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DOI

[10.1080/19415257.2020.1747104](https://doi.org/10.1080/19415257.2020.1747104)

Publication date

2022

Document Version

Final published version

Published in

Professional Development in Education

License

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[Link to publication](#)

Citation for published version (APA):

Verhoef, L., Volman, M. L., & Gaikhorst, L. (2022). The contribution of teachers of research-intensive teacher education programmes to a culture of inquiry in primary schools. *Professional Development in Education*, 48(5), 861-877. <https://doi.org/10.1080/19415257.2020.1747104>

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The contribution of teachers of research-intensive teacher education programmes to a culture of inquiry in primary schools

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ABSTRACT

A culture of inquiry in schools, where teachers work collaboratively and inquiry based, can contribute to the quality of education. It is assumed that teachers of research-intensive teacher education programmes can play an important role in creating such a culture. Little is known, however, about how these teachers function. This case-study research investigates how primary school teachers of research-intensive teacher education programmes in the Netherlands contribute to a culture of inquiry and which factors influence this. In five schools semi-structured interviews were conducted with a teacher and her/his school leader. Also school policy documents were analysed and team meetings were observed. The teachers contributed to a culture of inquiry in their schools in three ways, by 1) initiating collective critical reflection on school policy, 2) sharing knowledge with colleagues and 3) initiating innovations. According to the teachers, self-efficacy in collaboration with colleagues in inquiry-based working and a formal research position in the school facilitates the contribution they can make to a culture of inquiry.

ARTICLE HISTORY

Received 18 July 2019
Accepted 13 January 2020



KEYWORDS

Teacher research; inquiry-based working; teacher professional development; culture of inquiry

Introduction

The demands that are being posed on education are increasing and constantly changing. Teachers are therefore expected to continue their professionalisation and keep improving the quality of education (Cordingley 2008, Zwart *et al.* 2015, Meijer *et al.* 2016, Darling-Hammond 2017). Practice-oriented research is a way of analysing one's own educational practice and of adapting it as necessary; it contributes to teachers' professionalisation (Ellis and Castle 2010, Cantalini-Williams *et al.* 2015, Zwart *et al.* 2015, Meijer *et al.* 2016, DeLuca *et al.* 2017).

Teacher education therefore pays increasingly more attention to practice-oriented research (Cantalini-Williams *et al.* 2015, Maaranen and Krokfors 2008, Niemi and Nevgi 2014). University programmes for primary school teachers have only existed in the Netherlands since 2008. These university programmes are research-intensive. The teachers they educate differentiate themselves from other teachers by having more theoretical knowledge and more research skills. With their inquiring attitude and research competences, these academically educated teachers are expected to contribute to inquiry-based working (Maaranen 2009, Maaranen and Krokfors 2008, Snoek, Bekebrede, Hanna, Creton and Edzes 2017). Research by Baan, Gaikhorst and Volman (2018) shows that academically educated teachers engage in inquiry-based working in practice in various ways. They systematically reflect, for example, on their own actions and behaviour and partly base these on research and literature. This inquiry-based working primarily occurs at an individual level, in the teacher's own classroom, and less at school level.

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The systematic improvement of quality in the school, however, requires more than teachers' individual inquiry-based actions (Cohran-Smith and Lytle 2009, Godfrey and Brown 2019). A culture of inquiry in which there is inquiry-based collaboration is also necessary (Snow-Gerono 2004, Katz and Dack 2013, Godfrey and Brown 2019). In such a culture teachers collectively critically reflect on education in the school and its improvement, and support their choices and actions with research.

However, little is known yet about how teachers from research-intensive teacher education programmes can contribute to such a culture of inquiry and what they need in order to do so. These teachers are specially prepared for inquiry-based working in their schools and therefore are expected to play a precursor role in this respect. However, because research intensive routes are a relatively new development in teacher education, insight in how graduates from these programmes can contribute to the research culture in their schools is still lacking. This case-study research shows what role university educated teachers can play and what factors influence this.

Contextual background

Teacher education programmes last four years in the Netherlands. There is a great deal of freedom in how the curriculum is organised, with no national curriculum, and final objectives are only described in global terms. The educational institutes themselves determine the course content. Both standard and university teacher education programmes for primary education exist. They are both bachelor programmes. Institutes of higher professional education offer the standard teacher programmes. In comparison to the standard programmes, the university programmes pay more attention to research, including practical research and doing research yourself. Teachers who have followed such a programme are expected to engage in inquiry-based working in their class and school (Snoek et al. 2017, Wal-Maris, Beijaard, Schellings, and Geldens 2018). This research investigated the extent to which teachers who have followed these research-intensive programmes actually contribute to the culture of inquiry in their school and what factors are of influence.

A culture of inquiry in schools

Various studies emphasise the importance of a culture of inquiry for school development (Snow-Gerono 2004, Given et al. 2009, Katz and Dack 2013, Cantalini-Williams et al. 2015, Godfrey 2016, Brown and Zhang 2017, Brown and Greany 2017, DeLuca et al. 2017, Godfrey and Brown 2019). Teacher research in such a culture can, for instance, encourage active and joint teacher learning and lead to an increase in student achievement (Sharp 2007, Godfrey 2016). A clear, unequivocal definition of a *culture of inquiry*, however, does not exist. Some authors mainly place the emphasis on the collective use of data, such as test results or the outcomes of pupil observations (Katz and Dack 2013, Schildkamp and Poortman 2015). According to this interpretation, in a culture of inquiry teams of teachers carefully examine existing ideas and practices, change these and form new ones based on data. Other researchers put more emphasis on a reflective/inquiring attitude in the team, the collective use of existing research, or on teachers conducting research themselves as important aspects of a culture of inquiry (Godfrey 2016, Reagan et al. 1993, Cochran-Smith 2009, Snow-Gerono 2004). In this study we have chosen a broad definition of a culture of inquiry, namely a culture in which it is usual for teachers to undertake inquiry collectively in order to evaluate and improve their own teaching and the quality of education in the school as a whole. We interpret 'undertake research' broadly.

