Article

The Role of External and Internal Team Coaches in Teacher Design Teams. A Mixed Methods Study

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Abstract: Teacher design teams (TDTs) are increasingly used as a means for teacher professional development. It has been posited that for teacher learning to occur, TDTs need support from team coaches. These coaches are either external experts or peer teachers that guide the team from within. The current literature is in debate on whether external or internal coaches are most effective in supporting TDTs. In this study, we, therefore, examine whether these coach types differ in how they fulfil their role. We additionally evaluate how coaching interacts with the team learning process and the TDT trajectory's outcomes. We used a mixed methods design in the context of a large-scale TDT trajectory in Flanders (Belgium). We administered questionnaires among 63 teachers of 18 TDTs, and conducted interviews with the coaches of 14 TDTs. Our results indicate that coaching activities correlate with the majority of team learning beliefs and behaviours (TLBB) examined, as well as with perceived team effectiveness and the quality of material developed. Whereas teachers in TDTs with an internal coach seem to evaluate the coaching activities and the TLBB more positively than teachers in TDTs with an external coach, the opposite holds for perceptions of the trajectory's outcomes.

Keywords: mixed methods; team coach; teacher design team; team learning; teacher professional development

1. Introduction

Teacher professional development (TPD) has the potential to improve the quality of in-service teachers [1]. Existing TPD research emphasises the importance of teacher collaboration for teacher learning [2,3]. Providing teachers with the time and space to collaborate has been shown to enlarge teachers' sets of teaching tools and activities, resulting in more effective teaching [4–6]. Since professional learning communities (PLCs) focus on collaborative learning, there is a growing interest in this form of professional development. PLCs are defined as "groups of teachers who share and critically question their practice in an on-going, reflective, collaborative, learning-oriented way to promote their growth and skill" [7], and have been shown to benefit teaching practices and student learning [8]. PLCs are particularly effective as they allow for the integration of the six features that are essential to effective TPD initiatives: content focus, active learning, coherence, duration, collective participation, and ownership [9,10]. We refer to Binkhorst [9] for an elaborate explanation of these six key features, and how PLCs provide the opportunity to integrate these.

A teacher design team (TDT) is a specific type of PLC, defined as "a group of at least two teachers, from the same or related subjects, working together on a regular basis, with the goal to (re)design and enact (a part of) their common curriculum" [10]. A TDT is characterised by its focus on the design of concrete learning materials. Previous studies showed that engaging in collaborative design is beneficial

for teachers' professional development [11]. Among others, teachers have reported appreciating the opportunity to share knowledge and ideas with colleagues and the deep reflection on the teaching subjects [12].

TDTs are often set up in contexts of educational reform. To maximise the probability that educational changes are implemented as intended, particular conditions on the level of the teacher need to be met. After all, it is the teacher who translates the changes into practice [13]. First, teachers need to master the (pedagogical) content covered in the new curriculum. In addition, it is critical that teachers have positive attitudes towards the reform and that feelings of resistance are prevented [13,14]. The enhanced ownership resulting from engagement in curricular design is suggested to positively impact teachers' willingness to implement educational changes [15]. Another condition for the successful implementation of a curricular reform is teachers' self-efficacy. Since teachers tend to feel uncertain, anxious and stressed in times of educational change [14,16,17], their self-efficacy, or "perceived ability to perform an action that will lead successfully toward a specific goal" [18], diminishes. Since teachers' beliefs on their capability to carry out changes correlate with their implementation efforts and the eventual implementation quality [13,19], increasing self-efficacy is highly desirable.

Despite the established potential of TDTs, merely bringing teachers together is unlikely to result in teacher learning. Rather, for TDTs to be effective, particular preconditions on both the team level (e.g., team composition) and the organisational level (e.g., "time, place and infrastructure") need to be met [20]. The present study focuses on one condition for effective TDTs that is debated in the existing literature on PLCs, namely the role of the "community leader" in communities of practice, (e.g., [21]); the "facilitator" in faculty learning communities, (e.g., [22]); and the "team coach" in TDTs (e.g., [9]). On the one hand, growing evidence has emerged on the importance of the team coach in creating the conditions for successful team performance. In the specific context of TDTs, previous studies stated that a team coach is required to complement the knowledge and skills of the TDT members with expertise on curricular design [9]. After all, while the TDT members may be excellent teachers, they might not have the capabilities that are needed to design high-quality curricular materials [23].

On the other hand, studies in both educational and other organisational settings have stressed the importance of shared leadership in teams and, consequently, question the traditional, vertical hierarchies where power is concentrated in a single person [24–26]. These studies, with antecedents in the conceptualisation of communities of practice as self-emerging and self-organising networks [27], posit that when the team regulates the process themselves, this leads to stronger involvement of all team members in reaching shared goals and, eventually, enhanced team performance [28,29]. In light of this debate, the first aim of this study is to gain further insight into the influence of team coaches on the team learning process, and the eventual outcomes of the TDT trajectory.

In the majority of TDT trajectories, team coaches are external experts who enrich the team learning process by bringing in curricular design expertise, pedagogical content knowledge, or knowledge on the reformed curriculum [10,23]. In other TDTs, the team is supported by an internal coach, who tends to be a peer teacher who is a full member of the team, guiding it from within [30]. Research on the implementation of educational changes in schools raised multiple arguments in favour of bringing in the expertise of individuals who are external to the school. Among others, the neutral, objective status of external individuals tends to result in enhanced credibility among team members [31–33]. However, vertical, top-down leadership may start to smother the involvement of team members, especially in the case where it becomes autocratic [28,34]. In response, studies in both educational and executive contexts have suggested that an internal coach could be effective, as the equal status of the coach and team members more easily results in trusting relationships that provide a sense of safety and confidentiality [35,36]. Given the different positions of external and internal coaches in TDTs, they might differ in how they perform their role, and in their impact on the team learning process and its outcomes. Consequently, the second aim of this study is to unravel whether the coach types differ in their coaching activities.

Summarising the above, the research questions of this study are as follows:

1. To what extent do external and internal team coaches of TDTs differ in their coaching activities?
2. To what extent is there an interaction between the support provided by team coaches and the team learning process?
3. To what extent is there an interaction between the support provided by team coaches and the outcomes of a TDT trajectory?

To answer these questions, a large-scale TDT trajectory of a school network in Flanders, the Dutch-speaking region of Belgium, was monitored. This trajectory took place in the context of a government-driven educational reform that affected all teaching subjects in all secondary schools. External coaches were pedagogical experts from the school network, and internal coaches were selected teachers who were willing to fulfil this role. Internal coaches followed training sessions before the onset of the trajectory and attended follow-up meetings. We used an explanatory sequential mixed methods design, in which we first examined general trends in the data derived from questionnaire responses of 63 participating teachers from 18 TDTs. Ten of these TDTs were supervised by an external coach, the remaining eight by an internal coach. Teachers indicated the activities performed by the team coach, shared their perceptions of the team learning process, and evaluated the trajectory's outcomes. In-depth insights on the approaches of the team coaches were derived from semi-structured interviews with 14 coaches.

Our study contributes to the existing literature by providing insight into whether external and internal coaches differ in their coaching activities and whether this has a differential impact on the team learning process and its eventual outcomes. As our study takes place in a context wherein the full curriculum is revised, we could gather data of a broad variety of TDTs. Therefore, it provides a representative view on the role of the team coach in TDTs. Our conclusions may provide educational policy makers with more in-depth insight into how TDTs should be supported to optimise the professional learning of teachers.

2. Theoretical Framework

The impact of the team coach on the effectiveness of TDTs is central to this study. Therefore, we first discuss existing literature on the role of the coach in general, and the potential differences between external and internal coaches in specific. We then examine the team learning conditions that are necessary for the effective functioning of TDTs. We end with a description of the outcomes that may be expected from TDT participation.

