

Prologue

It is well known that nowadays we live in a rapidly changing world. The decade of '80s was marked by the transition from the "industrial society" to the "information society", while in the decade of '90s we began to talk for the transition to the "knowledge society". Nowadays we talk for the "creative society" (Resnick 2008), which requires from people to develop the ability to think and act creatively in problem solving everyday situations.

Under the effect that those changes had on education, a series of new educational tools, based mainly on the use of personal computers, have been invented last two decades to educate the student generations of the "knowledge" and "creative" society. Educational robotics is one from these new innovative tools that has attracted the interest of educational community from kindergarten to universities during last few years.

Educational robotics is introduced as a powerful, flexible teaching/learning tool stimulating learners to control the behavior of tangible models using specific programming languages (graphical or textual) and involving them actively in authentic problem-solving activities. This is the field where the European project "Teacher Education on Robotics-Enhanced Constructivist Pedagogical Methods - TERECOP" was activated during the years 2006-2009 with the participation of 8 European educational institutions from 6 European countries (www.terecop.eu). The TERECOP Project aimed at the development of a design and implementation framework for activities advisable mainly for secondary school education related to programmable robotic constructions and based on learning methodologies inspired from constructivism and constructionism theory.

Believing that the role of teacher is crucial for the successful introduction of robotics in classrooms, the TERECOP Project focused on the training of prospective and in-service teachers in the use of robotics technologies (LegoMindstorms Education NXT) through courses implemented in each of the six participating countries, the evaluation of the training courses and the dissemination of the educational results at a European level. Finally the TERECOP project aspired to develop a community of practice between researchers, teacher trainers and teachers that can facilitate and sustain teachers' professional development in the use of robotic tools in classrooms.

This book is a collective product coming from the cooperative and shared work done by the TERECOP partnership during the 3 years of the project. The book is addressed mainly to teachers at all school levels who are interested in introducing robotics in Science, Technology, Mathematics and Informatics classes or in the frame of interdisciplinary learning activities. In addition to that, the book is addressed to trainers of teachers offering them a constructivist model for training

teachers in educational robotics.

The content of the book addresses a wide range of both theoretical and practical aspects of educational robotics.

Chapter 1 (Constructionism and robotics in education) presents and discusses some critical pedagogic aspects behind the educational use of robotics with respect to the potential of control technology to generate constructionist learning processes in the light of the constructionism theory. A review of research literature in the field of educational robotics and the evolution of Robotic technologies (from “floor Logo turtles” to Lego Mindstorms) are presented and commented.

Chapter 2 (robotics as learning object) begins with a Piagetian and Vygostkian methodological perspective for designing constructivist didactic situations to study robotics as learning object. The chapter continues with some good reasons to prefer the Lego Mindstorms NXT system among others, then offers practical knowledge for using the hardware and the software of the Lego Mindstorms NXT system with practical examples for constructing robotic vehicles and programming them to move in straight line, to turn right and left, to communicate with their environment and to acquire and log data through sensors.

Chapter 3 (robotics as learning tool) presents a constructivist methodology for designing teaching and learning activities where robotics is used as learning tool and exemplifies it with a representative example: the bus route project.

Chapter 4 (Teacher Training Course in Introducing Robotics in the Curriculum - The TERECOP Project Proposal) presents in details the TERECOP methodology for training teachers in educational robotics. The chapter includes training curriculum, detailed description of each module, training activities, tools and materials and tools for the evaluation of the training course. The chapter finishes with evaluation results, experiences and recommendations from training courses implemented in Athens and in Prague.

Chapter 5 offers some additional exemplary projects and examples of learning activities with robotics that teachers can use in their class adapting them both to the proposed constructivist training methodology and to their students’ cognitive level taking into account that some of them demand from students a sound background in mathematics.

Chapter 6 offers useful resources for teachers including books, papers (in journals and proceedings of conferences) and web resources.

Appendix 1 offers some basic technical knowledge for the LegoMindstorms NXT system (hardware and software) and **Appendix 2** a textual description language which is equivalent to the NXT-G graphical language and is used just for a convenient detailed description of some complex NXT graphical programs appeared in chapters 2 and 5.

Finally, this book aspires to bring closer researchers, academic and school staff working in the field of educational robotics and to contribute to the further development of the dialogue especially under the light of constructionism theory, not only within the TERECOP project partnership but within the broader European and international community of educational robotics. This dialogue will hopefully continue next years and the TERECOP partnership is willing to undertake or participate in new relevant initiatives in the future.

References

Resnick, M. (2008), 'Sowing the Seeds for a More Creative Society'. | Learning & Leading with Technology December/January 2007–08, International Society for Technology in Education, 18-22.

Dimitris Alimisis, ASPETE, Greece

Patras, 2009