In the literature different forms of research and/or inquiry-based working are named which can all be seen as methods of working that are part of a culture of inquiry. Baan et al. (2018) differentiate three forms. Each form can be aimed at improving one's own actions and behaviour as a teacher and at improving the quality of education at school level.

The object of *systematic reflection* is to gain more insight into one's own actions and behaviour and the possibilities for improving them (Cochran-Smith 2009, LaBosky and Richert 2015). This involves, for example, interpreting and analysing data derived from observations of pupils (qualitative) or pupils' test data (quantitative) and basing decisions on them. We only speak of a culture of inquiry when teachers reflect collectively and the reflection includes developments in the school.

Use of existing research or existing knowledge

This relates to evidence-based or evidence-informed working. In evidence-based working teachers use methods which have been proved to be effective (Wiseman 2010, Cochran-Smith 2009). In evidence-informed working (Levin 2010, Cochran-Smith 2009) teachers use insights from the literature or research and base their actions and behaviour on them. They adapt the knowledge to the specific school context. A culture of inquiry, however, presupposes that these research findings and literature are shared with others in the same school and that colleagues inform each other of how they base their actions and behaviour on these insights.

Conducting research involves teachers doing research themselves in their own classroom or school. The literature describes different examples of this, such as self-study, action research and lesson study (Chokshi and Fernandez 2005, LaBoskey and Richert 2015, Zwart *et al.* 2015). These forms of research differ in approach but are similar regarding process. A goal-oriented, systematic approach to improving teaching is characteristic of this process (Cochran-Smith and Lytle 2009, Ellis and Castle 2010). Several positive outcomes of conducting research by teachers were found. For example, the case-study of LaBoskey and Richert (2015) shows that self-study by teachers, including analysing data and functioning as a critical friend, made the participating teachers examine their own underlying teaching assumptions that influence their teaching practices. The systematic and reflective approach had a transformative influence on their thinking and practice. Cochran-Smith and Lytle (2009) found that teacher action research can shape school reform and educational policy. However, in order to do so, there is a need for collaborative research practices in schools.

Baan *et al.* (2018) found that teachers with an academic education applied the first two forms of inquiry-based working – systematic reflection and using existing research knowledge – but conducted research themselves to a lesser extent. The inquiry-based working of academic teachers was also shown to occur mainly at an individual level (in their own class) and less at school level. However, this individual way of inquiry-based working does not automatically lead to systematic and sustainable quality improvement in the school. In order to realise this, it is important to focus not only on the level of the individual teachers, but also on the wider eco system of the school (Godfrey and Brown 2019). Teachers can only contribute to sustainable schoolwide improvement if their research practices are embedded in a broader system (including policy), in which they can collaborate with others (in and outside the school) and when they are supported and facilitated by their school leaders (Brown and Greany 2017, Brown and Zhang 2017, Godfrey and Brown 2019).

Factors that foster or hinder a culture of inquiry in schools

Factors that have an influence on teachers' inquiry-based working and hence possibly on the culture of inquiry in a school have emerged from earlier research. There are also direct indications in the literature of what fosters or hinders a culture of inquiry; a differentiation can be made between individual and organisational factors.

An inquiring attitude and self-efficacy influence the extent to which teachers engage in inquiry-based working at an individual level. These factors also seem to be essential for a culture of inquiry in a school (Uiterwijk-Luijk, Krüger and Volman 2017). An *inquiring attitude* is a positive attitude towards inquiry-based working; an open attitude which is driven by curiosity (Cochran-Smith and Lytle 1999). *Self-efficacy in inquiry-based working* has been defined as confidence in one's own ability and pertains to the extent to which teachers experience expertise in inquiry-based working (Uiterwijk-Luijk *et al.* 2017).

Collaboration and communication in relation to research are described in the literature as important in a culture of inquiry; *collaboration* then relates to collectively conducting research and reflecting on it (Snow-Gerono 2004, Given *et al.* 2009, DeLuca *et al.* 2017). Communication plays an important role in this collaboration (Cantalini-Williams *et al.* 2015, Cochran-Smith and Lytle 1999, Snow-Gerono 2004).

A *collective vision on inquiry-based working* within the school is likewise an organisational factor influencing the culture of inquiry. It specifically concerns a clear vision on research and its importance in improving educational practice (Uiterwijk-Luijk and Volman 2017). A vision on inquiry-based working includes, for example, the *relevance of research* to the school.

Leadership aimed at inquiry-based working is a factor of huge importance in creating a culture of inquiry (Godfrey 2016, Godfrey and Brown 2018, Godfrey and Greany 2017). On the one hand it concerns formal and informal leaders acting as role models (Given *et al.* 2009, Cantalini-Williams *et al.* 2015, Uiterwijk-Luijk and Volman 2017) and on the other creating team involvement in inquiry-based learning. This can be achieved by sharing responsibility (distributed leadership) (Given *et al.* 2009, Godfrey and Brown 2018) and, for example, collectively determining research themes which fit in with policy and developments in the school (Cantalini-Williams *et al.* 2015; Godfrey and Brown 2018). Organising and facilitating research in the school are also important aspects of leadership in relation to a culture of inquiry (Cantalini-Williams *et al.* 2015, DeLuca *et al.* 2017, Godfrey and Brown 2019).