2.1. Team Coach

Research on the role of team coaches points to the need to find a balance between shared and vertical leadership [26,34,37]. On the one hand, TDTs ought to be self-steering, so that team members themselves take the lead in aspects such as the sharing of ideas and decision-making [10]. This shared leadership is thought to benefit the motivation of all team members to reach the team's goals, so that they all take on particular tasks and responsibilities [38]. However, there may simultaneously be a need for more vertical, top-down leadership. Team coaches may be required in aspects such as the clarification of objectives, provision of support and encouragement, and stimulation of innovative thinking [39].

Binkhorst, et al. [37] developed a framework in which 10 leadership behaviours in TDTs were identified as either shared or vertical leadership behaviours. Morgeson, DeRue and Karam [40] similarly listed different types of team leadership behaviours and additionally examined which of these behaviours appear best suited to different types of team coaches. Specifically, they developed a matrix on coach types using two dimensions: the locus of leadership (internal vs. external to the team) and the formality of leadership (informal or formal responsibility for the team performance). Among others, this study suggests that external coaches are better positioned to establish expectations

and to challenge the team, whereas internal coaches appear to be in the better position to create a positive atmosphere and to engage in performing the team task.

Focusing on the educational context, Mayer, et al. [31] state that an important advantage of external coaches is that the key roles of brokering and modelling suit them well. They suggest that teachers perceive external coaches as neutral and objective, because of their external status. Similarly, the exploratory study by Sue-Chan and Latham [33] showed that the credibility of external coaches is higher than the credibility of peer coaches. Furthermore, these coaches are able to use their prior experience and expertise to offer novel perspectives to a team that may otherwise be unlikely to generate or accept new ideas [31]. However, the exclusive use of external coaches could lead to resistance among team members whenever the leadership is too one-sided [28,34]. This is particularly likely to occur when the process conflicts with teachers' existing beliefs or practices, such as in times of reform. Given that shared team effort is essential to complete tasks, team members need to be willing to collaborate and to implement changes when necessary [41,42]. To build functional TDTs, coaches should not only establish team members' mutual trust, but also their trust in the process by creating shared ownership of the work [43]. Potentially, this sense of trust is achieved more easily when TDTs are guided by internal coaches, as their status is equivalent to the status of the team members [35,36].

Even though numerous studies have discussed the benefits of using either external or internal team coaches, studies that directly compare these coach types are limited [35]. It is, therefore, unclear to what extent external and internal coaches engage in vertical and shared leadership behaviours and how effective these behaviours are. Furthermore, only a limited number of studies have explored the potential interaction and cooperation between the two coach types [41,42].

The 10 leadership behaviours in the model of Binkhorst, et al. [37] are divided over four features of the TDT process: goals, activities, team interaction, and organisation of the TDT. In line with these process features, Schelfhout, Sprangers, Lochten, Vanthournout and Buckinx [44] distinguish four types of roles that team coaches can fulfil. First, coaches could facilitate the team process by ensuring that there is agreement on the team goals and to guide the team towards reaching those goals (i.e., *goal-oriented coaching*). Second, they can take up the role of the expert, by bringing in new knowledge on various domains (i.e., *content-wise coaching*). Third, they may perform organisational activities, such as taking notes and encouraging communication between meetings (i.e., *organisational coaching*). Fourth, coaches may play a role in creating or maintaining a positive dynamic within the team (i.e., *group-dynamic coaching*). Petrone and Ortquist-Ahrens [45] noted that team coaches should adapt their coaching activities throughout the TDT trajectory to respond to the changing needs of the TDT (i.e., *adaptive coaching*). In the present study, this categorisation of the roles of coaches will be used as a basis for discussing the potential differences in coaching activities between external and internal coaches and their impact on the team learning process and the trajectory's outcomes.

2.2. Team Learning

A key characteristic of a TDT is that it provides the opportunity for team learning. Since team members build a shared knowledge base, teams are expected to be more effective in fulfilling tasks than individuals. Previous research showed that the quality of interactions within a team has a significant impact on team learning [46]. The team learning beliefs and behaviours (TLBB) model by Van den Bossche, Gijselaers, Segers and Kirschner [47] posits that team members' beliefs about the interactions in the team (i.e., interpersonal context) influence the team learning behaviour. In turn, team learning behaviours encourage the building of mutual understanding and shared cognition on the task at hand. Mutually shared cognition, eventually, results in increased team effectiveness. The findings of Zboralski [21] suggest that team coaches impact the interaction processes within the TDTs. The present study follows the TLBB in distinguishing five types of beliefs and three types of behaviours that serve as catalysts for team learning [47,48].

Psychological safety refers to whether team members perceive the team as a safe space for taking interpersonal risks. Being able to suggest new ideas and to make mistakes, without fearing the reaction

of others, is considered a precondition for effective team learning [49]. The second belief, *interdependence*, can be distinguished in two types. While task interdependence refers to the completion of one task being dependent on the completion of another task, outcome interdependence refers to the extent to which achievements of other team members impact one's own situation. Both types encourage the shared responsibility within teams [50]. *Social cohesion* is perceived as the emotional attachment that is experienced between team members, while *task cohesion* is the extent to which there is a shared sense of commitment towards achieving the team's goals. When members feel connected, and when they are eager to fulfil the task at hand, members are likely to increase their effort, which positively impacts team learning [47]. Finally, *group potency* refers to the team's belief in its potential to reach its goals. This confidence increases perseverance whenever the team faces difficulties during the learning process [51].

In the TLBB model, a number of essential team learning behaviours are defined in terms of conversational actions (i.e., interactions). These conversational actions could be categorised in three stages: *construction* (e.g., team members listening carefully to each other), *co-construction* (e.g., team members building upon each other's information and ideas), and *constructive conflict* (e.g., critical comments on the other team members' ideas are considered). With regard to mutually shared cognition, it is important that team members not only have a similar understanding of how to execute the task, but also all accept the plan of action [47].

2.3. Outcomes

Previous literature showed that TDT participation does not only result in concrete learning materials, but that it could also foster teachers' professional learning [52]. In addition, TDT participation may strengthen teachers' self-efficacy towards handling the challenges of the educational reform. These factors are likely to influence teachers' perceptions of the effectiveness of the team, and the TDT trajectory as a whole. In the present study, we evaluate five main outcome variables.

The first outcome that we examine is *team effectiveness*. The inclusion of this variable in the model follows from the TLBB model, as the different beliefs and behaviours as described in Section 2.2 were shown to influence perceived team effectiveness. The variable captures perceptions with regard to multiple aspects, namely the team process, the eventual outcome, the viability of the team, and team learning [47].

Second, as TDTs are characterised by their aim of designing learning materials, coaches' and teachers' perceptions of the *quality of material* are evaluated. Among others, materials may differ in the extent to which they are usable in practice, and in whether the subject matter and didactical approaches, as prescribed in the new learning standards, are sufficiently integrated.

Third, it is insightful to retrieve *general evaluations* on the TDT trajectory. This refers to satisfaction with the trajectory as a whole, satisfaction with the trajectory's outcomes, and the ratio of the outcomes and the time that was invested.

The final two outcomes evaluated in this study are related to teachers' *self-efficacy* towards the curricular reform. The components considered are self-efficacy with regard to knowledge on the new learning standards of teachers' own discipline(s), the related (didactical) subject matter, and the extent to which teachers felt prepared to implement the changes in their teaching practice. To evaluate whether teachers' self-efficacy improved due to TDT participation, the scale was administered both before and after the start of the trajectory. The resulting difference constitutes the *change in self-efficacy* variable.

3. Methodology

3.1. Research Context

In Belgium, the educational system is organised on the regional, rather than federal, level. This study was conducted in Flanders, the Dutch-speaking region. The secondary school trajectory in Flanders consists of three cycles, with each cycle composed of two learning years. The government

announced an educational reform which would be implemented from September 2019 onwards, starting with the implementation of new learning standards in the first cycle.

