

Arranging for better learning opportunities in radiology

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Purpose: The study provides an example on how it is possible to design environments at the workplace that could meet learning demands implied by the introduction of novel imaging technologies in radiology (in this case tomosynthesis). The innovative aspect of this design does not result from the implementation of any specific tool for learning. Instead, advancement is achieved by a novel set-up of existing imaging technologies. Based on a number of pedagogical principles, we developed what we call a *Technology enhanced Learning Session* (TLS), an interactive format that allows for focused discussions between learners with different levels of expertise.

Method: Interactions during a TLS were videotaped and later analysed using interaction analysis. We did not seek to explain factors affecting learning, but rather identify qualities of the arrangement that presented opportunities for professionally meaningful forms of action, i.e. enabling conditions of the TLS for displaying knowledge on how to judge radiological section images produced by the novel technology.

Results: Based on the analysis we propose three principles to be considered when designing learning environments for teaching professional modes of reasoning in radiology: First, the ways in which participants with different levels of experience interact and communicate have a large impact on the outcome of the activity. By publicly displaying records of the participants' individual assessments everyone can become involved and mistakes become dissected rather than hidden. Second, experts working on authentic cases give prominence to case specific details, disambiguation practices, and several dimensions of variation (in representations, anatomy, pathology etc.). Professional modes of reasoning, when being made publically visible, operate as instructions. Third, participants should be given shared access to visual materials: Given different setups, participants will have different possibilities of establishing shared references and partake in reasoning that build on visual details. As we have seen, the observers' ability to notice, discuss, and investigate particular features of the radiological images became a necessary requirement for the accomplishment of their collaborative work.

Conclusions: The study points to what we see as the underexplored possibilities of tailoring basic and specialist training that meets the new demands given by novel imaging technologies in radiology.