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### Connecting practice-based research and school development. Cross-professional collaboration in secondary education

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# CHAPTER 2

## Characterizing cross-professional collaboration in research and development projects in secondary education<sup>1</sup>

### Abstract

Collaboration between practitioners and researchers can increasingly be observed in research and development (R&D) projects in secondary schools. This article presents an analysis of cross-professional collaboration between teachers, school leaders and educational researchers and/or advisers as part of R&D projects in terms of three dimensions: reasons for collaboration, the division of roles and tasks, and the communication structure. Data were collected in interviews with participants from twelve Dutch projects, from documents and from meetings with participants. The results show that the parties involved can have the same reasons for cross-professional collaboration but that the external educational experts may also have additional objectives. Roles and tasks were divided in different ways, depending on who directs and guides the research and development, and whether teachers were involved as teacher researchers in the project. The communication structure appeared to be linked to the division of roles and tasks, but also to the number of participants in the project. The three dimensions proved to be valuable viewpoints to study cross-professional collaboration in R&D projects in Dutch secondary education. Furthermore we distinguished four types of cross-professional collaboration in R&D projects. These types differ in the extent to which the school or the external party direct and guide the project: (a) School-directed collaboration; (b) School- and researcher-directed collaboration; (c) School- and adviser-directed collaboration; (d) Researcher-directed collaboration. Our findings can support participants to consciously choose a particular type of cross-professional collaboration that fits their purposes and specific situation.

**Keywords:** Cross-professional collaboration; teacher research; practice-based research; research and development projects

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<sup>1</sup> This chapter is based on Schenke, W., van Driel, J.H., Geijsel, F.P., Sligte, H.W., & Volman, M.L.L. (in press). Characterizing cross-professional collaboration in research and development projects in secondary education. *Teachers and Teaching: Theory and Practice*.

## Introduction

Collaboration between teachers, school leaders and external researchers or advisers in practice-based research is increasingly common in the Netherlands and internationally (Nutley, Jung, & Walter, 2008; Yashkina & Levin, 2008). There are many variations, from teachers who carry out a study on the outcomes of their lessons under external supervision in a research and development (R&D) project, to external researchers who do research on a school's language policy in collaboration with representatives from the school management (Cochran-Smith & Lytle, 1999; Darling-Hammond, 2010; Geijsel, Krüger, & Slegers, 2010). Various terms are used in the literature for this kind of collaboration between external educational experts and practitioners: mutual engagement (Huberman, 1990), cross-profession collaboration (Amabile et al., 2001), collaborative school-university research partnerships (Baumfield & Butterworth, 2007), engaged scholarship (Van de Ven, 2007) and researcher-practitioner collaboration (Coburn & Stein, 2010). In this article we use the term cross-professional collaboration because this particularly expresses the potential 'cross pollination' between the participants and emphasizes the professional background of both the researchers and the school practitioners (Penuel, Fishman, Cheng, & Sabelli, 2011; Van de Ven, 2007; Wagner, 1997).

Although some knowledge is available about cross-professional collaboration between educational researchers, teachers and school leaders (see e.g. Hora & Millar, 2011; Vanderlinde & Van Braak, 2010), in educational research little attention has been paid to analyzing the characteristics of cross-professional collaboration. The objective of the study described in this article, conducted in the context of twelve collaborative R&D projects in the Netherlands, is to gain insight into the characteristics of cross-professional collaboration between practitioners and educational experts in R&D projects in secondary schools and how this collaboration is shaped by the participants.

## Theoretical framework

We have derived three recurrent themes associated with cross-professional collaboration between practitioners and external educational experts from the contemporary literature (see e.g. Coburn & Stein, 2010; Huberman, 1990; Penuel et al., 2011; Rynes, Bartunek, & Daft, 2001; Wagner, 1997; Yashkina & Levin, 2008): (1) the reasons for cross-professional collaboration, (2) the division of roles and tasks between the practitioners and the external educational experts, and (3) the

communication between the parties. We will use these three themes to identify characteristics of cross-professional collaboration.

### **Reasons for cross-professional collaboration**

Governments in countries such as United Kingdom and the Netherlands stimulate cross-professional collaboration, for example through funding that encourages teachers to perform practice-based research and instigates R&D projects in schools (NAPDS, 2012; NTRP, 2012; SEED, 2002). In some R&D projects the focus lies on the school-based monitoring of an innovation by practice-based researchers; in other projects research results are used to stimulate school development. School development is referred to as activities that aim at improving educational practices (Slegers & Leithwood, 2010; Walter, Nutley & Davies, 2005). R&D projects create the opportunity to perform practice-based research. Practice-based research is seen as research aimed at generating useful – often situational – knowledge on and for educational practice and with the possibility of disseminating that knowledge (McLaughlin & Black-Hawkins, 2007; Vanderlinde & Van Braak, 2010). The research question is mostly locally oriented and contextual (see Coburn & Stein, 2010). Research with an orientation on practice should not be viewed as a research method, but more as a research approach with a focus on generating useful knowledge for practice. Depending on the research goal and question a choice is made for certain types of research, such as design-based research or specific forms of formative and summative evaluation (see e.g. Nutley et al., 2008; Penuel et al., 2011; Van de Ven, 2007).