We conducted this study in collaboration with the school network OVSG, which organises education on behalf of municipal councils. OVSG offered teachers the opportunity to prepare for the reform by participating in a large-scale TDT trajectory. Teachers were recruited by an open invitation. Based on teachers' disciplines, they were grouped in a TDT that would develop subject-specific learning materials. TDTs consisted of two to nine teachers from various schools, such that these TDTs were "networked" [10]. The majority of TDTs consisted of teachers from all over Flanders, while the remainder consisted of teachers working in a specific school community. TDTs met six times in the second semester of the school year 2018–2019. In an introductory session, teachers were informed about the content and aims of the new curriculum. Then, there were four three-hour sessions in which material was developed, aligning with the new subject-specific learning standards. In a closing session, all TDTs presented their work to each other. Figure 1 presents the intended, general course of the TDT trajectory in more detail. Nevertheless, note that we expected the actual progress to vary between the TDTs.
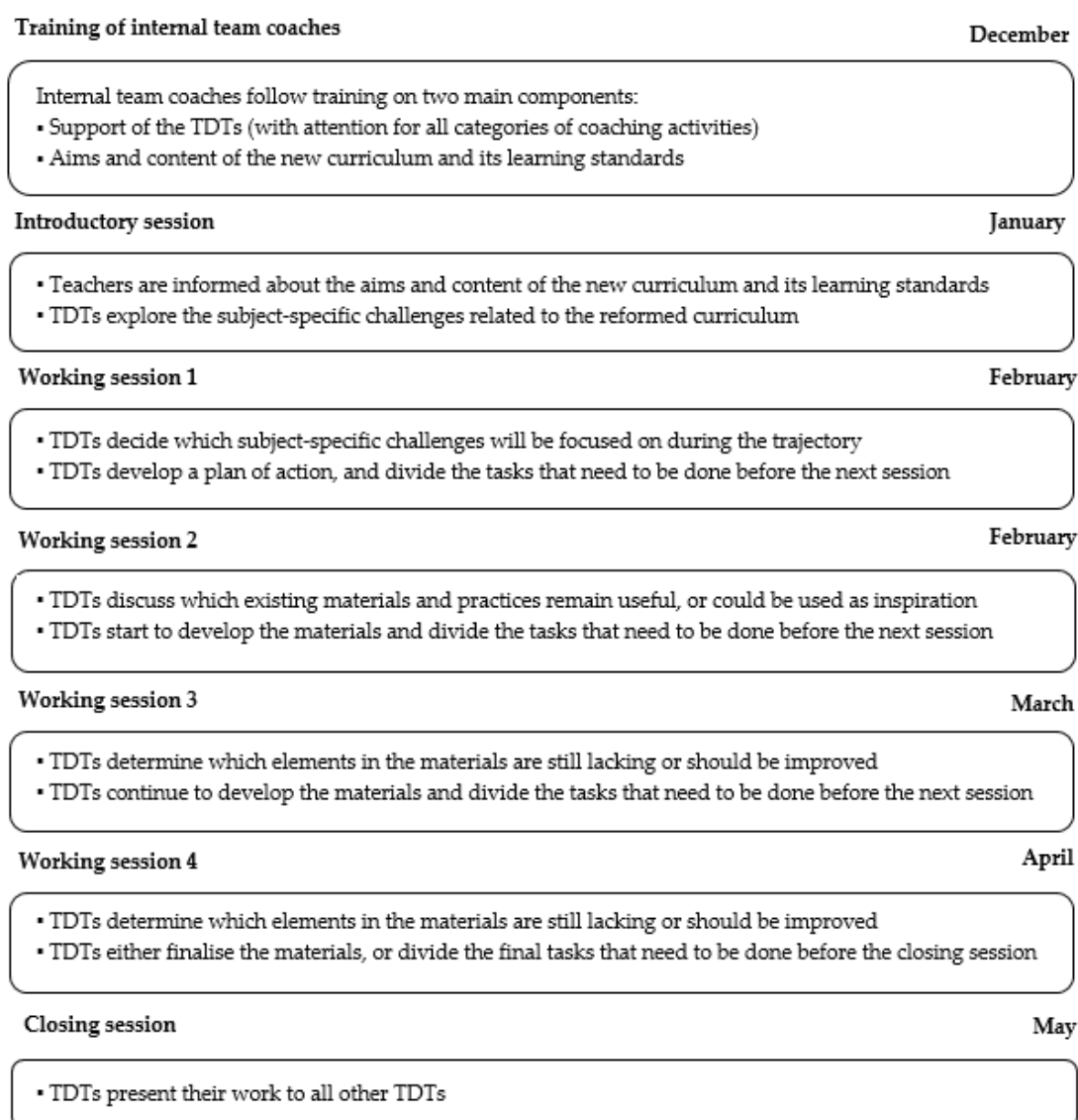
Training of internal team coaches　　　　　　　　　　　　　　　　　　　　**December**

Internal team coaches follow training on two main components:
- Support of the TDTs (with attention for all categories of coaching activities)
- Aims and content of the new curriculum and its learning standards

Introductory session　　　　　　　　　　　　　　　　　　　　　　　　　　　**January**

- Teachers are informed about the aims and content of the new curriculum and its learning standards
- TDTs explore the subject-specific challenges related to the reformed curriculum

Working session 1　　　　　　　　　　　　　　　　　　　　　　　　　　　**February**

- TDTs decide which subject-specific challenges will be focused on during the trajectory
- TDTs develop a plan of action, and divide the tasks that need to be done before the next session

Working session 2　　　　　　　　　　　　　　　　　　　　　　　　　　　**February**

- TDTs discuss which existing materials and practices remain useful, or could be used as inspiration
- TDTs start to develop the materials and divide the tasks that need to be done before the next session

Working session 3　　　　　　　　　　　　　　　　　　　　　　　　　　　**March**

- TDTs determine which elements in the materials are still lacking or should be improved
- TDTs continue to develop the materials and divide the tasks that need to be done before the next session

Working session 4　　　　　　　　　　　　　　　　　　　　　　　　　　　**April**

- TDTs determine which elements in the materials are still lacking or should be improved
- TDTs either finalise the materials, or divide the final tasks that need to be done before the closing session

Closing session　　　　　　　　　　　　　　　　　　　　　　　　　　　　**May**

- TDTs present their work to all other TDTs

Figure 1. Intended course of the teacher design team (TDT) trajectory.

Each TDT was supervised by a team coach. The external coaches are employed by OVSG as pedagogical experts for secondary schools, and each have expertise in a different teaching subject. Pedagogical experts in Flanders coach schools and teachers to ensure that the offered education is of high quality and aligns with the school's pedagogical vision. The internal coaches are in-service teachers who were willing to take on the role of coaches in the TDT trajectory. Whereas some of the internal coaches had participated in PLCs before, others were newly recruited. Internal coaches participated in a training trajectory, organised by OVSG, to ensure that they had sufficient knowledge and competences to support the TDTs. It was emphasised that rather than enforcing a vertical relationship, internal coaches should strive to establish shared leadership. Two follow-up meetings were organised during the trajectory, in which experiences and issues could be shared. Each internal coach could rely on an external coach for support.

3.2. Research Design

To answer our research questions, we used an explanatory sequential mixed methods design. This design consists of two consecutive phases. The quantitative data is collected and analysed in the first phase and provides general insights into the research problem. In the second phase, the qualitative data is collected and analysed. This data is then used to provide in-depth explanations of the statistical results obtained in the first phase [53,54]. The rationale for using a mixed methods approach is that the combination of quantitative and qualitative analysis allows us to capture both the overall trends as well as the details of situations so that researchers can benefit from the strengths of each method [55]. In the remainder of this section, we elaborate on the methodology employed in each phase.

3.2.1. Quantitative Phase

The data for the quantitative phase were gathered by administering questionnaires. This phase allowed to form a first impression of teachers' perceptions of the coaches, the interaction between coaching activities and the team learning process, and the interaction between coaching activities and the outcomes of the trajectory.

