

Cover Page



Universiteit Leiden



The handle <http://hdl.handle.net/1887/25806> holds various files of this Leiden University dissertation.

Author: Dam, Michiel

Title: Making educational reforms practical for teachers : using a modular, success-oriented approach to make a context-based educational reform practical for implementation in Dutch biology education

Issue Date: 2014-05-21

Chapter 3

ATTENTION TO INTENTIONS - HOW TO STIMULATE STRONG INTENTIONS TO CHANGE

Abstract

The implementation of educational reforms requires behavioral changes from the teachers involved. According to theories on successful behavioral change, teachers need to possess the necessary knowledge and skills, form strong positive intentions to perform the new behavior and have a supporting environment for change. Existing approaches to teacher professional development in the context of educational reforms are predominantly aimed at the development of knowledge and skills and at creating a supporting environment, but lack attention for teachers' intentions to change. In the study described in this chapter, we performed so-called 'motivating-for-educational-change' interviews (MECI) and explored the developments in teachers' intentions to change in the direction of the proposed national biology education reform, that is, the introduction of a context-based curriculum. The MECI comprised two tools: building on earlier successful experiences and using lesson segments to rearrange instructional approaches. We explored the influence of the MECI technique on the strength and specificity of teachers' intentions. After conducting the MECI, participants (n=9) expressed that they were able to see in what way they had already implemented aspects of the reform in their regular instructional approaches. This served as a basis to formulate strong and specific intentions to change their regular instructional approach towards that of the proposed reform while taking their regular instructional approach as a starting point.

3.1 Introduction

In recent years there has been much debate on educational reforms and their implementation in secondary education. Many educational reforms have been found to cause implementation problems, and the teachers involved have questioned the value of the proposed reform for their daily practice (Fullan, 2007). Research about the implementation of educational reforms shows that teachers play a crucial role in achieving the goals of a reform (Fullan, 2007; Van Driel, Beijaard, & Verloop, 2001). A reform proposal can therefore only succeed if teachers expand and change their behavioral repertoire in line with the reform. However, changing teachers' regular practices and routines has proven to be very difficult. For a successful behavioral change it is not enough to simply offer teachers new knowledge and skills; they first have to be motivated to change. Literature on behavioral change shows that people need both the ability and the willingness to change their behavior successfully (Fishbein & Ajzen, 2010). However, in current approaches to teacher professional development there seems to be an emphasis on supporting teachers in their ability to change, whereas teachers' willingness to change receives too little attention (Borko, Jacobs, & Koellner, 2010).

In the study described in this chapter, we therefore explored teachers' intentions to change. We performed so-called 'motivating-for-educational-change' interviews (MECI) and explored the resulting developments in the strength and specificity of teachers' intentions to change in the direction of a context-based reform proposal. If successful in achieving strong intentions, the MECI could be a useful tool to administer at moments such as the start of a professional development program or when motivation to continue professionalization is lacking. The MECI technique was based on two approaches: using lesson segments to assist teachers in rethinking their practices and using earlier successful experiences with parts of the proposed reform to assist teachers in proposing strong intentions to change. We focused on the strength and specificity of intentions, as these are found to be the closest determinant for the occurrence of new behavior (Fishbein & Ajzen, 2010). The research took place in the Netherlands, where the National Reform Committee For Biology Education proposed a context-based reform program (Boersma et al., 2007) in secondary biology education. The research question was the following: What are the developments in the strength and

specificity of biology teachers' intentions to implement a context-based educational reform after performing a 'motivating-for-educational-change interview' (MECI), and what are the underlying mechanisms?

3.2 Theoretical framework

One of the most important factors in the success rate of any educational reform is the way in which it is implemented. When implemented, reform design aims such as increased student outcomes or higher student motivation are often not achieved as expected (Van den Akker, 2003). In the process of implementing a reform proposal, there are many actors. There is a vast amount of literature concerning the change of classroom practices that places teachers as "key agents" in attempts to change classroom practice (Borko et al., 2010). As Fullan (2007) stated: "Educational change depends on what teachers do and think – it's as simple and as complex as that" (p. 129).

In the implementation of any educational reform, it is therefore important that teachers expand their behavioral repertoire on the basis of the reform requirements. In the field of social psychology there is a wide consensus on the conditions for effective behavioral change. Three major conditions are considered to be necessary for any new behavior to occur (Fishbein & Ajzen, 2010):

1. An individual has the knowledge and skills necessary to perform the new behavior.
2. The environment must support the occurrence of the behavior.
3. An individual has formed a strong positive intention to perform the new behavior.