The opportunity to engage with practically relevant questions may be a reason for external experts to participate in R&D projects. The setting of these projects makes them interesting, because compared to traditional research the possibility is increased that research results will have practical implications (Rynes et al., 2001; Vanderlinde & Van Braak, 2010). A reason for schools to collaborate with external researchers is the contribution of research to legitimizing an innovation at school. Research in the school is also seen as a way of working on teachers' professional development in the light of improving educational quality. In some schools teachers are stimulated to become teacher researchers who collect and analyse data about their school practice (Borko, 2004; Cochran-Smith & Lytle, 1999; Leeman & Wardekker, 2014).

### **Division of roles and tasks**

When practitioners and educational experts collaborate in R&D projects they contribute to closing the gap between academic educational research and educational practice (Broekkamp & Van Hout-Wolters, 2007; Gore & Gitlin,

2004). Several authors state that cross-professional collaboration enables an equal relationship in terms of power than in more traditional ways of performing research. The initiative for a study, for example, is not always taken by a researcher but may also lie with one of the practitioners (Taylor, 2008; Vanderlinde & Van Braak, 2010; Van de Ven, 2007). The funding scheme of R&D projects can influence the formation of collaboration, as it might demand that researchers and schools collaborate in a project. The participants may be provided with time and resources in order to come together and to be able to create a shared project goal. A funding scheme could also have an impact on the particular roles participants take, e.g. when participation of teachers as researchers is encouraged. Teacher research can address issues ranging from school-wide to individual problems, as is the case with action research, which often is characterized by a focus on practical problems of individual teachers (Gray, 2013; Platteel, Hulshof, Ponte, Van Driel, & Verloop, 2010). Often, teacher researchers are encouraged to collaborate with colleagues, comparable with the circumstances created in professional learning communities (Cochran-Smith & Lytle, 1999; Kirkwood & Christie, 2006; Stoll, Bolam, McMahon, Wallace, & Thomas, 2006).

Coburn and Stein (2010) have made an analysis of R&D projects and the way research results are disseminated. Their study makes clear that it is important to examine who directs and guides a project and what kind of roles and tasks teachers, school leaders and external researchers have in the development and/or research. Researchers have a dominant role in directing and guiding the research and dissemination activities, and no information is given on the possible role of advisers. The roles of practitioners vary from teachers and school leaders who are research respondents and users, to practitioners who share some research tasks with researchers and to teachers and school leaders who perform research independently (Coburn & Stein, 2010; Van de Ven, 2007).

Additional knowledge on how roles and tasks can be divided between external experts and practitioners can be found in the work of Wagner (1997) and Van de Ven (2007). Based on his studies and observations Wagner (1997) has distinguished three types of cross-professional collaboration: (a) researchers see the school as a laboratory, with practitioners providing the data, (b) researchers' and practitioners' expertise is utilized and research choices are made in consultation with each other, (c) researchers' and practitioners' tasks are shared with each other. One of the noteworthy points in these types of cross-professional collaboration is that researchers have different viewpoints on the research approach and research tasks that shapes the type of cross-professional collaboration (Wagner, 1997). In the type of cross-professional collaboration in which external experts and practitioners share research tasks, the researcher can be seen as an 'involved insider' in the

educational practice (Van de Ven, 2007). Often external educational experts have a role in R&D projects of helping or supporting the teachers and school leaders. Most of the time these experts are researchers, advisers or supervisors. Where previously the focus of such support used to be on innovative challenges, nowadays the focus also lies on developing research competences for teachers at school. Sometimes researchers give advice and feedback during the project on issues such as school development; in these cases they can be seen as advisers (Akkerman, Bronkhorst, & Zitter, 2011; Geijssel et al., 2010; Leeman & Wardekker, 2014; Taylor, 2008).

### **Communication structure**

It is essential for practitioners and external educational experts to have the capacity to collaborate, which can be supported by a good communication structure (Edwards, Lunt, & Stamou, 2010; Taylor, 2008). The communication structure might have impact on choices made regarding research goals. A good communication structure requires an appropriate consultation structure in which the participants see each other frequently and suitable means of communication are employed (Geijssel et al., 2010). In the literature on collaboration in R&D projects several rules and conditions are mentioned that stimulate communication (see e.g. Engle, 2010, p. 22-23): exploring the problem together contributes to relating to the subject; respecting each other's authority results in a contribution from everyone's perspective; being accountable to each other, including sharing norms and values, results in shared ownership; and lastly, investing sufficient time and money is necessary to build a communication structure that makes cross-professional collaboration possible. Time is necessary to build up a relationship of trust between participants. Continuity in the cross-professional collaboration is also crucial, which can be encouraged by building on a long-term partnership between for example school and university (Baumfield & Butterworth, 2007; McLaughlin & Black-Hawkins, 2007; Yashkina & Levin, 2008). Continuity is threatened by changes in participants and therefore communication. Discontinuity of the R&D project itself can occur when plans are not implemented (Penuel et al., 2011; Van de Ven, 2007).