Instrument

The questionnaire was administered during the closing session. It was designed so that the responses would provide insight into the three main categories of the theoretical framework: coaching activities, the team learning process, and the trajectory's outcomes. It was emphasised that the data would be handled confidentially and used for research purposes only. All teachers agreed with their participation in the study. The instrument was developed in Dutch.

To indicate the coaching activities, we constructed four subscales, reflecting activities that are categorised as goal-oriented, content-wise, organisational, or group-dynamic. Given the importance of adapting coaching activities to the TDT's needs [45], the instrument additionally included an item on whether the support indeed aligned with these needs. Perceptions of the team learning process were captured by the TLBB scale [47]. To assess the trajectory's outcomes, we used existing scales measuring perceptions of team effectiveness [47] and the quality of material developed [adapted from 9]. We additionally included an item assessing general evaluations of the trajectory as a whole. To examine self-efficacy with regard to the reform, we developed a new scale, as described in Section 2.3. This scale had also been administered in the introductory meeting, so that we were able to capture the change in self-efficacy. Table S1 provides an overview of example items for each scale, and Table S2 elaborates on the scales' internal consistency.

The majority of scales in the instrument (except general evaluation and self-efficacy) measure constructs that are conceptually meaningful at the team level. For example, the item "The team members agreed on what we wanted to accomplish" is phrased such that the perception of the entire TDT, rather than the individual, serves as the referent [56]. For this type of item, the individual responses of teachers are not independent. Rather, correlations among the responses of team members

are expected. We follow Raes, Kyndt, Decuyper, Van den Bossche and Dochy [57] in assessing the interrater agreement using the $R_{wg(j)}$ estimator by James, Demaree and Wolf [58] before aggregating the responses of the different members of the TDT. We elaborate on the findings in Supplementary File C.

The scales assessing the coaching activities, the team learning process, and the outcome variables team effectiveness, quality of material, and general evaluation were also administered among coaches. After all, the perceptions of teachers and coaches might differ. In Supplementary File D, the responses are compared.

In addition to the scales, teachers in TDTs with solely an external coach were asked whether they felt that an internal coach would have been beneficial. In addition, they indicated whether an internal coach "emerged" throughout the process. Teachers in TDTs with an internal coach reported whether they felt as if the external coach, who internal coaches could rely on, was an added value during the process. As for the teachers, the instrument for external coaches examined whether one of the teachers had taken on the role of (internal) coach. The internal coaches were asked whether they had needed and valued the support from the external coach.

Sample

In total, 69 teachers from 20 TDTs completed the instrument. Teachers' responses from two TDTs were removed from the analysis; one TDT had not finished the trajectory and in the other TDT, the initial team coach was substituted. Therefore, the eventual sample for the quantitative analysis consists of 63 teachers (N_i) from 18 TDTs (N_t). Of these teachers, 43 had also completed the instrument that was administered in the introductory session. Since the sample size is relatively small and would be further restricted when solely including teachers who completed both questionnaires, the quantitative analyses focus on the full sample (except for when the change in self-efficacy is considered). Within the 18 TDTs, the average team size was 3.5. Of the teachers in the final sample, 57% were female. An overview of the sample, including information on the subject-specific focus of each TDT, is provided in Table S5.

The instrument for coaches was completed by six external team coaches. Since one of the coaches who supervised multiple TDTs completed the instrument for two TDTs, this results in a total of seven responses. We additionally collected the data of eight internal coaches.

Data Analysis

The quantitative analysis started with retrieving descriptive statistics that provide insight into teachers' perceptions of the activities of the coach, the team learning process, and the trajectory's outcomes. Next, we constructed a correlation matrix that presents the correlations between these elements. Since the responses to the questionnaire items were on a Likert-scale, we estimate Spearman correlations.

3.2.2. Qualitative Phase

To gain a deeper understanding of the exploratory findings retrieved in the quantitative phase, qualitative data were collected by conducting interviews with a selection of the team coaches. Given that teachers had repeatedly indicated they experience TDT participation as highly time-consuming, especially on top of all other teaching tasks, we did not interview teachers.

Interviews

By conducting semi-structured interviews, we aimed to gain in-depth insights into how the team coaches approached and shaped their role [59]. By asking general, open-ended questions and probing, we strived to gain as many insights as possible and to avoid socially desirable answers [60,61]. The coaches were informed that the data would be handled confidentially and used for research purposes only. All coaches agreed with the interviews being audiotaped and their participation in the study. The interviews were conducted in Dutch.

Sample

Two external coaches supervised multiple TDTs and were both interviewed about two TDTs. In total, interviews on seven TDTs with external coaches were conducted. Similarly, seven internal coaches were interviewed. The interviews all took between 30 and 45 min. Coaches could correct the transcripts if desired, but the authors did not receive any comments. Table S5 indicates from which TDTs the coaches were interviewed.

Data Analysis

We started analysing the interviews using an a priori, deductive approach. This implies that a coding scheme was developed, which was then applied to the transcribed text. The scheme was based on the concepts in the theoretical framework. This first phase was followed by using an inductive approach, allowing us to determine subcategories of codes. In both phases, the authors elaborately discussed and agreed upon the coding schemes.

Table 1 shows the final overview of the coded categories, including descriptions of each category. For all codes, we report the share of external and internal coaches who explicitly referred to these items in the interviews. Note that the descriptions of the qualitative results in Sections 4.1.2 and 4.4.2 provide an additional, more nuanced view, given that this allows us to provide more context to the findings. Furthermore, this enables us to also describe indirect references to particular categories. The final column shows representative examples of the coding categories, derived from the transcripts.

Table 1. Overview of coded categories.

Coded Category	Description	% of Respondents		Representative Qualitative Comment
Background characteristics internal team coaches				
Background—coaching or TDT experience	References to prior experience of the team coach with participation in PLCs, (PLC) coaching, and experience/background in teaching in general	N.A. 100%	External Internal	"I was already a member of the learning communities before they . . . in previous years they called them PLCs [. . .]. I did that for two years."
Perceived coaching competences	References to the extent to which the team coach felt competent to take on this role	N.A. 100%	External Internal	"In that regard I didn't find myself competent, because in the introductory session I was like, wow, I can never turn all that negative energy in my role as team coach."
Initial self-efficacy	References to the extent to which the team coach felt self-confident to implement the new learning standards, before the start of the trajectory	N.A. 75%	External Internal	"When we saw the first draft of the new learning standards, and the transversal ones, and the key competences. We were all like, what is this?"
Goals—reasons participation	References to team coaches' goals or reasons for participating in the trajectory	N.A. 100%	External Internal	"I do not have a permanent job. So it seemed smart to also become important within my own school in this way."
Coaching activities				
Goal-oriented coaching				
Goal setting	References to how the team coach influenced the process of determining the goal/focus of material	50% 75%	External Internal	"I knew, I had a pretty good idea on what I wanted. I wanted a tool that was usable in multiple contexts. And I have been able to pitch that idea."
Focus on goal	References to how the team coach kept the TDT focused on reaching its goals	50% 50%	External Internal	"Yes, I have tried to keep the team members focused. Because it easily becomes a chatty café. So get back to the point."
Content-wise coaching				
Guarding quality	References to how the team coach guarded the quality of material that was being developed	67% 38%	External Internal	"I have tried to always adjust in the right direction, and to think critically. I have a good feeling about that, let's state it like that."
Expertise	References to knowledge transfer by the team coach in general, and the provision of information on the new curriculum in specific	67% 38%	External Internal	"Every now and then there was a need for information, and then I took on the role of the pedagogical expert, the advisor."

