3.3 A PROFILES Model of Science Teachers' Professional Development, a Slovenian Perspective of Implementation of Action Research

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Abstract

Teachers' continuous professional development (CPD) is an important aspect of an effective science education. In this chapter the Slovenian perspective of the PROFILES (Professional Reflected Oriented Focus on Inquiry-based Learning and Education through Science) as a model of teachers' professional development in the context of the action research is presented. Detailed description of CPD PROFILES programme implemented in two rounds (school year 2011/12 and 12/13) is presented.

Introduction

Teachers' professional development is a lifelong process in which teachers constantly acquire new knowledge, develop new skills and competences and they move towards a better quality of teaching performance and other professional work in the school. This process includes teachers' individual, professional and social dimension, and it also means teachers' progressing towards the direction of critical, independent, responsible decision-making and acting (Vogrinc & Valenčič Zuljan, 2009). *"Teacher development is the professional growth a teacher achieves as a result of gaining increased experience and examining his or her teaching systematically"* (Glatthorn, 1995, p. 41). Effective teachers' professional programme needs to provide an opportunity for teacher reflection and learning about how new practices can be evolved or moulded from existing classroom practice. Teachers need to familiarise themselves with new ideas and also understand the implications for themselves as teachers and for their learners in the classroom before they adopt and adapt them (Harrison, Hofstein, Eylon & Simon, 2008).

Teachers' professional development is a complex process; its success is the responsibility of all institutions related to the education of education practitioners: faculties which educate future education practitioners, education institutions where education practitioners are employed, and suitable national institutions that take care of the education system. However, a key element of teacher's professional development is his/her willingness for in-depth learning and knowledge of scientific achievements pertinent to his/her professional work, coupled with critical evaluation and considerate integration of new findings into pedagogical work.

Professional development includes formal experiences (such as attending workshops and professional courses) and informal experiences (such as reading professional publications, watching television documentaries related to an academic discipline, etc.). This perspective is, in a way, new to teaching. For years the only form of professional development was in-service training, usually consisting of workshops or short-term courses that would offer teachers new information on a particular aspect of their work. Only in the last decades has the professional development of teachers been considered a long-term process; a continuous professional development (CPD) that includes regular opportunities and experiences planned systematically to promote growth and development in the profession (Villegas-Reimers, 2003). Effective CPD programmes have some important features: they engage teachers in collaborative long-term inquiries into teaching practice and student learning; these inquiries are situating into problem-based contexts that place content as central and integrated with pedagogical issues; they enable teachers to see such issues as embedded in real classroom contexts through reflections and discussions of each others' teaching and/or examination of students' work; focusing on the specific content or curriculum teachers will be implementing such that teachers are given time to work out what and how they need to adapt what they already do (Harrison, Hofstein, Eylon &

Simon, 2008). It is important to emphasize that the PROFILES project undertakes a so-called "bottom-up" approach in the CPD programme that can be identified as a project-based model of teachers' long term in-service professional development (Blonder, Mamlok-Naaman & Hofstein, 2008; Hofstein, Mamlok-Naaman, Rauch & Namsone, 2012).

The PROFILES CPD programme in Slovenia

The PROFILES project contributes a great amount of time to teachers' professional development in the perspective of the long-term education (WP 4, 5 and 6). This means that teachers should participate in their in-service education for at least one school year where they are engaged in collaborative development of learning materials (PROFILES learning modules) with other teachers and members of the national PROFILES team (consultants). The consultants advise teachers in developing the innovative teaching approaches according to the PROFILES philosophy following the bottom-up approach. In each group of teachers in the second round of the project one of the leading teacher is also included, who already went through the PROFILES training in the first round. Teachers are grouped according to their professional science orientation. All groups of teachers have to develop or adapt three PROFILES modules which have specific 3-stage PROFILES structure. The Slovenian project team has also upgraded the learning modules for students' independent group work (teachers only guide students in the process of collaborative learning) by following the principals of active learning. This approach was applied in the first round of the PROFILES professional development, but in the second round some teachers have the opportunity to choose and adapt one PARSEL module, one PROFILES module from the first round and they also have to develop one new PROFILES module by themselves (all modules developed in Slovenia can be accessed on-line http://www2.pef.uni-lj.si/kemija/profiles/moduli.html). Developed modules were then implemented in the school and some specific variables regarding students' achievements were measured. Teachers also prepared portfolios where they documented their engagement in the PROFILES project. All teachers' activities in the PROFILES project were conducted in the frame of the action research, which represents one of the important factors in teachers' professional development, in particular when it is designed as a collaborative process involving teachers and researchers. Specific teachers' training and implementation of the modules were considered as a cycles in the action research model. Stages of this model are presented in Figure 1.