### **This study**

In this article we aim at characterizing cross-professional collaboration between school leaders, teachers and educational researchers and/or advisers in R&D projects in Dutch secondary education. We define cross-professional collaboration

as a process in which the various participants involved come together for a diversity of reasons to achieve project goals by directing, guiding and performing research and development activities and through mutual communication. The following two research questions are of concern: (1) What differences and similarities in cross-professional collaboration in R&D projects can be specified in terms of reasons for collaboration, the division of roles and tasks, and the communication structure? and (2) What types of cross-professional collaboration can be derived from these differences? The three themes that were derived from existing literature were used as a dimensional framework in our study. The first dimension concerns the participants' 'reasons for cross-professional collaboration' and refers to the following aspects: the prior history of the cross-professional collaboration, the approach in practice-based research, who took the initiative to do the research, and whether there is congruency in the participants' reasons for the cross-professional collaboration. The second dimension concerns the 'division of roles and tasks' and refers to the questions who directs and guides the development and the research respectively and who is participating in research and development tasks. The third dimension concerns the 'communication structure' and refers to the following aspects: the consultation structure, frequency of the consultation and time investment of the participants.

## Method

The study was set up according to a multi-case study design and included twelve R&D projects in secondary schools in the Netherlands, in which empirical data was collected. The R&D projects received a research funding from the Dutch Council for Secondary Education for two or three years after the funding application was accepted. The funding scheme was intended for research projects based on a question posed by a school. The school concerned had to apply for the funding, although all of them were supported by an external party: educational experts from universities, universities of applied sciences, teacher education institutes and research and advice bureaus. The school leaders, teachers and external researchers and advisers who participated in these R&D projects form the research units in this study. Table 1 gives an overview and some basic characteristics of the twelve R&D projects under study using anonymized names: Project A to L.

These twelve R&D projects have been monitored intensively by the first author. For the present study, qualitative data gathered in the first year of the twelve projects were used. These data were collected in two rounds of interviews with project

managers, school leaders and researchers and advisers based on pre-structured interview guidelines. To minimize the effect of influencing each other's opinion during an interview, school practitioners and researchers were interviewed separately. The interview guidelines included topics on the dimensions and aspects of the cross-professional collaboration as described above, and on the progress of the projects. The first round of interviews included additional questions on previous cross-professional collaboration projects and expectations on reaching goals of the project. The second round of interviews with the same participants included additional questions on opinions of the way the cross-professional

▼ **Table 1** | Basic characteristics of the projects

<b>Project code</b>	<b>School locations</b>	<b>External organization</b>	<b>Content of project</b>	<b>Research approach</b>
Project A	1 school; 2 locations	Research bureau	Policy interventions in pupils' language and arithmetic skills; effect evaluation of pupils	Effect research
Project D	2 schools; 2 locations	Research and advice bureau	Develop educational theory and methods model for teenagers' school; evaluation pilots	Design-based and evaluation research
Project F	1 school; 1 location	University	Teachers develop teaching method for highly gifted pupils	Design-based research
Project G	1 school group; 4 locations	University	Develop instrument to measure reading skills	Instrument development
Project H	1 school group; 5 locations	University teacher education	Teachers develop teaching method for reading skills; effect evaluation of teachers	Design-based and effect research
Project J	1 school; 1 location	University teacher education; advice bureau	Teachers design teaching material; evaluation of pupils and teachers	Design-based research and advice
Project K	1 school; 1 location	University of applied sciences; research bureau	Use of games; effect evaluation of pupils	Effect research
Project M	1 school; 1 location	University teacher education; research bureau	Research on use of school exams protocol and mentor program and effect evaluation of alumni	Design-based and effect research
Project O	3 schools; 3 locations	Advice bureau	Teachers develop digital lessons; effect evaluation of pupils	Design-based and effect research
Project P	8 schools; 13 locations	Research and advice bureau	Insight into instruments showing effectiveness of learning-support resources	Monitoring and evaluation research
Project Q	1 school group; 3 locations	University of applied sciences; advice bureau	Develop instrument to measure reading skills after reading lessons; effect evaluation of pupils	Instrument development and effect research
Project R	1 school; 1 location	University teacher education	Teachers develop their teaching skills; effect evaluation of teachers	Instrument development and effect research

collaboration was working out. Supplementary documentation was also collected, namely project applications, progress reports by project managers and reports of meetings in which experiences were shared between participants of all projects. This documentation was used to receive context information on the projects, to prepare the interviews, and afterwards to check answers given in the interviews.