Table 1. *Cont.*

Coded Category	Description	% of Respondents		Representative Qualitative Comment
Co-creating content	References to the extent to which the team coach co-developed material	33% 75%	External Internal	"I realised […] I am not solely going to focus on guiding the other two teachers. And then I started to also develop material myself."
Organisational coaching Task division—agreements—communication between meetings	References to how the team coach divided tasks and made agreements, references to how the coach ensured that these were obeyed, and references to the coach taking care of the communication in between physical meetings	50% 38%	External Internal	"So then I took the report. Okay, today we need to work on this and that. Then we split up into two groups and came back together after three hours."
Group-dynamic coaching Convince–motivate for TDT task	References to events where the team coach strived to convince the team members of the relevance of the trajectory and references to events where the coach encouraged team members' overall motivation	50% 38%	External Internal	"And then it is my job to try to motivate them to still collaborate. Which is not always so easy."
Being understanding—listening	References to how the team coach dealt with both personal and professional concerns within the TDT	50% 50%	External Internal	"Another person e-mailed us that he was dealing with rough emotional problems. With a divorce. Understandable. He also sent that e-mail to the external coach. And we both responded in the same way."
Adaptive coaching	References to team coaches' attempts to adapt their coaching activities to the needs of the TDT	50% 50%	External Internal	"So I think that it is a personal style. To first observe and … If I feel we are not getting anywhere, to take the lead."
Interaction coach types				
Training trajectory—support in coaching	References to the extent to which internal team coaches felt supported by the external team coach, and references to the training trajectory of the internal coaches	N.A. 100%	External Internal	"So we received the training by OVSG. And I was pretty satisfied with that actually."
Emergence internal coach	References to the extent to which one of the team members took the lead during the trajectory	83% N.A.	External Internal	"Also, there was someone who started demonstrating leadership"
Coach multiple TDTs	References to cases of (external) team coaches supervising multiple TDTs	67% N.A.	External Internal	"The switching between groups, it makes you feel like an octopus"

Note. Overview of the coded categories. For each category, a description of the category is provided. The % of respondents column reports the share of external and internal coaches explicitly referring to each of the categories. The final column provides example statements from the interviews for each coded category. PLC—professional learning communities.

4. Results

Each of the following subsections starts with an overview of the teachers' responses to the questionnaire items. Specifically, Section 4.1 shows the descriptive statistics on the coaching activities; Section 4.2, those on the team learning beliefs and behaviours; and Section 4.3, those on the trajectory's outcomes. In Sections 4.2 and 4.3, we additionally refer to the correlation matrix that provides insight into whether the coaching activities are related to the team learning aspects and outcome variables. Section 4.4 concludes with perceptions of both teachers and coaches on the interaction between external and internal coaches. In Sections 4.1 and 4.4, we will complement the pattern of results in the quantitative data with in-depth insights obtained by the qualitative data.

4.1. Coaching Activities of External and Internal Team Coaches

4.1.1. Quantitative

The teachers' responses to the questionnaire items are presented in Table 2. We first discuss the results presented in the first column, which shows the average scores without distinguishing between TDTs who were supervised by an external or internal team coach. We continue by discussing the responses for the external and internal coaches separately. We conduct *t*-tests to reveal whether there are statistically significant differences in perceptions of the coaching activities of the two coach types (i.e., external and internal). However, due to the relatively low sample size, especially for the internal coaches, there is little statistical power to detect significant differences. We, therefore, also discuss the general trends observed in the descriptive data. Table S6 shows the descriptive statistics for each TDT separately.

Focusing on the average scores for external and internal coaches combined, we observe that three of the five categories are scored between 3.85 and 3.90. The score for group-dynamic coaching is somewhat higher, namely, 4.32. This implies that teachers were particularly positive about coaches' abilities to ensure a good dynamic within the TDT. Given that one of the group-dynamic coaching activities is ensuring that all team members have input in the process, the results suggest that the coaches sufficiently encouraged shared leadership. Adaptive coaching is scored with an average of 3.72, which is lower than the values of the more specific activities, but still hints towards a relatively positive evaluation on the ability of the coaches to sense the needs of the TDT.

Comparing the responses on coaching activities based on coach type, we observe that the pattern of results is similar for the two samples and in line with the results for the combined sample. However, for each category of activities, the internal coaches were scored higher than the external coaches. The *t*-test results indicate that this difference is only statistically significant for organisational coaching.

4.1.2. Qualitative

In this section, we elaborate on the activities performed by the external and internal coaches, using the data derived from the interviews. Regarding goal-oriented coaching, the data showed that both coach types played a role in two main elements. First, the coaches were involved in goal setting, as they helped deciding upon the content that would be focused on, and the form in which the material would be developed (Coaches A–C–E–L–M–N–O–P–R). Second, the coaches ensured that the TDT remained focused to reach this goal, for example by limiting the time spent on aspects other than developing material, and regularly checking whether the material still aligned with the initial goal (Coaches A–G–I–L–O–P–Q). With regard to goal setting, we note that external coaches tended to be less directive in the decisions than internal coaches. For example, Coach A reported, "By talking about the contents of the learning standards, together with the teachers, the choices were made relatively quickly. It was decided in consensus".

Table 2. Descriptive statistics on teachers' responses and *t*-test results.

	Combined		External		Internal		*t*
	M	*SD*	*M*	*SD*	*M*	*SD*	
Team coach							
Goal-oriented coaching	3.86	0.64	3.78	0.67	4.06	0.51	−1.61
Content-wise coaching	3.85	0.59	3.78	0.58	4.01	0.60	−1.41
Organisational coaching	3.90	0.69	3.78	0.75	4.18	0.42	−2.18 *
Group-dynamic coaching	4.32	0.53	4.27	0.58	4.43	0.41	−1.07
Adaptive coaching	3.72	0.71	3.63	0.76	3.95	0.53	−1.69
Team learning							
Team learning beliefs							
Psychological safety	4.16	0.39	4.08	0.40	4.34	0.29	−2.61 *
Interdependence	4.10	0.40	4.06	0.39	4.18	0.42	−1.17
Social cohesion	3.94	0.38	3.94	0.42	3.93	0.28	0.09
Task cohesion	3.69	0.65	3.59	0.74	3.95	0.24	−2.08 *
Group potency	3.67	0.31	3.64	0.32	3.74	0.30	−1.13
Team learning behaviours							
Construction	4.24	0.37	4.18	0.39	4.39	0.25	−2.09 *
Co-construction	4.12	0.31	4.06	0.33	4.25	0.21	−2.25 *
Constructive conflict	4.10	0.36	4.04	0.40	4.23	0.22	−1.95
Mutually shared cognition	3.75	0.48	3.73	0.45	3.82	0.55	−0.67
Outcomes							
Team effectiveness	3.86	0.53	3.80	0.52	3.99	0.53	−1.28
Quality of material	3.80	0.48	3.85	0.45	3.68	0.54	1.29
General evaluation (i)	3.68	1.06	3.75	1.04	3.53	1.12	0.77
Self-efficacy reform (i)	3.90	0.60	3.97	0.66	3.74	0.43	1.43
Change in self-efficacy (i)	0.69	1.01	0.69	1.09	0.67	0.70	0.06
N	63		44		19		63

Note. Items on all scales were answered on a five-point Likert scale from 1 (strongly disagree) to 5 (strongly agree), except the general evaluation item, which was answered on a Likert scale from 1 (very dissatisfied) to 5 (very satisfied). The *t*-tests indicate the difference between the perceptions of teachers in TDTs with external and internal team coaches. Scales measured on the individual level are indicated by (i). * $p \leq 0.05$

Similarly, Coach E mentioned that he had encouraged the team to set its goals, but that the team members themselves eventually decided who would perform what task. In contrast, multiple internal coaches mentioned that they had clear visions on the type of material they would like to develop and that they were the ones making the eventual decisions (Coaches O–L–M–N). This implies that when goal setting is concerned, internal coaches were more likely to demonstrate vertical leadership behaviour than external coaches. However, they all mentioned they ensured that all team members agreed. Coach O, for example, mentioned the following, "I had a pretty good idea on what I wanted. I wanted a tool that was usable in multiple contexts. And I have been able to pitch that idea. And [teacher] agreed to help working on it".

