

RESEARCH NOTE

Design of a model for a professional development programme for a multidisciplinary science subject in the Netherlands

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(Received 24 May 2011; final version received 21 February 2012)

Schools are increasingly integrating multidisciplinary education into their programmes. The Minister of Education, Culture and Science has introduced a new, integrated science subject in secondary education in the Netherlands, called Nature, Life and Technology (NLT). This research note describes the design of a generic model for a professional development programme to prepare teachers with and assist them during the implementation of a multidisciplinary science module. Three sources were used for this design: subject features including school practices, the curriculum design phases, and professional development characteristics, in combination with three factors influencing the quality of the professional development: context, process and content. These sources and factors have been translated into a generic model. Three experts evaluated this generic model: a teacher trainer who was also involved in the development of NLT modules; a biology and NLT teacher who was also involved in a regional NLT information centre; and a chemistry and NLT teacher. Overall, the experts were positive. They judged 12 out of 13 aspects of the model as sufficient or better. They were, however, critical about the issue of whether the model offers sufficient possibilities for participants to familiarise themselves with new subject content knowledge.

Keywords: multidisciplinary subject; professional development programme; implementation; new curriculum; teacher involvement

Introduction

A new science subject called Nature, Life and Technology¹ (NLT) has been introduced in secondary education in the Netherlands. NLT is related to the traditional science subjects but differs from these because of its interdisciplinary character and modular structure. A module consists of a situated practice (e.g. holography) in which concepts traditionally belonging to physics, chemistry, biology, mathematics and physical geography are introduced in rich context. This multidisciplinary character required a professional development (PD) programme to prepare and assist teachers during the implementation of NLT. Different kinds of programmes are described in the literature but none in the context of a multidisciplinary science subject.

Guskey (2000, p. 16) defined PD as ‘processes and activities designed to enhance the professional knowledge, skills and attitudes of educators’, and

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distinguished three quality-determining factors: context, referring to the ‘who’, ‘when’, ‘where’ and ‘why’; process, referring to the ‘how’; and content, referring to the ‘what’ of professional development.

This research note describes the design of a generic model for a PD programme to prepare teachers for and assist them with a multidisciplinary science module.

The generic model

For the design of the model we combined the three factors – context, process and content – with three sources identified in a previous study: NLT features including school practices, curriculum design phases and PD characteristics (Visser *et al.* 2010). These factors and sources have been translated into a generic model shown in Figure 1. The programme consists of three phases – before, during and after teaching the module – chaired by a coordinator.

Individual preparation

Teachers are asked by an email from the coordinator to examine the module and consider some issues: ‘What knowledge and skills do I want my students to acquire?’, ‘What kind of assessment methods do I intend to use?’ and ‘What questions do I have for the preparation seminar?’ As the delivery time of equipment for practical activities can be long, teachers are advised to find out what materials their school already possesses.

