

NARRATIVE-CENTERED LEARNING ENVIRONMENTS

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Synonyms

Interactive Pedagogical Dramas, Story-Based Learning Environments

Definition

Narrative-centered learning environments are a class of game-based learning environments that contextualize educational content and problem solving with interactive story scenarios. A key feature is their tight integration of narrative, subject matter and gameplay dynamics. Narrative-centered learning environments are designed to couple salient features of stories (rich settings, believable characters, and compelling plots) and digital game environments (interactivity, rewards, and feedback) in order to increase student motivation, support meaning making, and guide complex problem solving. Interactions with narrative-centered learning environments can take several forms. Students may directly influence a narrative by completing actions in order to solve a problem, or they may indirectly influence events by providing guidance to autonomous virtual characters. Narrative-centered learning environments have also been developed to support either single or multiple players, they have been realized using realistic 3D graphics engines as well as abstract cartoon-like representations, and they have structured problem-solving activities within overarching narratives, as well as sequences of related vignettes.

Theoretical Background

While research on narrative-centered learning environments is in its initial stages, several prior developments were necessary to launch this line of investigation. The first development was progress on technologies for developing and deploying digital games. As a result of these advancements, growing numbers of developers have begun to build interactive virtual environments for diverse applications and contexts. Second, there has been growing interest among educators in using digital games for instruction. This has brought about expanded efforts to develop game-based learning environments, which are digital games explicitly designed for instruction. Third, the late 20th century witnessed increased recognition among psychologists of narrative's importance in human cognition and learning. This recognition produced calls to enhance the role of stories in education. These three parallel developments facilitated the integration of narratives and digital games for educational purposes.

Narratives are pervasive throughout human communication and culture. While they are predominantly viewed as a source of entertainment, narratives are also critical to human cognition and perception. Narratives provide structure for encoding experiential knowledge and are an integral component in meaning making (Polkinghorne, 1988). By extension, stories offer significant promise for enhancing learning and problem solving (Jonassen, 2002). Stories are ubiquitous tools for sharing experiential knowledge, recounting prior problem solutions, and fostering vicarious experience. They can provide problem-solving guidance by serving as examples to be adapted to current situations. Additionally, stories are instrumental in assessment by virtue of their ability to present novel situations to test transfer of generalizable skills.

Despite the longstanding educational potential of narratives, their traditionally passive nature has limited the types of narrative-centered learning experiences possible in educational settings. Only in recent years have advances in commercial game technologies enabled rich narratives to be integrated into virtual environments replete with cinematic presentations, believable characters, and dramatic plots. By repurposing these technologies for educational objectives, narrative-centered learning environments overcome the inherently passive nature of traditional stories, while maintaining their motivational and pedagogical benefits.

There are three driving goals behind efforts to integrate narratives and digital games for education. The first goal is enhancing student motivation and engagement. Narratives and games are ubiquitous forms of entertainment, and work on narrative-centered learning environments aims to utilize their engaging qualities to evoke student interest and sustain learning. The second goal is to support students' meaning making processes, leveraging humans' natural facility for narratives to reinforce associations with educational material. The third goal is enhancing students' problem-solving skills. Given stories' role in supporting complex problem solving, narrative-centered learning environments are designed to guide students as they develop generalizable problem-solving skills.

Many students experience declines in intrinsic motivation as they progress through formal schooling. One possible explanation for these declines is the decontextualization of instruction, where material is presented in its most abstract form with the intent of fostering generalizable knowledge (Cordova and Lepper, 1996). However, experimental studies have found positive impacts of contextualization on student motivation and learning. In their influential study, Cordova and Lepper found significant benefits of fantasy contexts, personalization, and user control on student learning and motivation in a rudimentary computer game for elementary mathematics learning (1996). Narrative-centered learning environments expand upon these features by integrating interaction, narrative context, and problem solving. Interactive stories are designed to engender a sense of *narrative transportation*, or a feeling of being more present in the virtual story world than in the real world. Narrative transportation is a compelling characteristic of non-interactive stories, and it is enhanced by the addition of interactivity in narrative-centered learning environments. Salient features of

digital games, such as rewards, immediate feedback, and cinematic presentations, also serve as extrinsic motivators.

Narrative-centered learning environments support the process of meaning making (Polkinghorne, 1988). Narratives provide a natural structure for drawing meaningful connections between individual pieces of information. Donald Polkinghorne describes narrative as “a lens through which the apparently independent and disconnected elements of existence are seen as related parts of a whole” (1988, p. 36). Narrative-centered learning environments take advantage of this natural support for meaning making by drawing connections between story events and important concepts from instructional material. Plots associate contextual goals with problem solving activities, lending importance and relevance to learning content. The inclusion of interactivity, and by extension challenge, can also support meaning making. Research on intrinsic motivation suggests that humans associate activities that are challenging with activities that are meaningful.