Focusing on content-wise coaching, we observe that coaches performed multiple activities. In line with our expectations, particularly the external coaches were perceived as experts on the new curriculum, and they were regularly consulted in case TDT members had questions (Coaches A–C–G–I). As phrased by Coach I, "Every now and then there was a need for information, and then I took on the role of the pedagogical expert, the advisor […]".

Nevertheless, a few internal coaches also mentioned they engaged in knowledge transfer (Coaches L–N–P). Additionally, both coach types were involved in guarding the quality of the material that was developed. They ensured that the material captured the essence of the learning standards (Coaches B–P) and asked the members for updates and whether they required help (Coach L). TDTs were additionally encouraged to integrate aspects related to didactical innovation, such as differentiated instruction and formative evaluation. While external coaches A and G explicitly referred to having emphasised these aspects, the interviews indicate that TDTs with both types of coaches had paid

attention to didactical innovation. Finally, we note that with exception of Coaches A and G, it was mostly the internal coaches who had also actively taken part in the development process (Coaches A–G–K–L–N–O–P–R As mentioned by Coach N, "Because of the dropout of other members in the TDT, which occurred fairly soon, I realised, I am a creative person, I am not solely going to focus on guiding the other two teachers. And then I started to also develop material myself".

The main activities reported that reflect organisational coaching are to divide the tasks within the TDT, to make clear what needs to be done before the next meeting, and to check that the team members keep their agreements (Coaches A–C–I–M–P–Q). From the interviews, we derive that both types of coaches played a role in these activities. In addition, OVSG expected the internal coaches to write and upload a report after each meeting containing an overview of what had been done and about what was expected of the TDT members for the next meeting. This may be an explanation for why the organisational coaching activities of internal coaches were scored higher than those of external coaches, as was revealed by the *t*-tests in Table 2.

Then, the interviews indicated that the coaches performed several types of activities during the trajectory to establish positive group dynamics. The importance of the team coach in establishing a safe atmosphere within the TDT, as a basis for the entire team learning process was verbalised by Coach A:

> You need to ensure that, especially in the beginning, there is a comfortable, safe space, wherein people can collaborate. The eventual outcomes may only be of secondary importance. It is especially the collaboration, the group dynamic, that is essential. Because that is a precondition to take further steps in the future.
>
> —Coach A

Elaborating on how the coaches fulfilled this role, the interviews showed that in multiple TDTs, team members felt the need to share their concerns or complaints about the curricular reform or specific situations in their schools. Both external and internal coaches mentioned having allowed some time for reflection on these aspects (Coaches A–C–I–M–N). The internal coaches acknowledged that they had also valued it themselves to share concerns with colleagues. Coaches C, G, K, and N mentioned efforts to be positive, enthusiastic, and motivated themselves, so that this would transfer to the team members. Coaches I and P noted that in their TDTs, not all members were motivated to actively contribute. They, therefore, tried to convince them of the TDT concept and their responsibility to co-create material. A few coaches reported situations wherein a team member was unable to meet certain agreements for private or professional reasons. In these cases, the coaches strived to be understanding and to find solutions (Coaches O–P). Coach L specifically mentioned having ensured that all team members had input in the process. Whereas the interviews reflect a positive group dynamic in the majority of TDTs, this was not the case in TDT D, where the members had difficulties connecting. This is also reflected in teachers' evaluations of the group-dynamic coaching activities of the external coach, which were the lowest of all coaches, as shown in Supplementary File F.

With regard to adaptive coaching, some coaches mentioned that they tried to sense the needs of the team, and altered their role based on these needs. For example, Coach A mentioned having realised that it is important to adapt to the rhythm of the group, even when the process evolves slower than you had initially expected. Coach G reported the following on her coaching:

> It goes with the flow […]. I think that I try to give input when necessary, and for the rest, I give a lot of trust to the people I work with. I now had a group where I could exert influence. That is not always the case. Sometimes you have to invest longer in a group to be allowed to guide them. And here we had a pretty good match, so that could be done fast […]. But to say that this is a style I have, I think it goes pretty naturally. It is not a conscious choice.
>
> —Coach G

Potentially, this coach's respect for the shared leadership within the team may have contributed to the teachers' positive evaluations on the adaptive coaching of Coach G. Similarly, Coach E described his coaching style as intuitive, especially at the beginning. The case of TDT D highlighted that coaches may not always sense the needs of the TDT correctly. Whereas Coach D had the impression that there were sufficiently skilled teachers within the team so that it would reach its goals, it appeared gradually that in addition to the dubious group dynamic, the TDT experienced difficulties to set clear goals and to work productively. With hindsight, more vertical leadership by the external coach might have improved the team's process. Whereas the external coaches tended to discuss adaptive coaching most extensively, two internal coaches mentioned a few specific elements related to adaptive coaching. Coach Q reported to have based the division of tasks based on her senses of who could do what type of task best, and Coach L said that it is her coaching style to first observe the behaviour of team members, and to only intervene when she feels that this is necessary to help the group progress.

4.2. Coaching Activities and Team Learning

The first column in Table 2, showing the results for the coach types combined, shows that the average scores for the team learning beliefs all lie between 3.67 and 4.16. Psychological safety and interdependence were scored highest. The team learning behaviours were scored 4.24, 4.12, and 4.10 for construction, co-construction, and constructive conflict, respectively. These latter results are intuitive given that co-construction and constructive conflict are less common to occur in a starting team [57]. Mutually shared cognition is scored with an average of 3.75.

When comparing teachers' responses between TDTs with external with the internal coaches, we observe that as for the combined sample, the average scores are highest for psychological safety and interdependence for both coach types. With exception of the social cohesion scale, where the difference between the coach types is negligible, the descriptive statistics indicate that scores are generally higher in TDTs with internal coaches than in TDTs with external coaches. As indicated by the *t*-tests, these differences are statistically significant when the psychological safety and task cohesion scales are concerned. In addition, for the team learning behaviours, the pattern of results for TDTs with external and internal coaches are comparable to each other, as well as to the combined sample. Teachers of TDTs with an internal coach scored these aspects higher than those in TDTs with an external coach. The differences are statistically significant for construction and co-construction. We do not observe a difference between TDTs with external and internal coaches for the mutually shared cognition scale.

Table 3 displays the results of the correlational analyses. Panel A shows the correlations between the coaching styles and the team learning beliefs and behaviours. We follow the classification of Evans [62] in interpreting the strength of the correlations: correlations less than 0.20 are considered as very weak, those from 0.20 to 0.39 as weak, those from 0.40 to 0.59 as moderate, those from 0.60 to 0.79 as strong, and those from 0.80 or greater as very strong.

The matrix shows that for the majority of combinations, there are statistically significant, positive correlations between coaching activities and the team learning beliefs and behaviours. Most of these correlations are either moderate or strong. This implies that the coaching activities and the team learning process clearly interact with one another. Nevertheless, note that we cannot assume causal relationships from these correlations. We discuss a few aspects in more detail.

First, the group-dynamic coaching style has the most consistent correlation with team learning, given that it significantly correlates with all beliefs and behaviours, as well as the mutually shared cognition scale (even though the latter is considered a weak correlation). Therefore, it appears that having a coach who ensures a positive dynamic within the group positively interacts with the entire team learning process. From the four coaching styles, content-wise coaching is least consistent in its interaction with the team learning process. Note that we still observe moderate to strong correlations with psychological safety, task cohesion, group potency, and construction, but that the remainder of correlations are either not significant or considered as weak correlations.

Second, we observe that there are no correlations between content-wise and organisational coaching on the one hand, and social cohesion on the other hand. The correlations with goal-oriented coaching and adaptive coaching are significant, but categorised as weak. These results do not seem surprising, since activities such as keeping the team focused, bringing in expertise, and taking care of logistics, also intuitively do not necessarily align with team members feeling a sense of friendship within the TDT.