In many of the current approaches to teacher professional development in the context of implementing educational reform, there is a strong emphasis on the first condition. In such an approach, there is attention for the development of knowledge that teachers need to implement a reform (Borko et al., 2010). Also, in recent years, the notion has sprung up that teachers need to develop the necessary skills, so that they are also capable of implementing the change proposal (Ball & Forzani, 2009; Grossman et al., 2009). In regard to the second condition, some of the existing approaches also pay attention to the limited availability of time, possibilities and resources that teachers have for changing their behavior. However, the third condition, the formation of a

strong intention to change, is lacking in many attempts to implement a reform proposal. This formation of strong intentions to change behavior may however well be a crucial step in the process of implementing a reform proposal into classroom behavior.

In their influential work on understanding intentions, Fishbein and Ajzen (2010) state that intentions can be defined as “the readiness to perform a certain behavior” or “an indicator of how hard people are willing to try to perform the behavior”. The stronger the intention, the more likely it is that the goal behavior will be carried out. In their theory of planned behavior, Fishbein and Ajzen (2010) state that three kinds of beliefs serve to determine the strength of an intention:

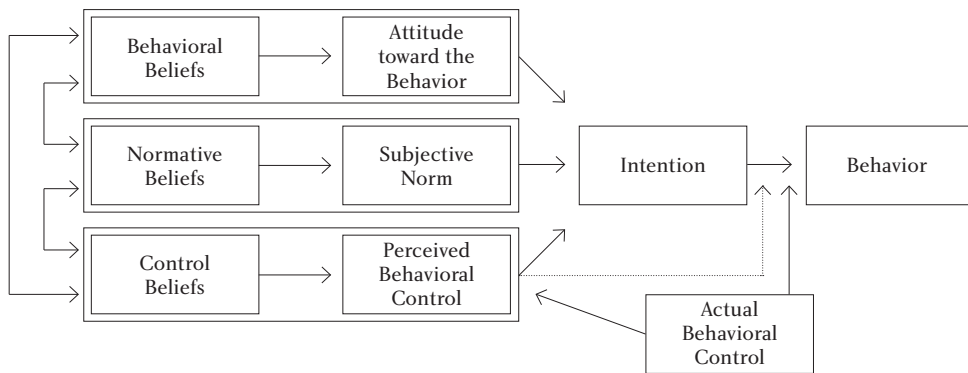
- a. Behavioral beliefs: Positive or negative consequences people might experience if they performed the new behavior. Together these beliefs are responsible for a positive or negative attitude.
- b. Normative beliefs: Beliefs about the approval or disapproval of important groups or persons on the execution of the new behavior. These beliefs are responsible for the perceived social pressure to engage or not to engage in the behavior.
- c. Control beliefs: Factors that help or hinder the attempt to carry out the behavior. These beliefs constitute the perceived behavioral control, and are thought to be closely related to Bandura’s well-known concept of self-efficacy (Bandura, 1977; 1997).

What follows is that many factors that hinder attempts to carry out the behavior (control beliefs), many expected disadvantages of the outcomes (behavioral beliefs), and low social support (normative beliefs) can lower the strength of an intention and vice versa. Beliefs about certain behavior have been studied extensively in educational research (Pajares, 1992). Such belief studies are however mainly focused on general educational beliefs about, e.g., teaching and learning, or teachers’ epistemology (Boulton-Lewis, Smith, McCrindle, Burnett, & Campbell, 2001; Schommer, 1990). In recent years there has been a call for more domain-specific beliefs, such as teachers’ orientations towards specific topics (Van Driel, Bulte, & Verloop, 2007). But even in such more domain-specific belief studies, a straightforward relationship between the beliefs and the actual practice of teaching seems to be lacking (Ajzen & Fishbein, 2005; Richardson, 1996; Stipek, Givvin, Salmon, & MacGyvers, 2001). In the present research,

we propose that this gap between teachers' beliefs and concrete teaching practices can be bridged by using intentions as proposed by Fishbein and Ajzen (2010). These intentions are underpinned by beliefs (see Figure 3.1), but are also closely related to the actual behavior. In fact, the strength of intentions is known for its' ability to predict the occurrence of specific behavior (Fishbein & Ajzen, 2010).

Figure 3.1

Graphical representation of the theory of planned behavior (Ajzen, 2006)



Copyright © 2006 Icek Ajzen

It is, however, not solely the strength of an intention that determines the chance for a new behavior to occur. People can have strong intentions but still have problems acting upon them (Orbell & Sheeran, 2000). In his work on analyzing this discrepancy between intentions and behavior, Gollwitzer (1999) tried to make intentions more effective. He found that the goals formulated in intentions are more easily attained when the intentions are more specific about the how, when and where. This measure of specificity could well be the complementing factor needed to fully understand how intentions influence behavior.