We conducted a qualitative analysis of the transcriptions of the interviews and documentation with the help of pre-prepared coding schemes (based on elements from the research question and the interview guidelines), see Appendix A and B. MaxQDA (version 10) was used for the coding. A second researcher was asked to code two interviews from the first round using the coding scheme to determine the inter-coder reliability. The number of codings on which there was agreement was divided by the total number of codings and this figure was multiplied by 100. There was 95 per cent agreement on the first interview and 84 per cent on the second, which is well above the percentage of 83 per cent that Miles and Huberman (1994) consider to be adequate. The interrater reliability of the first interview is 0.95 in terms of Cohen's Kappa and the second 0.82, which both can be considered as almost perfect (Cohen, 1960). As an additional result of the dialogue with the second researcher, we added further description to six codes in the coding schemes to make them more distinctive from other codes.

The coded fragments of text and the relevant information from the applications, progress reports and the reports of meetings were then sorted per project per dimension of cross-professional collaboration. Tables were composed for each project with notes and/or citations for each aspect of the three dimensions of cross-professional collaboration (*within-site* matrices, see Miles & Huberman, 1994). The projects were entered in the rows and the aspects in the columns. A *cross-site* analysis was then made in which the information was entered per dimension (and within the dimensions per aspect) in a table, so that the projects could be compared to find differences and similarities (Miles & Huberman, 1994). Where possible, the basic characteristics of the projects, as shown in Table 1, were related to aspects such as congruent or additional goals. In this way, the potential influence of these characteristics on the different aspects could be revealed.

With the second research question in mind, a follow-up *cross-site* analysis was made. First we identified decisive aspects within the three dimensions that specifically showed differences between the projects. Then we looked for patterns in these aspects across the dimensions that might justify the characterization of types of cross-professional collaboration. These patterns became visible on the moment the outcomes on these aspects were placed in a table. The decisive aspects were entered in the columns and projects that had comparable outcomes were placed jointly in the rows.

The analysis was conducted by the first author. As a form of audit, the research team discussed all the steps in the process of analysis and its outcomes, and where necessary the primary data were rechecked (Miles & Huberman, 1994).

## Results

### Reasons for cross-professional collaboration

As can be seen in Table 2, in ten of the twelve projects, the school took the initiative to collaborate within the framework of the research funding, the exceptions being Projects K and R, where the researchers initiated the application for funding (see ‘application author’ column in Table 2). Each of the schools sought external parties who could contribute to answering their research questions. The school leader in Project J clearly states that the external institute has:

...to make an active contribution to our own development in the school. With an emphasis on our own development.

▼ Table 2 | Reasons for collaboration

Project code	Previous history	Application author	Collaboration goal
<b>PROJECTS WITH CONGRUENT REASONS</b>			
Project A	Existing	School and external party	Legitimize innovation
Project D	Existing	School	Legitimize innovation
Project F	New	School	Professionalization teachers
Project G	Existing	School	Legitimize innovation
Project H	New	School	Professionalization teachers
Project J	Existing	School	Legitimize innovation
Project M	Existing	School and external party	Legitimize innovation
Project O	Existing	External party	Professionalization teachers
<b>PROJECTS WITH EXTERNAL PARTIES' ADDITIONAL REASONS</b>			
Project K	New	External party	Legitimize innovation and sales
Project P	Existing	External party	Legitimize innovation and disseminate
Project Q	New	School and external party	Legitimize innovation and sales
Project R	New	School and external party	Professionalization teachers and science

Our analyses showed that in eight projects the reasons for collaboration matched those of the external parties (see 'Collaboration goal' column in Table 2). One of the researchers expressed this as follows:

We have a common goal and we try to make the best of it. As I do the research, they do something with it. So I really see it as collaboration. Making the project succeed together.

External experts appear to comply with the wishes of the school, particularly in the projects with congruent goals of the school and external party. As one of the researchers said:

This type of research is very much based on the needs of the schools themselves. You notice that in the research, because the school cooperates, for example, in organizing the pupils for the research. The schools are highly motivated to cooperate on the research... I try to fit in with the school's rhythm, such as the summer holiday. Then I don't make any appointments with the school. And if the school needs me several times one week, I'm prepared to do this. In that sense I'm flexible.

Moreover, as can be seen when relating these results to the basic characteristics of the projects (Table 1), the studies that were conducted in these eight projects were practice-based and not primarily aimed at creating academic knowledge. The approach in research chosen in these projects was mainly design-based, which provided teachers and school leaders the opportunity to actively participate in the research (six out of eight). It is also noticeable that in a relatively high number of these schools, collaboration with external parties was already existing (six out of eight) and that the majority of the schools wrote the application for the funding themselves (five out of eight). These findings indicate that research skills and knowledge were present in these schools before the project started. An existing collaboration between a school and an external party seems to predict congruency in reasons for the collaboration, in which the external educational experts declare to have school interests first.

When asked in the interviews to point out the goals for collaborating in the project, the participants most frequently mentioned goals that can be considered fitting either in legitimizing an innovation (five projects) or in teachers' professionalization (three projects). Projects such as Projects A and G have introduced an innovation in their schools in the subject of

reading, which is evaluated. Teachers' professionalization is indeed important for example in Project F, as the project manager stated:

To get insight in how various teachers develop themselves from the moment they are working in a group in a development project.