Third, we notice that for mutually shared cognition, the correlations with the four specific coaching styles are either not significant, or are considered as weak correlations. This implies that while for the majority of team learning beliefs and behaviours, we observe clear interactions with coaching activities, this does not hold for mutually shared cognition. However, we do observe a moderate correlation with adaptive coaching. Therefore, it appears that adequately responding to the needs of the TDT benefits the sense of mutual understanding on the task, and how it should be executed.

Supplementary File G demonstrates that the correlational matrix looks highly similar when we control for multiple testing and that this robustness test even results in the majority of correlations between coaching activities and the general evaluation item becoming significant.

Table 3. Correlation matrix.

Panel A: Correlations between Coaching and Team Learning					
N = 63	**Goal-oriented coaching**	**Content-wise coaching**	**Organisational coaching**	**Group-dynamic coaching**	**Adaptive coaching**
Team learning					
Team learning beliefs					
Psychological safety	0.736 ***	0.515 ***	0.731 ***	0.881 ***	0.706 ***
Interdependence	0.571 ***	0.337 **	0.526 ***	0.606 ***	0.367 **
Social cohesion	0.387 **	0.170	0.136	0.502 ***	0.339 **
Task cohesion	0.733 ***	0.537 ***	0.713 ***	0.697 ***	0.698 ***
Group potency	0.671 ***	0.639 ***	0.640 ***	0.736 ***	0.491 ***
Team learning behaviours					
Construction	0.700 ***	0.564 ***	0.677 ***	0.688 ***	0.509 ***
Co-construction	0.546 ***	0.369 **	0.432 ***	0.558 ***	0.219
Constructive conflict	0.443 ***	0.157	0.327 **	0.430 ***	0.185
Mutually shared cognition	0.378 **	0.194	0.234	0.392 **	0.567 ***
Panel B: Correlations between coaching and outcomes					
N = 63	**Goal-oriented coaching**	**Content-wise coaching**	**Organisational coaching**	**Group-dynamic coaching**	**Adaptive coaching**
Outcomes					
Team effectiveness	0.403 ***	0.287 *	0.264 *	0.571 ***	0.300 *
Quality of material	0.481 ***	0.503 ***	0.404 ***	0.310 ***	0.344 **
General evaluation (i)	0.218	0.203	0.217	0.290 *	0.164
Self-efficacy reform (i)	−0.002	0.032	−0.067	−0.048	−0.111
Change in self-efficacy (i) (N = 43)	0.195	0.068	0.225	0.238	0.219

Note: Spearman correlations. Scales representing constructs measured at the individual level are indicated by (i). * $p \le 0.05$ ** $p \le 0.01$ *** $p \le 0.001$.

4.3. Coaching Activities and Outcome Variables

Focusing on the outcome variables, we observe in the first column of Table 2 that team effectiveness, quality of material, and self-efficacy reform are scored between 3.80 and 3.86. The general evaluation item is scored somewhat lower, namely, 3.68. The absolute average change in self-efficacy score, thus, the change from before to after the TDT trajectory, is 0.69. Note that this latter value was calculated using a sample size of 43, as not all teachers had also completed the scale in the introduction session. Performing a *t*-test on this sample shows that this increase in self-efficacy is significant ($t = -6.54$, $p < 0.001$). Based on these scores, we conclude that the average teacher positively evaluated the team coach, the team learning process, and the trajectory's outcomes.

Comparing the descriptive statistics of teachers in TDTs with an external coach with those in TDTs with an internal coach, we notice that in contrast to the previously discussed elements, the majority

of variables, except for perceived team effectiveness, are scored higher in TDTs with an external coach. This indicates that a more positive evaluation of the coaching activities and the team learning process does not necessarily result in enhanced satisfaction with the trajectory's outcomes. However, note that the *t*-test results show that the differences between TDTs based on coach type are not statistically significant.

Panel B of Table 3 shows the correlations between the coaching activities and the outcome variables. The data indicate that all four specific categories, as well as adaptive coaching, correlate significantly with perceived team effectiveness. These correlations are moderate to strong for goal-oriented coaching and group-dynamic coaching, but weak for content-wise, organisational coaching, and adaptive coaching. Similarly, all categories, except adaptive coaching, correlate with the quality of material that was developed in the TDT, with moderate to strong correlations. Given that we observe the strongest correlations between the outcome variables and group-dynamic coaching, this may indicate that coaching activities that encourage a positive dynamic within the group influence the trajectory's eventual outcomes. Potentially, this also relates to the findings discussed in Section 4.2, where we noticed that the group-dynamic coaching activities seem to be most consistently related to the team learning process. There does not seem to be an interaction between coaching activities and teachers' evaluations of the trajectory as a whole, given that solely for group-dynamic coaching, we observe a significant, but weak, correlation. Neither are there any significant correlations between coaching and the self-efficacy variables.

4.4. Interaction between External and Internal Coaches

4.4.1. Quantitative

This section first discusses whether teachers in a TDT with an external coach felt as if the TDT would have benefited from also having an internal coach. We then present both teachers' and external coaches' responses on whether an internal coach emerged during the process. Finally, we turn to teachers in TDTs with an internal coach, who indicated whether they perceived the support of an external coach as necessary and if this was a valuable complement to the internal coach. These questions were asked to the internal coaches themselves as well.

In total, 25 of the 44 the teachers with an external coach responded to the item on whether an internal coach would have been desirable. This was scored with an average of 3.56 (SD = 1.23), implying that according to the teachers of at least few TDTs, this could have been beneficial. We asked teachers to elaborate on their answers. One teacher mentioned that the external coach solely paid attention to other TDTs, which is why an internal coach would have been relevant. The average response to the item on whether an internal coach had emerged during the process was 3.00 (SD = 1.29). One teacher reported that she felt as if she was "handed" the role of internal coach as she had worked with the external coach before during a school inspection. One teacher switched to another group where he then helped steering the process.

Turning to TDTs with an internal coach, 15 of the 19 teachers responded to the questionnaire items on the interaction with the external coach. The first item referred to whether it was necessary that the internal coach was supported by an external coach. The average score was 3.44 (SD = 1.25), with eight teachers scoring this item with a 4 or 5. The second item referred to whether the teachers perceived the external coach as an added value, and the average score was 3.40 (SD = 1.55). This item was scored with a 4 or 5 by seven teachers. These results imply that teachers' perceptions on the need for an external coach differed between the TDTs. The average response of the eight internal coaches themselves on whether they had felt the need for support from an external coach was 4.00 (SD = 0.76). A few coaches elaborated on their response. One of the coaches reported that the external coach was an added value because of the expertise that was brought in, while another coach mentioned that he had needed help with the administrative tasks. A third coach said that it was assuring to have an external coach as back-up, but that the support was not needed.

4.4.2. Qualitative

The qualitative data provide additional insight into the support that internal coaches received from the external coaches and into the situations wherein an internal coach emerged during the process. Confirming what was indicated by the questionnaires, internal coaches largely appreciated the presence of an external coach. First of all, they praised external coaches' expertise in the new curriculum. Internal coaches turned to the external ones whenever they had questions on the (implementation of) learning standards and to ask whether the TDT was heading in the right direction with their work-in-progress (Coaches L–O–P–R). Furthermore, Coach M reported that she received support in how what she had learned in the TDT could be shared within her own school. Coach N additionally mentioned that he valued the fact that the external coach listened to teachers' concerns on the new curriculum, and that feedback was always phrased in a positive way. One of the external coaches was, due to private reasons, only limitedly available. The internal coach reported that this was challenging sometimes, as it was unclear who to turn to with questions.

