

# **Title: Realizing data-driven changes and teacher agency in upper secondary schools through formative interventions**

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## **Abstract**

This chapter presents a Norwegian developmental work research (DWR) project between schools and a university aiming to develop assessment literacy using a school-based professional development entrance. Twenty upper secondary schools (year 16–18) participated in the project, and this case study presents data from two of these schools. In-service training serves as the boundary object, and we explore how collaboration between teachers in the school, and between the school and university, support the development of assessment literacy. We argue that the use of expansive learning for investigating and developing inquiry-based teaching seems promising in order to develop professional assessment practices, but commitment to the task needs to be established. Top-down processes may prevent commitment, but specialisation can lead to more interaction between schools and university which, in turn, can lead to increased understanding, increased commitment, and improved teacher practices.

## **Introduction**

In this chapter, we present a development work research (DWR) project aiming to understand the professional development of assessment literacy in Norwegian upper secondary schools. Over the last few decades, developing assessment literacy in and across schools has been an international concern, involving policy and practitioners, and different professional development programs have been developed and implemented to develop assessment literacy (Laveault, 2016). Due to the central role assessment plays in student learning and the key role teachers play in educational assessment (Black & Wiliam, 1998a; Wiliam & Thompson, 2007), there is a growing interest in assessment litearcy as an integral part of teacher professionalism (DeLuca & Johnson, 2017; Laveault, 2016). Despite these compelling benefits, research shows that many teachers struggle to interpret assessment policies and to implement assessment practices related to contemporary policies and assessment theories (DeLuca & Johnson, 2017; Hopfenbeck, Flórez Petour, & Tolo, 2015; Popham, 2009).

The first challenge seems to be the complexity of the knowledge and skills being assessed. Assessment literacy involves a basic understanding of educational assessment as well as the related skills to apply, such as the various reliable measures of student achievement and how to use this information to facilitate valid instructional designs (DeLuca & Johnson, 2017;

Popham, 2009, 2013; Stiggins, 2010; Xu & Brown, 2016). Second, the development of expertise among teachers and school leaders in assessment seems to be challenging (Laveault, 2016) when it comes to professional development and to generating change at the school level (Hill, 2016).

A major challenge in the Norwegian education system when it comes to implementing Assessment for Learning (AfL) programme—a government-initiated programme seen as a top-down implementation—has been the low accountability and transparency on the one hand and the high level of decentralization and autonomy among the teachers on the other (Hopfenbeck et al., 2015). The capacity to use assessment information appears to be a real challenge for teachers when the purpose is to support learning (Hopfenbeck, Tolo, Flórez Petour, & Masri, 2013; Laveault, 2016; Mausethagen, Prøitz, & Skedsmo, 2018).

Research recommends using professional development (PD) as a component of policy enactment (Laveault, 2016; Postholm, 2018), and bottom-up implementation processes characterized by trust, dialogue and high levels of teacher agency are considered important to resolve tensions in educational reforms to realize teacher-driven improvements in schools (Donohoo & Velasco, 2016; Hopfenbeck et al., 2015; Leahy & Wiliam, 2012). Also, the role of school leaders to facilitate and follow up the improvements is crucial, as is the university researchers who function as trainers or facilitators (Datnow & Hubbard, 2016; Postholm, 2015). Shared transformative agency happens when a group of teachers search collaboratively for a new form for productive activity (Virkkunen, 2006), but it also needs a form of collaboration that crosses established organizational boundaries (Kotter, 1996).

This chapter reports on a DWR project focusing on the school-based professional development of assessment literacy in 20 upper secondary schools (year 16–18) in Norway. The DWR project concerns the challenges related to the large-scale implementation of the AfL programme, and it is an attempt to link school development and teacher learning in classroom assessment practices. This goal is based on the assumption that learning occurring in school in cooperation with other teachers and a school administration that supports social learning is the best way for teachers to develop their own teaching, which, in turn, can lead to benefits for the students' learning (Postholm, 2018).

In this DWR project, the expansive learning cycle (Engeström, 1987) (see chapter 1 and 2) stimulates teacher agency in school development processes. The purpose of this research is to explore how this project using an expansive learning approach (Sannino et al., 2016) would enhance teachers' assessment literacy and to build capacity in schools for more data-driven assessment practices. There is an increasing need for interventions that support not only teachers' involvement in transforming the system in which they are involved but also their development into a collective subject of change.

