Digital Simulations as a training method: player's self-efficacy and transfer of learning impact[1]

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In 2012, researchers from the Universitat Autònoma de Barcelona and the Technische Universät München conducted a meta-analysis for assessing the outcomes of sef-efficacy and transfer of learning in computer-supported collaborative learning (CSCL), i.e. trainings based on digital simulations as a teaching-learning method due to its similarity between natural settings and simulated representations (Mayer et al., 2011; Siewiorek et al., 2012), promoting transfer of learning (Baldwin & Ford, 1988).

From this perspective, if the aim is to design computer-based learning environments that help people transfer their learning, and if self-efficacy is documented to promote transfer (Gegenfurtner, Veermans, & Vauras, 2013), how to promote self-efficacy in CSCL environments? To answer this question, authors analysed the effects of different instructional designs elements using meta-analysis.

These elements were: social design (number of players, team context), narrative (scenario, player perspective, fantasy, timing), adaptivity (increase of difficulty level, rule rigidity, simulation ending), multimedia (modality, realism, dimensionality), and assessment (timing, level, safety of assessment). To understand the different elements, it is important to imagine a regular leisure moment: the last time you played a video-game. Think about the screen: was it 3D or 4D? Was it a simulation of reality? Did it allow multiplayer? Could you choose the difficulty level at the beginning? All these elements, and more, were categorized by the authors through the information provided by the papers selected in the meta-analysis process (k=15; N=2,274).

Gathering these elements, the study wanted to identify which instructional design elements reached highest level of self-efficacy and transfer of learning. Three independent coders coded the papers, with a high intercoder reliability (Cohen's κ = .82).

The forest plot illustrates the obtained effect sizes from the individual studies. First, there are nonsignificant differences between individual and collaborative learning (number of players); therefore, designing digital simulations with one or more than one learners at the same time, working in pairs or individually, do not affect transfer of learning. Second, high levels of user control resulted in higher estimates of self-efficacy and transfer. It means that learners who control the increase of difficulty tend to show significantly more self-efficacy and transfer of learning. Offering performance feedback after rather than during training led to higher self-efficacy and transfer; it may be cause because having feedback of low performance during the simulation, which is particularly likely in early phases of the simulation, may compromise learner's efficacy beliefs and, consequently, jeopardize transfer of learning. Effects of narrative and multimedia characteristics were nonsignificant.

In summary, authors concluded that instructional designers can devote their efforts on finding optimal solutions for implementing user control and for providing performance feedback after training. Moreover, It would be interesting to see whether the present findings on self-efficacy can generalize to other motivational dimensions, such as engagement or motivation to learn (Garris et al., 2002; Rutten et al., 2012).

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