On the basis of this understanding of the nature and formation of intentions we developed an interview procedure to motivate teachers for educational change which is aimed at increasing both the strength and the specificity of intentions. Interviews in general mainly serve as a source of information and contain unbiased questions.

The 'motivating-for-educational-change' interview (MECI) in this study is, however, developed to affect teacher's thinking and in this way resembles the motivational interviewing technique as proposed by Miller and Rollnick (2002). The MECI comprises two tools: building on earlier successful experiences, and using lesson segments to rearrange lesson structures which are described in the following sections.

3.2.1 Building on earlier successful experiences

The first tool is structured around the use of teachers' earlier successful experiences. The idea of working with successful experiences is derived from the field of psychology, where Seligman (2002) and others emphasize that "treatment is not fixing what is broken; it is nurturing the best". Central to this positive approach is helping people to use their positive qualities and strengths of character for personal growth and change. On the basis of the same idea psychotherapists in the early 1980s worked on a new method for helping patients to tackle problems (De Shazer, 1985; Miller, Hubble, & Duncan, 1996). Their approach focused directly on patients' skills and goals instead of an in-depth analysis of patients' problems. Patients first stated what goals they wished to achieve, followed by a check whether they had ever actually realized these goals in previous settings (i.e., finding positive exceptions in the past in which the desired behavior was already present). These, sometimes small, positive exceptions were rephrased into solutions for the patients to solve their problems and achieve their goals. In short, this approach focuses on solutions instead of problems and aims to build on earlier successful experiences with, sometimes parts of, the goal behavior. Translating this approach to educational, Janssen, De Hullu, & Tigelaar (2008) found that pre-service teachers' reflection on successful experiences led to stronger intentions and more positive beliefs than when they reflected on problematic experiences. In the same way, Bandura (1977; 1997) found that earlier mastery experiences resulted in a strong sense of control over similar future behavior. During these mastery experiences teachers have, in some way, seen that they are able to execute the required behavior. This implies that the use of earlier successful experiences could also help teachers to think back to the benefits of their execution of that behavior in the past, which in turn could positively influence the strength of their intentions and their behavioral beliefs for future behavior.

3.2.2 Using lesson segments to rearrange instructional approaches

In his work on analyzing all sorts of innovations, Holland (2000) states that most innovations can be understood as the rearrangement of the smaller parts or building blocks that make up a certain structure. Holland (2000) describes that in order to propose an innovation, one first needs to find the essential building blocks within a certain environment and next, arrange them differently to propose innovation. Translated to education, this implies that educational innovation can be reached by rearranging the main building blocks of educational settings. These building blocks should then be focused on the most effective elements of education that directly influence student learning. Merrill (2009) showed that these most effective parts of education are the main teaching-learning activities such as presentation, practice or demonstration. In our research, we therefore determined such building blocks to be the segments of lessons as teachers give many every day. Put in specific orders, such lesson segments can then represent many forms of single lessons given by teachers on an everyday basis. In our research, we made use of such lesson segments in the setting where teachers have to learn to change their practices towards the reform requirements.

From literature it is known that the strength of an intention to perform certain new behavior depends for a large part on how much the individual in question values the goal situation as an improvement (Pollock, 2006). In order to judge whether something is an improvement one has to be able to compare the existing and goal situation (Simon, 1978). However, this is often not possible due to different terminology or levels of abstraction of the two situations. In educational settings the change proposal (goal behavior) is mostly formulated as a vision or rationale instead of a program for practice. Such visions conflict with the practices of many teachers, which are very specific and concrete about how to act. This situation asks for a tool in which the two situations can be represented at the same level of abstraction and in the same terminology. The lesson segments as proposed in this study could serve as such a tool to (1) represent teachers' regular practices; (2) represent the change proposal at classroom level; (3) make comparison possible and (4) facilitate teachers to recombine or adapt the lesson segments of their regular teaching practice to change in the direction of the change proposal. In previous research by the author (Dam, Janssen, & Van Driel, 2010), such a set of lesson segments was internally validated. The elaboration of the factual lessons segments for the present study is further described in section 3.4.2.

The MECI technique thus comprised two tools; i.e., building on successful experiences and using lesson segments to rearrange lesson structures. Combining these tools was hypothesized to positively influence both the strengths and specificity of biology teachers' intentions to make a change towards the proposed context-based reform (see also section 3.4.3.)

