Development of a modelling learning path

van Buuren, O.P.M.

Citation for published version (APA):

General rights
It is not permitted to download or to forward/distribute the text or part of it without the consent of the author(s) and/or copyright holder(s), other than for strictly personal, individual use, unless the work is under an open content license (like Creative Commons).

Disclaimer/Complaints regulations
If you believe that digital publication of certain material infringes any of your rights or (privacy) interests, please let the Library know, stating your reasons. In case of a legitimate complaint, the Library will make the material inaccessible and/or remove it from the website. Please Ask the Library: https://uba.uva.nl/en/contact, or a letter to: Library of the University of Amsterdam, Secretariat, Singel 425, 1012 WP Amsterdam, The Netherlands. You will be contacted as soon as possible.
Acknowledgements

When reading acknowledgement sections of dissertations, I used to be amazed about the large number of people being thanked by the author. I wondered whether all these people really had contributed that much to these dissertations. Now, I know they probably did. During my own research, I too was supported by many people offering useful and intriguing ideas about modelling in education, sharing their experiences, willing to try out the instructional materials, or providing help, criticism, and moral support when I needed it. As an educational researcher, I often felt as the centre of gravity towards which much existing, albeit fragmented knowledge was attracted. If educational researchers live in an ivory tower, this tower is definitely crowded with people, and the door is open to visitors.

This project would not have been possible without the PhD scholarship granted by VO Haaglanden, the foundation for secondary education in which the school at which I work as a teacher, the Montessori Lyceum of The Hague (HML), is one of the participating schools. As far as I know, such a scholarship, offered by an organisation of secondary schools to its teachers, is unique in the Netherlands and maybe even in the world. I have been the first teacher to receive this scholarship and I hope that many more teachers will follow. For me, this research project has been most inspiring and motivating.

This project would also not have been possible without the support of the former AMSTEL Institute, of which Ton Ellermeijer was the director. It is sad that this institute, that has offered so much support and ideas to secondary science education for such a long time, does not exist anymore. For me, it has been a privilege to work with the people from this institute. Most of everyone, I thank my promotor Ton Ellermeijer. I also thank Peter Uylings and André Heck, for their cooperation and support. Peter helped me during the initial phase of the project. After the closing of the AMSTEL Institute, André took over in an invaluable way. But I received support from many more co-workers at the AMSTEL Institute. I explicitly express my gratitude to Ed van den Berg, Pauline Vos, Wolter Kaper, Piet Molenaar, Norbert van Veen, Frank Schweickert, and Bob Landheer, and to my roommates Lodewijk Koopman, Sanne Schaap, and Beryl Yilmaz, for our fruitful discussions and for the ideas on science education and educational research that we have shared. Special thanks go to Paul Logman, my roommate, sparring partner, and conference companion during almost this entire research project. I also thank the people from the foundation CMA (Centre for Microcomputer Applications), especially Vincent Dorenbos, Martin Beugel, Ron Vonk, and Ewa Kedzierska, who gave technical support on
Coach, were willing to adapt Coach to my needs, and offered many creative educational ideas. Finally, I express my gratitude to Jenny Batson, who gave me academic shelter at the Institute of Language, Logic, and Computation (ILLC) of the University of Amsterdam when everybody else at the UvA seemed to have forgotten about me, to Jan Wiegerinck, director of the Korteweg-de Vries Institute for Mathematics (KdVI), who offered me a place to work during the last part of my research project, and the Faculty of Science of the UvA for defraying the last two months of this project.

I am also grateful to the DUDOC program council for allowing me to participate as a guest in their research training sessions. These sessions, guided by Tjeerd Plomp, Marie-Christine Knippels, and Gjalt Prins, have been very valuable. I also thank the other participating teacher-researchers. Our discussions and mutual moral support have been of great value to me. Special thanks go to those teacher-researchers whose subjects were most closely related to my own fields of interest: Paul Logman, Joke Zwartveeen-Roosenbrand, Sonia Palhia, Sanne Schaap, and Daan van Smaalen.

Educational research without support of a school is hardly possible. I am grateful to the HML for offering me the unique possibility to carry out this longitudinal research project. I always felt supported by Hugo Dirksmeijer and Henriette Boevé, the former and the current principal. I thank all my HML colleagues who participated as a teacher or supported this project in another way: Piet Heyboer, Geert Huismen, Anton Wolvers, Frits van Geenen, Simon van der Zwan, Ton Schijvens, Evert Jansen Schoonhoven, Otto Kraamwinkel, Erik Luymes, and Thomas ter Hart. Two HML-colleagues deserve special attention, namely Robert Bregten, who participated as a teacher in almost every research round, and Lee van Oosten, the technical assistant at the HML. Lee was involved in the development of all the experiments in the learning path, and helped to try out and refute many more. Lee really made things work. I also thank all involved teachers from other schools, especially Jan Huurnink, Albert Brouwer, Norbert van Veen, Piet Molenaar, and Karsten Köhler.

The most important contributors to this research project have been the HML students, who were willing to share their thoughts and feelings about the lessons and about the instructional materials with me; I received countless valuable suggestions from them. By mentioning only a few of these students, I would fail to do justice to the others, but mentioning all of them would take too much time and space. Therefore I confine myself to those students who contributed in a special way: Wendy Hazeboek and Lara Migchelbrink, who assisted in doing classroom observations, Danielle Baak and Daniel van der Sanden, who helped developing experiments, and Emma Vrins, who assisted with the analysis of questionnaires and with the layout of this dissertation. I am very happy that Bas van Buuren was willing to design the cover of this dissertation, and I thank Bart Wage for his advices concerning the English language. Finally, I thank my wife Marijke, my son Micha, and my daughter Merel for all their love and support. For them, it must not have been easy, living with someone who often showed considerable resemblance to a zombie.
Marijke and Micha helped me to keep a down-to-earth view on students. Merel received modelling lessons herself as an upper secondary student at another school and provided me with very realistic and honest insights in her conceptions and in the learning effects of those lessons, gave valuable advices, and helped analysing some of my tests.

I hope that people with whom I have worked but who are not mentioned explicitly do not feel offended. I felt supported by many more people than the ones mentioned in this section. Of course, I am responsible for the content of this dissertation, but it certainly is the result of the work of a community.