### ***Assessment for learning implementations***

There are numbers of examples of how the implementation of AfL programmes has been done successfully in small-scale projects in which the motivation to join the project is based on special arrangements (Baird, Hopfenbeck, Newton, Stobart, & Steen-Utheim, 2014; Black & Wiliam, 1998b; Hayward & Spencer, 2010; Hodgson & Pyle, 2010). Enacted as large-scale policy, however, there has been difficulties in their implementations (Hopfenbeck et al., 2013; Tam & Lu, 2011; Thompson & Wiliam, 2008).

When a school develops its assessment practice, well-established teaching routines can be challenged by new ideas. The literature discusses concerns about the lack of subject content knowledge and assessment skills among teachers and also calls for a broader understanding of the complexity of AfL programmes and the wider context of education (Black & Wiliam, 2018; Carless, 2005; Hodgson & Pyle, 2010; Nordenbo, Larsen, Tiftikçi, Wendt, & Østergaard S., 2008; Thompson & Wiliam, 2008).

Another implementation concern is related to whether teachers are part of a whole-school commitment to the implementation and whether AfL communities have been created to generate change at the school level (Hill, 2016). The school's overall assessment literacy is a crucial aspect of such processes and includes the ability of teachers and school leaders to investigate students' achievements, to develop action plans based on assessment results to raise learning outcomes and to participate in the public debate on the use and abuse of such data (Black, Harrison, Lee, Marshall, & Wiliam, 2010; Fullan, 2001).

There are a number of models for how school development can take place, and according to Kennedy (2005), they can be categorized on a spectrum from the pure transfer of knowledge to more transformative-oriented and inquiry-based development models. In the transfer

model, also called the ‘cascade’ model for school development, the existing knowledge introduced into the school has been dominant and also within the assessment field (Hutchinson & Hayward, 2005). New school development models, in contrast, emphasise an investigative and school-based approach to the professional learning of teachers and school leaders (Cochran-Smith & Lytle, 2009; Jiang & Hill, 2018; Helen Timperley, 2011) in close collaboration with experts (Datnow & Hubbard, 2016). Successful school development processes, therefore, require knowledge, good relationships, trust, and meaningful collective experiences (Fullan, 2001). To establish and sustain AfL communities, creating professional learning communities has been recommended as a strategy (Birenbaum, Kimron, & Shilton, 2011; Hargreaves, 2013; Timperley, Wilson, Barrar, & Fung, 2007).

### ***The Norwegian context***

Norway, like many other countries, has been inspired by the AfL movement, and in 2006, the country underwent new curriculum reforms focusing on learning outcomes descriptions. A national AfL programme was launched in 2010 (and concluded in 2014) to develop assessment skills at school, especially AfL terms. Schools were motivated to participate through government funding. The national initiative was based on the four research-based principles of the AfL programme (Assessment Reform Group, 1999), which are also emphasised in the Norwegian Education Act as a student's right to receive assessment that promotes learning (Regulations of the Education Act, 2006).

The Norwegian authorities assumed that the relationship between policy and practice was quite simple. If the teachers received information about new ideas and the opportunity to reflect on them along with some tools for school development, the implementation would be relatively problem free. The idea was that some teachers would hear a little about the desired changes, and then they would spread these ideas or practices in their own classroom, among their own colleagues and to other schools. Experience from AfL programme in Norway shows that the transfer model (Kennedy, 2005) has good intentions but also several shortcomings in its practical implementation (Hopfenbeck et al., 2015). Furthermore, the cascade model does not consider the complexity of a school as an organization and how teachers learn with it (Hutchinson & Hayward, 2005; Sandvik & Buland, 2014).

### ***The context of the DWR project***

A county municipality in Norway and a university have entered into an agreement to undertake a DWR project aimed at school-based professional development of assessment literacy. The agreement covers all upper secondary schools in the county and lasts four years (20 schools and two years in each school), where the schools enrol in groups of four during the four year period. The purpose of this DWR project is to develop the school's overall knowledge and understanding for the professional development of assessment literacy in a community of practice. A key objective is to help develop assessment literacy through inquiry-based teaching practices within the school subjects—that is, the teachers develop the capacity to do development work research (DWR) related to their teaching and assessment practices. This DWR emphasises school-based professional development (Cochran-Smith & Lytle, 2009), which implies that the school, including management and all participants in the competence initiative, actively participates in the development process within its own workplace (Bennett, 2011).