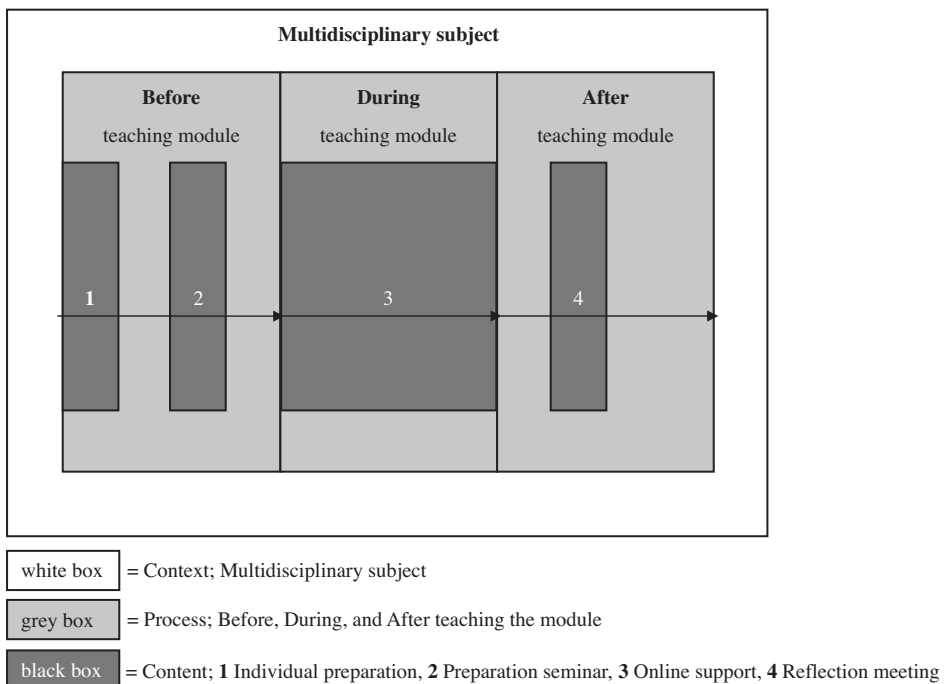


Figure 1. Generic model for a professional development programme.

Outline of the Collaborative Seminar Programme		Goal	What teachers do
I.	Opening		
II.	Soliciting teachers' questions to be included in the programme	To create strong sense of ownership with the programme.	Mention personal questions.
III.	Discussion of the overall module	To familiarize with alternative ideas, and to form a clear picture of the overall module.	Discuss and exchange experiences, ideas, and good practices.
IV.	Substantive aspects of the module		
	• Experiments	To handle practicalities, and discuss solutions for practical problems.	Try-out experiments from the module.
	• Module outline	To prepare module and lesson outline.	Outline the module for own class use.
	• Design materials	To develop additional learning materials.	Discuss additional learning materials, assessment methods and instruments.
V.	Appointments		Reflect on the professional development programme and make appointments.
VI.	Closure		

Figure 2. Seminar programme including underlying goal and teacher activities.

Preparation seminar

PD is most relevant when it focuses on teachers' real work. Therefore, teachers' personal questions form the starting point of the seminar. Figure 2 shows the outline of the seminar. This is a first step to the formation of a network, because teachers from different schools start collaborating.

Online support

Teachers need support during the teaching phase, especially when they have to implement new approaches in their classes. Email is selected as an online exchange tool. Teachers are regularly asked by the coordinator to describe their individual good practices and problematic experiences with the module, and to post personal requests. Responses are summarised by the coordinator and returned to all participants.

Reflection meeting

Issues to be discussed in the reflection meeting are: strengths and weaknesses, assessment methods, learning goals, teaching methods, and module outline. Joint reflection is an important learning activity, as strengths and weaknesses of the teaching–learning process emerge and are described for future use. Such a collaborative process builds confidence for the next module.

Expert appraisal

Three experts evaluated the model. The PD model and an explanation of the model were sent to the experts. They were asked to score, on a five-point Likert scale, whether the model adequately takes 13 different factors into account (i.e. teachers'

content knowledge deficiencies, PD culture of Dutch schools, student's prior knowledge, change subject matter, assessment methods, preparation phase, teaching phase, reflection phase, acquire new knowledge and skills, make the module relevant and attractive for students, prepare and organise teachers for their lessons, exchange and discuss experiences and ideas with colleagues, and a well-organised network).

Conclusion

Experts judged 12 aspects of the model as sufficient or better, the exception being the possibility to work on teachers' content knowledge deficiencies. Teachers have a master degree for one science subject and are therefore non-specialists in other science subjects. We acknowledge the notion that teachers might have deficiencies in specific content knowledge. The solution for NLT can be found in the formation of teacher teams, as it is impossible for teachers to acquire the knowledge of the other science disciplines at the required level. Teacher teams at schools must therefore consist of at least three teachers with different master's degrees (Steering Committee NLT 2008). In the PD programme we focus on class use of modules in relation to pedagogical content knowledge, planning, and equipment.

Note

1. Also known as Advanced Science, Mathematics and Technology.

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