



## Understanding teacher design teams – A mixed methods approach to developing a descriptive framework



F. Binkhorst <sup>a,\*</sup>, A. Handelzalts <sup>b</sup>, C.L. Poortman <sup>a</sup>, W.R. van Joolingen <sup>c</sup>

<sup>a</sup> ELAN Institute for Teacher Education, Science Communication & School Practices, University of Twente, P.O. Box 217, 7500 AE Enschede, The Netherlands

<sup>b</sup> Teachers College, Faculty of Psychology and Education, VU University, Van der Boechorststraat 1, 1081 BT Amsterdam, The Netherlands

<sup>c</sup> Freudenthal Institute for Science and Mathematics Education, Utrecht University, P.O. Box 85.170, 3508 AD Utrecht, The Netherlands

### H I G H L I G H T S

- We developed a descriptive framework for Teacher Design Teams (TDTs).
- The framework can be used to describe (relations between) factors in the TDT.
- TDT participants are generally very positive about their participation.
- TDTs can promote teacher professional development.
- The team coach plays a key role in the TDT's process.

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### A B S T R A C T

Collaboration is a crucial element of effective professional development for teachers. In Teacher Design Teams (TDTs), teachers collaborate on (re)designing educational materials. To optimize their effectiveness, a strong theoretical and practical basis is required. In this study, therefore, we first developed a conceptual framework based on literature. Subsequently, we used a mixed methods approach to explore teachers' perceptions regarding the factors in this conceptual framework. The results reveal detailed insights in the functioning of TDTs, for example, regarding the role of the team coach. The resulting framework can be used to describe the functioning of TDTs and improve future TDTs.

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### 1. Introduction

One of the most important elements of effective professional development programs for teachers is collaboration among teachers (Avalos, 2011; Crow & Pounder, 2000; van Veen, Zwart, Meirink, & Verloop, 2010). A well-known approach to collaborative teacher professional development is the Professional Learning Community (PLC): a group of teachers focused on collaborative learning by sharing experiences and critical reflection. PLCs are considered to be very effective, as they can build teachers' individual as well as

their collective capacity (Stoll, Bolam, McMahon, Wallace, & Thomas, 2006). In this way, well-designed PLCs can improve teaching practice and student achievement (Vescio, Ross, & Adams, 2008). Most PLCs include participants from the same school (school-based PLCs). Recent studies indicate that a shift is needed from teacher communities within schools to teacher communities with participants from different schools in order to bring about actual school improvement (Chapman, 2014; Hofman & Dijkstra, 2010). Networked communities have the potential to bring professional learning to a level that exceeds what can be achieved within the school (Bryk, Gomez, & Grunow, 2011; Jackson & Temperley, 2007). Other factors that are considered to be essential for effective professional development programs are: focus on concrete classroom practices, focus on content knowledge, opportunities for active learning, coherence with teachers' own (learning) goals and that the program is stretched over enough time

\* Corresponding author.

E-mail addresses: [f.binkhorst@utwente.nl](mailto:f.binkhorst@utwente.nl) (F. Binkhorst), [a.handelzalts@vu.nl](mailto:a.handelzalts@vu.nl) (A. Handelzalts), [c.l.poortman@utwente.nl](mailto:c.l.poortman@utwente.nl) (C.L. Poortman), [w.r.vanjoelingen@uu.nl](mailto:w.r.vanjoelingen@uu.nl) (W.R. van Joolingen).

(Garet, Porter, Desimone, Birman, & Yoon, 2001; Penuel, Fishman, Yamaguchi, & Gallagher, 2007; van Veen et al., 2010).

One emerging type of professional development program that incorporates these essential factors is the Teacher Design Team (TDT). A TDT is a type of PLC with a specific focus on (re)designing educational materials. Although the term “TDT” gained popularity the past years – mainly in Ireland and the Netherlands – the idea of engaging teachers in (re)designing educational material is not new. Since the mid-seventies, several scholars claimed that teachers should play an active role in curriculum design (e.g. Green, 1980; Stenhouse, 1975). Nowadays, there are many types of TDTs, and similar to PLCs, most TDTs are school-based (e.g. Handelzalts, 2009). Also similar to PLCs, some scholars argue that networked design teams have much potential, as they lead to more fluid exchanges across institutional boundaries (Bryk et al., 2011).

The TDTs in this study are all networked, have meetings on a regular basis and are supported by an expert from their field, for instance, a teacher educator from the university. Participants in most of our TDTs teach the same or related subjects and are focused on the design of concrete educational materials or experimenting with new instructional strategies (or technologies) for their own subject. Examples are materials about new topics in the national examination programs, materials about modern scientific insights or materials incorporating innovative instructional practices.

Studies have shown that TDTs can contribute to teachers' professional growth (Voogt et al., 2011). Furthermore, the fact that participants in a TDT produce concrete educational materials themselves creates a feeling of ownership, which increases the probability that teachers will use these materials in their classroom practice (Carlgren, 1999; Mooney Simmie, 2007; Penuel et al., 2007). Therefore, TDTs can contribute to the successful implementation of sustainable educational innovations (Handelzalts, 2009; Mooney Simmie, 2007).

### 1.1. Aims of this study

From both perspectives – teacher professionalization and implementation of educational innovations – TDTs thus have great potential to improve education. To optimize the effectiveness of future TDTs, a strong theoretical and practical basis that defines and explains the essential characteristics of TDTs is crucial. Previous studies have indicated many individual factors that can promote or interfere with the effectiveness of TDTs. In this study, we aimed to develop an integrated descriptive framework that connects these individual factors. This descriptive framework will help to understand the functioning of TDTs in both theory and practice.

As a starting point, we developed a conceptual framework for TDTs based on theory (shown in Fig. 1). In the next section we describe how we constructed this conceptual framework.

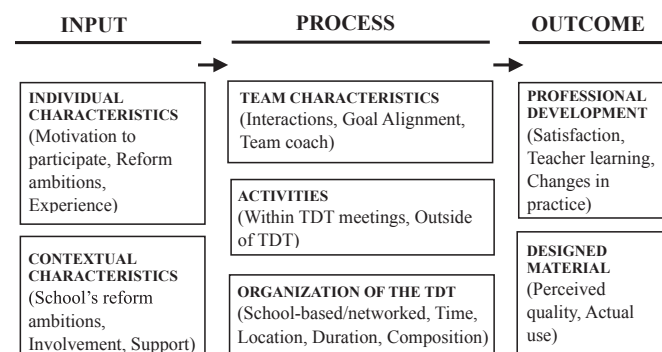


Fig. 1. Conceptual framework for TDTs.

Subsequently, as the main goal of this paper, we explored the perceptions of TDT participants regarding the factors in this framework. Insights into how this conceptual framework works in practice were used to evaluate the conceptual framework and to refine it to an integrated descriptive framework. We used two perspectives from practice:

1. Describing the perceptions of *all TDT participants* to get insights on the input, process and outcome of TDTs and the relations between these factors in general
2. Describing the perceptions of *participants in four cases of TDTs* to get more detailed insights on the input, process and outcome of TDTs and the relations between these factors in specific situations.

