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A new paradigm for serious games: Transmedia learning for more effective training and education

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ABSTRACT

Serious games present a relatively new approach to training and education for international organizations such as NATO (North Atlantic Treaty Organization), non-governmental organizations (NGOs), the U.S. Department of Defense (DoD) and the U.S. Department of Homeland Security (DHS). Although serious games are often deployed as stand-alone solutions, they can also serve as entry points into a comprehensive training pipeline in which content is delivered via different media to rapidly scale immersive training and education for mass audiences. The present paper introduces a new paradigm for more effective and scalable training and education called transmedia learning. Transmedia learning leverages several new media trends including the peer communications of social media, the scalability of massively openonline course (MOOCs), and the design of transmedia storytelling used by entertainment, advertising, and commercial game industries to sustain audience engagement. *Transmedia learning* is defined as the scalable system of messages representing a narrative or core experience that unfolds from the use of multiple media, emotionally engaging learners by involving them personally in the story. In the present paper, we introduce the transmedia learning paradigm as offering more effective use of serious games for training and education. This approach is consistent with the goals of international organizations implementing approaches similar to those described by the Army Learning Model (ALM) to deliver training and education to Soldiers across multiple media. We discuss why the human brain is wired for transmedia learning and demonstrate how the Simulation Experience Design Method can be used to create transmedia learning story worlds for serious games. We describe how social media interactions and MOOCs may be used in transmedia learning, and how data mining social media and experience tracking can inform the development of computational learner models for transmedia learning campaigns. Examples of how the U.S. Army has utilized transmedia campaigns for strategic communication and game-based training are provided. Finally, we provide strategies the reader can use today to incorporate transmedia storytelling elements such as Internet, serious games, video, social media, graphic novels, machinima, blogs, and alternate reality gaming into a new paradigm for training and education: transmedia learning.

1. Introduction

Games have been used for a number of years in fields such as business and management science, economics, intercultural communication, and military science to expose both large and small audiences to complex dynamics. Military use of warfare board games dates back to 17th Century Germany [29]. Centuries later the U.S. Army War College was among the first to use networked, multiplayer simulations in the 1970s to refine mathematical models. The first use of a networked multiplayer computer game for training was by the U.S. Marine Corps. The U.S. Marines were among the earliest adopters of video game-based learning with the development of Marine Doom, a modified version of Id Software's Doom II, in 1995 [41]. Marine Doom was developed to allow four-person fire teams to train real-time teamwork and decision-making in an interactive virtual environment. Thus Marine Doom was the earliest modification of a commercial entertainment computer game for training and learning communication and coordination—not shooting or killing [32]. Since the late 1990s video games have been used by all branches of the Services for training and education, although most of this adoption has occurred in the last eight years. These video games are often called "serious games."

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Serious games can be defined as the use of interactive digital technologies for training and education in private, public, government, and military sectors [35]. While there are many definitions for games, most identify some sort of conflict, rules, structure, goals, and uncertain outcomes as salient elements [5,7,11,19,26,42]. For example, serious games can include role-play experiences, and social-process, immersive simulations for exploring interpersonal development, adaptive thinking, combat tactics, emergency response, diplomacy, governance, health, education, management, logistics, and leadership.

Military and government use of serious games and interactive multimedia instruction has grown steadily. The need for effective use of multiple media, immersive simulations, and gaming approaches for homeland security and defense has never been greater. The United States military adopted serious game-based training for reasons that also appeal to many other organizations. These reasons include reduced cost when compared to the cost for large simulators or live training, reaching digital natives who have grown up with technology, increased motivation to learn [17,32], and the ability to leverage state-of-the-art technology. That said, the use of serious games remains largely stand-alone, lacking interoperability of data models, and failing to adequately support self-paced learning outside of facilitated exercises. In addition many serious games lack the ability to detect the users' context and therefore cannot personalize instruction very well. Nor do many serious games in use scale up to train thousands of learners at any given time as a Massively Open Online Course (MOOC) would. MOOCs are online courses (e.g. Coursera, Udacity, edX) that feature large-scale interactivity and open access via the Internet.

For these reasons, serious game training and education must move beyond stand-alone solutions toward more complete, self-paced, and enduring training experiences that are part of a learning system. Twenty-first century demands on training and education will extend the use of serious games beyond the manner in which they are currently used. If utilized as part of a system of experiences, serious games can serve as entry points into a comprehensive experiential training pipeline in which evolving content is delivered via different modalities and media throughout a learner's career.

