Does Simulation Fidelity Affect Training? A Lesson from a Brief Review of Literature

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Introduction

- In training programs, fidelity of simulation is the level of surface realism of training materials [1].

Example: Troubleshooting electronic circuits

- Traditional assumption: simulators with higher fidelity are more effective in training than those with lower fidelity [2, 3].
- Recent findings question this assumption. In many cases, low-fidelity systems were more effective in training than high-fidelity systems [4, 5].
- This has caused problems as designers do not know what level of fidelity is suitable for training systems [6].

Our goal is to review the literature to see the effect of fidelity on training in various domains.

Review

We categorized major domains that use training systems:

1 Healthcare
In healthcare and medical training, although the belief in the traditional theory still strongly exists, recent studies has challenged the widespread trend towards high-fidelity simulation [6, 7].

2 Flight training
Despite the established practice of using expensive high-fidelity flight training systems [3], Dahlstrom et al. [8] showed that high-fidelity flight-training simulation does not necessarily lead to better performances in target environments.

3 Maintenance and troubleshooting
Rouse [9] showed that, unlike high-fidelity systems, low-fidelity training simulators could train skills that could be transferred to a wide variety of tasks.

4 Other areas
Similar results were found in firefighting [10], route-learning [11], and some other areas.

Conclusion

- In many cases, low-fidelity systems are more effective in training than high-fidelity systems.
- So, fidelity is not a reliable construct in design.
- The remaining question is how to design training systems now?
- The future needs theories of design that focus on human elements of the training cycle (novices and experts) as a resource for designing training systems.