## 2. Conceptual framework

In this section we describe how we constructed the conceptual framework for TDTs (shown in Fig. 1), by using literature about team-based professional development programs (such as TDTs, PLCs, Teacher Networks) and literature about teacher involvement in educational innovations. An extensive review article about PLCs (Stoll et al., 2006) and a doctoral dissertation about TDTs (Handelzalts, 2009) were used as key publications. Subsequently, we performed an informal literature search using the snowball method to find relevant cited and citing publications. The factors that we found to be identified as relevant for the effectiveness of such programs were systematically mapped in a framework referring to three stages: input, process and outcome.

The input stage refers to individual teacher characteristics and the characteristics of their schools (contextual characteristics). The process stage refers to factors that describe and influence working processes while the TDT is active. We distinguished three categories within the process stage: characteristics of the team, the activities they perform and organizational features. For the outcome stage, we focus on the two domains that are most important for TDTs: teachers' professional development and (implementation of) the designed material.

### 2.1. Input

#### 2.1.1. Teacher characteristics

The first teacher characteristic included in our framework is **motivation to participate** in programs aimed at educational reforms such as TDTs. This factor is mainly mentioned in literature about educational reforms, in which there is a debate whether to involve all teachers in educational reform or only the motivated teachers (Erickson, Minnes Brandes, Mitchell, & Mitchell, 2005; Fullan, 1993). In Self Determination Theory, two main types of motivation are distinguished: Autonomous motivation and Controlled motivation (Ryan & Deci, 2000). Teachers who are autonomously motivated are more likely to participate in professional development programs aimed at reforms, and they are more likely to adopt those reforms (Goroizidis & Papaioannou, 2014).

Furthermore, teachers' **personal reform ambitions** play an important role in the effectiveness of professional development and educational innovation. Teachers' uncertainty about educational reforms has a negative influence on implementation of educational innovations (Geijsel, Slegers, van den Berg, & Kelchtermans, 2001). In line with these findings, Handelzalts (2009) states that teachers with clear reform ambitions realize more reform goals by working in a TDT. Thus, positive initial attitude towards educational innovations is essential for sustainable change.

Teachers' **design experience** also plays a role in TDTs (Huizinga, Handelzalts, Nieveen, & Voogt, 2013). Teachers are not trained to

design curriculum materials, and they often lack crucial design skills (Bakah, Voogt, & Pieters, 2012). This can affect the design process and the quality of the designed material (Hardré, Ge, & Thomas, 2006).

The last teacher characteristic that is considered is **teaching experience**. Working as a teacher is often perceived to be a very isolated job (Little, 1990). New teachers may feel the need to share their experiences as a teacher with colleagues and to be able to learn from them. Professional development programs with a focus on collaboration can be beneficial for them (Thomas, Wineburg, Grossman, Myhre, & Woolworth, 1998). On the other hand, experienced teachers who have clear ideas about their own classroom practice can perceive collaboration as difficult and threatening (Thomas et al., 1998).

### 2.1.2. Contextual characteristics

Similar to personal reform ambitions, the **school's reform ambitions** can affect the outcomes of a TDT (Handelzalts, 2009). Schools with great reform ambitions might have more potential to actually change.

The role of the teaching staff in the school is of special interest as a contextual characteristic. To what extent does the **school involve teachers** in the reform? Involving teachers in the school's decision-making process related to educational reform can affect their feeling of ownership of the reform, and results in shared co-constructed decisions (Geijssels et al., 2001; Smylie, Lazarus, & Brownlee-Conyers, 1996).

Furthermore, the **school's conditions for supporting** teachers' participation are included in the framework. Studies have shown that 'emotional supportiveness' (Geijssels et al., 2001; Wikeley, Stoll, Murillo, & De Jong, 2005), as well as providing practical conditions, such as adequate time and space (Stoll et al., 2006), have positive effects.

## 2.2. Process

### 2.2.1. Team characteristics

Regarding team characteristics, **team interaction** is important. Team interaction is most effective if there is an open atmosphere, and teachers are willing to share ideas and information with each other (Stoll et al., 2006). In such open atmosphere, it is also important that teachers support each other, by giving feedback and by openly discussing differences in visions or potential conflicts (Grossman, Wineburg, & Woolworth, 2001; Hord, 2004; Kuusisaari, 2014). A shared feeling of responsibility and equal contributions also promotes the effectiveness of the group work, as it strengthens the commitment to the team (Stoll et al., 2006). Furthermore, it is important that the individual members feel as if they belong to the group (Stoll et al., 2006).

In our definition of TDTs there is always a **team coach** to organize and structure the process. In most cases the team coach is an expert from their field, e.g., a teacher educator from the university. Support from an expert can improve the effectiveness of TDTs, as he or she brings new knowledge into the team (Huizinga et al., 2013; Cordingley, Bell, Rundell, & Evans, 2005). Besides knowledge transfer, team coaches have two main tasks: organizing and structuring the process towards a specific (and shared) goal (Erickson et al., 2005; Grossman et al., 2001) and stimulating group interaction, including dealing with conflicts (Thomas et al., 1998).

Finally, the individual group members can have different expectations of the TDT, which can affect the perceived outcomes (Gregory, 2010). It is important to have a clear focus or goal (Hord, 2004; Little, 2002). Having shared goals, or **goal alignment**, is especially important in teacher collaboration programs (Meirink, Imants, Meijer, & Verloop, 2010; Stoll et al., 2006). There should be coherence

between the individual goals, the team goals and the overall goals of the program, in this case, the TDT (Penuel et al., 2007).

### 2.2.2. Activities

The participants can perform various **activities within TDT-meetings**. During the meetings, teachers can share information and experiences with each other, but external expertise is also considered to be crucial (Cordingley et al., 2005). External experts present 'formal knowledge' and up-to-date developments to the group (Erickson et al., 2005). TDTs can also perform design activities. Being involved in the actual design of educational material contributes to teachers' professional competencies, as opposed to teachers who are only involved in implementation of new educational materials (Shawer, 2010). Teams with clear goals and ambitions tend to start directly with the actual design task, while teams with less clear goals need more structure and clarification of what is expected of them (Handelzalts, 2009).

Furthermore, teachers can perform **activities outside of TDT meetings**. One of the essential characteristics of teacher professional development programs is that they must be coherent with teachers' own classroom practices (van Driel, Meirink, van Veen, & Zwart, 2012; van Veen et al., 2010). Long-term programs in which teachers have the chance to test their new knowledge or designed materials in practice (such as TDTs) therefore have great potential to be effective. Implementation activities are thus of great importance in TDTs.

### 2.2.3. Organizational characteristics

Many organizational characteristics are already fixed by our definition of TDTs, which is limited to **networked TDTs** instead of **school-based TDTs**. Furthermore, the **duration** of the TDTs in this study is always an academic year, and the **location** of the meetings is at the university. We describe two additional organizational characteristics that can vary within the scope of this definition.

First the **composition of the group** as a whole can vary. Effective teams are small enough to know everyone in the team and large enough to bring a variety of knowledge and ideas into the team (Thousand & Villa, 1993). Many other aspects of group composition could be considered, such as mono-disciplinary versus multidisciplinary teams, the amount of previous experience as a group, et cetera. Important features for group composition are: teachers need each other to succeed, teachers inspire each other with new ideas and there is a balance between natural teacher relationships and the artificial setting of the TDT (Handelzalts, 2009; Hargreaves, 2003; Little, 1990).

