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Tools and principles for the design of collaborative learning environments for complex domains.

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This is a conceptual paper pertaining to the design and development of interactive, simulation-based learning environments for complex domains. The underlying modeling theory is derived from systems dynamics, especially as applied to complex domains such as project management (Abdel-Hamid and Madnick, 1994). The learning theory which guides the development of the learning environments is derived from the cognitive apprenticeship model of instruction (Collins, Brown, and Newman, 1989) and from a socio-cultural perspective on learning (Vygotsky, 1978). The instructional design approach consistent with these theoretical bases is elaboration theory (Reigeluth, 1983), informed by the notion of graduated complexity. The instructional systems development model represented in these learning environments is derived from Tennyson's (1994) fourth generation instructional systems development model. System dynamics-based learning environments are often called management flight simulators (Serman, 1988). A review of learning environments for complex domains reveals that inadequate attention is given to the set-up phase for learning (Gagné, 1993) and to the resolution phase of learning (Hannafin, Hall and Hill, 1994). The discussion here will focus on design principles and tools which are consistent with a theoretical framework appropriate for the development of learning environments for complex domains. Particular attention is given to the need for learner access to the underlying models. Additionally, learner-learner collaboration is an important aspect in a socially-situated, cognitive apprenticeship learning environment. Data collected on learning environments developed using these principles and tools suggest positive learning outcomes. The availability of design and development tools provides additional motivation to explore the potential for highly interactive, collaborative learning environments for complex domains.

Classification: C30

Keywords: learning environment; learning theory; instructional design; elaboration theory; graduated complexity