We assume that the effectiveness of teaching in schools would be substantially improved if teaching were a research-based profession and if educational practitioners were to play a central role in carrying out educational research. Teachers' involvement in research should also stimulate ownership of the innovation (PROFILES teaching strategies) because researching his/her own practice can directly influence his/her further work due to direct evidence of students' achievements, which are the fundamental goal of teaching.

Practitioner and action research

The idea of teachers conducting research on educational practice came from the work of the 1973–1976 Ford Teaching Project in the United Kingdom, under the direction of John Elliott and Clem Adelman. This project involved teachers in collaborative action research into their own practices. Its notion of the "self-monitoring teacher" was based on Lawrence Stenhouse's (1975) views of the teacher as a researcher and as an "extended professional". Stenhouse's view of educational research implies doing research as an integral part of the role of the teacher, just as a teacher who uses research into their subject as a basis for teaching implies that s(he) does research into the subject through their teaching. Stenhouse has actually introduced teacher/practitioner research as a concept for the professional development of teachers. According to Schön (1991), practitioners should: (1) participate in research of their own practice and (2) develop educational theories that directly reflect actual educational practice. Action research, as presented below, provides an appropriate means for realizing these objectives.

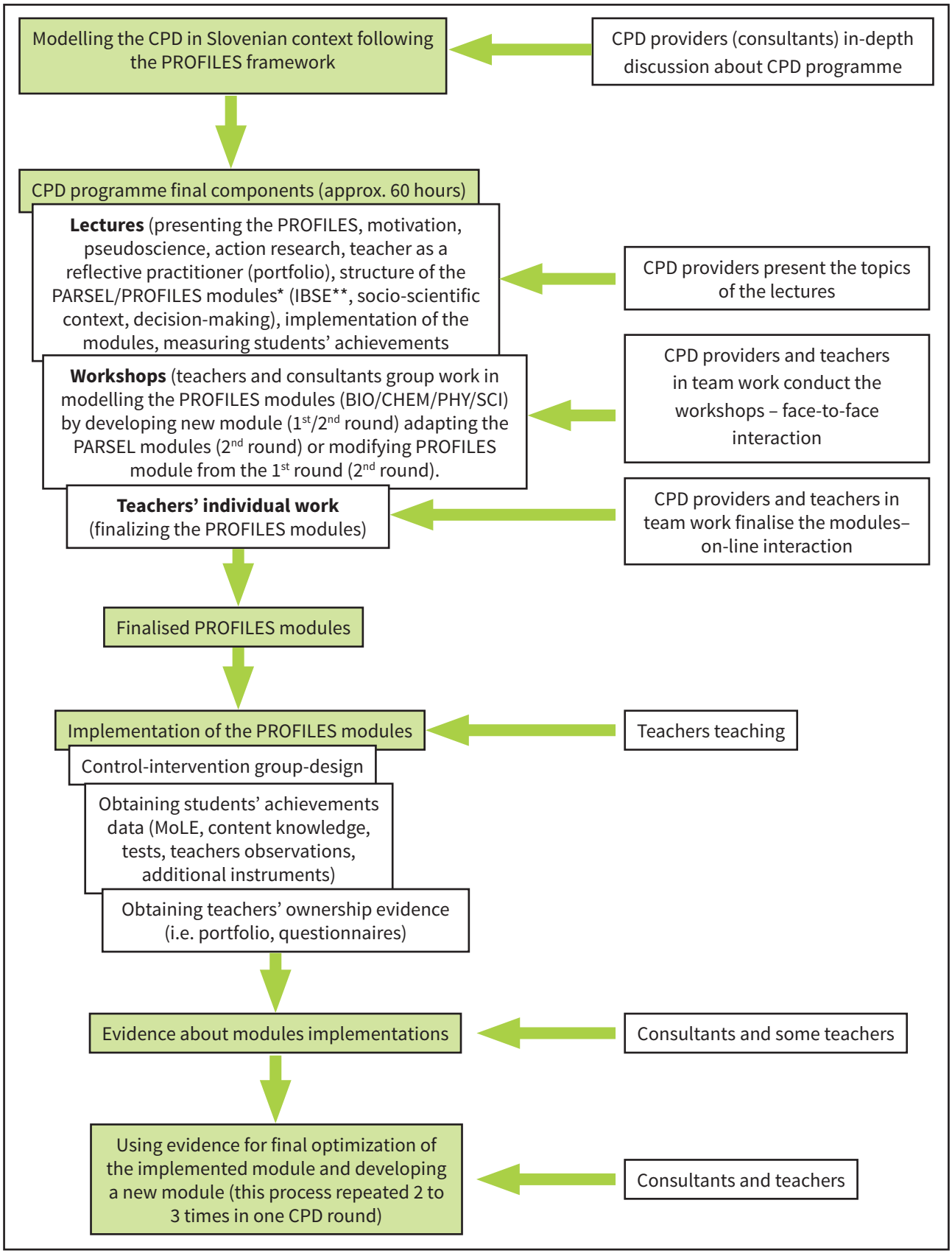

*Figure 1. Structure of the CPD PROFILES programme in Slovenia; * PARSEL module »No smoke without a fire – (Un)Desirable combustion« and PROFILES module »How to prevent car accidents in winter?« developed in Slovenia were used for presenting the structure of the modules to the teachers; **IBSE – Inquiry-based Science Education*

There is ample evidence that practitioner research can be a powerful factor in the lives of the teacher-researchers: teacher researcher report learning more about their students, about their schools, and about themselves; they use this knowledge to change their practice, to feel more professional, to engage "authentically" with the profession of teaching in a new way (for more on this see Berger, Boles & Troen, 2005). As Wilson (2000, p. 303) explains of his own teacher research efforts,

> *"The question is not so much 'How can I teach better?' but rather 'How can I organise my thinking about what is happening in my classroom to enable me to gain a deeper insight into the learning process and to maximise the effectiveness of the learning experiences I prepare for and share with my students?'"*