The application of transmedia learning is a fairly recent innovation. In 2010 this author began applying transmedia storytelling to training and education while developing graphic novels to support game-based training scenarios with the U.S. Army Program Executive Office for Simulation, Training and Instrumentation (PEOSTRI) Games for Training and TRADOC Capability Manager TCM Gaming [34]. The *transmedia learning* construct has since been refined and defined by this author as the scalable system of messages that represents a narrative or core experience that unfolds from the use of multiple media, emotionally engaging learners by involving them personally in the story [34]. Transmedia learning is a new paradigm for education and training that has the potential to revolutionize the way organizations learn by providing a framework from which to hone learners' abilities to synthesize information across multiple media channels and become more agile thinkers. Transmedia learning leverages several new media trends including the peer communications of social media, the scalability of MOOCs, and the design of transmedia storytelling to sustain learner engagement with memorable learning experiences. This paper introduces the notion of transmedia learning, an approach to connect learners to content and each other through the use of a transmedia learning campaign. A transmedia learning campaign is the purposeful, coordinated, and strategic use of multiple media messages to support a story or narrative over time to engage new learners or keep learners engaged. Integral to the design of transmedia campaigns and measurement of transmedia learning is the ability to track user interaction, feedback, and user-generated content through data mining social media and activity tracking for the future development of computational models of learners.

There are very few integrated applications of transmedia learning in use today by researchers, instructors, or training cadre and therefore few examples of experimental data are available on its effectiveness. Nevertheless the concept merits discussion now, so that the training & education and computational modeling & simulation communities can get in front of the trend. Therefore subsequent sections explore the science, application, and design of transmedia learning. We introduce the Army Learning Model (ALM) which presents a military vision to deliver training and education to Soldiers across multiple media, anytime, anywhere. The Simulation Experience Design Method demonstrates how transmedia story worlds can be created using a framework that has also been used successfully to design serious games [35]. A social media data mining approach under development for tracking learner participation and feedback is described. Mining social media data can inform the development of learner models for future transmedia campaign assessment. An open source method used to track learner activity streams is discussed, and existing research on agent-based approaches introduced as potential applications to transmedia learning. Examples of how the U.S. Army has utilized transmedia for strategic communication and game-based training are provided. Finally, strategies the reader can use today to incorporate transmedia storytelling elements such as Internet, serious games, video, social media, graphic novels, machinima, blogs, and alternate reality gaming into defense and homeland security transmedia learning campaigns are mentioned throughout. The purpose of the present paper is to familiarize the readers with an emerging concept (transmedia learning campaigns) that has great potential for further exploration through computational science. In order to introduce the concept such that readers can reflect on how their own particular computational approaches may apply, we discuss background, examples of transmedia learning in use, how specific elements (individual technologies) and campaigns are designed, and how learners' feedback and activities can be tracked by while interacting with a transmedia learning campaign. We refer interchangeably to transmedia storytelling, transmedia campaigns, or simply transmedia learning as the same concept.

2. Background: transmedia storytelling for learning

The first use of a transmedia model for an entertainment franchise was in 1976 to support George Lucas' *Star Wars*. A publishing group was formed to produce and promote all products such as games, movies, toys, cartoons, books, and comics associated with the film [18]. The objective of this transmedia application was to create a fan base that followed the transmedia experience across different media so as to not miss out on any part of the story. While the films now serve as the basis for the main story, the audience can remain engaged in the *Star Wars* storyline through multiple media such as websites, wikis, video games, books, encyclopedias, comics, animated series, toys, clothing, and jewelry, among many others. In fact, the franchise is so large now that the richness of the narrative content is referred to as a story world, or universe. Whether one's interest is political, social, science fiction, or mythology—the franchise offers unique content to appeal to different interests in order to increase their fan base.

Transmedia storytelling can be defined as crafting a narrative or consistent message (story) across multiple media. According to Henry Jenkins, "A transmedia story unfolds across multiple media platforms with each new text making a distinctive and valuable contribution to the whole" [21]. In other words, transmedia storytelling for learning allows learners to engage with expanded parts of a narrative for a variety of reasons—to learn more deeply, gain a

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