3.4 Method

3.4.1 Selection of participants

The context-based educational reform is meant for all biology teachers at secondary level in the Netherlands. Therefore, we selected participants varying on many different characteristics such as age, teaching experience, and experience with context-based education (see Table 3.1). When selecting the participants we used both purposive and snowball sampling. Nine biology teachers from six different secondary schools in the west of the Netherlands agreed to participate. Participating teachers taught upper and/or lower level classes in general secondary or pre-university education.

Table 3.1

Survey of participants

Participant	Age	Teaching experience (years)	Experience with context-based education	Grade Level ^a	Upper/Lower secondary level
Walter	40	10	0	PUE	Higher
Anne	52	4	0	GSE	Lower
Ryan	34	5	4	PUE	Higher
Kathryn	49	12	0	PUE	Higher
Howard	49	11	3	PUE	Higher
Becky	46	10	0	GSE	Lower
Mark	28	3	0	GSE	Higher
Julia	7	10	0	GSE	Higher
Ivy	42	10	0	PUE	Higher

Note. ^aPUE - Pre-university education, GSE - General secondary education

3.4.2 Lesson segments

The lesson segments in this study served as a tool to bridge the perceived gap between a teachers' regular practice and the change proposal for biology education, that is, the introduction of a context-based curriculum. By rearranging and/or adapting one or more lesson segments, teachers were given a tool to propose a change in the direction of the proposed reform. We chose to base the lesson segments on the work of Merrill (2001), who proposed four lesson segments to design different forms of direct instruction (tell, show, ask and do). However, we also needed to add lesson segments that enabled the design of teaching practices based on ideas from constructivism. For this, we looked into the characteristics of context-based education as described in section 3.4.3 (e.g., starting with a context with central question, reflection on concepts to be learned).

The teachers' regular practice, represented in lesson segments, served as a starting point for change (e.g., *explain* → *reproduction and/or application* → *answering questions*). Next, teachers could propose an intention to change this regular practice in the direction of the reform by adding, rearranging or adapting lessons segments. For the complete set of lesson segments as used in this research, see Table 3.2.

Table 3.2

The set of lesson segments as used in this research

Lesson segment	Definition
Orientation	Introducing the subject, formulating goals, activating prior knowledge and planning time and activities
Test	Assessing to what extent the learning outcomes and/or processes match the pre-set goals
Reflect	Looking back on results or processes, finding explanations for success or failure, finding improvements
Explain	Explaining or presenting the content
Context with central question	Introducing the context with an attendant central questions or problem

Reproduction and/or Application	Reproduction: assigning questions or tasks for which previously acquired knowledge or skills have to be literally repeated Application: assigning questions or tasks in which previously acquired knowledge or skills have to be applied in new settings
Answering questions	Answering the questions

3.4.3 Context-based biology education

In the Netherlands, a National Reform Committee For Biology Education (CVBO) proposed a context-based reform (Boersma et al., 2007) in secondary biology education. This context-based reform proposal was designed to increase the relevance and coherence of the curriculum, and reduce the curriculum overload. The aim is to achieve appealing curricula in which the subject matter is taught and organized through contexts. The underlying idea is that students will learn to direct their own learning and come to see the important role of biology in society and further education. The use of a context in education is thought to increase relevance, coherence, and meaning for students (Gilbert, 2006). As the aim for contexts in the proposed reform is to be culturally defined and realistic, the reform committee has proposed three categories for these contexts: professional, academic, and the public sphere (Boersma et al., 2007). In the Netherlands, government policy states that educational policy makers can prescribe certain content and final requirements, but not specific teaching methods. Teachers in secondary education thus have a great deal of autonomy. The reform committee therefore focused on updating the biological subject matter of the curriculum and on the formulation of new objectives and final requirements. However, meeting these new objectives and requirements will inevitably have pedagogical implications.

A context-based lesson is characterized by the use of a context which is relevant to students so that they can feel part of it. Also, students are encouraged to direct their own learning process and work around a central question that follows from the context. Especially in the higher grades there has to be a strong emphasis on the decontextualized concepts of biology that need to be learned. It is therefore important for teachers to spend part of their lesson on the reflection of the decontextualized concepts (Bennett,

Lubben, & Hogarth, 2007; Bennett, Grasel, Parchmann, & Waddington, 2005; Boersma, 2011; Bulte, Westbroek, de Jong, & Pilot, 2006).

3.4.4 Procedure

When constructing the MECI protocol we first tried out the interviews on four secondary-school biology teachers (Pre University Education n=3, General Secondary Education n=1) to test its practical and internal validity. Based on the results, we adapted the interview protocol on issues such as order and phrasing of the questions.