This is why in the project PROFILES attention has been shifted from questions about implementing innovations proposed from outside to questions about implementing changes in collaboration with teachers.

As basically illustrated on Figure 1 PROFILES teachers and consultants (members of the national PROFILES group from university) work in team to develop an innovating teaching approach following the PROFILES framework. CPD PROFILES programme comprises three major activities: (1) lectures where members of the national PROFILES group present the basic aspects of the PROFILES, (2) developing PROFILES teaching modules in group work (workshops) and (3) implementing PROFILES modules into the science teaching.

Teachers had to design and implement four precisely structured documents (Front page, Instructions for students, Instructions for teachers comprising additional teaching information and assessment tools (i.e. pre- and post-content knowledge test; classroom activities observation rubric). The design of each PROFILES module had to undergo several steps. Firstly, an initial draft had to be created in cooperation between the teachers and the consultants. Each step in the PROFILES module construction by the group of teachers was revised by the consultant. In the second round of CPD programme each group of teachers also had one leading teacher – teacher who participated in the first round of the PROFILES CPD programme and also implemented the PROFILES modules in the first year of the project. The leading teacher instructed the novice teachers (those who were involved in the PROFILES CPD for the first time) and helped them in modules design and implementation in the classroom environment. The consultants revised all PROFILES modules giving the teachers adequate feedback where necessary, focusing on both the content and the teaching methods included in the module. Specific focus was made on the 3-stage PROFILES model (socio-scientific context, IBSE, and decision-making). In the process of module optimization, each teacher in the group had an opportunity to take part in a common discussion. After the optimization process teachers went to their schools and try to implement the developed modules. Teachers came to the CPD meetings reflecting their observations and views about implementation of the modules in the classroom settings. They also suggested to other teachers what was good and what went wrong according to their opinion during the module first implementation in the science class.

The phase of implementation of the PROFILES modules and gathering the data about students' achievements and teachers' observations about students using the modules can be understood as some form of practitioner research specifically focused on action research (Vogrinc & Valenčič Zuljan, 2009; Burmeister & Eilks, 2013) that was used in Slovenian context when planning PROFILES CPD.