Organisation and structure of inquiry-based working within the school can be considered basic conditions for the realisation of a culture of inquiry; they make conducting collective research possible (Cantalini-Williams *et al.* 2015, Godfrey and Brown 2018). Structure involves, for example, working systematically on the basis of a research cycle (DeLuca *et al.* 2017). The composition of research groups is also an aspect of organisation and structure. It is important that research is *facilitated*, that is to say, the means and support that foster inquiry-based working are made available. The most influential facilitating factor, *making time available*, was pointed out in earlier research (DeLuca *et al.* 2017, Cochran-Smith 1992, Cantalini-Williams *et al.* 2015, Uiterwijk-Luijk and Volman 2017); time to undertake research, for reading and interpreting data and literature, dialogue and interchange of research and collective reflection. *Coaching by experts*, involving external expertise and experience with inquiry-based working is another form of facilitation (Given *et al.* 2009, Cantalini-Williams *et al.* 2015, DeLuca *et al.* 2017).

The present study

The existence of a culture of inquiry in which teachers collectively engage in inquiry-based working is an important condition for school development (Earley and Bubb 2014). Academically educated teachers are expected to work in this way and contribute to the culture of inquiry in their school. Earlier research shows, however, that inquiry-based working in the broadest sense is not a matter of course for these teachers. They conduct little research and the research is mainly restricted to their own class (Baan, Gaikhorst and Volman 2018). Little is known about academically educated teachers' contribution to the culture of inquiry in schools, and just as little about what determines whether they are successful or not in fulfilling the role of initiator of a culture of inquiry. With the help of case-study research we have analysed and described the role of five university educated teachers in the culture of inquiry in their school and what factors positively or negatively influenced their role. This research focused on the following research questions:

- (1) How can the contribution of academically educated teachers to a culture of inquiry in the school be characterized?
- (2) What factors make it possible for academically educated teachers to contribute to a culture of inquiry in their school?

Methods

The research is a qualitative descriptive case study. Semi-structured interviews were conducted with five teachers and their school leaders giving them the opportunity to describe their experiences in detail. A document analysis was also made to gain insight into the place of inquiry-based working in the school in question and the conditions created for this. In two of the five cases observations were used, in addition to excerpts from interviews, to illustrate the contribution of academically educated teachers to a culture of inquiry and the context factors that play a role in this.

Participants

For this study teachers were selected who had completed a university-based, research-intensive primary teacher education programme in the Netherlands and had a minimum of three years' and a maximum of six years' experience. The research group comprised teachers (N = 5) and their school leaders (N = 5). Prior to the research all the respondents were sent an informative letter and signed a declaration of consent to participate.

Table 1 shows background information on the schools and the respondents.

Variables and instruments

Interviews

Semi-structured interviews were the most important method of data collection. The interviews were held at the schools where the participants work. The interview guidelines included questions about the teacher's contribution to the culture of inquiry, followed by questions regarding individual factors and factors at an organisational level that foster or hinder this contribution. Examples of questions about the culture of inquiry and the teacher's contribution to it were: *Can you tell us something about the culture of inquiry at this school? How do you contribute to the culture of inquiry in the school (for example, promoting collective reflection, using collective research, undertaking collective research)?* Questions asked about individual factors included: *Do you think a culture of inquiry is important? Why/Why not? Do you think you have sufficient knowledge and skills to be able to do inquiry-based work?* Examples of questions on organisational factors were: *Is there a vision on inquiry-based working in the school? Does the school leader act as a role model on inquiry-based working in the school and if so, how? Is time reserved for research and if so how?*

Document analysis

Following on from the interviews, we requested school leaders by email to provide policy documents for an analysis of aspects of a culture of inquiry. The document analysis was used to provide more information about the context of the different cases.

Table 1. Characteristics of the respondents/cases.

Case	Name*	Gender	Age	Years of teaching experience	University	School size (amount of students)	Schoolboard
1	Rob	M	26	4	A	164	A
2	Steve	M	29	6	B	175	B
3	Lois	F	26	3	A	601	C
4	Mark	M	27	4	A	227	C
5	Caroline	F	26	4	A	400	D

*Pseudonyms are used

Observations

In addition to interviews and document analysis, data were collected by means of observations. The case teachers were filmed in a team meeting. Thick descriptions were made of these film recordings (Bryman 2016).

Analysis

A content analysis of the interview transcripts was made to answer the research questions, using Miles and Huberman's method (1994) and the computer programme ATLAS.ti. The data analysis was an iterative process of reading and rereading the data, selecting and coding (data reduction) and displaying the data in within-case and cross-case matrices (Miles and Huberman 1994). The coding scheme was based on the theoretical framework and the research questions, which focused on the contribution of academically educated teachers to the culture of inquiry (for instance, 'systematic reflection' and 'using existing research or knowledge') and collective and individual factors in relation to the culture of inquiry (such as 'collaboration', 'leadership' and 'self-efficacy'). Lastly, a number of excerpts were selected from the observations of the team meetings. Some of these were used to illustrate the results.

Trustworthiness and credibility

Different sources of data collection were used in this research (triangulation), which contributed to the trustworthiness and credibility of the analysis (Creswell 2013, Bryman 2016). Interviews were recorded and transcribed to prevent interpretation bias by the researcher as far as possible. A co-researcher also checked the codes of the first researcher. When they did not agree on the codes, they discussed them until a consensus was reached. As well as the codes, the data matrices (for the within and cross-case analyses) and choices made in the various phases of the research process were checked and discussed with co-researchers (Akkerman *et al.* 2008). During the analysis phase the researcher kept a record of memos which reflected on the important steps and decisions in the research process. Lastly 'disconfirming cases and patterns' were sought (Miles and Huberman 1994), which resulted in more nuanced explanations.

