NUCLEO an adaptive role game based scenario

Pilar Sancho[1], Rubén Fuentes[1], Baltasar Fernández-Manjón[1]

1Universidad Complutense de Madrid, Dpt. Of Software Eneneering and Artificial Intelligence, C/ Profesor Jose Garcia Santesmases S/N, Ciudad Universitaria, 28040 Madrid, pilar@sip.ucm.es; ruben@fdi.ucm.es; balta@fdi.ucm.es

Abstract

Traditional university instructional formats and methods are experimenting an increasing lack of effectiveness, mainly because student's lack of motivation. The NUCLEO e-learning system tries to approach the learning scenario to the engaging and immersive formats of the videogames. It provides a futurist scenario in which students (represented by avatars) have to collaborate to solve a learning "mission". The proposal is based in two socio-constructivist approaches, problem based learning and computer supported collaborative learning and it makes use of adaptation techniques to optimize group effectiveness and to individualize the educational strategy by considering students' learning styles.

1 Introduction

The Net Generation has arrived to university and college. They have grown up using technology for almost any activity which has surely affected the way they perceive and interact with their environment. In this context, most university instructional methods, anchored in traditional text based formats, suffer from an increasing lack of student's interest. The educational community is starting to feel that the learning applications may benefit by taking some of the engaging features of videogames and Internet tools [Prensky 2001].

NUCLEO is an e-learning environment that combines active and collaborative learning with the engaging formats of videogames and virtual worlds. Deeply grounded in the socio-constructive pedagogical stream [Vygotsky 1978], takes the learner (represented by an avatar) into a futurist scenario where he has to solve a difficult mission working in collaboration with other students inside a team. Therefore, the system combines the problem based learning (PBL) and the computer supported collaborative learning (CSCL) approaches in a framework that uses a multiplayer role videogame as the delivery format.

In a collaborative learning context, groups are a key factor in the success of the learning experience. A positive learning experience might turn into a negative one depending on the group composition [Alfonseca, Carro, Martín, Ortigosa, Paredes 2006]. NUCLEO makes use of adaptation techniques to optimize student's interaction (by grouping students according to their learning habits) and to provide personalized learning activities in order to address their specific learning needs.

2 Adaptation model in NUCLEO

PBL and CSCL are increasingly popular instructional methods that require learners to actively gather and apply knowledge in order to solve ill-structured real-world problems. However research has shown that the implementation of these approaches is a challenging task. Among the variety of reasons (see [Miao, Holst, Haake, Steinmetz 2000]) literature stresses that the students easily loose focus and get frustrated by lack of adequate guidance and help. This fact implies that effective PBL requires the tutor to provide a lot of personal attention to the students. Nevertheless an implicit assumption in collaborative learning is that students working in groups will learn from and teach one another. NUCLEO uses this assumption in the form of an

adaptation model conceived to combine students in a way that helps making tutor task a little less demanding by distributing part of his role to the students themselves.

Adaptation can be characterized as the ability of an e-learning system to adapt to different conditions over time. In general, the adaptation process can be described by three stages: retrieving information about the user, processing the information to initialize and update a user model, and using the model to provide the adaptive behaviour [Brusilovsky, Maybury, 2002]. In NUCLEO we consider student's learning style according to Vermunt's conception for constructing a user model. Vermunt's framework contains relevant information about student's capabilities towards the learning process that are, in our opinion, very useful for optimizing team performance; it includes several student's characteristics concerning their learning habits that may lead to determine how capable is a student of driving his own learning process and how much of teacher guiding he needs. Along with the group formation the student's learning style determines the role he plays in the learning scenario by conditioning his duties in the proposed mission as well as the tools he is allowed to use. Also individual learning activities are proposed to the student depending on his role in order to address specific learning needs of his learning style type. Therefore, the student's learning style is the determinant of the adaptation process (i.e the aspect of the learning experience which drives the adaptation or "on what is the adaptation based") and the constituents (i.e. the aspects of the learning experience subject to adaptation or "what is being adapted") are the teams and the learning strategies [Brusilovsky, 1999].

Among the variety of proposals for user modelling [Brusilovsky, Millán 2001], we use a dynamic stereotyping model that responds to the following adaptive cycle: At the first step the system classifies the student into a certain learning profile by gathering the information required using a simplified version of the "Inventory of Learning Styles" created by J. Vermunt. Then the adaptation engine has to update and maintain this profile using data from the student system interaction. We obtain it from three sources: the individual activities, the results of the collective missions and the evaluation from the rest of the members of the team of one particular student.

Adaptation of the learning strategy is supported by associating instances of the element role provided in the IMS LD specification to the different student profiles. As the different learning activities are conceived to be performed by a certain role, we have created roles for every defined learner profile (in our case for the considered learning style types).

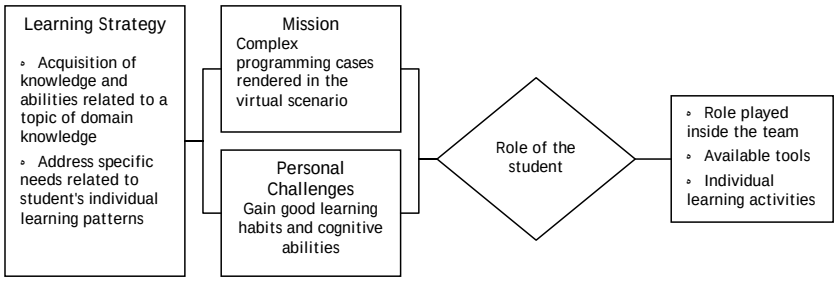

Figure 1. Structure of a learning strategy

3 Conclusions and Future Work

In order to prove our hypothesis, a pilot system is currently being tested to teach a programming course in C++ this semester at the Physics Faculty of the Universidad Complutense de Madrid in Spain.

Acknowledgement

The Spanish Committee of Science and Technology (projects TIC2002-04067-C03-02, TIN2004-08367-C02-02 and TIN2005-08788-C04-01) has partially supported this work, as well as the Regional Government / Complutense University of Madrid (grant 4155/2005 and research group 910494).…

References

Alfonseca, E., Carro, R. M., Martín, E., Ortigosa, A., Paredes, P. The impact of learning styles on student grouping for collaborative learning: A case study. User Model & User Adapted Interaction. Vol 16. 2006. 377-401.

Brusilovsky P, 1999. Adaptive and Intelligent Technologies for Web-based Education, Kunstliche Intelligenz, Special Issue on Intelligent Systems and Teleteaching, 4

Brusilovsky, P., Maybury, M. T., 2002. From adaptive hypermedia to the adaptive web. Communications of the ACM, 45(5), 30-33.

Brusilovsky, P., Millán, E. "User Models for Adaptive Hypermedia and Adaptive Educational Systems". P. Brusilovsky, A. Kobsa, and W. Nejdl (Eds): The Adaptive Web, LNCS 4321, pp. 3-53, 2001.

Miao, Y., Harrer, A., Hoeksema, K., Hoppe, H. U., Modeling CSCL scripts – A reflection on learning design approaches. Scripting Computer-Supported Collaborative Learning. Cognitive, Computational and Educational Perspectives. Fischer, Kollar, Mandl, Haake (Ed.) Springer, 2007.

Prensky, M. Digital natives Digital inmigrants. On the Horizon. NCB University Press, Vol 9. No. 5, October 2001.

Vygotsky, L. S. Mind in society: The development of higher psychological process. Harvard University Press, 1978.