Before the MECI, we first conducted a baseline test (t=0) in which we introduced the participating teachers (n=9) to the reform by using official reports from the reform committee. These reports are the main source of information for any biology teacher in the Netherlands confronted with this educational reform. In this baseline test teachers were asked in what way they would like to implement context-based education in their own teaching practice. Next, this was formulated as an intention to change. Teachers then indicated the strength of the intention on a 1-7 Likert scale (1=low to 7=high).

After that, we conducted the MECI. For the full MECI protocol we refer to Appendix 3 and in what follows we will briefly explain the main steps. We first asked the participants to describe their regular teaching practice. We then asked the participants if they could represent the same regular teaching practice in the given lesson segments. When the meaning of a lesson segment was unclear from the list (see Table 3.2), the interviewer gave additional explanation. After this, the interviewers presented the following two main approaches to context-based lesson structures to the participants: (1) Context with central question – Answering questions – Explain; (2) Context with central question - Explain – Answering questions. Next, solution-focused questions were asked to find earlier successful experiences with parts of context-based education (e.g., what could take your regular teaching practice one step towards the goal situation? did you ever have success with this, however small?). The intentions to change were the answers to the following open question: What could take your regular teaching practice one step towards the goal situation?

After collecting the intentions, teachers were asked to indicate the strength of their new intentions on a 1-7 Likert scale (1=low to 7=high). This method of rating intentions was previously described by Fishbein & Ajzen (2010).

After completing the MECI, the final step was to elicit specific beliefs about the new intention or intentions. We therefore posed questions on behavioral beliefs (advantages and disadvantages), normative beliefs (people that approve or disapprove), and control beliefs (enabling and hindering factors). Interviews lasted between 1 3/4 and 2 hours and were recorded using voice recording technology.

3.4.5 Data gathering and analysis

To determine the development of the strength and specificity of biology teachers' intentions, we gathered several data. First, we gathered all the intentions and their strengths, both from the baseline test and after using the MECI. We also listened to the recorded interviews to copy the exact phrasing of the intentions in order to determine the specificity of an intention. This specificity of intentions was then determined by analyzing to what extent an intention is specific about the how, when, and where (Gollwitzer, 1999). There was a clear goal for the teachers; i.e., the two sequences of lesson segments that represent context-based education. This restricted the formulation of intentions, so that in fact all intentions were aimed at the goals of the context-based reform. However, teachers could choose the aspect or aspects of context-based education they were most motivated for.

To determine the mechanisms underlying the developments, we analyzed the specific role of the two tools in this research and looked into the underlying beliefs of the intentions. We expected that earlier successful experiences helped teachers to think back to situations where they were able to execute the required behavior and see the benefits of the goal behavior. We expected the set of lesson segments to assist teachers in recombining and adapting their regular teaching practice in order to propose a change towards the goal situation, in this study being context-based education. On the basis of these hypothesized outcomes, we specifically looked into data from the interview recordings where teachers spoke about a. earlier successful experiences; b. their regular practice and the sequence of lesson segments that represented this; c. the rearrangement or adaptation of the sequence or content of these lesson segments and d. their beliefs about the intention or intentions. For each participant we made a document with an overview of these data, which was then sent back to the participant

for a member check to ensure internal validity (Miles & Huberman, 1994). After all teachers had approved the documents as good representations of the interview, the first and second author further analyzed this. We first checked whether the intentions were formulated in terms of rearranging and/or adapting lesson segments. Also, did teachers refer to specific successful experiences when formulating intentions to change? If so, were these successful experiences helpful in predicting hindering and enabling factors, advantages and disadvantages and/or people that approve or disapprove due to the fact that they already executed the required behavior?

3.6 Results

Performing the MECI yielded several distinctive outcomes. Regarding the development of teachers' intentions, the first thing to note is that all teachers scored their intentions higher after the MECI (see Table 3.3). Important here is that intentions in the baseline test (t=0) are often different from those formulated after teachers had used the MECI technique. Our comparison of these intentions also showed that teachers formulated more intentions after using the MECI technique.

