Chapter 6
Collaborative Learning and Game Mastering in Multiplayer Games

Johannes Konert
Technische Universität Darmstadt, Germany

Kristina Richter
Technische Universität Darmstadt, Germany

Viktor Wendel
Technische Universität Darmstadt, Germany

Stefan Göbel
Technische Universität Darmstadt, Germany

ABSTRACT

The purpose of the chapter is to provide a state of the art survey addressing research and development aspects for the control of multiplayer Serious Games for collaborative learning scenarios. Hereby, several facets of multiplayer scenarios are addressed: synchronous and asynchronous gameplay and the role of an instructor as Game Master, supervisor, and provider of individual feedback as well as individual feedback among learners in the process of continuous adaptation of the on-going gameplay. Existing approaches and best-practice examples focus on digital educational games for pupils and collaborative learning environments for students. The theoretical foundations of instructional support as well as the implications and technical approaches are discussed. They include some aspects of authoring Serious Games (as already covered in chapter "Authoring Serious Games").

INTRODUCTION

Collaborative learning is a concept which has been researched for many decades and is an established method of teaching in today's classes. Serious Games (SG) show a similar trend from single to multi player, just like the gaming world did during the last ten years with more and more focus on social interaction between players in the last years. In recent years, first approaches appeared which try to combine the collaborative learning paradigm with SG technology. In the focus are collaborative learning scenarios and social interaction between players.

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Compared to single player SG, multiplayer SG provide additional challenges during authoring, control, and validation.

In terms of authoring, concurrent gaming in one game world/level has to be considered. How can the game be designed to enable players/learners to interact in the game (world) in a way such that they profit most from the presence of other players? This includes design of collaborative challenges, division of labour or knowledge sharing.

During runtime, adaptation multiplayer scenarios considering the characteristics of individual users (players, learners) and heterogeneous user groups (e.g. a school class) and supporting knowledge sharing and peer education (tutoring and assessment) among learners during play is vital. The concept of Narrative Game-Based Learning Objects (NGLOBs) as presented in the previous chapter is only partly usable in multiplayer scenarios. Therefore, new concepts for adaptation of multiplayer games to the needs of learner groups will have to be developed. One focus is set on the Game Master concepts. These domain experts use software tools to monitor, control, and influence the game scenarios with their individual instructional support. A key challenge is to optimize their view on the game during runtime so that they can analyse and control the group's learning process inside the game in an optimal way.

In terms of validation, one major challenge is to assess learning progress of groups in multiplayer Serious Games. Although assessment of (collaborative) learner groups is being researched for several decades, up to today it is still not entirely clear, how these mechanisms can be adapted in order to be used for the assessment of groups of learners in games.

The proposed mechanisms and RTD principles are presented in the context of the best-practice examples (projects) Genius (technology transfer projects in the field of Serious Games authoring and combining Serious Games with social networks; funded by the State of Hessen in the frame of the LOEWE program for economic and scientific excellence), PEDALE (strategic interdisciplinary research at TU Darmstadt addressing collaborative math learning supported by peer education), Woodment and Escape from Wilson Island (strategic research at the Serious Gaming group offering multiplayer learning scenarios enhanced by game mastering principles to support coaches/tutors).

COLLABORATIVE LEARNING

Whereas the proposed NGLOB concept serves for single player SG, other mechanisms are required for the control of multiplayer environments: Multiplayer games offer a whole new range of applications for Serious Games. With Multiplayer games, inter-personal skills like communication, teamwork, or other soft skills may be trained. Multiplayer Serious Games are also especially well fit to be used for game-based collaborative learning scenarios.

The concept of collaborative learning is being discussed among educators for decades. Collaborative learning is used in schools today in various forms, like joint problem solving in teams, debates, or other team activities. According to Pierre Dillenbourg (1999, one definition for collaborative learning is "*a situation in which two or more people learn or attempt to learn something together.*" Roschelle and Teasley (1995) define collaboration as "*a coordinated, synchronous activity that is the result of a continued attempt to construct and maintain a shared conception of a problem.*" Compared to Dillenbourg's definition of cooperation, "*In cooperation, partners split the work, solve sub-tasks individually and then assemble the partial results into the final output,*" this is much more than just cooperation. Dillenbourg defines collaboration as follows: "*In collaboration, partners do the work 'together.'*" The idea of collaborative learning is to make learn-