

## Applying Serious Game Design Frameworks to Existing Games for Integration of Custom Learning Objectives

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**Abstract :** Serious games (SGs) have been shown to be an effective teaching tool in many contexts. Because of the success of SGs, several design frameworks have been created to expedite the process of making original serious games to teach specific learning objectives (LOs). Even with these frameworks, the time required to create a custom SG from conception to implementation can range from months to years. Furthermore, it is even more difficult to design a game framework that allows an instructor to create customized game variants supporting multiple LOs within the same field. This paper proposes a refactoring methodology to apply the theoretical principles from well-established design frameworks to a pre-existing serious game. The expected result is a generalized game that can be quickly customized to teach LOs not originally targeted by the game. This methodology begins by describing the general components in a game, then uses a combination of two SG design frameworks to extract the teaching elements present in the game. The identified teaching elements are then used as the theoretical basis to determine the range of LOs that can be taught by the game. This paper evaluates the proposed methodology by presenting a case study of refactoring the serious game Battlespace Next (BSN) to teach joint military capabilities. The range of LOs that can be taught by the generalized BSN are identified, and examples of creating custom LOs are given. Survey results from users of the generalized game are also provided. Lastly, the expected impact of this work is discussed and a road map for future work and evaluation is presented.

**Keywords :** serious games, learning objectives, game design, learning theory, game framework

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