The second organizational characteristic, which can vary between participants, is **time**. In general, professional development programs that extend over a longer period of time – such as TDTs – are considered time-consuming. As described in the section on *Contextual characteristics*, it can be helpful if participants' schools are supportive, and if they give their teachers enough time and space (Stoll et al., 2006), but teachers also need to make time for the TDT activities themselves. Studies have shown that it is useful to organize meetings on a regular basis (Handelzalts, 2009), but there should also be enough time between the meetings so that participants can perform implementation or design activities outside of the TDT meetings.

## 2.3. Outcome

### 2.3.1. Professional development

The first outcome domain that is included in the conceptual framework is the participants' professional development. The evaluation levels described by (Guskey, 2002) can be used in order to determine the results in terms of professional development.

Guskey states that there are five levels of evaluation for professional development programs: 1. Participants' reaction; 2. Participants' learning; 3. Organization support and change; 4. Participants' use of new knowledge; 5. Student learning outcomes. Each level is based on the previous levels. In other words, success at the lower levels is necessary for success at higher levels.

The first evaluation level is focused on the participants' initial **satisfaction** with the experience. The second level is the **teachers' learning**: the new knowledge and skills that the participants gained, such as pedagogical knowledge, content knowledge, design skills or professional skills such as networking. The focus of the TDT determines the kinds of knowledge teachers can gain. The third evaluation level, organization support and change, is already mentioned in the section on *Contextual characteristics*. Therefore, in this study the participants' use of the new knowledge (**change in practice**) is the third level of professional development. At this level, one can examine the extent to which the participants perceive their classroom practice to have changed due to their new knowledge and skills. The last evaluation level for Guskey concerns improvements in student learning outcomes, which is always the ultimate goal for teachers. However, in this paper we only focus on the first, second and fourth evaluation levels, as they are prerequisites for improvement in student learning outcomes.

### 2.3.2. Designed material

Because teachers (re)design educational material in TDTs, the designed material itself is also an important outcome domain. This domain can be divided into two variables: the **perceived quality** of the designed material and the **actual use** of the designed material. Similarly to Guskey's evaluation levels, the second level is based on the first level. In other words, sufficient perceived quality of the designed material is a requirement for implementing it in practice.

## 3. Method

### 3.1. Context

Our mid-sized university in the Netherlands has been organizing networked TDTs since 2010. This study was held with participants in these TDTs. TDTs were led by a team coach; in most cases a teacher educator from the university. The team coaches recruited TDT-participants by sending an open invitation to teachers in their field. The TDTs typically had 7–11 teachers from various secondary schools in the region of the university as members. Each TDT held ten 3-h meetings during an academic year. During these meetings, they collaborated to design educational material. Most TDTs were focused on one school subject. These TDTs were aimed at designing new educational materials or experimenting with new instructional strategies (or technologies) for their own subject. But some TDTs had a more general theme, for example, dealing with gifted students. These TDTs were multidisciplinary, with teachers from different subjects. The TDT participants always registered for one academic year (from September to June), but teachers could decide to reregister for several years.

### 3.2. Research design

The perceptions of TDT participants were explored with an explanatory sequential mixed methods design (Creswell, 2013). This type of design starts with a quantitative phase to gain general insights and is complemented with a qualitative phase to gain in-depth explanations.

In this study, we first administered a questionnaire to all previous participants in TDTs. Subsequently we collected qualitative data by interviewing participants from four different TDTs. For the

first perspective in our research – the perceptions of all TDT participants – the quantitative data from the questionnaire were used to identify general perceptions about TDTs and provide initial insights into the relations between the factors. The qualitative data helped to explain the general perceptions about TDTs and the relations between input, process and outcome factors, as a complement to the quantitative data. For the second perspective in our research – the perceptions of participants in four cases of TDTs – we also used both the quantitative and the qualitative data. The questionnaire results of the four selected TDTs were first used to detect notable differences between the TDTs. The qualitative data gave us insights into the different relations between the input, process and outcomes in the four TDTs. The results from both perspectives were combined to convert the conceptual framework to an integrated descriptive framework. The ethical committee of our university approved the design of this study.

### 3.3. Instruments

#### 3.3.1. Questionnaire development

In order to measure participants' perceptions of TDTs in retrospect, we developed a questionnaire based on our conceptual framework for TDTs. The questionnaire incorporated existing validated scales and instruments where available (although they had to be translated into Dutch). Some scales were constructed in collaboration with the TDT coaches. The questionnaire included all of the factors in the conceptual framework (Fig. 1) except for a number of the organizational factors, most of which could be determined from background documentation or were the same for all TDTs in this context (i.e., networked TDTs with coach from the university).

In order to enhance the reliability and validity of the questionnaire, we performed a small pilot study. The pilot questionnaire was completed by 7 teachers. The last question was an open-ended question in which we asked the respondents for remarks and identification of possible ambiguities in the questionnaire. As some items appeared to be multi-interpretable, we made some adjustments to the formulation of the statements.

The final questionnaire consisted of 20 (sub)scales with a total of 101 items (excluding a few background questions such as age, gender, name of the school). Most items were measured with a 5-point Likert scale (1 = completely disagree; 5 = completely agree). To calculate a value for goal alignment, the questionnaire included nine statements with 5-point Likert scales for possible personal goals and the same nine statements with perceived team goals. A value for goal alignment was calculated as the mean of the absolute differences between the nine personal and team goals. A summary of the questionnaire with some examples of the statements is shown in the [Appendix](#).

#### 3.3.2. Questionnaire respondents

The questionnaire was provided to the 176 secondary school teachers who participated in one of the TDTs that have run at our university since 2010. Participants who were still active in one of the TDTs received the questionnaire on paper and filled it in manually. The other participants received a digital version of the questionnaire by email.

In total, 94 respondents from 14 different TDTs completed the questionnaire (53.41% response rate). Because teachers can participate in a TDT for several years, they were asked to give their most recent year of participation. Information about the respondents is shown in [Table 1](#).

#### 3.3.3. Questionnaire data analysis

For the statements about activities, we had no prior



**Table 1**  
Information about questionnaire respondents.

Age	M	SD
	47.3	11.5
	Number	Percentage
Gender		
Male	57	60.6%
Female	37	39.4%
Years of TDT participation:		
One year	40	42.6%
Two years	36	38.3%
Three years	11	11.7%
Four years	7	7.5%
Last TDT participation:		
2010–2011	4	4.3%
2011–2012	24	25.5%
2012–2013	52	55.3%
2013–2014	14	14.9%

assumptions for categorization. Therefore, an exploratory factor analysis was performed for the activity statements. Four categories of activities were found: Knowledge-related activities in the TDT (5 statements, e.g. discussions about educational innovations, or guest lectures by external experts), Design-related activities in the TDT (6 statements, e.g. discussions about the design process, or writing/producing material), Activities outside TDT (7 statements, e.g. searching for relevant information, or testing the material in the classroom) and Excursions (3 statements, e.g. company visits). The reliability of all questionnaire scales was tested with Cronbach's Alpha calculations. All Cronbach's Alphas were above .70, except the activity scales of Knowledge-related activities in TDT ( $\alpha = .68$ ) and Excursions ( $\alpha = .51$ ) (Appendix). The means, standard deviations and correlations of all scales with the outcome scales were calculated. For the four TDTs that were selected for the qualitative analysis, we also calculated group means and standard deviations for all factors.

