

INTERNATIONAL TECHNOLOGY EDUCATION SERIES

Professional Development for Primary Teachers in Science and Technology

The Dutch VTB-Pro Project in an International Perspective

Marc J. de Vries, Hanno van Keulen, Sylvia Peters
and Juliette Walma van der Molen (Eds.)

Foreword by Michel Rocard



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Teachers in Science and Technology**

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Scope

Technology Education has gone through a lot of changes in the past decades. It has developed from a craft oriented school subject to a learning area in which the meaning of technology as an important part of our contemporary culture is explored, both by the learning of theoretical concepts and through practical activities. This development has been accompanied by educational research. The output of research studies is published mostly as articles in scholarly Technology Education and Science Education journals. There is a need, however, for more than that. The field still lacks an international book series that is entirely dedicated to Technology Education. *The International Technology Education Studies* aim at providing the opportunity to publish more extensive texts than in journal articles, or to publish coherent collections of articles/chapters that focus on a certain theme. In this book series monographs and edited volumes will be published. The books will be peer reviewed in order to assure the quality of the texts.

Professional Development for Primary Teachers in Science and Technology

The Dutch VTB-Pro Project in an International Perspective

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MICHEL ROCARDⁱ

FOREWORD

In this beginning of the XXIst century, we seem to have many reasons to worry about the future: climate heating, financial disequilibrium, nuclear proliferation among others. . .

Let me call the reader's attention on another one, less visible and more forgotten, but more capable to produce some optimism when looked at, and treated: it can be remedied.

I am thinking here to this long term, slow and regular tendency which conducts in most developed countries boys and even more girls at school to choose scientific studies in a declining percentage. This evolution is threatening, for the future, for our competition position in front of emerging countries and especially China. The answer is to be found in deep changes and improvements in the way mathematics and sciences are taught.

In the Report I presented to the European Commission in 2007, *Science Education Now: a Renewed Pedagogy for the Future of Europe*, we stressed the fact that teachers are key players to renew science education, especially in primary schools. I was pleased to see the large impact of this Report, not only in the funding decisions taken by the Commission, but primarily in the numerous initiatives, experiments and creative projects which began to flourish in Europe. Besides, we observe an increasing involvement of the scientific community, which follows the pioneering path traced by Georges Charpak.

Among these many successful initiatives, I have been pleased to discover the VTB-Pro three-years project carried out in the Netherlands (Broadening technological education in primary school). Focusing on professional development of teachers and presenting first hand testimonies and research, the present book demonstrates how to deal with this issue, so critical for a renewed pedagogy. With proper methods, the knowledge of science, the interest in science and technology, the pedagogical skills can all be improved among teachers who often have no or little affection for science.

I congratulate the authors of this book and I hope that the new European strategy Europe 2020 will keep supporting such creative ventures, which are so important for our common future.

NOTES

ⁱ Michel Rocard is a former French Prime Minister and was also a member of the European Parliament. He chaired the High Level Group on Science Education that produced the report *Science Education Now: a Renewed Pedagogy for the Future of Europe* (European Commission, 2007).

MARC J. DE VRIES, HANNO VAN KEULEN, SYLVIA PETERS, AND
JULIETTE H. WALMA VAN DER MOLEN

PREFACE

This book is the outcome of a major project on science and technology in primary education in the Netherlands that ran from May 2007 till December 2010. The project aimed at providing professional development to Dutch primary teachers in order to enable them to implement new activities in their curriculum that focus on science and technology. The name of the project was: VTB-Pro. VTB stands for *Verbreding Techniek Basisonderwijs - Professionalisering*, in English: *Broadening Technological Education in Primary Education – Professional Development*. A substantial part of this project was dedicated to educational research. This book contains a selection of research studies that have been conducted in the context of this project. As the themes that are dealt with in the research go beyond the specific situation in the Netherlands, this book is truly a publication that is of interest for an international readership. To emphasize this, we have asked two experts of international reputation to write the first chapter. Wynne Harlen (University of Bristol) and Pierre Léna (Université Paris Didérot) were prepared to do this.

The VTB-Pro project was related to the VTB project in which the introduction of science and technology activities in primary education was the main goal. This project was at school level. But it is well known that in order to make this introduction a success, teachers need to be well prepared for it. This is by no means obvious when it comes to science and technology in primary education. The large majority of primary teachers have no affection for science and technology. To the contrary, they often became primary teachers in the expectation that they would not need to be involved in that. Often, the mere thought of having to teach science and technology makes them feel quite uncomfortable. That is why the VTB-Pro project was initiated: as a response to this problem. The purpose of the VTB-Pro project was to create favourable conditions for primary science and technology education by helping primary teachers to acquire the necessary knowledge, skills, attitudes and pedagogy for teaching science and technology. The professional development activities and the research in this project were developed and conducted by consortiums of primary teacher training institutes and universities. These were organised in what was called ‘Knowledge Centres’, of which there were five in the country. A Project Management group was responsible for the organisation of the project; a Programme Council was installed to guard the scientific quality of the project. Two external assessment organisations were hired to monitor the project.

The VTB-Pro project was guided by a theoretical framework that described what primary teachers needed to know and be able to in order to implement

science and technology in their classroom practice (Walma van der Molen, de Lange, & Kok, 2007). Three main elements were identified:

1. Science- and technology-related knowledge and skills
2. Favourable attitudes towards science and technology, and
3. Pedagogical skills for inquiry-based learning and learning-by-design.

These three elements formed the basis of the professional development activities, but also of the research part in the project. This is reflected in the structure of this book. Part I is about the first strand in the VTB-Pro research programme: knowledge and skills. In this part there are both studies on what knowledge and skills are desirable from a social and educational point of view and studies on what primary teachers already know and are able to. Part II is on attitudes. The studies in this chapter range from instrument development to identifying the actual attitude teachers have. Part III deals with concept learning and language development as the two main domains that have been studied in the context of the Pedagogical Content Knowledge for primary science and technology education. Studies in this part investigate to what extent the professional development activities have resulted in teachers acquiring this type of expertise. Part IV focuses on the nature of the professional development activities themselves: what makes such activities successful? Each of these Parts is further introduced in a separate chapter, one for each Part.

We want to thank all authors for their cooperation in this effort. In particular we want to thank Wynne Harlen and Pierre Léna for their input. We still have very positive remembrances of the meeting of us as the editors of this book with the two of you in Pierre's institute in Paris. We also want to thank Sense's Peter de Liefde for offering us the opportunity to present the outcomes of the VTB-Pro project in the International Technology Education Studies series. We hope this volume will prove to be a worthy addition to this successful series.

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