18. CHARACTERISTICS OF EFFECTIVE PROFESSIONAL DEVELOPMENT FOR PRIMARY SCIENCE AND TECHNOLOGY

ABSTRACT

The professionalization program VTB-Pro (elaborating technology in primary education, professional) was founded in the year 2007 and enabled 5000 teachers and 5000 student teachers to professionalize themselves in the field of science and technology. This chapter describes the investigation of three professionalization programs developed by the knowledge centre for science and technology in the southern part of the Netherlands. The participants report that the investigated professional development programs for primary school teachers contributed to positive changes, in particularly in pedagogical content knowledge and attitude. The element that emerges from different investigation methods as the one that contributes the most to these changes is the participants’ own activity in assignments that took place during the course meetings. Program developers are advised to stay close to the teaching practice of participants and let them engage in practical experiences as much as possible. Key words: Science and technology, professional development teachers, professional learning teachers, teachers primary school

INTRODUCTION

Because of expected shortages of scientists the European Council aims to achieve 15% more student outflow in higher scientific and technological education in the year 2010 (Council for education, Youth matter and Culture, 2007). Initiatives regarding this aim in the Netherlands are provided for by the Platform Bèta Techniek, founded in 2004 (Deltaplan Bèta/Techniek, 2003a). Within the platform different programs have been launched including the professionalization program VTB-Pro. This program started in 2007 to achieve professionalization in science and technology of 5000 teachers and 5000 student teachers. Within regional science and technology knowledge centres professionalization programs for (student) teachers have been developed that are carried out by elementary teacher education colleges (pabo’s) (Kuijpers & Walma van der Molen, 2008).

The professionalization programs of the science and technology knowledge centre in the southern part of the Netherlands are offered in three regions, in this chapter indicated by A, B and C. In each region an in-service teacher education course, that was part of the professionalization program, was attended and
investigated. Each course encompassed six day parts and a similar amount of study time. The objective of the courses was to foster the teachers' subject matter knowledge, attitude, and pedagogical content knowledge in the field of science and technology (S & T).

CONCEPTUAL FRAMEWORK

To realize an increased outflow of S & T students in higher education, an increased intake is needed. Choices in education are made at a young age in the Netherlands. To increase the number of students that choose programs with a stronger emphasis on S & T, already in primary education a positive attitude of students should be fostered. Unfortunately, however, only 12% of the primary schools provide structured technology education (Inspection of Education, 2005-3). To enhance this percentage there are three known domains of teacher knowledge for S & T that can be attended to: subject matter knowledge, pedagogical content knowledge and attitude (Rohaan, Taconis and Jochems, 2008; Walma van der Molen, de Lange, & Kok, 2009). Primary schools cannot improve these domains by only purchasing S & T support materials: professional development is needed (Hagunama, 2008).

There are different ways to achieve professional development. Prebble, Hargraves, Leach, Naidoo, Suddaby, and Zepke (2004) distinguish short courses (for institutional information or training skills and techniques); professional development within working groups (to enhance more complex knowledge and skills); peer assessment and coaching; use of student evaluation of teaching (to improve teaching); and intensive study programs (to change teaching beliefs and practice). This implies that program developers should be aware of the goals they want to achieve and use the approach that is best suited for these goals.

Effective learning environments stimulate learners to retrieve previous knowledge on the basis of which new knowledge can be constructed. Feedback on learning is important and should match the goals that learners want to achieve. Learning environments are more effective when participants feel part of the learning community and are motivated to learn. Successful in-service teacher training courses can be realised in learning communities in which teachers can share their experiences, in programs that extend over a longer period of time, and by means of practical activities that teachers can also use while teaching their students (Brown, Bransford & Cocking, 1999).

When focusing more on the subjects of S & T some exemplary programs and models can be found. Stein, Ginnns & McDonald (2007) developed a professional development model for technology education, which showed that three elements (institutional knowledge, pedagogical knowledge, and field/discipline knowledge) can contribute to the development of personal constructs via enhancement, development, and reflection on experiences that are theoretical, practical, and reflective of nature. By developing personal constructs teachers’ knowledge and beliefs regarding technology can improve and practices can be changed. This implies that professional development programs for teachers regarding technology should focus on the development of personal constructs (using previous knowledge