Results

The contribution of academically educated teachers to a culture of inquiry (research question 1)

The data revealed three ways of academically educated teachers making a contribution to the culture of inquiry in their school: 1) critical reflection on and contributions to school policy, 2) using and sharing knowledge with the team and 3) initiating innovation.

Critical reflection on and contributions to school policy

School leaders said that all the academically educated teachers had a critical view of education and contributed to school policy and reflection on that policy. Steve's school leader, for example, saw him with his critical eye as his sparring partner.

I often have things come in from the council offices, then I ask him if he'll have a look at them. Partly because his way of thinking is to look further, to go into things. When I ask him to look at something the board has sent me, he doesn't just scan it, he delves into it and comes back with a careful judgement on it ... (school leader case 2)

Teacher Caroline (case 5) was a member of the management team (MT) at her school. With her critical way of looking at things she contributed to developing school policy, as well as playing a role in fostering team members' involvement in school policy. She communicated team members' questions to the management team, which constituted input for school reforms, and translated school policies formulated in the long-term policy plan for colleagues, so that policy could be transformed into concrete changes in the school.

Because I'm the initiator I'm now in the management team as well, since the end of last year. There we've now said: we've got a good annual plan drawn up by the management, but this is not something for the management only, this is something for the school. We are now working on actualizing the annual plan in an annual board. The management's goals have been noted and we are now planning with the team: in what period are we actually going to work on what? Then it's something of ours, something we've done. (Caroline, teacher case 5)

The contribution of Mark (case 4), who had a formal role as research coordinator, can in some ways be compared with Caroline's. It was apparent from the interview with both the teacher and the school leader that Mark played an important role in the practical translation of theory and school policy to the team. In the quote below he talked about how he tried to make research, a focal point in school policy, accessible by organising a workshop:

I then compiled a sort of programme specifically for the workshop. There were six research groups that gave a presentation, which I had divided into themes. [...]and I'd also invited some other research coordinators from other schools [...]. I could tell from the questions teachers asked that it really enthralled them [...].The word research gives lots of people a fright but it is doesn't have to be as big as it seems. It can be just a simple question like, 'What's a handy way of doing this?' (Mark, teacher case 4)

Mark also inversely contributed to the development of school policy. He took care of passing on the outcomes of research in the school to the management and that they were included in the school's policy plan.

Rob (case 1) also had a role in translating school policy to the classroom. For him, however, it was primarily about translating policy drawn up by school leaders for the team. Lois pointed out that her critical eye had led to changes in her class and that a colleague with a class in the same school year had adopted her innovation. However, it made no contribution at school level.

A comment must be made about Steve's contribution. He pointed out that he experienced his contribution as one-sided.

I'm a member of such a teacher learning group that has done research on group composition in arithmetic, whether heterogeneous or homogeneous grouping is better, and how we want to do that. In practice it comes down to ... me then writing the plan and colleagues implementing it. (teacher Steve, case 2)

Using and sharing knowledge with the team

Rob has a meeting with a colleague who is in the same research group as him, with the school leader and an expert to prepare for an afternoon workshop. After discussing a number of organizational issues, Rob points out that it would be a good idea to look at the data. He opens an overview with a number of bar charts and a table of data. Within a couple of seconds Rob says: 'I can see it.' The others look at the screen as well. (observation case 1)

In this example the teacher showed that he valued the use of data and knew how to search for and interpret data with ease. At a glance he retrieved an important result from the school data and pointed this out to the others in support of the discussion.

In four of the cases the academically educated teachers used their knowledge and shared it with the team. This was knowledge derived from earlier research, professional literature and pupils' test data. Three teachers also sometimes coached colleagues, as illustrated in the following quote from an interview with Rob's school leader.

He's really completely immersed himself in data. Recently he explained this in a team meeting, how everyone can work with data. He completely checked it out first and gave a presentation on it, with a form he's adapted so that we could then work with it and you can quickly fill it in. So that at the end of the week you can quickly enter it in the system. (school leader case 1)

The example of Rob shows how he contributed to collaboration with colleagues and coaching them in using data.

Mark and Caroline's situation was comparable to that of Rob. They were also competent at analysing and interpreting data and were able to make a practical translation of the data for the

team. Mark distinguished himself further by using existing knowledge from the professional literature and earlier research. He introduced play-based learning in group 3 with a colleague, after he had read up on it in the literature and attended workshops. When he taught group 1/2 Mark realised that it is good for children to learn by playing. He thought it was a pity that there was far less time for this in group 3 and started a combined group 2/3 with more time for play-based learning for children in group 3.

Steve also thought it was very important to use the literature to substantiate the choices you make. His school leader supported this by actively encouraging the use of literature. Steve kept his colleagues informed and suggested practical ways of acquiring knowledge. However, he did not think that his colleagues were getting the message.

I do try to share my knowledge. Only I'm not happy with how that's received ... I was given a pile of professional journals one time and handed them out to colleagues, with info that was of interest to them. I have the idea they didn't do anything with them. I have the idea they're not capable of searching, finding it in the right way. They don't ask me where they can find good literature or how they can find more information. I think that they restrict themselves more to googling or perhaps professional journals. (teacher case 2)

Initiating innovation from an inquiring attitude and inspiring colleagues

All the academically educated teachers had a role in innovation in the school. This often started with a teacher's need to tackle a particular problem in her/his own class or the school. Sometimes the teacher saw that there was room for improvement or change from a theoretical point of view. In one case this was an initiative of the school leader. By experimenting with a new approach in the classroom and talking to colleagues, other team members became inspired and initiatives were extended to a change in approach and policy within the school. These innovations could pertain to three levels: the class, a section of the school or a specific subject field and the school level. Below, we elaborate on these three levels.