### 3.3.4. Interview content

The qualitative phase of this study was aimed at developing more in-depth explanations about the perceptions of TDTs. Each interview started with the perceived outcomes of the TDT and the respondents were asked to reason backwards in order to determine which factors contributed to this outcome. The interviewer tracked whether all factors of the conceptual framework were mentioned. If not, the interviewer brought it up. The interviews took between 30 and 50 min.

### 3.3.5. Interview case selection

The TDTs for the qualitative phase of this study were selected based on the following selection criteria that resulted from the preliminary results of the quantitative phase:

- The TDT was active in the school year 2012–2013 (this year has the most questionnaire respondents);
- The TDT had between 7 and 11 participants in 2012–2013 (the average is 9 participants)
- The TDT had at least 6 questionnaire respondents for 2012–2013 (the aim was to interview at least 3 teachers from each TDT; the expected response rate was about 50%)

Four TDTs met these criteria and were thus selected for the case studies.

### 3.3.6. Interview respondents

All questionnaire respondents from the selected case studies

who had participated in 2012–2013 were contacted for an interview. In total, thirteen teachers agreed to participate. The interviews took place at the participants' schools. Background information about the selected TDTs and individual participants is shown in Table 2.

### 3.3.7. Interview data analysis

The interviews were audiotaped and transcribed verbatim. The transcripts were first coded by labeling text sections based on all factors in the conceptual framework. After that, more detailed codes were given to topics that needed further specification. For example, a section about the team coach was first coded as 'Team coach'. In the second stage, sequences were coded as 'Team coach as organizer' or 'Team coach as team motivator'. A PhD student who was not involved in this study independently double-coded 12% of the codes with the same coding scheme. Calculations of inter-rater reliability based on Cohen's kappa revealed that the reliability was .82. All codes were sorted in a large table and were analyzed by interpreting the perceptions of each individual respondent and by interpreting the overall perceptions of the four groups.

## 4. Results

The results of this study are presented in two parts. First we explain the general perceptions of the TDT participants and the relations between input, process and outcome (first perspective). Subsequently we use the framework to describe the four selected TDTs in more detail (second perspective). We used quantitative as well as qualitative data in both parts.

### 4.1. General perceptions of TDTs and relations between factors

Table 3 shows the average perceptions of all questionnaire respondents, and the correlations with the outcomes. We begin by elaborating on the outcomes of the TDTs, to get an overview of the perceived successfulness of the TDTs. In the following sections, the results of the input and process factors and the relations with the outcomes will be discussed.

#### 4.1.1. Outcome factors

On average, the questionnaire respondents scored above the middle of the scale (3) on the outcome factors of Satisfaction ( $M = 3.5$ ,  $SD = .92$ ), Teacher learning ( $M = 3.3$ ,  $SD = .78$ ) and Quality of material ( $M = 3.4$ ,  $SD = .84$ ). The interviews also showed that the participants experienced learning gains, for example: "New content knowledge about our subject. [ ... ] And sometimes knowledge about education. Every now and then the team coach came up with something new in the field of pedagogy", or "I learned some practical things. How can you shape a series of lessons? That was very informative, designing the material". The other two outcome factors, which both concern actual change or use in practice, had lower average scores (Changes in practice:  $M = 2.9$ ,  $SD = .88$ ; Actual use:  $M = 2.8$ ,  $SD = 1.10$ ). The interview participants found it difficult to indicate real changes in practice due to their TDT participation: "Well, I don't know how the practice would have been if I had not been participating in the TDT. So it's difficult to show the concrete changes in practice."

#### 4.1.2. Input factors

The respondents perceived more autonomous motivation than controlled motivation to participate ( $M = 4.0$ ,  $SD = .63$ ;  $M = 1.8$ ,  $SD = .71$ , respectively). Autonomous motivation correlated with all outcome factors, in contrast to controlled motivation, which did not correlate significantly. In general, the same relation emerged from the interviews, although the participants in team C experienced

**Table 2**  
Information about interview respondents.

TDT	A	B	C	D
Focus of TDT (in 2012–2013)	Designing new course modules, experiments and practical tools for teaching.	Designing new course modules and experiments.	Experimenting with remotely teaching using video-conferencing	Developing school policy for excellent and highly gifted students.
When active?	2010–2014	2010–2014	2010–2014	2011–2013
Number of questionnaire respondents <sup>a</sup>	N = 11	N = 15	N = 7	N = 10
TDT-participants in 2012–2013 <sup>b</sup>	9 teachers with same science-related subject	7 teachers with same science-related subject	9 teachers with same science-related subject	9 teachers with various subjects (mostly science-related)
<b>Respondents</b>				
Number of interview respondents	3	3	4	3
Male/female	1 m/2 f	3 m/0 f	4 m/0 f	2 m/1 f
One year/two or more years of participation	1 one/2 more	0 one/3 more	0 one/4 more	2 one/1 more

Note.

<sup>a</sup> The questionnaire respondents could have participated during one or more of the active years.

<sup>b</sup> Not all TDT-participants in 2012–2013 completed the questionnaire.

**Table 3**  
Perceptions on all framework factors and correlations with outcomes.

N = 94	Scale/topic:	M	SD	Correlations				
				Satisfaction	Teacher learning	Changes practice	Perc. quality	Actual use
<b>Input</b>								
Individual characteristics	Autonomous motivation	4.0	.63	<b>.40**</b>	<b>.43**</b>	<b>.39**</b>	<b>.38**</b>	<b>.29**</b>
	Controlled motivation	1.8	.71	–.17	–.03	–.15	–.11	–.12
	Personal reform ambition	4.3	.57	<b>.26*</b>	.19	<b>.22*</b>	<b>.25*</b>	<b>.27**</b>
	Education experience <sup>a</sup>	15.5	9.95	–.13	–.18	<b>–.29**</b>	–.14	–.19
Contextual characteristics	School's reform ambitions	3.9	.61	.17	.08	.07	.15	<b>.24*</b>
	Teacher involvement	3.7	.71	.09	.05	–.01	.12	.15
	School support	3.7	.77	.09	.05	–.01	.12	.15
<b>Process</b>								
Team characteristics	<b>Team interaction:</b>							
	- Communication	4.0	.68	<b>.70**</b>	<b>.58**</b>	<b>.45**</b>	<b>.64**</b>	<b>.42**</b>
	- Mutual support	3.9	.72	<b>.77**</b>	<b>.58**</b>	<b>.48**</b>	<b>.71**</b>	<b>.49**</b>
	- Effort/participation	3.5	.75	<b>.53**</b>	<b>.48**</b>	<b>.40**</b>	<b>.51**</b>	<b>.42**</b>
	- Cohesion	3.3	.70	<b>.69**</b>	<b>.58**</b>	<b>.44**</b>	<b>.60**</b>	<b>.52**</b>
	Team coach	3.7	.78	<b>.73**</b>	<b>.61**</b>	<b>.45**</b>	<b>.66**</b>	<b>.44**</b>
Goal alignment <sup>b</sup>	.57	.44	<b>–.28**</b>	<b>–.25*</b>	<b>–.40**</b>	<b>–.24*</b>	<b>–.38**</b>	
Activities	Knowledge-related in TDT <sup>c</sup>	2.8	.77	<b>.35**</b>	<b>.46**</b>	<b>.34**</b>	<b>.28**</b>	<b>.21*</b>
	Design-related in TDT <sup>c</sup>	3.4	.88	<b>.68**</b>	<b>.65**</b>	<b>.43**</b>	<b>.70**</b>	<b>.60**</b>
	Excursions <sup>c</sup>	1.8	.79	.08	.16	.13	.17	.08
	Activities outside TDT <sup>c</sup>	3.1	.75	<b>.32**</b>	<b>.42**</b>	<b>.34**</b>	<b>.37**</b>	<b>.52**</b>
Organization	Time spent on TDT <sup>d</sup>	6.7	2.4	.08	.05	–.05	.08	.05
<b>Outcome</b>								
Professional development	Satisfaction	3.5	.92	–	–	–	–	–
	Teacher learning	3.3	.78	<b>.66**</b>	–	–	–	–
	Changes in practice	2.9	.88	<b>.56**</b>	<b>.68**</b>	–	–	–
Designed material	Perceived quality	3.4	.84	<b>.79**</b>	<b>.72**</b>	<b>.58**</b>	–	–
	Actual use	2.8	1.1	<b>.64**</b>	<b>.59**</b>	<b>.60**</b>	<b>.70**</b>	–