Lastly, narrative-centered learning environments provide facilities for guiding and scaffolding problem solving. They provide a natural platform for delivering diverse problem types, from simple, well-structured scenarios to complex situations with ambiguous goals, multiple routes, and numerous interrelated factors. Further, instruction about effective problem-solving strategies can be discreetly embedded in plot structures. By sequencing story events to coincide with important phases of problem solving, such as stating a scenario’s goal to a superordinate, gathering relevant information from interviews with virtual characters, or periodically reporting progress through an in-game communications device, narrative-centered learning environments scaffold student learning while simultaneously advancing a narrative. Virtual characters can also contribute to learning. Characters may offer hints about important facets of the problem-solving task or provide examples for students to observe and emulate. In this way, narrative-centered learning environments can provide instruction on strategies for self-regulated learning, thereby fostering problem solving skills that can be transferred to future situations.

In addition to work by learning scientists, the artificial intelligence community has made contributions to research on narrative-centered learning environments. Artificial intelligence research on narrative-centered learning environments has focused on three principal areas: interactive narrative generation, animated pedagogical agents, and student modeling. Research on interactive narrative generation focuses on devising models for creating and adapting story experiences, such as introducing hints or events that are tailored to individual students. Work on animated pedagogical agents focuses on devising believable, responsive characters that convey emotion, communicate naturally, and fulfill important narrative and pedagogical objectives. Student modeling focuses on assessing students’ beliefs, goals, and affect in real-time, and then using the assessments to drive decisions for tailoring story experiences.

Interactions with narrative-centered learning environments take several forms. One form involves students guiding and influencing story events, rather than directly taking actions in the environment. FearNot!

implements this approach through a series of non-interactive, educational vignettes featuring autonomous virtual characters coping with bullying situations (Aylett, Louchart, Dias, Paiva, & Vala, 2005). In between the vignettes, virtual characters consult students for advice about prior bullying situations, and then use this feedback to inform their behavior in subsequent scenarios. An alternative form has each student take an active role in the narrative by directly performing actions that advance the story. CRYSTAL ISLAND, a narrative-centered learning environment for middle school microbiology, is one example of this approach (Rowe, Shores, Mott, & Lester, 2010). In the environment, students investigate a mysterious spreading illness plaguing a research outpost on a remote island. Students solve the mystery by gathering clues from conversations with virtual characters, conducting laboratory tests, and presenting a recommended treatment plan to a camp nurse. A third form of interaction with narrative-centered learning environments involves multiple students adopting roles and collaborating to complete a story scenario. One example of this approach is the River City virtual environment. In River City, students work in teams to investigate an epidemic afflicting a 19th century city, dividing responsibilities as they gather clues and test hypotheses about the source of the disease (Ketelhut, 2007).

Important Scientific Research and Open Questions

Research on narrative-centered learning environments is in its early stages. While narrative-centered learning environments offer promising educational opportunities, creating the environments is resource intensive. Developing a narrative-centered learning environment involves months to years of collaboration between game designers, educators, programmers, and artists. As a consequence, there have been a limited number of studies that systematically investigate how narrative-centered learning environments impact students' learning experiences. Enriching the empirical account is a critical challenge for the field.

Several open questions drive the field's current research. One question concerns the impacts of narrative-centered learning environments on student learning, problem solving, and engagement. Despite considerable interest in the potential of narrative-centered learning environments, there are only a handful of experimental studies comparing them to alternate instructional tools. In fact, there is limited consensus on methodology for evaluating narrative-centered learning environments. While there are well established methods for evaluating student learning, evaluations of narrative experiences and student engagement raise notable challenges.

A second question concerns the cognitive and affective mechanisms through which narrative-centered learning environments impact students' learning experiences. Important questions have been raised about whether their motivational benefits are associated with increased engagement in learning, or engagement in peripheral features of virtual environments. While it is likely that the motivational and pedagogical benefits of narrative-centered learning environments are a function of design, there is currently limited data on the subject. Further, there have been arguments that the narrative and gameplay features of these environments

risk introducing seductive details, which distract or divert student learning. It is also conceivable that adding these features could introduce cognitive load, which may constrain the resources that students have available for learning.

A third open question focuses on the identification of effective design principles for narrative-centered learning environments. This includes identifying optimal narrative features, gameplay mechanics, and instructional methods, and the conditions under which they are most appropriate. While there has been some design-based research investigating these questions, there is little experimental evidence to support specific design principles such as those available for multimedia learning. Additionally, it will be necessary to determine the appropriate role of artificial intelligence technologies in supporting student learning and engagement in narrative-centered learning environments.

Cross-References

[Additional] Related entries in the Encyclopedia of the Sciences of Learning; please find the complete list of all contributions at http://oesys.springer.com/sciences_learning by going to “download current List of Contributions as a PDF document”.

- Game-based learning
- Adaptive game-based learning
- Serious games
- Learning in multi-user virtual environments
- Animated pedagogical agents
- Intelligent Tutorial Systems

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