Researchers collaborate with the schools for a period of two years (see figure 1 below). The university researchers, as collaboration partners, stress that they do not own the DWR project. The school and the school leadership are at the front of this school-based project. The first half year is used to assist the school leadership in anchoring the project among teachers. In addition, it involves a mapping phase to gain knowledge about the school's assessment literacy and experience with PD before starting the development work. Also, the school leadership often needs to gain more knowledge about how to lead PDs' during the project. The expansive learning cycle (Engeström, 1987, 2001) (see chapter 1 and 2) forms the basis for the work on assessment and PD, both for teachers and leaders; it stresses the use of data to investigate both the assessment practices and the outcome of their DWR. The school leaders and teachers receive professional support onsite, and the university collaboration partners also give guidance and supervision between school visits to support the DWR. There are also established networks between schools, where school leaders have the possibility to share experiences, discuss problems, and learn from each other. Additionally, DWR could be both teacher training and further education in a flexible model. The further education training program 'assessment and R&D' awards participants 15 ECTS credits upon completing the program. This means that teachers in groups of three or four collaborate in the different phases of the expansive learning cycle (Engeström, 1987, 2001). In the further education

programme, the teachers systematically document and investigate their practice in assignments, which are supervised by university researchers; the teachers also receive extra lectures and training in different but related topics. The university researchers also offer available resources, model texts, and writing frames to meet the various phases of the expansive learning cycle (Engeström, 1987, 2001). Figure 1 below gives an overview of the different processes in this DWR project.

FIGURE 1 IN HERE

Figure 1. DWR model for PD and assessment literacy

In this chapter, we analyse data from two of the 20 participating schools. School 1 was a small upper secondary school (200+) with vocational studies, and School 2 was a large (700+) urban upper secondary school. These two schools were chosen as case schools because they chose different ways of working within the DWR project. School 1 chose the further education programme, whereas School 2 decided on teacher training without ECTS credits. Furthermore, School 1 is a school with vocational studies, and School 2 educates students for university studies.

### **Theoretical and methodological framework**

This study is based on the cultural history activity theory (CHAT) (Wertsch, 1991). In this study, assessment is understood as situated social practice, which means that what is seen as legitimate knowledge and practice in the classroom is influenced by both traditions and the institutional discourse on assessment (Pryor & Crossouard, 2008). This approach to assessment may identify tensions and conflicts within the social practice where the assessment takes place. Black and Wiliam (2009) have applied CHAT to analyse how formative assessment may change what the teacher expects of her students and how different assessment tools can be used to change the assessment practice. Furthermore, studies giving greater insight into the effect of formative assessment has significant importance for how the teacher uses the knowledge she gains about the students' learning. Pryor and Crossouard (2008) have applied CHAT to study how the teacher's role as teacher, examiner, subject expert and learner affects the division of work and how the rules are formed in relation to the

students. They claim that by being aware of the different roles, the students will find it easier to understand switching between them, which, in turn, will help them develop critical awareness of the educational discourse and its construction. These are examples of how CHAT could be applied in analysing assessment cultures on the macro level. On the micro level, Thorne (2004) has used CHAT to study how co-student assessment functions in a classroom and to examine the changes that are required to improve this assessment practice. On a more organizational level, Postholm et al. (2013) have used CHAT to understand how school-based competence development may contribute to developing professionalism in lower secondary school. In a review of studies based on CHAT, Roth and Lee (2007) emphasise the advantages of the theory in development-oriented studies, and the authors call for studies that use the theory on both the organizational and individual level.

Engeström introduced formative interventions as a way of putting teacher agency in the front in the design of research (Engeström, 2011; Sannino et al., 2016). A DWR project is a ‘formative intervention’ methodology (Engeström & Sannino, 2010), which promotes positive change in practices using a participatory, collaborative design. It also offers the following: (a) interventions based on design done by the teachers or leaders; (b) a collective design effort based on an expansive learning process, including participatory analyses and implementation phases; and (c) insight into the capacity building work of schools as well as the differences in context-specific knowledge needs in the individual school's activities concerning data use. Within formative interventions, the expansive learning cycle (Engeström, 1987, 2001) is a model that could stimulate inquiry-based teaching practices and data use. The model is presented in detail in chapter 1 and 2.

Formative interventions could also contribute to the development of theories, practices and tools that can be used in other schools and in teacher education to develop further knowledge about professional development in data-poor and autonomous contexts (Engeström, Sannino, & Virkkunen, 2014).

### ***Teacher agency***

In today's working life, teachers are expected to be creative, present initiatives and contribute to innovative solutions. They are expected to critically reflect on and develop their work practices; however, they are also expected to be committed and loyal to the school and as well as its policy. The desired agency is, therefore, to be considered participative, development



oriented, innovative and compliant. Implementing the nationwide AfL programme showed that teachers were not fully committed or engaged in the top-down programme (Hopfenbeck et al., 2015; Sandvik & Buland, 2014). Practices developed mostly individually, and collaboration that crossed established organizational boundaries did not succeed.