\*p < .05; \*\*p < .01 (both bold).

Note: all items are measured with a 5-point Likert scale (1 = completely disagree; 5 = completely agree), except:

<sup>a</sup> Education experience in years.

<sup>b</sup> Calculated goal alignment value (0 = personal goals and perceived team goals are the same; 4 = personal goals and perceived team goals are completely opposite).

<sup>c</sup> Frequencies (1 = never; 5 = very often).

<sup>d</sup> Hours spent on TDT per month.

more controlled motivation, which will be explained in Section 4.2. Individual reform ambitions were above the middle of the scale ( $M = 4.3$ ,  $SD = .57$ ). In the interviews, participants explained that being open to innovations is in the nature of TDT participants. For example: "In general, they [TDT participants] are persons who want to innovate and dare to broaden their views." Furthermore, interview participants explained that having a group of ambitious

teachers is essential to the success of TDTs: "Enthusiasm is the key. You need teachers who are willing to do something, to achieve something and to try something. Otherwise it doesn't work."

Table 4 shows the questionnaire respondents' design experience prior to their TDT participation. The majority of the respondents had experience in designing material for their own classes or schools, but for most respondents this experience did not go

**Table 4**  
Design experience prior to TDT participation.

Experience:	Frequency	Percentage
No experience	9	9.6%
Designed material for own classes	61	61.9%
Designed material for own school	55	58.5%
Designed material for external party	12	12.8%

beyond the school level. This topic was barely mentioned in the interviews. Some interview participants thought that it might have helped if they had a little more design experience, like this participant: *“If I had been more experienced, it would probably have gone easier. It is quite difficult to develop new material and to write things”*.

There was a range of years of educational experience ( $M = 15.5$  years,  $SD = 9.95$ ), but all teachers had some degree of educational experience (2 years experience was the minimum reported). A negative correlation was found between educational experience and the outcome of Changes in practice. However, in the interviews participants explained there was no relation between experience and willingness to change: *“There are people with 20 years of experience who think, I have been teaching like this for 20 years, why would I change? There are also people with 20 years of experience who really like the reforms. It depends on the person.”*

The quantitative results for the contextual input characteristics show that the respondents on average scored on the positive end of the scale. The TDT participants were positive about their school's reform ambitions, teacher involvement and the support provided ( $M = 3.9$ ,  $SD = .61$ ;  $M = 3.7$ ,  $SD = .71$ ;  $M = 3.7$ ,  $SD = .77$ , respectively). Few significant correlations were found between contextual characteristics and the outcome variables. In the interviews, none of the participants mentioned these topics spontaneously, but in general they were positive about their school's reform ambitions and the way the school involved teachers in it. For example: *“I think we are an ambitious school, in terms of innovations. When you look at the possibilities here, I think that's very important. [ ... ] Teachers are involved in the process, yes”* Furthermore, in general the interview participants were satisfied with their schools' support during the TDT. Although most participants mentioned that their schools did not interfere with their participation very often, they did not experience a lack of support: *“Sometimes they asked me about what I did in the TDT, but they never asked what I really learned and how the school could benefit from my TDT participation. [ ... ] I didn't miss that. If it's useful I will tell them myself.”* This participant also explained that the TDT is focused on a specific subject. Results or products from the TDT are therefore not always relevant for the whole organization, but only for a select group.

#### 4.1.3. Process factors

With regard to team characteristics, all questionnaire scales correlated with the outcomes. Under team interaction, the sub-scales of communication and mutual support had the highest average scores ( $M = 4.0$ ,  $SD = .68$ ;  $M = 3.9$ ,  $SD = .72$ ). The interview participants also reported that the team members communicated quite well and openly with each other: *“The people in the TDT liked to share information. [ ... ] The willingness to exchange information was very great.”* Likewise, most participants stated in the interview that the team members were willing to support each other, listen to each other and give each other feedback. Questionnaire respondents were slightly less positive about the team effort and cohesion in the group. Mean scores for these sub-scales were just above middle of the scale ( $M = 3.5$ ,  $SD = .75$ ;  $M = 3.3$ ,  $SD = .70$ ). In the interviews, the participants from all TDTs noted that participation in the TDT was not equally distributed among the members.

However, in most cases, this was not seen as a problem: *“That is very different, the effort. But if you just say you have no time, the group is OK with that.”* The perceptions of cohesion in the group differed between TDTs, which will be further explained in Section 4.2.

On average the respondents were positive about their team coach ( $M = 3.7$ ,  $SD = .78$ ). The interview participants explained their expectations of the team coach. According to the interviewees, the coach (should have) played a role in structuring the activities, stimulating the team interactions and mediating between the members to find a shared team goal. The coach was mentioned in a positive sense, for example: *“The coach made an inventory of all personal goals to find a shared goal”*, as well as in a negative sense: *“I missed a clear structure in the activities, the coach could have given more structure”*.

The average value for goal alignment was .57 (where 0 = personal goals and perceived team goals are the same; 4 = personal goals and perceived team goals are completely opposite;  $SD = .44$ ). This value means that in general, the questionnaire respondents reported that they strived for the same goal as their fellow team members. The value for goal alignment correlated with all outcome variables in the sense that closer alignment of goals correlated with higher outcome scores. The interviews revealed that there was a broad consensus that TDTs should have a clear and shared goal. There were differences in *how* and *when* this goal was formulated. In two TDTs, the goal was pre-defined and known before enrolling the TDT. In the other two TDTs the team members defined the goal during the first meetings. Differences between those approaches are further explained in Section 4.2.

The most frequent activities were design related activities inside the TDT ( $M = 3.4$ ,  $SD = .88$ ; where 1 = never and 5 = very often) and activities outside of the TDT ( $M = 3.1$ ,  $SD = .75$ ). Knowledge-related activities within the TDT were somewhat less frequent ( $M = 2.8$ ,  $SD = .77$ ). The category of Excursions had the lowest frequency score ( $M = 1.8$ ,  $SD = .79$ ). This is not surprising, because company visits or visiting other schools cannot take place as often as activities such as discussing educational reforms, or writing (parts of) new educational materials. The frequency of design-related activities within the TDT showed the strongest correlations with the outcome factors. In the interviews, participants described this kind of activity as most useful: *“We made a lesson plan that teachers could actually use. In small groups of two or three, we picked a part and we worked that out. How can you teach this topic? What kinds of experiments are possible?”* They also mentioned knowledge-related topics such as exchanging experiences with each other and external guest speakers. Furthermore, participants mentioned that it is essential to have the possibility of immediately implementing or testing the designed material in practice: *“When we come up with something, we can immediately implement it in the classroom. [ ... ] It is the same with visiting conferences. When do I actually learn something at a conference? If I can use something the next day in my class.”* The frequency of activities outside of the TDT correlated with all outcome factors, especially the outcome Use of material (.52;  $p < .01$ ).

