

# RePresentation of Complex Curricula - State of the Art in Network Education and Training

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Network technology education and training includes dealing with a considerable amount of complex topics, including large heterogeneous topologies, high numbers of historically developed protocols, non-trivial algorithms, and complicated devices. This leads to several challenges for teachers and students. Focusing to relevant parts and limiting the level of detail is essential. The sole use of “classical teaching material” (text and static pictures and graphics) is no more a satisfactory option. Over the last few years a number of different possibilities to enhance the quality of teaching in the networking area have been introduced. Therefore, this field can act as a representative example for the usage of different “illustrative” representations in education. In this paper we give a broad overview of different possibilities to support the cognitive learning type but also some technologies to stimulate affective and psychomotoric possibilities.

This paper starts to give a mapping for the learning domains of bloom’s taxonomy to network curricula. We show the current practice for presentation and interactive material of a large-scale e-learning program. Then we give some examples for different representation forms of static and dynamic media, dealing with several aspects of computer or communication networks. A comparison of network evaluation and simulation tools shows the current state of advanced teaching possibilities in the area of network design. Especially for the educational use of network modeling and evaluation tools the type of interaction is a decisive factor. Several different approaches to defining network topologies respectively configurations and accessing results exist. Therefore, today’s most often implemented types of user interaction, including example tools, will be described. To have a closer look at common modeling interfaces, three network modeling and evaluation tools, namely OPNET Modeler, QualNet and NetRule will be analyzed and compared with respect to their graphical capabilities in model development and evaluation. This allows for drawing conclusions on which features and which types of presentation and interaction are likely to support the learning process eminently. Hereby, not only the graphical implementation of the tools will be highlighted, but also the way used to map real network topologies to a model, which should be possible by minimizing the degree of complexity on the one hand while still providing an adequate level of realism on the other hand. Logical abstraction plays a big part in this respect because developing network models most often requires simplifying the reality. The means by which this capability is implemented in network evaluation tools both in matters of functionality and graphics is therefore a significant factor concerning the educational use. As the chosen tools use quite different means regarding the issues mentioned, they allow for gaining a proper insight into common practices of network modeling and evaluation. We finally report our experience in the course of an Austrian university of applied sciences.

**Keywords:** Complex Curricula, Network Technology, Education, Training, Representation, Presentation

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