Agency in CHAT is not the starting point (Virkkunen, 2006). The starting point is activity, and activity always has a creative and transformative aspect to it, which comes from its inner contradictions and movement. According to Virkkunen (2006), agency in CHAT boils down to the following question: how participants become authors of their activity and give direction and shape to the activity? Within CHAT, studying agency means going to the roots of how agency emerges (Virkkunen, 2006).

The expansive learning cycle is the model used in this DWR project to stimulate teacher agency, question today's practice, analyse it, develop new solutions, investigate them and then make decisions about future practice (Engeström, 1987, 2001). The cycle is also used as a theoretical framework to understand the processes in the two schools analysed.

### ***Boundary crossing and boundary objects***

In this DWR project, the schools and the university collaborated to improve assessment literacy among teachers and school leaders, and “in-service training” was introduced and created as the new boundary object. As Bowker and Star (1999) explain, ‘Boundary objects are those objects that both inhabit several communities of practice and satisfy the informational requirements of each of them’ (p. 297). In order to facilitate DWR, the university could provide teacher training and further education in a flexible model. The in-service training had two forms. In School 1, it took form as further education with exams giving 15 ECTS, whereas in School 2, only teacher training without exams and ECTS was chosen as DWR.

The in-service-training was intended to lead to profound changes due to assessment literacy in the two schools, as we examined the learning that took place for the participants—that is, teachers across departments and their leaders crossed community boundaries and engaged in the joint enterprise of teaching and learning mediated by the in-service training. The object was to improve literacy assessment across boundaries.

Boundary-crossing involves going into unfamiliar territories and requires cognitive retooling. New elements are introduced from one community of practice to another via boundary crossers, or ‘brokers’ (Wenger, 1998). These elements, referred to as ‘boundary objects’ (Star, 1989), often lead to the creation of new tools. Akkeman and Bakker (2011) argue that not only people but also objects can play an essential role in crossing boundaries.

Boundaries may be challenging, but they may also give opportunities for innovation and renewal, as crossing boundaries forces the teachers to reflect on their practices and assumptions, which can contribute to deeper learning (Wenger, McDermott, & Snyder, 2002). Boundary crossing within work gives opportunities to realize and explicate differences between practices and, thus, to learn something new about their own and others' practice (Akkerman & Bakker, 2011). In our case, two activity systems collaborated—the community of each participating school and the university. The collaboration intended to acquire expertise across boundaries.

## **Methodology and methods**

A case study approach (Creswell, 2013) was used to investigate the DWR projects conducted in the two schools. We have used different sources of data, and all data reported in this chapter informs the study. Audio-recorded data from focus group interviews with school leaders (12 leaders: seven from School 1 and five from School 2) and teachers (40 teachers: between three and five in each focus group interview) before and after the interventions were used for this study. The interviews were transcribed by a researcher assistant and then analysed.

Other sources of data for this study included the following: school plan documents, teacher documents about the DWR (historical analysis, questions to investigate practice, theory and methods informing the DWR, and analyses of the results of the DWR), and field notes and observations from meetings and workshops with teachers and leaders during the intervention phase.

To analyse the data, we coded the data from each school using directed content analysis (Wenger, McDermott, & Snyder, 2002). We focused on how teacher collaboration in developing professional assessment practices were affected by the use of the expansive learning cycle as a model to follow in the DWR project and on how expertise was acquired

across boundaries to bring the practice towards the object and to develop assessment literacy across boundaries. Then, we interrogated the coded data through theoretical categories suggested by the construct of the expansive learning cycle (Engeström, 1987, 2001), teacher assessment literacy in practice as conceptualized by Xu and Brown (2016) and of teacher transformative agency occurring through boundary objects (Wenger, 1998).

## **Findings**

Four main findings were identified in relation to teacher collaboration and assessment literacy: 1) commitment and school leadership; 2) participation in community activities; 3) developing the assessment knowledge base; and 4) using data to inform and develop practice. In the table below (table 1), we present how the two schools followed the different phases of the expansive learning cycle.

TABLE 1 IN HERE

Table 1. The DWR seen through the lens of the expansive learning cycle

### ***The role of commitment and school leadership***

At School 1, they had organised their work in collaborative teams, and they were used to share and plan teaching with other teachers. Also, the leaders were used to be close to their teachers. They had expressed expectations that the actions should be integrated in their daily work, and they used much effort to anchor the project within the teachers. Also, as they expressed, they ‘showed an open interest in the teachers’ different projects’, and the leaders participated in activities with the teachers.