Most organizational factors were the same for every TDT in this study. All TDTs included teachers from different schools (networked TDTs), and held ten monthly 3-h meetings at the university during an academic year. The number of participants in TDTs varied between 2 and 19, with an average of 9.1. Most TDTs consisted of teachers from the same or related topics, except team D, which will be further described in Section 4.2. On average, the participants spent 6.7 h ( $SD = 2.4$ ) on the TDT per month. Taking into account that the duration of the monthly meetings was 3 h, the participants spent 3.7 h per month on the TDT of their own or their school's time. No correlations were found between time spent on the TDT

and the outcome variables. Some interview participants explained that participating in a TDT felt like a huge time investment. On the other hand, some participants mentioned that participating in a TDT saves time in the long term, because the designed material can be used year after year. The participants explained that the TDT should be a more continuous process. “Directly after the meeting you think, the next time will be next month, that’s a pretty long time. So you go on with your daily practice, and before you know it, three or four weeks have passed, and you should have done something for the TDT”.

#### 4.2. Case descriptions of four TDTs

This section gives an overview of the differences in the four TDTs and of the relations between the framework factors. Although the main focus of this part of the study is on the qualitative interview data, we also used the questionnaire results of the four selected TDTs to detect notable differences between the TDTs (Table 5).

##### 4.2.1. Team A – positive and implementing

Team A consisted of teachers from the same subject, and was aimed at designing educational modules. Table 5 shows that team A is the only team in which all outcome scores are above the middle of the scale. The interview participants from this team also reported the greatest learning gains and actual implementation of the gained knowledge. For example: “Yes, the idea with the logbooks,

which we used in that module. I picked that up to use in my daily practice, and that clearly came from working in the TDT.”

In general, the participants from team A were autonomously motivated to participate ( $M = 4.4$ ) and they were ambitious concerning educational reforms ( $M = 4.6$ ). The contextual characteristics were perceived as positive; the schools also had reform ambitions, they involved teachers and they were perceived as supportive during TDT participation. The group work was perceived as positive; all team interaction subscales had an average score above 3.5. One of the interview participants explained about the team interaction: “Everything goes very naturally. Because we are all similar and like-minded people” The respondents were satisfied with the team coach ( $M = 4.2$ ). In the interviews they explained that the team defined a shared goal together, coordinated by the team coach. They performed activities within as well as outside of the TDT meetings. Parts of the designed material were directly tested in practice between the TDT meetings. Team members were positive about this approach.

##### 4.2.2. Team B – positive but not implementing

Similar to team A, this team had teachers from the same subject, and aimed at designing educational modules. Team B was positive about most outcome factors. However, Table 5 shows that the outcome factor Actual use of material had an average score below the middle of the scale ( $M = 2.6$ ). The interview participants explained that they were satisfied with their TDT participation and

**Table 5**  
The perceptions on all framework factors for four selected TDTs.

Scale/topic		TDT A	TDT B	TDT C	TDT D
		N = 11 <sup>e</sup>	N = 15 <sup>e</sup>	N = 7 <sup>e</sup>	N = 10 <sup>e</sup>
		M	M	M	M
<b>Input</b>					
Individual characteristics	Autonomous motivation	4.4	4.1	3.4	4.1
	Controlled motivation	1.3	1.5	2.9	1.7
	Personal reform ambitions	4.6	4.1	4.1	4.5
	Education experience <sup>a</sup>	16.3	14.9	24.9	18.0
Contextual characteristics	School's reform ambitions	4.1	4.0	3.8	4.1
	Teacher involvement	4.1	3.5	3.7	3.9
	School support	3.8	3.7	3.7	3.9
<b>Process</b>					
Team characteristics	<b>Team interaction:</b>				
	- Communication	4.5	4.2	3.6	3.5
	- Mutual support	4.2	3.8	3.6	3.1
	- Effort/participation	4.0	3.4	3.3	2.6
	- Cohesion	3.6	3.3	2.9	2.6
	Team coach	4.2	4.0	3.2	2.6
	Goal alignment <sup>b</sup>	.50	.74	.75	.64
Activities	Knowledge-related in TDT <sup>c</sup>	3.2	3.3	1.9	3.0
	Design-related in TDT <sup>c</sup>	4.2	3.3	3.1	2.5
	Excursions <sup>c</sup>	1.4	1.2	1.9	1.1
	Activities outside TDT <sup>c</sup>	3.8	3.0	3.0	2.7
Organization	Time spent on TDT <sup>d</sup>	8.8	7.3	5.9	5.9
<b>Outcome</b>					
Professional development	Satisfaction	4.2	3.5	2.6	2.6
	Teacher learning	4.1	3.6	2.7	2.3
	Changes in practice	3.4	3.0	2.1	2.5
Designed material	Perceived quality	4.0	3.3	2.8	2.5
	Actual use	3.6	2.6	2.4	1.8

Note: all items are measured with a 5-point Likert scale (1 = completely disagree; 5 = completely agree), except.

<sup>a</sup> Education experience in years.

<sup>b</sup> Calculated goal alignment value (0 = personal goals and perceived team goals are the same; 4 = personal goals and perceived team goals are completely opposite).

<sup>c</sup> Frequencies (1 = never; 5 = very often).

<sup>d</sup> Hours spent on TDT per month.

<sup>e</sup> N represents the total number of questionnaire respondents from this team. Year of participation was not necessarily 2012–2013.



the learning gains, but they were somewhat cautious in their opinion about the material: “Well, the problem is, I haven’t tested it yet. Now there is material that I can grab at the moment that I’m going to teach that lesson. And only then I can tell whether it matches with my students. Or that I have to do it in a different way.” They did not actually use the material in the classroom, therefore they were unsure about its quality. In contrast to team A, none of the participants from team B told about testing the material in practice during TDT participation. This is reflected in their different frequencies for activities outside of the TDT (Team A:  $M = 3.8$ ; Team B:  $M = 3.0$ ).

The input factor and process factor scores for team B were similar to those of team A. Members of Team B were also autonomously motivated, they were open to educational reforms, just as their schools were, and they perceived the team interactions as positive (mean scores on all questionnaire factors were above the middle of the scale). Furthermore, like team A, this team formulated a shared team goal during the first sessions. The team coach led this process.

#### 4.2.3. Team C – controlled motivation and skepticism

Team C consisted of teachers of the same science-related subject and aimed at experimenting with video conferencing technologies. The goal was to teach two classrooms in two different schools at the same time. Table 5 shows that all mean outcome scores were on the negative end of the scale in this team. The interview participants explained they gained some knowledge about new technologies, but on average they agreed that the main insight was that it is not profitable to use video conferencing in classes: “Our group has come to the conclusion that it doesn’t work. A normal lesson is always more effective than a video lesson”. Therefore, the negative perceptions of the outcomes could be explained in part by the fact that the main goal of the TDT failed.

