality demonstrations. Students have different ways of understanding a certain topic, using a broad range of tools for knowledge transfer facilitates deep understanding and increases learning efficiency. Air flow is by nature invisible and represents a further challenge in the effort of providing sufficient understanding of typical flow patterns and behaviour of room air flow. An example of visualisation of room air flow by means of Computational Fluid Dynamics is presented by vector plots, flow fields and movies. It is discussed how different display systems like low-cost VR (e.g. active and passive stereo viewing) and high-cost VR (e.g. CAVE) can be applied and gained experiences are reported. It is found that a combined application of various tools for knowledge transfer increases learning efficiency, for instance it is seen that a combination of physical experiments in laboratory and virtual experiments by computer simulation has a high level of synergy. A model for a combined use of several learning tools is presented. The model describes the teaching method and the pedagogical means. It explains how different learning domains – physical as virtual – may be combined to form a high efficiency learning environment (HELE).

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