Innovation in the classroom

Lois's example illustrated how a change in her own group was extended to one of the other middle groups of the school.

This year, for example, I started a language circuit. The other group 3 has done the same but it has nothing to do with the school. It sounds really simple, it's not very difficult ... So it's more something that I've tried myself, but I've had to look very carefully at it and have made changes to make it really effective. (Lois, teacher case 3)

Innovation in a section or a specific subject field

Rob was a member of a research group on a specific theme, namely the social-emotional behaviour of children. He himself did not take the initiative for the innovation in question; the school leaders drew up the policy. Rob did, in collaboration with those colleagues who were also members of the research group, have a role in motivating and inspiring other colleagues for this innovation.

Caroline had an active role in innovations in the school as coordinator of a research group on the subject field arithmetic and a research group in the upper years in the school. The importance she attached to collaboration with and equality between colleagues typified her contribution; she sought this out and encouraged collective critical reflection within the groups. This is evident in the following excerpt.

And arithmetic, I'm now the arithmetic coordinator, so all the recommendations we made in the research, we're now implementing in the school. We're looking back: where did we discover what didn't work and what do we need to tackle? And that's what we're now expanding on ... those members and I sit down together: okay, let's first take a critical look at ourselves, are we doing it well, what do we come up against ourselves ... (Caroline, teacher case 5)

Caroline inspired colleagues by, for example, linking a collective bottleneck or issue with an issue in her own class and undertaking concrete action on it. She took the initiative by working out ideas that she considered relevant to her pupils' learning and implemented them in the class. From there she could offer colleagues support and encourage them to go on to take action. The school leader said the following about Caroline's supportive and inspiring attitude:

The moment someone asks, will you help me? She quickly shows them and really quickly too. Say a teacher comments, 'I don't understand it.' She's always willing to go there and to say, 'I'll support you.' (school leader case 5)

Both the school leader and the teacher pointed out that collaboration mainly took place in the individual sections of the school (the research groups are also at this level) but that the teacher was also behind various schoolwide innovations.

Schoolwide innovation

The excerpts below from the interview with Mark and his school leader show how innovation came about, was extended to the sections of the school and then included in school policy. Mark took the initiative here in collaborating with and involving colleagues.

What he naturally manages to do well, is actually involve the teachers of the lower groups in the vision that he thought of for them. To make a 2/3 combination, starting from the ambition that it should be possible to do it differently. He worked out that principle to the very last detail. So in one way or another he's succeeded in putting his insights, theoretical insights, into practice. (school leader case 4)

Well, I've of course read a lot about it and also attended workshops on it ... I read that children are not really ready for school and formal learning until they are seven ... At school here it was precisely in group 3 that all that independence and that freedom and autonomy were curtailed a bit, and everyone had to do the same. That really set me thinking, with a colleague too, who has wanted to do that for a while, but hadn't managed to get it off the ground, because she was very much alone in this. So yeah, if there's more of you, often you have more success. (teacher case 4)

In the two cases in which the teachers' contribution extended to school level, the innovation was also monitored through conducting research collectively, with the objective of improving the quality of education in the school together. The teachers took the initiative in their role of coordinator and sought the collaboration of colleagues. By asking critical questions and using their research knowledge and skills they encouraged that time and space were allocated to others and that these colleagues actively participated in collective research.

Which factors facilitate academically educated teachers' contribution to a culture of inquiry? (Research question 2)

Table 2 gives an overview of the factors which, according to teachers and their school leaders, promote or indeed hinder the contribution of academically educated teachers to the culture of inquiry in the school.

Factors at an individual level

The teacher's inquiring attitude

All the teachers showed that they had an inquiring attitude; they reflected on their own practices and tried to improve them. Owing to this attitude, they took the initiative for innovation and demonstrated inquiry-based behaviour, hence inspiring their colleagues. This seemed to result in colleagues seeing these teachers as experts on inquiry-based working, or a particular aspect of it, and these teachers being given a position in the team.

Table 2. Factors which promote or hinder the contribution of academically educated teachers to the culture of inquiry in the school.

Promoting factors	Hindering factors
<i>At individual level</i>	
(1) Teacher's inquiring attitude	(1) Lack of self-efficacy in collaboration in the field of inquiry-based working
(2) Self-efficacy in teaching skills, and in inquiry-based working	(2) Self-efficacy in teaching skills is considered as a condition for inquiry-based working
<i>At organisational level</i>	
(1) A research role in the school organisation	(3) No research role in the school organisation
(2) School culture = a culture of inquiry, in which teachers collaborate, have an inquiring attitude, and the knowledge and skills to work inquiry-based	(4) School culture: no culture of inquiry in the school
(3) Presence of a vision on inquiry-based working in the school	(5) Lack of a (collective) vision on inquiry-based working
(4) School leader who promotes the importance of inquiry-based working but also the importance of collaboration, communication and involvement	(6) Inquiry-based working is considered as an extra pressure for teachers
(5) Involvement of the school leader in inquiry-based working (for instance by participating in a research group and acting as a role model)	(7) School leader who is not or only to a limited extent involved in inquiry-based working in the school (school leader did not act as a role model)
(6) Structurally making time for collaboration and communication with the whole team on inquiry-based working in the school	(8) Number of years of experience as a teacher is seen as an important condition for fulfilling a supervisory role in the school
(7) Colleagues' attitudes towards research (team motivation) and team members' ability to engage in inquiry-based working (team efficacy)	(9) Little (facilitating in) collaboration and communication in the field of inquiry-based working
(8) Support for inquiry-based working (for instance from an expert)	(10) Lack of ability of the team to work inquiry based

Self-efficacy

In all the cases self-efficacy emerged as partly determining the teacher's position in the school. Moreover, it was evident from the results that three different areas could be differentiated in which self-efficacy can play a role in teachers' contribution to a culture of inquiry, namely self-efficacy in teaching skills, in inquiry-based working and in collaboration on inquiry-based working.