Table 3.3

Survey of the intentions pre- and post-test

Name	Baseline test (t=0)		After the MECI	
	Intention	Strength	Intentions	Strength
Walter	I want to choose a subject that is spread over several chapters of the textbook and teach this in a more coherent way	3.5	I want to start the lesson with an example or situation, which I normally plan at the end of the lesson. From this example I will formulate central questions for the pupils. After that, I will explain the topic and give notes. With this explanation and the textbook pupils will have to answer the central questions	6.5

Name	Baseline test (t=0)		After the MECI	
	Intention	Strength	Intentions	Strength
Anne	I want to do something with the pupils' prior knowledge by constructing something together	5	I want pupils to be actively searching information to answer the central question	7
			I want to start the lessons by using a context	7
Ryan	I want to be able to help students to learn specific contents	5.5	I want the pupils to look for and find out the required specific knowledge themselves on the basis of specific questions	6
			I want to start the lesson with a context more often	6
			I want to use more student-centered activities	6
Kathryn	I want to start the lesson by presenting a context	6	I want to start the lesson by presenting a context followed by a central question	7
			I want to give pupils a more prominent role in reflecting on the lesson	7
			I want to demonstrate first how to answer questions	7
Howard	I want to focus the lesson on the concepts to be learned	6	I want to use a context to motivate students for practical work in the next week	6
			I want students to be involved in designing contexts	6.5
Becky	I want to start the lesson by presenting a context	6	I want to construct contexts from the questions that pupils asked in previous lessons. After that, I want the pupils to answer the questions themselves	7

Name	Baseline test (t=0)		After the MECI	
	Intention	Strength	Intentions	Strength
Mark	I want to connect student activities to the subject within a context	4	I want to start the lesson with a context, working from the examples and movies I normally show separately	6
			I want to pose a central question that follows from the context and have students find the answers	4
			I want students to work in small groups on solving the central questions	4
Julia	None	-	I would like to start the lesson with a context, for which I will use application exercises that I normally hand out later in the lesson	5.5
Ivy	I want to have pupils work together on a certain problem within a context	6.5	I want to start the lesson by presenting a context, for which I will use adapted assignments which I would normally hand out after the explanation phase	6.5
			I want the pupils to look up and find out the required information themselves	6.5

A second result of the MECI technique is that it indeed resulted in intentions that are more specific than those found in the baseline test. Mark, for example, first formulated the intention: “I want to connect student activities to the topic within a context”. After the MECI, he however formulated the intention: “I want to start the lesson with a context, working from the examples and movies I normally show separately”. Another participant, Anne, formulated the following intention in the baseline test: “I want to do something with pupils’ prior knowledge by constructing something together”. After MECI, she was able to be more specific in the how: “I want to start the lessons by using a context” and “I want the pupils to be actively searching information to answer the central question”.

As to the mechanisms underlying the MECI, it seems that the two tools each functioned to assist teachers in specific ways. First, teachers were indeed able to represent their regular teaching practice in a specific sequence of lesson segments, which made comparison with the sequences of context-based education possible. This made visible for participants that sometimes, they had already implemented a certain part of the context-based education in their regular practices. This in turn stimulated feelings of ability (control beliefs). Second, teachers were also able to formulate intentions using the terminology of the lesson segments, which implies that seeing the reform represented in lesson segments helped them to devise ways in which they could change towards the reform. Third, participants were all able to think back to relevant successful experiences with parts of the new behavior. Because they envisioned situations in which they had already successfully implemented parts of the reform, teachers were able to predict the specific advantages and disadvantages (behavioral beliefs) of the change proposal. This however also led to high feelings of control (control beliefs). In the remainder of this section we will describe two cases of participating teachers in which we try to visualize the process and outcomes of the MECI technique and the way in which the intentions interrelate to certain beliefs. We selected the participants for these cases to represent teachers who at first do not see the benefits of the reform (Walter), and teachers who find it hard to direct their change (Ivy).

3.6.1 The case of Walter

Walter is a 40-year old biology teacher with ten years of teaching experience. He is an enthusiastic biologist with a huge collection of prepared bird skeletons, who would like to convey his passion for biology to the students. His reasons for participation in our research were his curiosity about what the context-based reform proposal would mean for his everyday practice and the opportunity to expand his teaching repertoire in a broader sense. His most common approach to instruction is to present biological topics in a traditional classroom setting. He really feels that he has to emphasize the most important terms from the textbook and show the students how these relate together. In his lessons (50 minutes) he would regularly lecture most of the time and have the students do reproduction (sometimes application) exercises for the last ten minutes of

the lesson. He is not very enthusiastic about the reform proposal. On the basis of the reform materials provided by the researchers in the baseline test, he recognized the notion about the little coherence within biology lessons. Because of this he formulated the following intention in the baseline test: "I want to choose a subject that is spread over several chapters of the textbook and teach this in a more coherent way". He rated the strength of this intention 3.5 (1-7 Likert scale, 1=low and 7=high). In the subsequent interview he represented his regular teaching practice in the following lesson segments: *Orientation → Explain → Reflect → Reproduction and/or Application → Answering questions.*