Action research in Slovenian PROFILES context

Slovenian PROFILES team decided to engage teachers into the action research during their CPD PROFILES programme. According to the action research characteristics described above, we decided that Slovenian science teachers would benefit most from profiles CPD programme if they are actively engaged into their education. Figure 3 shows the model of Slovenian action research in

the context of CPD programme and followed by the teachers and consultants. Each group of teachers followed the model according to their abilities to perform research. It is important to emphasise that the majority of PROFILES teachers in both rounds were not familiar with action research, so they had to get used to teaching, researching and following their and students' work. It is also important to emphasise that Slovenian science teachers are quite familiar with IBSE and using context in science education for initial boost of interest, and this helped them to design the modules easier. They had some problems with the last level of the 3-stage PROFILES module, because they usually do not use decision-making very often in science education, especially because they are usually focused on content knowledge and not so much on the wider educational component of the school science (i.e. education through science as an important aspect of PROFILES).

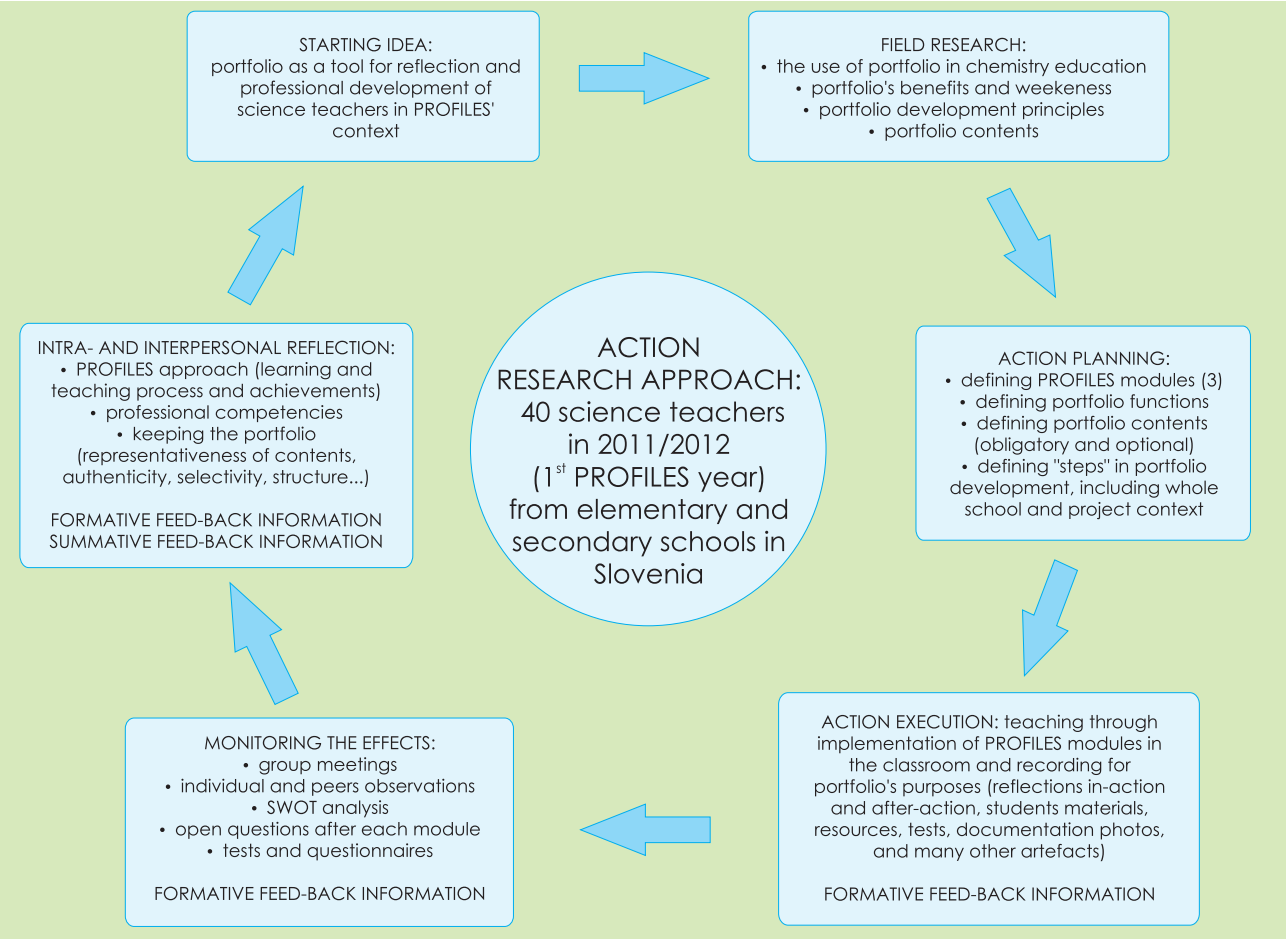

Figure 2. A model of CPD programme implemented in the PROFILES framework in Slovenia in the first and second round of the project (Jurišević, Devetak & Vogrinc, 2012).