Self-efficacy in teacher competences concerns the teacher's feeling that she/he is capable of teaching well and the class is in order. The majority of the teachers seemed to see this as a condition for inquiry-based working. It was evident from four interviews with teachers and two with school leaders that they thought it was important that the basis – teaching the class – must be in order before the teacher can contemplate inquiry-based working.

In all the cases teachers said they thought or experienced that they had sufficient knowledge and skills at their disposal to be able to engage in inquiry-based working (self-efficacy inquiry-based working). Two teachers indicated in the interview that their research knowledge and skills had deteriorated or were insufficiently developed because there was no call for them in their school context and they thus scarcely used them.

I know all about it in theory. I've had it all and I've done it all too, on a small scale of course at university. I think I'll have to get into it again ... I notice that you don't do much about it if you're not in one of those research groups. In theory I think I should be able to do it but I would have to look some things up again. (teacher case 3)

Hence it seems important to make demands in school on teachers' knowledge and skills regarding inquiry-based working to prevent these deteriorating.

Self-efficacy in collaboration in the field of inquiry-based learning concerns teachers' ability to collaborate with colleagues and become involved in inquiry-based working in the school. All the teachers indicated that this was a challenge and that they experienced a lack of knowledge and skills in this field. They indicated that problems regarding collaboration with colleagues are a hindrance

to being able to contribute to a culture of inquiry. The interviews with two school leaders supported this. The following quote of one of the teachers gives an impression of the challenges.

And now and again that's really a problem. Because there are people who want it to be, but if it hasn't been agreed you've of course always got those who say no, who don't feel like it, don't have time, because they're already too busy and dead weight and pressure of work ... Then it is very difficult to get things done because it's often seen as an extra burden, while it doesn't necessarily have to be so. And that really is difficult. (teacher case 5)

The teachers were trying to find out how they should and/or want to position themselves in the team. Their daring and drive to seek out collaboration with colleagues, even when they were lacking self-efficacy at this level, seemed to be positively influenced by coaching and encouragement by the school leader. This was evident, for example, from Caroline and Mark's situation, in which the school leaders not only promoted the importance of inquiry-based working but also the importance of collaboration, communication and involvement. They did this by discussing the importance of inquiry-based working and collaboration with the teachers or by acting as a role model. In most cases the school leaders and internal coaches did not have more expertise in the field of inquiry-based working than the academically educated teachers themselves. The situation was different in Mark's case, as an expert from a university was involved, who provided support in conducting collective research in the school.

Factors at the organisational level

In addition to individual factors, organisational factors evidently played an important role in being able to contribute to the culture of inquiry in the school or not. A formal research role for the academically educated teacher and a school culture already aimed at focusing on inquiry-based working seemed to be of particular influence.

Research role in the school organisation

A formal research role (for example, as a member or coordinator of a research group) furthered academically educated teachers' ability to contribute to the culture of inquiry. Four teachers had such a role. Moreover, the type of role seemed to influence the impact of that contribution in the school. Below, we discuss three types of roles.

Formal role as research-group coordinator. The impact of the teacher on the culture of inquiry was greatest in the cases in which the teacher had a formal role as research-group coordinator. However, only two academically educated teachers had such a role. Mark was involved in all the research groups in the school as research coordinator and had an important task in monitoring and supervising research in the school. In this role he played a part in stimulating communication and collaboration in the field of inquiry-based working within the entire team. Caroline coordinated two research groups and had a management position in the school. These roles meant that she was given room to contribute to school development. As a sort of translator – from policy to practice and vice versa – she could exercise influence on school policy.

Formal role as member of a research group. Rob and Steve participated in a research group at school but did not have a formal coordinating role. Communication and collaboration occurred mainly within the research group, not in the whole school. In Rob's case his contribution was primarily aimed at organisational matters. Steve's contribution was directed more at inquiry-based actions and behaviour, but he was not satisfied with the collaboration with others. In the interview he indicated a strong need for a more formal coordinating role. He thought that the status attached to a formal position would increase his possibilities to make a contribution to the culture of inquiry:

I still try but I don't have the idea that it works ... But I have the feeling that if I say something, then it's just, 'That's what Steve thinks.' In other words, I don't have the status. (teacher case 2)

No formal role in a research group. Lois had no role in a research group. The impact of her contribution was restricted to her class and year; there was no visible contribution to the culture of inquiry. The following excerpt from the interview with the school leader gives an impression of how the latter viewed Lois's contribution.

Simply that Lois is a really fine starting teacher. But I don't see her using more data than other colleagues. For me that's comparable to the other two first grade group teachers. ... (school leader case 3)

The school culture

In all the cases the school culture had the effect of fostering or hindering the contribution of academically educated teachers to the culture of inquiry. There seemed to be an interaction between the culture of inquiry in the school and teachers' contribution to it. The extent to which such a culture already existed in the school influenced an academically educated teacher's possibilities of contributing to that culture of inquiry and its further development. Below, we discuss how the school culture promoted or hindered the academically educated teachers' contribution to the culture of inquiry.

The school culture as a promoting factor. The culture of inquiry seemed to be strongest at Mark's school. Collective inquiry-based working appeared to be completely integrated into the school culture. A clear, collective vision on inquiry-based working had, according to the teacher and the school leader, however, not yet been established. Yet from information in the school plan, the interviews and the observations, inquiry-based working did seem to be considered relevant; the school leader promoted it and collective inquiry-based working appeared to be the normal way of working in the school. The excerpt below is from the school plan and is part of the school vision on pupils' and teachers' learning.