During the MECI the interviewer showed the context-based lesson sequences, represented by the same set of lesson segments (see Method). We then asked Walter whether he had ever had a successful experience related to the goal behavior. He stated that he had already tried to engage pupils by using examples from pupils' everyday lives, for example by presenting the ADH-hormone in relation to the maximum amount of alcoholic drinks on a night out. He also had had some experience with teaching thematic units and at the time had found pupils to be active learners. However, pupils had also said to him that he could explain subjects really well and that his notes were excellent and helpful. He stressed the importance of giving notes and the central role of the textbook in his lessons. However, he also admitted that students were quieter and more engaged when he asked them an interesting question, for instance about the role of the liver in the breakdown of alcohol. After reflecting on such examples, he exclaimed: "So if the reform program proposes a context to engage and motivate students to find information themselves, this means that I sometimes already apply part of the reform within my regular lessons?" On the basis of his successful experiences he formulated the following intention to change his lesson sequence in line with context-based education: "I want to start the lesson with an example or situation, which I normally plan at the end of the lesson. From this example I will formulate central questions for the pupils. After that, I will explain the topic and give notes. With this explanation and the textbook pupils will have to answer the central questions." Strength of this intention is 6.5.

Next, we asked questions concerning his beliefs about this intention. As behavioral beliefs (advantages and disadvantages) he mentioned that he saw advantages in creating increased relevance for the students by connecting to the students' experiences in the context; in the idea that he could still explain the topic at hand

before the phase of finding answers; and in the idea of being able to use students' questions in his explanation. As disadvantages he expected a slower pace throughout the lessons and negative reactions to the students' task to find information. As normative beliefs (people that approve or disapprove) he mentioned no persons or groups in particular that he thought would approve or disapprove. As control beliefs (enabling and hindering factors) he mentioned the limiting aspects of not having enough time to let students find the necessary information themselves; the fact that not all information needed to solve a task can be found in the students' textbooks; and that not all topics are suitable for starting with a context because sometimes the necessary pre-existing knowledge is lacking. Finally he considered an enabling factor the fact that he already had some experience within a thematic unit in which he started the lesson series with an example from everyday life.

3.6.2 The case of Ivy

Ivy is a 42-year old biology teacher with a PhD in immunology. She has been teaching upper secondary level for ten years. The reason for her participation in our research was that she was worried about the students' lack of motivation and her own growing discontent with the quality of her teaching. She said: "Actually, in my everyday practice I am appeasing my conscience with a sense of security that I at least mentioned all the important textbook terms. Pupils cannot come to me after a test and say that I did not address this or that issue, even though I noticed in tests that they learned little of what I said." She had read the reform materials and formulated the following intention in the baseline test: "I want to have pupils work together on a specific problem within a context." She rated the strength of this intention 6.5. Her regular teaching practice is represented as follows: *Orientation* → *Explain* → *Reflect* → *Reproduction and/or Application* → *Answering questions*.

When confronted with the two sequences of context-based education and asked for ideas and successful experiences, Ivy mentioned that she had made pupils work in small groups centered around stories from cancer patients. Another time she started the lesson with some questions about dissimilation and let pupils work together to answer the questions. She found that pupils were more motivated during such lessons.

However, she also said that it depended on the class level and the pupils themselves whether such an approach worked or not. She further stressed that she felt like there was little time to experiment in lessons, due to the many topics she is required to cover in a year. But she does think that students are better prepared for university when they are regularly encouraged to find the required information themselves. On the basis of her successful experiences she formulated two intentions, of which we will elaborate one: "I want to start the lesson by presenting a context, for which I will use adapted assignments which I would normally hand out after the explanation phase", strength 6.5. As behavioral beliefs she mentioned that the use of a context could increase the relevance for students; she expected students to participate in the activities more intensively, and she believed that adopting this model would enhance her professional performance within the school. She saw no disadvantages. She held two normative beliefs: (1) the school board would approve her intention because they had asked her for a portfolio on the process of personal growth and (2) at her school, working from the textbook generally had a negative image. As control beliefs she mentioned doubts about her creativity to design contexts and her lack of preparation time for each lesson.