In a few TDTs that were supervised by external coaches, and especially in those cases where this coach needed to share the attention between multiple TDTs, an internal coach naturally emerged, who took over coaching activities (Coaches A–C–D–E–I). As mentioned in previous sections, Coach D mentioned having overestimated the capacities of this person to steer the group in the right direction. The other external coaches, however, were positive about the "internal" coaches. Among others, these team members made agreements and ensured that teachers continued working on the material at home. The internal coach in TDT C was even able to reassure her team members that they would succeed in reaching their goals. As a general conclusion, both external coaches who supervised more than one TDT emphasised that in future initiatives, each TDT should be appointed a separate coach that is present throughout the entire trajectory (Coaches A–C–D–E).

5. Discussion

We conducted a mixed methods study with two main objectives: comparing the coaching activities of external and internal team coaches of TDTs and evaluating how coaching affects the team learning process and the TDT trajectory's outcomes.

Focusing on the first objective, the questionnaire responses indicated that teachers generally evaluated the coaching activities of both external and internal coaches positively. While the scores were systematically higher for internal than for external coaches, this difference was only statistically significant for organisational coaching. The interviews with coaches revealed more details on how the coach types differed in fulfilling their roles. With regard to goal-oriented coaching, we noted that external coaches primarily demonstrated shared leadership behaviour by facilitating a discussion to decide what type of material the TDT would develop, while the approach of internal coaches was more vertical, as they explicitly proposed specific suggestions themselves [37]. This finding contrasts what is suggested by Morgeson, et al. [40], namely that external, formally assigned coaches tend to be better positioned to establish team goals and expectations than internal, formally assigned coaches. A potential explanation is related to the fact that TDTs aim to develop materials that team members can eventually use in their own teaching practice. Given that internal coaches are teachers themselves, they might have been more eager to share their ideas on the material they would like to implement in the classroom. External coaches are not expected to actually make use of the developed materials and may, therefore, have been more likely to let the team members come up with specific suggestions.

For content-wise coaching, the data showed that primarily the external coaches brought in expertise on the new curriculum. This aligns with previous studies who emphasised the need for support of external coaches in sharing curricular knowledge with the team members [10,23]. We additionally observed that internal coaches more often engaged in co-developing material than external coaches. This finding corresponds with Morgeson, et al. [40], in which performing the team task is suggested to better suit internal rather than external coaches.

Both coach types engaged in organisational activities, such as ensuring communication between meetings and the division of tasks. As OVSG expected internal coaches to upload a report after each meeting, this may have resulted in the observed difference in teachers' perceptions of organisational coaching.

Focusing on group-dynamic coaching, we noted that both external and internal coaches engaged in a variety of activities, but that there were no particular differences between the coach types. This implies that whereas it has been suggested that internal coaches might be more likely to support the positive dynamic within the group [40], this was not confirmed in the present study. Rather, it was one of the external coaches who emphasised that a positive atmosphere in the TDT is a precondition for the remainder of the team learning process. Teachers' positive evaluations of the group-dynamic coaching activities of the team coaches suggest that they succeeded in encouraging shared leadership, rather than overly engaging in vertical leadership behaviours.

Finally, for adaptive coaching, primarily the external coaches referred to adapting their coaching to the needs of the team. This may be explained by the fact that in the present study, the pedagogical experts are experienced coaches, in contrast to the majority of internal coaches. These findings support previous research indicating that external coaches often have a broader range of competences and more in-depth expertise [31,33], which enhances their ability to respond to potential problems.

With regard to the team learning process, the teachers evaluated the team learning beliefs, behaviours, and mutually shared cognition rather positively. Similar to the coaching activities, we noted that teachers in TDTs with an internal coach tend to score the majority of these aspects higher than teachers in TDTs with an external coach. For a few of the beliefs and behaviours, these differences were significant. The correlation matrix revealed that there are moderate to strong correlations between many of the coaching activities and the TLBB scales, indicating that these clearly interact with one another. Although no causal conclusions may be drawn, this finding seems to confirm that team coaches play an important role in the TDT process. Furthermore, the results imply that group-dynamic coaching has the most consistent correlation with team learning. This suggests that by successfully engaging in these activities, team coaches can create an important basis for the team learning process. Indeed, Schelfhout, et al. [44] stated that the effectiveness of learning communities is strongly dependent on the interpersonal interactions within the team.

Focusing on the outcome variables, our results indicated that teachers were generally positive about the team effectiveness, the quality of material, and the trajectory as a whole. In addition, the average teacher's self-efficacy increased after TDT participation. For all outcome variables except team effectiveness, we observe that scores are higher in TDTs with an external, rather than an internal coach. Although the differences between the coach types are not significant, this pattern of results contrasts the findings for the coaching activities and TLBB. Potentially, teachers in TDTs with an internal coach chose to be more lenient in evaluating the coaching activities than teachers in TDTs with an external coach, given that the internal coach was a peer teacher. Since perceptions of the trajectory's outcomes were likely to be influenced by factors other than coaching, this consideration of evaluating a peer teacher may not have played a role for the outcome variables. The correlation matrix seemed to indicate that coaching activities interact with team effectiveness and the quality of material, but that other factors appear more influential when perceptions of the entire trajectory or the (change in) self-efficacy towards the curricular reform are concerned.

Unravelling the interaction between the two coach types, the data indicated that at least in a few TDTs with an external coach, teachers would have valued the presence of an internal coach. In some of the TDTs, and primarily those where the external coach was not consistently present, an internal coach naturally emerged during the process. In the interviews, it was emphasised that each TDT should be supported by a formally assigned coach throughout the full trajectory. For instance, the absence of the external coach in one specific TDT, which resulted in a lack of both vertical and shared leadership, might have been one of the reasons for why this TDT experienced difficulties in terms of group dynamics, and the setting and reaching of goals. Focusing on teachers in TDTs with an internal coach,

it appeared to differ whether teachers perceived the additional support by an external coach to be an added value. Nevertheless, the data from the internal coaches suggest that in general, they benefited from the presence of an external coach.

We report three limitations of this study that give rise to future research. First, although our study took place in the context of a curricular reform that affected all secondary schools in Flanders, our sample size was limited. Among others, this is due to the fact that the school network initiating the TDT trajectory contains relatively few schools compared to other school networks. Furthermore, not all school leaders were willing or able to provide their teachers with the opportunity to engage in the initiative. As a result, our statistical analyses remained limited to conducting correlational analyses. Future studies are encouraged to perform (multi-level) regression analyses or structural equation modelling, which both allow for a more detailed and causal interpretation of the data. Furthermore, an increased power of the analyses would have been more informative in terms of determining whether differences between TDTs with external and internal coaches are statistically significant. The second limitation concerns the types of TDTs evaluated. Whereas we compared TDTs with external and internal coaches, the trajectory did not contain any TDTs without a formally assigned team coach. Whereas our results suggest an important role of the team coaches in the team learning process and its outcomes, future studies could consider employing an experimental design which includes a control condition wherein TDTs collaborate without an assigned team coach. As a final limitation, we emphasise that our study was conducted in a highly specific context, which limits the generalisability of our findings. Comparable evaluations of trajectories in different regions, and with different aims and time spans, for example, are needed to provide further evidence for our results.

In conclusion, the present study showed that team coaches play an important role in the team learning process. Additionally, coaching activities were shown to relate to teachers' perceptions of team effectiveness and the quality of material developed in the TDT. Teachers in TDTs with an internal coach seem to evaluate the coaching activities and the TLBB more positively than teachers in TDTs with an external coach. However, the reverse pattern of results was observed for the outcome variables.

Supplementary Materials: The following are available online at http://www.mdpi.com/2227-7102/10/10/263/s1, Table S1: Example items of scales (Supplementary File A), Table S2: Reliability of scales (Supplementary File B), Table S3: Interrater agreement within TDTs (Supplementary File C), Table S4: Comparison of teachers' and coaches' responses (Supplementary File D), Table S5: Overview of TDTs in analysis (Supplementary File E), Table S6: Descriptive statistics per TDT (Supplementary File F), Table S7: Correlation matrix after controlling for multiple testing (Supplementary File G).

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