... An inquiring attitude of the pupil but also of the teacher must be part of the above-mentioned. For a number of years the school has worked with research groups of teachers, students, externals and other interested parties. We want to extend and secure and transfer this inquiring attitude to pupils. (school plan case 4)

During the interview the school leader mentioned the following about the relevance of a culture of inquiry in the school to the development of teachers and pupils:

I think that's important, firstly, because you bring in knowledge from outside with a culture of inquiry. Secondly, the work becomes more pleasant for people. Well-being increases. Professionalization gets a place. And it naturally has a positive effect on the children. (school leader case 4)

The school leader not only promoted the importance of research and a culture of inquiry in the school; she also served as a role model by participating in a learning team and using research outcomes as input for developing school policy. This all followed a recognisable cycle that had been organised for the team. Conscious attention was paid to involving the team by, for example, structurally making time for collaboration and communication with the whole team about research in the school. Both the school leader and Mark had an important role in organising and facilitating this. The excerpt below gives an impression of how this worked.

The research in school is cyclically organized. Soon, in May in the spring, then the learning teams will give a presentation. It's highly likely that they'll come up with tips and recommendations then. Mark, the research coordinator, collects the tips and recommendations. We then discuss them together. This leads to new focal points, new learning questions and new learning teams, which start the following year. The cycle of a learning team is that they actually work with a plan of action that incorporates the research cycle. (school leader case 4)

The existing culture of inquiry in the school had a positive effect on the contribution the teacher could make. This is what Mark himself said about the factors that further his contribution:

What really does work is the time I've been given for it. The confidence of the management, that they themselves work in the same way: inquiry based. The culture was already very good, that helps too. I help more to maintain it, but when I came here there was already a good culture of inquiry. These factors mean that it really does work . . . (teacher case 4)

Not only the school leaders' role appeared to be essential for a teacher to be able to contribute to the culture of inquiry; colleagues' attitudes towards research (team motivation) and team members' ability to engage in inquiry-based working (team efficacy) were too.

The school culture as a hindering factor. At Lois's school the culture of inquiry seemed to be limited. All the data sources showed that there was no collective vision on inquiry-based working. The school leader was scarcely involved in research himself in the school. During the interview he indicated that research can put more pressure on teachers.

It was apparent from the interview with the school leader and the teacher that the number of years of experience as a teacher – in comparison to colleagues – was seen as an important condition for fulfilling a supervisory role in the school. This is what the school leader said:

You can do that when you've got ten years' experience, then you've got something to say, I think. I think three years is fairly short to be explaining something to other team members. (school leader case 3)

That research was seen as putting extra pressure on teachers, that experience as a teacher was considered important and that many teachers had worked for a longer period at the school seemed to be influential aspects of the school culture. These aspects influenced the way Lois positioned herself and used her research skills in the school. She said:

Since I've worked here, this is also due to me now, I don't have the idea that anyone wants this. I notice that when someone else does something different, the reaction is, 'Oh, do we do that too?' So it's to do with me that I don't do it, but I don't have the idea that others are very keen.

... It's a team of people who've worked here for a very long time. I'm one of the youngest . . . I don't contribute much that's new . . . it's a sort of interaction, I think, the people who've worked here for a long time are perhaps less open to it . . . and the new people there are, don't feel there's time, so very little happens. (teacher case 3)

Steve's school culture was also not optimal. The interview with Steve showed, for example, that he did try to share his existing knowledge with colleagues but that the team had little ability to use that knowledge. He pointed out that colleagues did not connect and exchanged few ideas. Communication was one-sided and he encountered problems in the field of collaboration, which he felt hindered his contribution to the culture of inquiry.

Conclusion and discussion

A culture of inquiry in schools, with teachers collectively engaging in inquiry-based working, plays an important role in improving the quality of education (DeLuca et al. 2015, Katz and Dack 2013). Research is beginning to entangle which factors contribute to creating such a culture of inquiry in schools. For instance, recent studies have emphasised the important role of leadership in this respect (Brown and Greany 2017, Brown and Zhang 2017, Godfrey and Brown 2019). School leaders can create the structural and cultural conditions in schools (such as sufficient time and resources) that enable teachers to work inquiry-based (Godfrey and Brown 2019). However, little is known yet about the specific contribution that teachers from research-intensive routes in teacher education can make to a culture of inquiry and what they need in order to be able to do so. Since 2008 university-based primary teacher education programmes have existed in the Netherlands. Other countries like Norway, Singapore, Canada, Ireland and Portugal also developed their programmes into more university-oriented programmes in the last decades (Aspfors and Eklund 2017, Darling-Hammond 2017, Struyve et al. 2019). They specifically educate teachers for inquiry-

based working. These teachers are expected to contribute to a culture of inquiry in their school. However, to what extent and in what way they do this in practice and which factors enable them to make a contribution is not known. This case-study research gives more insight into this.