In the Projects K, P, Q, and R there were additional reasons for collaboration next to legitimization (three out of four) and professionalization (one project). In these projects, the external parties held complementary reasons for collaboration in addition to the congruent reasons that they shared with the school. These reasons related specifically to commercial interests (the sale of an instrument), creating academic knowledge (data collection is part of a larger research project) and disseminating practical knowledge (linking the name of an organization to the method of working). In three of these four schools collaboration with external parties was new. This final notion suggests that at schools that have a longer tradition of collaboration with researchers, the practitioners obtain a greater say in the goals and planning of the research.

### Division of roles and tasks

Expertise was brought in from outside to complement the knowledge and experience of the school in all projects. In this sense there is a similarity between

▼ Table 3 | Division of roles and tasks

Project code	Direction and guidance		Roles and tasks in development		Roles and tasks in research		
	Development	Research	Ext. party in project management	Ext. adviser/supervisor development	School leader in project management	Teacher researcher	Ext. party in project management
Project F	School	School	-	-	+	+	-
Project A	School	School and external party	-	-	+	+	+
Project G							
Project M							
Project H	School and external party	School and external party	+	+	+	+	+
Project J							
Project D	School and external party	School and external party	+	+	+	-	+
Project O							
Project K	School and external party	External party	+	+	-	+	+
Project P							
Project R							
Project Q	School	External party	-	-	-	-	+

the projects. The differences become visible as soon as more attention is paid to the direction and guidance within the project and the participation of the practitioners and external parties in the development and the research. Differences pertain, for example, on the active or detached role of the external party in the project management and the strong involvement or absence of teacher researchers. The roles and tasks in the projects were divided in six ways, see Table 3. Some roles and tasks that were recurrent in every project are not included in the table for reasons of readability. This includes for example teachers as respondents: in every project teachers are involved as respondents in the research.

In Projects A, F, G, and M the schools have the main responsibility for the development in school, while the external party has no role in this. The project manager of Project M makes this clear:

In this, [the research bureau] has no active part. They processed the data and made good summaries out of it, which enabled us to draw conclusions.

The school management has joint responsibility with the external party for the research and teacher researchers carry out parts of the research. The external parties are often seen as critical friends in these projects. The external researcher at Project F gives tailor-made advice but does not actually do any research himself. The internal project manager is performing the research as well as coaching teachers and leading the development in the project. This causes a role conflict at some moments; he gives an example in which he would react differently as a researcher than as a developer:

During one of the group sessions with the teachers... we heard a teacher say something that makes me as a *researcher* think 'I would like to discuss this further' while as a *developer* 'I should not pay attention to this right now'.

In Projects H and J a division of tasks was chosen in which the external researchers and advisers collaborate with teachers and school leaders on both development and research. School leaders from these projects see teacher research as part of the teachers' task and researchers function as sparring partners in research and development, whereby internal and external participants support each other with decision making in the project. One school leader said that the researcher and she:

...worked together on organizing the whole thing. Even though I am clearly the project manager.

In Projects D and O there are no teacher researchers working on the project. External advisers are members of a steering group, as are the school leaders of the schools in question. These advisers monitor the processes and are focused on achieving the project goals set by the schools they are involved in. The steering group commissions the external researchers to carry out the research.

In Projects K, P, and R school leaders have no role in coordinating the research. External advisers or coaches are involved in these projects and contribute to the development, for example, by training teachers in research skills. In Project Q the researcher is responsible for the research, particularly because there is no research expertise in school. The internal project manager explains the complementary role of the external party:

If one person provides the conditions to do the research and another [the external party] makes it possible to generate the data, I really appreciate that... It's not the case that the researchers do work that we could have done ourselves.

In this project the expertise of the practitioner and researcher are not intertwined with one another. According to the project manager this was done to safeguard the independence of the research and match with the training and function of teachers, school leaders and researchers.

▼ **Table 4** | Communication structure

Project code	Involvement in consultation		Time investment in research*			Frequency of consultation
	Internal	External	School leader	Teacher	External party	
Project G Project H Project J Project K Project M	Regular consultation / project group with internal project management and external researchers		High	High	High	Monthly
Project A Project F	Internal project group with team leader / teacher researchers	Researcher of supervisor	High	High	High or low	Monthly to quarterly
Project Q Project R	Internal project manager	Researcher	Average	High or low	Average	Quarterly
Project D Project O Project P	Steering group with school heads and external advisers and researchers		Low	Low	High	Monthly to quarterly

\* High is > 200 hours, average 100-200 hours, low < 100 hours on annual basis.

## **Communication structure**

The consultation structure, means of communication, and investment of time in the projects differ according to the division of roles and tasks in the project and the number of schools and participants involved. Project managers and external researchers and advisers work separately for most of the time on development and research tasks in most projects, after having come to an understanding on the tasks and responsibilities. There is regular communication via e-mail and sometimes also contact by telephone. The external researcher also has occasionally contact with teachers, for example, as the teacher research coach.