But insights about the input factors reveal more explanations. Table 5 shows that the average score for autonomous motivation was more than .5 point lower than the other teams, and the score for controlled motivation was more than a full point higher. This was clarified in the interviews: “I think this TDT is top-down. My school leader comes to me and says: ‘our school has signed up for a video conferencing project, now we need teachers to participate in a TDT, do you want to participate?’ We did not directly see the usefulness of the project.” Formally, the teachers were asked whether they wanted to participate in the TDT, but they felt as if they were more or less forced. The other input factors show similar results as those for team A and B.

The interview participants explained that the controlled motivation to participate affected some process factors. The TDT had a clear pre-defined goal (experimenting with video lessons), but although this was the goal of the project, it did not feel like their own goal: “We had a clear goal, but that doesn’t mean that we thought that this would be the solution. From the very beginning there was skepticism in the group.” Although the participants explained they really tried to make it work most of the time, sometimes it was hard to stay positive: “Sometimes I thought, come on guys, try to think more positive. Try to think more about the solutions instead of only looking at the problems. [ ... ] The positive attitude was missing.” The team coach could have played a role in improving the atmosphere: “As a team coach you have the difficult task of making something out of it. And then I think you can better spare your energy to improve the atmosphere instead of [looking at the problems of] the TDT itself.”

#### 4.2.4. Team D – diverse group and hard to find shared goal

The aim of team D was to develop school policies for how to deal with excellent and gifted students. The TDT consisted of teachers

from different subjects, although most teachers taught science-related subjects. The participants had different roles in their schools; some teachers were ‘excellence coordinators’ and other teachers were just interested in this topic. Table 5 shows that the averages scores for all outcome factors were on the negative end of the scale for this team. Some interview participants reported some small learning gains, for example, some new insights and perspectives on this topic, but the overall tendency was not to really use these new insights in practice. Team D initially had a clear concrete goal, but at the end of the year there was no shared product: “The original intent was to create a booklet with guidelines for excellence. But we didn’t do that.”

The reasons for team D’s lower outcome values differ from those for team C. Table 5 shows that team D’s mean questionnaire scores for the input variables are all above the middle of the scale, similar to the positive teams A and B. The interview participants also reported that they were autonomously motivated to participate and they were positive towards educational reforms. However, team D had some issues during the process. Due to the diverse group composition it was hard to find cohesion in the group: “Although it is an interesting topic and you can learn a lot from each other, it is hard to find cohesion in the group. I can imagine that TDTs with teachers from the same subject, they have a shared view. We knew beforehand that wasn’t going to work.” Table 5 also shows that the value for cohesion in team D was lower than in the other teams ( $M = 2.6$ ). The participants experienced difficulties in finding a way to incorporate all of the different views and opinions into a shared end product: “On the one hand, I think that we as participants clearly brought up what we wanted. [ ... ] But some teachers came with features of which I thought, this is not exactly what I want.” So although the team had a clear pre-defined goal, it was difficult to find a shared interpretation of this goal. Consequently, it was difficult to carry out design-related activities that were perceived as relevant for all participants. The interview participants explained that they did some knowledge-related activities, but they did not use the new knowledge to actually develop something with the group: “There were guest speakers, who told us quite interesting things, but after that we didn’t do anything with it. Normally I criticize my students for that, for starting with something, and not doing anything with it. It’s a missed chance.”

Similar to team C, the interview participants from team D mentioned that the team coach could have played a role in solving the issues: “I missed a real plan. This is our goal, what steps should we take to reach that goal? [ ... ] If I coach a process like this, I always take a look at what we have to do, where are we going, what do I need?”

## 5. Conclusion and discussion

This study started with a conceptual framework for TDTs that was based on theory. The perceptions of TDT participants regarding the factors in this framework were explored with a mixed methods approach. We gained insights into general perceptions on TDTs and relations between those factors. Furthermore, we found several relations in four particular TDTs that help us understand how this framework can be applied in practice.

### 5.1. General perceptions of TDTs and relations between factors

The first perspective in this study was to gain insights into the general perceptions on TDTs and relations between factors. Both the quantitative and qualitative data showed that in general, participants in the TDTs were satisfied with the TDT’s outcomes. Teachers mentioned clear learning outcomes and most were happy with the quality of the designed material. However, teachers in this

study did not perceive their classroom practice to have improved after the TDT-participation and they did not often use the designed material. The educational innovation thus was not implemented in practice, as we did expect from literature (Carlgrén, 1999; Mooney Simmie, 2007; Penuel et al., 2007). Therefore, we can argue that despite the *potential* of TDTs, the *performance* remains only partially optimized. Another explanation for the lack of reported change is related to the measurement of perceptions in retrospect. Maybe the participants did not realize that their practice had changed in small increments. Future research can include a pre- and posttest to draw more conclusions about changes in practice.

In general, TDT participants formed a homogeneous group of motivated and ambitious teachers (input factors). As we mentioned in Section 2.1.1, there is an ongoing debate in the literature about involving all teachers in educational reforms or only involving the motivated teachers. On the one hand, one could argue that voluntary participation is desirable so that the group is committed and stable (Erickson et al., 2005) and teachers are inclined to implement the reforms (Gorozidis & Papaioannou, 2014). On the other hand, most innovation projects that only involve volunteers have less long-term effects (Hargreaves, 2003). With that argument, future TDTs should focus more on involving *all* teachers to support the sustainability of the reform.

The participants were positive about their own schools and the degree of involvement. But both the quantitative and qualitative data show that there is almost no relation between the contextual characteristics and the outcomes. This might seem to contradict the existing literature that states that the conditions in the school context are very important (e.g. Stoll et al., 2006; Wikeley et al., 2005). This can be explained in two ways. First, in this study, all TDTs were networked. There was not one specific school (leader) that had a direct interest in the outcomes of the TDTs. School leaders looked at the TDTs with a little distance, which increased the feeling of autonomy of the participating teachers. Second, teachers in the Netherlands are relatively autonomous in planning their own lessons. Therefore, they do not need their schools to be very involved in the process of designing materials for their own subject.

The process factors appear to be the most important in this study. The quantitative data show that all process factors correlated with almost all outcome variables. This is in line with the existing literature: positive team interaction, a good balance of activities, a good team coach and clear alignment of the team goals contribute to the effectiveness of the TDT.

### 5.2. Case descriptions of four TDTs

In the second perspective we aimed to describe different situations in particular TDTs using the framework. Analyzing the perceptions from four selected TDTs in more detail revealed differences between those groups and some relations between input, process and outcome factors in particular TDTs. Teams A and B reported the greatest gains in professional development and they were the most positive about the designed material. The perceptions of the input and process factors in these teams were positive and similar to the average perceptions of all respondents. The main difference between these teams is that the participants from team A performed more Activities outside TDTs and also reported more Actual use of the material than team B. Participants from the other two TDTs were less positive about the outcomes, but they mention different reasons.