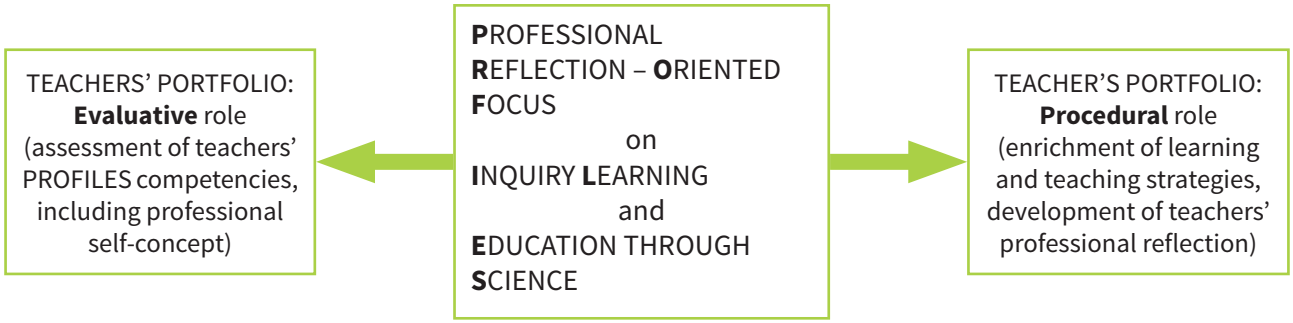

Figure 3. Identifying teachers' ownership by using portfolio in the CPD PROFILES programme in Slovenia (Jurišević et al., 2012).

Action research strategies used in the CPD programme can encourage teachers to more efficiently develop their ownership about PROFILES innovative teaching and learning science. We decided that portfolio can be used as a tool to follow teachers' professional development during PROFILES CPD. Teachers held written records of the specific observation, perception, hesitation, positive experiences or conclusion about different phases of the project. The portfolio serves two purposes (Figure 3).

The first is procedural, developing science teachers' reflection, encouraging their professional development and self-concept, and improving the quality of learning and teaching. The second is evaluative, with the portfolio functioning as a tool for science teachers to present their pedagogical competences and knowledge of the new professional experiences related to the project goals, through a process of action research following the main principles of the PROFILES approach (Devetak, et al., 2012). The last activity of the teachers' action research process is also publication of the research results. Some teachers and their consultants participated at the first PROFILES conference with the poster presentation in Berlin (Šket, Petrica Ponikvar, Klopčič, Mesojedec & Ferk Savec, 2012) and also at national science and mathematics teachers' conferences where they disseminated their work among other non-PROFILES teachers with oral presentations and workshops (i.e. Šket, Ferk Savec & Devetak, 2012; Devetak, 2013; Devetak & Ferk Savec, 2013) and also poster presentations.

Conclusion

In action research the final result as well as research process is important. Throughout this process a teacher can improve his/her professional standpoint and teaching (e.g. determines which teaching methods are more appropriate for children with special needs, which strategies of applying discipline are more effective, etc.), and acquire knowledge in research work. Action research trains teachers to perform independent studies, motivates them and trains them to read and critically judge other studies dealing with similar issues. Teachers with experience in own research work are usually more qualified to transfer the findings of other studies into their own practice. Action research can thus be defined as one of the important factors of a teachers' professional development and to increase the effectiveness of teaching. Practitioner research is often seen as a significant form of teacher professional development; however, practitioner research undertaken with academic researchers is also a significant form of academic professional development. Seen as such, academics can learn a great deal which contributes to the broader goal of improving their own practice (Groudwater-Smith & Mockler, 2006).

PROFILES CPD programme undoubtedly contributed to the teachers' awareness of what a practitioner research is and how it can be used for their continuous professional development in their scientific and didactical way.

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