Table 4 shows that in five of the projects (G, H, J, M, and K) internal and external parties meet regularly. There is frequent face-to-face consultation between project managers and the external parties to discuss the progress of the project and the planning. A researcher in Project K commented on this:

Once a month, every 6 weeks we had a progress meeting... This was about the progress, the process. Meetings to discuss the actual project content were more frequent than the progress meetings, more frequent than was anticipated... Documents were placed on the Internet exchange group; and a group was created there. There was a lot of e-mail traffic, which everyone in the team received.

The time investment as shown in Table 4 is the annual time investment, based on the hours registered in project reports, ranging from low, average to high. In Projects G, H, J, K, and M all participants invest a high amount of time in the project. The other projects show variations in time investment. For example, teachers in Project Q invest a low amount of time in research because they are solely respondents in the study of the external researchers and they participate once a year in a meeting in which the results of the study in their school is presented. In Project R teachers invest many hours, owing to the training and lesson observations of each other. A steering group was formed in Projects D, O, and P, which met a few times a year. In each of these three projects more than one school was involved, as can be seen in Table 1. In each school the school leaders and teachers spent relatively little time on research. So, investments of time, consultation structure and means of communication are related to each other in all projects.

## **Types of cross-professional collaboration**

The following aspects showed relatively the most specific differences between the projects: congruent or additional reasons for cross-professional collaboration; directing and guiding of development; directing and guiding of research;

▼ Table 5 | Types of collaboration in R&D projects

Type of collaboration	Reasons for collaboration	Division of roles and tasks and communication						Project code		
		Direction and guidance		Role in research and time investment		External party				
		Development	Research	School leader	Time investment	Teacher researcher	Time investment	External party	Time investment	
School-directed collaboration	Congruent	School	School and external party	Project manager	High	Present	High	Project manager, researcher, supervisor	High, sometimes low	Project A Project F Project G Project M
School- and researcher-directed collaboration	Congruent	School and external party	School and external party	Project manager	High	Present	High	Project manager, researcher, adviser, supervisor	High	Project H Project J
School- and adviser-directed collaboration	Congruent	School and external party	School and external party	Project manager	Low	Not present	Low	Project manager, researcher, adviser, supervisor	High	Project D Project O
Researcher-directed collaboration	Additional	School and external party	External party	Attune to development	Average	Present	Low to average	Project manager, researcher, adviser, supervisor	Average to high	Project K Project P Project Q Project R

participation and time investment of school leaders, teacher researchers, researchers and advisers in the project. These aspects of the three dimensions were decisive in the search for recurrent patterns between the projects in order to characterize types of cross-professional collaboration. The result of this analysis can be seen in Table 5.

This analysis resulted in the identification of four types of cross-professional collaboration.

### ***School-directed cross-professional collaboration***

In this type of cross-professional collaboration teachers and school leaders are performing practice-based research. During the project they develop the expertise to do so by following training or they already have this expertise, because of an earlier study or the participation in a research project. One of the researchers illustrates the role of teacher researchers in the project:

Teacher researchers think along with the results that are achieved. They verify the test scores and consider an intervention in order to ensure a step in the right direction prior to the next measuring point.

External researchers are seen by school practitioners as critical friends, who ask critical questions and often have a role as supervisor.

### ***School- and researcher-directed cross-professional collaboration***

Interests and tasks of school practitioners and researchers are intertwined in this type of cross-professional collaboration. As one of the school leaders explains, they made arrangements in the project by discussing who will be responsible for which part of the project, in this case development and research activities:

What I find very important is that you come together to set the targets within the context of the project and to decide where to work on. We have made a plan of activities for this reason.

In these projects, teachers and school leaders are involved in research activities. Researchers are functioning as sparring partners for school practitioners; they give support on decision-making in school matters, as well as performing research themselves.

### ***School- and adviser-directed cross-professional collaboration***

External advisers are in control in this type of cross-professional collaboration. They are focused on achieving the project goals set by the school management. One of the advisers says:

The project plan [made by the advisers in close contact with school leaders] is the guiding principle, but we will mention it if another direction is necessary.

School leaders and advisers form a steering group that gives instructions to researchers. Teachers and school leaders have minor time investment in research activities.

### ***Researcher-directed cross-professional collaboration***

In this type of collaboration, external researchers have additional interests, which come to the foreground, such as commercial or academic interests. One of the school leaders exemplifies the role of the researcher in the project:

He works as a researcher; for him, school is a place to collect data. He works at an academic research institute and as an academic researcher he is focused on pedagogical teaching skills.

Researchers in this type of cross-professional collaboration have a leading responsibility concerning research goals and activities, in close contact with the school.

With these four types of cross-professional collaboration, we can discern three additional findings. Firstly, it appears that external researchers have more influence on the design and coordination of the research if they also have their own additional reasons for cross-professional collaboration in the project, next to supporting the school's reasons. Secondly, the school gives more direction and guidance to the project, and hence the external researchers give less, when there is research expertise in the school itself. This is apparent, for example, from the fact that the funding application was written by the school itself. Thirdly, the structure of the project management is related to who directs and guides the project. The project management of the research activities is mostly in the hands of the external parties. In cases where the school management is also part of the research project management, the school's influence on the design and coordination of the research is greater.