Participants from team C reported more controlled motivation to participate. In the interviews they explained that they were more or less forced to participate. In the process, these participants mentioned skepticism regarding the pre-defined goal, which

affected the positive atmosphere in the group. The participants state that the team coach could have played a role in improving the atmosphere. The negative perceptions of the outcomes can partly be explained by the fact that the participants experienced controlled motivation to participate. This is in line with motivation theory. Furthermore, the participants experienced many practical and technical difficulties with teaching two classes with video conferencing. Eventually, the main insight was that it is not profitable to use video conferencing in classes. Therefore, part of the negative perceptions of the outcomes could be explained by the fact that the main goal of the TDT failed.

Team D was a heterogeneous group with teachers from different subjects. The participants explained that it was hard to find cohesion, due to this diverse group composition. Although this group had a clear pre-defined goal, the participants struggled to find a shared interpretation of this goal. They explained the coach could have done more to define a clear goal and structure the activities.

One overall difference between the positive teams (A and B) and the more negative teams (C and D) is that the latter both had clear pre-defined goals. This does not necessarily mean that having a pre-defined goal has a negative effect on the outcomes. We argue that it could be explained by the fact that teams A and B explicitly took time to define a shared team goal. The team coach led this process. In teams C and D the goal was given, and possible differences in expectations and interpretations were not extensively discussed during the first meetings.

### 5.3. Integrated descriptive framework

The perceptions of the TDT participants could all be interpreted in terms of the conceptual framework; no new factors were mentioned. This means that the conceptual framework is a useful starting point to describe the individual factors that are present in TDTs. The aim of this study was to use insights from practice to adjust the conceptual framework to yield an integrated descriptive framework in which these individual factors are connected.

Insights from practice revealed some relations between the input, process and outcome factors. Both quantitative and qualitative data showed that most significant relations occur between the process factors and the outcomes. Team interaction, the process of defining a goal together and the type of activities (within the meetings as well as outside of the meetings) were all perceived as important for the outcomes. More specifically: the interview participants indicated specific actions the team coach took or could have taken during the process to better support the team process. These actions always concerned other process factors: the coach could structure the activities, stimulate the team interaction and mediate the team goals to find a shared goal. The integrated descriptive framework therefore has more focus on the process factors, compared to the conceptual framework, and the team coach is placed as a central actor in this process.

In general, participants were autonomously motivated to participate in the TDT, but the participants from team C also mentioned controlled motivation. This affected process factors in this team, such as team interaction and ownership of the team goal. For the other input factors, all participants in this study were very similar. In general, the participants were positive about educational reforms and they perceived their schools as ambitious and supportive. This means that this study only revealed one example of how input factors can affect the process. But the fact that we did not find any other relations does not mean they are not possible. Therefore, all input factors are still taken into

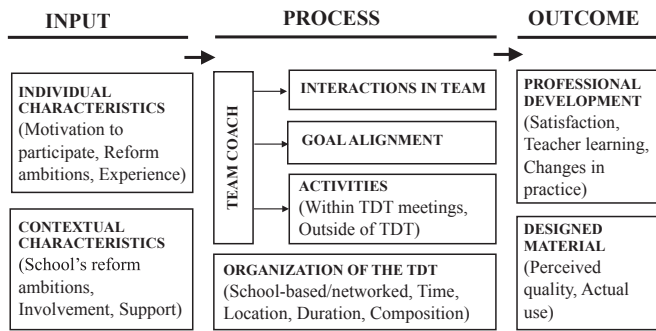


Fig. 2. Integrated descriptive framework for TDTs.

account in the integrated descriptive framework, as they could affect the process.

The integrated descriptive framework is depicted in Fig. 2. This framework is based on both literature and practice and can be therefore be considered the fundamental first step in the further development of a theoretical and practical basis for TDTs.

5.4. Limitations and future research

The main limitation of this study is that we only included TDTs in one specific context. Other types of TDTs might reveal other relations that we did not find in our context. For example,

we expect that school-based TDTs might show more relations between the contextual characteristics and the process than our networked TDTs. To make the integrated descriptive framework suitable for all types of TDTs, we kept it as broad as possible. Findings on school-based TDTs could therefore still be interpreted in terms of this framework. We encourage TDT-researchers to use this descriptive framework in different contexts to gain deeper understanding of how various types of TDTs work in practice.

The results of this study give reason to investigate the process of networked TDTs in more detail, as the process stage had most significant effects on the TDT outcomes. When we have a more thorough understanding of the processes within TDTs, future TDTs can be optimized if we intervene in this stage. In follow-up studies, new TDTs will be established in which some factors are controlled. Insights from studies on these TDTs can be used to extend the framework to use it as a prescriptive tool for optimizing the professional development work within TDTs.

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Appendix

Questionnaire scales and examples of items.

	Scale	Items	$\alpha$	Example
<b>Input</b>				
Individual characteristics	Autonomous motivation <sup>a</sup>	4	.78	“I participated in a TDT because it seemed interesting to me”
	Controlled motivation <sup>a</sup>	4	.70	“I participated in a TDT because my school obliged me to”
	Personal reform ambitions	4	.87	“I’m open to educational innovations”
	Education experience	1	–	“I have ... years of teaching experience”
Contextual characteristics	School’s reform ambitions	3	.82	“My school is open to educational innovations”
	Teacher involvement	3	.78	“My school thinks it is important to involve teachers in educational reforms”
	School support	4	.72	“I felt supported by my school during my TDT participation”
<b>Process</b>				
Team characteristics	Team interaction: <sup>b</sup>			
	- Communication	3	.83	“Relevant information was shared openly”
	- Mutual support	3	.83	“Suggestions of team members were respected”
	- Effort/participation	3	.73	“Each team member gave the TDT the same priority”
	- Cohesion	3	.80	“All team members felt involved in the TDT”
	Team coach <sup>c</sup>	7	.94	“The support of the team coach contributed to the results of the TDT”
	Personal goals <sup>d</sup>	9	–	“My goal was to improve my classroom practice”
Perceived team goals <sup>d</sup>	(Calculated value for goal alignment)	1	–	This value is calculated as the sum of the absolute differences between the nine personal and team goals.
Activities	Knowledge-related in TDT <sup>d</sup>	5	.68	“A visit of an external expert in educational design” (frequency)
	Design-related in TDT <sup>d</sup>	6	.85	“Producing or writing (parts of) educational materials” (frequency)
	Excursions <sup>d</sup>	3	.51	“Excursion to a company” (frequency)
	Activities outside TDT <sup>d</sup>	7	.82	“Testing the designed material in my classroom” (frequency)
Organization	Time spent on TDT <sup>d</sup>	1	–	“Monthly, I spent ... hours on the TDT (including TDT meetings)”
<b>Outcome</b>				
Professional development	Satisfaction	2	.91	“I was satisfied about the results of the TDT”
	Teacher learning	6	.84	“Through my participation, I gained new pedagogical insights”
	Changes in practice	5	.90	“Through my participation, I experiment more with new teaching strategies in my classroom”
Designed material	Perceived quality <sup>c</sup>	4	.91	“We adopted modern pedagogical insights in the material”
	Actual use	3	.85	“I actually use the designed material in my classroom”

<sup>a</sup> Derived from (Fernet, Senecal, Guay, Marsh, & Dowson, 2008; Gorozidis & Papaioannou, 2014).

<sup>b</sup> Derived from (Hoegl & Gemuenden, 2001).

<sup>c</sup> Derived from (Huizinga et al., 2013).

<sup>d</sup> Constructed in collaboration with TDT team coaches.

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