3.7 Conclusions and implications

Professional development aimed at the implementation of an educational change proposal often focuses on the skills and knowledge that have to be improved and/or changing the environment in which teachers work. In literature on behavioral change, however, there is another very important condition for successful change: the formulation of strong intentions to change (Fishbein & Ajzen, 2010). Before any successful attempt at change teachers first need to develop strong intentions for change. However, formulating strong intentions to change is often not included in professional development programs. In this chapter, we reported on our research into the development of teachers intentions to change in the direction of context-based biology education after using a 'motivating-for-educational-change' interview (MECI). The MECI comprises two tools: building on earlier successful experiences and using lesson segments to rearrange lesson structures. The results show that intentions to change were positively influenced by the MECI technique. After the MECI, all participating

teachers formulated intentions that were stronger than those in the baseline test (see Table 3.3). The intentions were also found to be more specific in their description on how to enact the reform. Eight out of nine teachers also formulated more intentions to change after the MECI. The ninth teacher (Julia) could not think of any intention to change her teaching behavior in the baseline test, but was able to formulate in what way she wanted to change after the MECI.

Both MECI tools seem to have contributed to the results, with a partial overlap. The first tool used in this research was explicitly intended for teachers to look back on past successful teaching experiences. From literature, we expected that successful experiences would positively influence both control and behavioral beliefs. Although we did not measure beliefs in the baseline test, the data show that thinking back to earlier successful experiences resulted in positive beliefs about the new behavior in several ways. For example, participants thought back to earlier successful experiences such as working around stories from cancer patients (Ivy) to understand in what way the reform would affect both their teaching practice and their materials. Teachers also discovered personal strengths such as talent to design relevant contexts (Mark), which they used to formulate intentions to change. Thinking back to situations in which they already successfully enacted parts of the reform, teachers generally saw the direct benefits for their students (positive control beliefs) and possible ways to implement the reform (control beliefs). However, they also mentioned limiting factors (control beliefs) of the proposed reform such as extra preparation time, a lack of creativity in designing contexts, or problems with directing students towards the scheduled topic.

The second tool in the MECI technique was the use of lesson segments to rearrange lesson structures. Our expectation for this tool was that it would enable teachers to better compare their regular practices with context-based education, and understand how to reach that reform by rearranging and adapting their regular practices. The results show that teachers were able to formulate an intention to change towards the reform proposal in terms of rearranging or adapting lesson segments. This is illustrated in the following intention, formulated by Anne: "I want pupils to be actively searching information to answer the central question", whereas in the baseline test she had stated that she "wanted to do something with the pupils' prior knowledge". When asked to describe their regular practice, all participating teachers would normally

design a lesson with reproduction or application exercises at the end. Eight of the nine teachers in our sample extended such exercises into a context and moved that lesson segment to the start of the lesson. In this way, teachers made an important step towards the essence of the proposed reform, i.e., achieving appealing curricula in which the subject matter is taught and organized through contexts.

To come back to the literature on the implementation of educational reforms, we emphasize that the aspect of teachers' willingness needs more attention. Many attempts at change pay attention to the knowledge and skills that teachers have to learn and/or creating a supportive environment (Borko et al., 2010). However, as stated before, these are only two of the three known conditions for behavioral change. The condition that teachers need to have strong intentions to change needs more attention. In this study, we have shown that combining a set of lesson segments with a focus on earlier successful experiences within a MECI can be successful to stimulate strong and specific intentions to change in the direction of an educational change proposal. At the start of PD programs, MECI can be administered to find out for what part of the change proposal teachers are motivated. Next, teachers could start their development in the direction of the proposed reform on the basis of their specific intention and pre-existing knowledge gained through the MECI. In this way, teachers start off with strong and specific intentions to change in the direction of a change proposal, which prevents failure of the reforms' implementation (Fullan, 2007). Secondly, MECI offers teachers the possibility to take their regular teaching practice as starting point for change, which is an important feature of effective PD (Borko et al., 2010). Finally, MECI offers teachers the possibility to use their personal strengths while proposing changes to their teaching practices towards a change proposal.

Appendix 3

The MECI protocol

1. Could you describe a lesson as you regularly teach it in your classes? Can you represent this same lesson using the set of lesson building blocks?

Interviewer shows sequence of building blocks that comprise context-based education:

A: Context with central questions – Answering questions – Explain

B: Context with central questions - Explain – Answering questions

2. Did you ever have positive experiences with context-based education or aspects of context-based behavior? Even something small? Why was this successful?
3. When you compare your regular lesson sequence to that used in context-based education, can you think of anything that could take your own regular lesson sequence (see question 1) one step towards context-based education?
4. Could you rephrase these proposed changes into intentions and rate them on a Likert-scale from 1-7 (1=low to 7=high)?

Additional questions for eliciting beliefs

5. What are the advantages and disadvantages of performing the intended behavior?
6. Are there any individuals or groups that approve or disapprove on performing the intended behavior?
7. What factors or circumstances would enable you of make it difficult for you to perform the intended behavior?