## Conclusion and discussion

This study provides insight in the characteristics of cross-professional collaboration between school leaders, teachers and educational researchers and/or advisers in R&D projects in Dutch secondary education. We used three dimensions, which we derived from literature on collaboration in R&D projects, as a framework to bring to the surface important differences and similarities in the way cross-professional collaboration is worked out. The three dimensions proved to be valuable viewpoints to study cross-professional collaboration in the R&D projects. The first dimension – reasons for collaboration – reflects the basic purpose for starting cross-professional collaboration.

In two-thirds of the projects the researchers adapted to the interests of the school. In a third of the projects the external parties also had additional academic or commercial interests. An existing collaboration between a school and educational experts seems to predict congruency in reasons for the collaboration. The second dimension – division of roles and tasks – displays variation in how development and research tasks were distributed among the participants, depending on their expertise. Projects also differed in the extent to which participants were allowed or allowed themselves to experiment with new roles. School leaders, teachers, researchers and advisers in some projects took over each other's tasks and function as experts in the development and/or the research. In these cases the term cross-professional can be literally applied, as there is cross pollination between the participants of the R&D projects. The third dimension – communication structure – also shows differences and similarities between the R&D projects. The communication structure is closely linked to the division of roles and tasks, but also to number of participants in the projects. The participation and time spent by school leaders and teachers in research activities is large in nearly all the projects, with the exception of the projects where no teacher researchers are present.

Concerning our second research question, we have ultimately identified four types of cross-professional collaboration based on recurrent patterns in the outcomes of the three dimensions: (a) School-directed collaboration; (b) School- and researcher-directed collaboration; (c) School- and adviser-directed collaboration; (d) Researcher-directed collaboration. Even within one funding scheme, differences occurred in the way cross-professional collaboration was shaped by schools and external parties. The extent to which the school and the external party directed and guided the project appeared to be a critical aspect in identifying the different types of cross-professional collaboration.

Some limitations of this study need to be mentioned. Firstly, the twelve R&D projects are part of the same funding scheme. This funding scheme may have had an impact on the division of roles and tasks, especially as the funding applicant, the school, had to distribute part of the funding to the external research party. Secondly, this study contains twelve case studies and does not focus in detail on processes of collaboration in one or two case studies. More detailed analyses could provide a deeper notion of cross-professional collaboration. On the other hand, the inclusion of twelve cases allowed us to look for patterns and types of collaboration, which would not have been possible with only a few cases.

Our findings can be seen as an empirical validation of the results of earlier studies on cross-professional collaboration in R&D projects (see e.g. Coburn & Stein, 2010; Wagner, 1997). Practice-based research with the participation of both external educational experts and practitioners takes shape in more and more countries and a larger group of teachers and school leaders carry out and utilize research (Cochran-Smith & Lytle, 1999). This study provides more insight in the nature of cross-professional collaboration, in line with the work of Hora and Millar (2011), and Penuel et al. (2011). In particular, our findings shed light on how collaboration is shaped by school practitioners and researchers, by using the framework of the three dimensions. Our study also emphasizes the outcomes of changing relationships between external educational experts and practitioners (compare Vanderlinde & Van Braak, 2010). In two-third of the projects school leaders and teachers adopt new roles; they direct and carry out research. External researchers also adopt new roles: besides doing research they give advice on research and development at school. The fact that cross-professional collaboration can be shaped in different ways implies that teachers, school leaders, external researchers and advisers need to negotiate about what their tasks are and that they may need time to learn to perform new tasks (Baumfield & Butterworth, 2007; Geijsel et al., 2010). This can also entail uncertainty and confusion for the participants. This study on twelve Dutch R&D projects can help participants of other research projects to be more conscious of different types of cross-professional collaboration. This may support them in choosing a type of cross-professional collaboration that fits their purposes and specific situation, besides deciding on the focus of the study and the research approach. In future research, it will be interesting to connect the characteristics of cross-professional collaboration with outputs of projects. It is also important to continue investigating the collaboration processes, as cross-professional collaboration can change during the course of a project, for example, due to changes in plans and participants.