The results showed that the contribution of university-educated teachers was manifested in three types of behaviour (research question 1). Firstly, it was evident that they contributed by critically reflecting on school policy and strongly encouraging their colleagues to do the same. Secondly, teachers made a contribution to the culture of inquiry by using their existing knowledge and sharing this knowledge with colleagues. Thirdly, all the teachers initiated innovations, which often originated from an inquiring attitude in the class and was extended to the sections of the school or even school level, owing to the inspiration of and collaboration with colleagues. This characterisation conforms with the categorisation made in earlier research in three different forms of inquiry-based working, namely 1) systematic reflection, 2) using research and 3) doing research (Baan *et al.* 2018). In our research it was apparent that academically educated teachers tried to apply these forms of inquiry-based working more widely than just their own classroom. They reflected, for example, not only at class level but also thought about school policy. They used their knowledge from the existing literature and research and also urged their colleagues to do research. It is evident from the research by Baan *et al.* (2018) that teachers did not conduct very much research in their school, which also applies to the teachers in our study. The teachers in our study were capable of identifying problems in their class or school and tried out various approaches to solve these problems. They experimented with innovations when they experienced a sense of urgency to improve particular issues in their class or school. Moreover, they used existing research and literature to underpin their choices and also inspired others to deploy the same approach.

Teachers pointed out that their contribution to the culture of inquiry could be strengthened further. This study provides insight into the factors that influence this contribution (research question 2). Earlier research has already described the factors that influence teachers' inquiry-based working (e.g. Leeman and Wardekker 2014, Butler, Schnellert and MacNeil 2015, Zwart *et al.* 2015) but these studies were not specifically aimed at university-educated teachers' engagement in inquiry-based working or the factors influencing their contribution to the culture of inquiry. A teacher's formal research position and a stimulating school culture were found to be determining factors in a university-educated teacher's possibilities to contribute to the culture of inquiry. University-educated teachers mentioned a formal role as coordinator of a research group as one of the most important factors in being able to contribute to the culture of inquiry. The results of this research therefore confirm the findings of previous research from Baan *et al.* (2018) that a formal research role for university-educated teachers is important. This research shows that this formal role not only helps academically educated teachers to engage in inquiry-based working at an individual level but also to contribute to the culture of inquiry within the school. So, providing teachers from research-intensive teacher education routes a formal research role can help them to become catalysts for an culture of inquiry in their school.

The importance of a research role for university-educated teachers is in line with the outcome of the studies of Godfrey and Brown (2018, 2019) in which they underline the value of distributed leadership and teacher leadership in relation to a culture of inquiry in schools. Our study showed that teachers from research-intensive teacher education programmes do need a leadership role in the form of a formal research position in their school in order to make a contribution to such a culture. At the same time, this study showed that teachers experience difficulties in fulfilling this leadership role adequately. Future research could focus on how we can better equip and support teachers for their leadership role in relation to inquiry-based working. In addition this research offers more insight into the way self-efficacy plays a role in the contribution of academically educated teachers to a culture of inquiry. The academic teachers in our research did not so much experience a lack of self-efficacy in the field of inquiry-based working but did feel unsure about the *collaboration* involved. This did appear to hinder them from contributing to the development of a culture of inquiry in the school. This is an important insight, as self-efficacy in collaboration has an influence on how teachers position themselves and approach collaboration and communication with others. Collaboration and communication are essential for progressing from

contributing at an individual level to contributing to a culture of inquiry in which educational professionals engage in collective inquiry-based behaviour (Cochran-Smith and 1999, Snow-Geronon 2004). In the training and professionalisation of teachers, therefore, we must not only pay attention to the development of research skills but also to the skills that enable teachers to collaborate with others in the field of research.

The teachers in this study were explicitly educated for conducting and using research and entered the profession with the expectation to work inquiry-based. From the person-organisation fit theory, we do know that it is demotivating when there is no fit between the expectations and goals of an individual (in this case the university-educated teacher) and those of the organisation (in this case the school) (Carless 2005, Farooquia and Nagendrah 2014). In this study, some of the beginning university-educated teachers felt not appreciated by their colleagues, and this, in the end, hindered them to contribute to the culture of inquiry in their schools. Because research-intensive routes in teacher education are relatively new, the university-educated teachers in this study were sometimes the only ones in their school with research expertise. We do know from the literature, that it is demotivating for beginning teachers when they enter school cultures in which their new ideas are not valued and supported by colleagues who have been working longer in the school (the so called 'veteran-oriented cultures') (Kardos Moore Johnson Peske Kauffman and Liu 2001). Therefore, it is important to investigate how we can better meet the needs of beginning teachers from research-intensive programmes, in order to keep them motivated and let them flourish. From this study, it appeared that it is at least important that they encounter a school context in which research is appreciated and there are opportunities for collaboration. Additionally, this study showed that providing professional development activities in which teachers can learn how to initiate innovations and cope with resistance from colleagues is important. Godfrey and Brown (2019) emphasise the value of an external network for research-engaged schools in which research practices are exchanged between different schools. Such an external network can be of particular importance for beginning teachers from research-intensive teacher education routes; it enables them to meet and collaborate with other teachers with research expertise and exchange and further develop their ideas and expertise concerning inquiry-based working. This qualitative study was carried out with five teachers and their managers. The outcomes cannot be generalised owing to the small scale of the study; but that was not the aim of this study. We wanted to explore academic teachers' contribution to the culture of inquiry in their school and the factors that influence that contribution. This qualitative research has provided better insight into this. However, the outcomes could be verified in a follow-up study with more respondents. For this research only teachers with a limited number of years of experience were interviewed. It would be interesting in future research to look at how the contribution of academically educated teachers develops further in relation to more years of experience.

Despite these limitations the insights from this study complement earlier studies on the inquiry-based working of teachers and professional development in this domain. The research generates insight into the contribution which university-educated teachers can make to the culture of inquiry in school and how we can strengthen this contribution. Schools and school leaders can use the outcomes to promote a culture of inquiry in the school and to utilise and promote fully the possibilities of academically educated teachers to contribute to this culture. Likewise university education teaching programmes and in-service training institutes can use the results to prepare students and teachers better for their role as academically educated teachers in practice.

Disclosure statement

No potential conflict of interest was reported by the authors.

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