## ▾ Appendix A

Coding scheme of first round of interviews, used for analyzing interviews

<b>Code</b>	<b>Explanation</b>
<b>General information</b>	
General information school	Participating schools and locations; number of teachers working at these schools and number of pupils
Participant of interview	Function at school/institute and role in project
Theme of development	Theme of development in school, to which research is done
Research questions	Research questions according to subsidy application and potential changes mentioned by interviewees
Research approach	Research approach: instrument development; design-based research; evaluation research; effect research
R&D questions	Research questions that correspond to R&D questions as formulated in the subsidy scheme
<b>R&amp;D project team</b>	
Project team; development	Composition of project team on the issue of development: names and tasks of project participants
Project team; research	Composition of project team on the issue of research: names and tasks of project participants
Collaboration external party-school	Collaboration between external party- school: collaboration goals; reasons for collaboration, progress, division of roles and tasks, communication
<b>Continuity</b>	
Starting point of the school	Previous projects on development and research issues in the same schools/ locations. Author(s) project application (external party/school)
Previous collaboration external party-school	Existing collaboration or a new collaboration with external party
<b>Knowledge</b>	
Expected research knowledge	Expected outcomes of the research and expected research knowledge; vision on research
Knowledge for school development	Research knowledge that will be used for school development and the way this will happen; internal dissemination of knowledge
Knowledge for accountability	Research knowledge that will be used for accountability by the school and the way this will happen; external dissemination of knowledge towards parents, school inspection and other schools
<b>Project activities</b>	
Interaction research and development	Research following school development or the other way round; role of research in development; position of research in school
Development activities	Important activities for upcoming school year on the level of development, with attention to e.g. an innovation, professional development of teachers
Research activities	Important activities for upcoming school year on the level of research, with attention to e.g. tests, questionnaires, analysis and reports

▼ Appendix A | Continued

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**Advancing and restrictive factors**

Advancing factors	Factors that are seen as advancing success, concerning output, activities and conditions, and collaboration
Restrictive factors	Factors that are seen as restrictive for success, concerning output, activities and conditions, and collaboration

**Conditions**

Conditions, personal	Conditions on personal and workplace level, with attention to support of employees for the project
Conditions, material	Conditions on material level, with attention to ICT and available spaces for the project activities
Conditions, financial	Conditions on financial level, with attention to available time investment for project participants
Conditions, teacher researchers	Conditions on level of teacher researchers, with attention to time and space facilities and training

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## ▾ Appendix B

Coding scheme of second round of interviews, used for analyzing interviews

<b>Codes</b>	<b>Explanation</b>
<b>R&amp;D project team</b>	
Project team; development	Composition of project team on level of development: names and tasks of project participants
Project team; research	Composition of project team on level of research: names and tasks of project participants
Changes in project team	Changes in project team; expectations for next school year; ways of transferring knowledge to new participants in case of changes in project team
<b>Continuity</b>	
Previous project	Characteristics of previous project (with external party)
Previous collaboration external party-school	Establishment of collaboration external party-school and writing of project application
<b>Project activities</b>	
Development activities	Progress in project activities on level of development and judgment on this issue; with attention to e.g. an innovation, professional development of teachers
Research activities	Progress in project activities on level of research and judgment on this issue; with attention to e.g. tests, questionnaires, analysis and reports
Role of research in the project	Role of research in the project and judgment on this issue
Planning project	Planning project as planned or reasons for changes in planning project
Conditions	Conditions on personal, material and financial level
Support for project	Support of employees for research and development project; creation of support
<b>Knowledge</b>	
Knowledge development in project and outcomes	Knowledge development in project and outcomes so far, on operational, formal and ideological level
Feedback of research results	Ways of giving feedback of research results and who is involved
Knowledge dissemination: school development and accountability	Knowledge dissemination and contribution to school development (internal dissemination) and to accountability (external dissemination)
Research in school	Ways for ensuring research to obtain a fixed place in school (organisation)
<b>Cross-professional collaboration</b>	
<b>Reasons for collaboration</b>	
Connection external party-school	What connects external party-school, e.g. research theme, previous history
Reasons for collaboration	Reasons for collaboration external party-school in this project; interests of parties
Project goals	Project goals; research and development
Convergent or divergent reasons	Convergent or divergent reasons for collaboration and project goals; vision on development and research
Opinion on collaboration	Opinion on how collaboration research institute-school works out

▼ Appendix B | Continued

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<b>Division of roles and tasks</b>	
Role of project manager	Role, tasks actions undertaken, and responsibilities of project manager in research and development
Role of school leader	Role, tasks actions undertaken, and responsibilities of school leader in research and development
Role researcher/adviser/ supervisor	Role, tasks actions undertaken, and responsibilities of researcher, adviser, supervisor in research and development
Role teacher(researcher)	Role, tasks and responsibilities of teacher(researcher); training and time and space facilitations; capable of performing research
Decision making	Decisions on project issues taken by school or researcher
Rhythm	Tuning the rhythm of school issues and research activities, e.g. planning questionnaires outside school exam periods
Needs	Tuning needs of school and researcher in research and development
<b>Communication structure</b>	
Workplace researcher	Frequency of working at school or at institute by researcher
Contact person	Contact person at school for researcher
Time investment	Time investment in project in hours per week/month
Communication means	Means of communication between research institute-school: consultation, e-mail, phone
<b>Vision on research</b>	
Vision on research, research engagement, performing research in school	Vision on research engagement, on who has to/can perform research in school: academic and/or school participants
Vision on research; goal and audience	Vision on practice-based research: enhancing academic knowledge and/or contributing to improvement of practice; audience for practice-based research (academic world and/or practice)
Vision of institute	Vision of school/institute on performing practice-based research in school; support on performing research
<b>Success and fail factors</b>	
Advancing factors	Factors that are seen as advancing success, concerning output, activities and conditions, and collaboration
Restrictive factors	Factors that are seen as restrictive for success, concerning output, activities and conditions, and collaboration

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