In School 2, the situation was different. The school leadership had addressed challenges associated with an organization that was not used to such collaborative work between teachers or between leadership and teachers. At the closing meeting with the university, one of the leaders said the following: ‘I am even more certain that we need to be closer to the teachers as leaders. I have learned that I have to be patient, be close on the coordinators, asking for their progress without telling them what to do’. However, one of the leaders felt they had succeeded in developing more collaboration within the teams:

There has been close cooperation between department head, subject coordinators and teachers. And we're not done yet. It is a development that will continue. We had great doubts and we had a bad start. But we have come very well into our goals. We didn't want small stunts. We wanted to have long-term development work.

### ***Participation in community activities***

The teachers at the two schools had different experiences connected to collaboration; also, the local values and rules concerning collaboration were totally different. Some teachers at School 2 worried about the development projects coming from outside the school. One teacher asked: 'Why do we need to collaborate more? Does it mean I'm not doing a good job?' However, as the project gradually got settled, many teachers found that the project had been important considering the community of practice of the different departments and that they had increased knowledge about assessment. They found they actually could discuss pedagogical practices with colleagues they never had talked to before.

At School 1, this project stimulated more systematic collaboration; sharing between groups was especially valuable for the teachers. One important thing for the systematic work was how the leadership put the collaborative work on the time schedule for teachers—one hour per week was dedicated for this work. Some of them also had the opportunity to present their work for teachers at other schools, and one teacher said this was 'extremely motivating and stimulating'.

### ***Developing the assessment knowledge base***

The main difference between the projects in the two schools was that in the School 1, almost every teacher wanted to go through the project and finish the education programme, including all of its obligations and assignments. Many of the teachers at School 1 had not finished a master's degree because they came from other occupations as mechanists, healthcare professions or other occupations taught in the school. Therefore, they felt a need for more formal education. At School 2, the situation was different. Most of the teachers had a master's degree and were teachers at a school preparing students for university studies. They did not feel the same need for this formal competence.

At School 1, the teachers worked hard to develop relevant research questions; they read assessment theory, chose research methods fitting their research questions and wrote written

assignments. During the whole process, they interacted closely with the university, as they got feedback, support and theoretical advice from university members during the different phases of the DWR. This is what one group wrote in its assignment:

We believe that as a group we are left with a great benefit from the work. We developed our assessment expertise, both through practical actions and the theoretical knowledge through the project. This will affect our teaching and assessment practices to a large extent in the future.

At School 2, the work developed in other directions. The university mainly interacted with the leaders but not with the teachers. The teachers planned their work alone in groups and did not want much interaction with the collaboration partners from the university to investigate the practice, neither for theory nor for methods. It is not clear how much the leaders interacted in the processes either.

The leaders from School 1 reported from their meetings with the student council. The students had experienced various practices concerning assessment for learning—something that the students found very confusing and unfair. They had clearly expressed to the leadership that they wanted teachers who can use assessment criteria in their teaching practice. It appears that assessment has generated more interest among the students through the project.

### ***Using data to inform and develop practice***

The expansive learning cycle suggests that the teachers and researchers (collaboration partners from the university) should use data about the participants' learning to inform the project—both in the historical and actual-empirical analysis as well as in the evaluation phase. At School 1, two of the groups reported that they found the evaluation gave useful information about the students' learning processes that they reported, which would be used to develop this project even further. Other groups based their information on the teachers' experiences and shared their reflections on what they had tried. Data were also collected and used by the teachers in order to evaluate the influence of their DWR projects in their classrooms and to write the report that served as the exam of the further education.

At School 2, data use was a new turn in their collaboration and sharing practices; the project challenged the way collaboration was done. One teacher expressed the use of data this way:

‘it has totally changed how I teach and assess my students work’. However, only a few of the groups evaluated the influence of their DWR projects on student learning.

## **Discussion**

### ***Teacher agency***

The findings indicate that DWR projects can contribute to transform teachers’ agency using an expansive learning approach and enable them to understand the importance of data use to enhance students’ learning (Sannino et al., 2016; Virkkunen, 2006). This project with the further education programme followed by most of the teachers in School 1, seem to have stimulated a change in the activity system at the school level. The further education programme created a closer relationship with the university, as there were obligatory tasks to be delivered and upon which to receive feedback. This specialization may have led to increased understanding and, thus, increased commitment, as the teachers find that this has significance for improving their own practice.

This capacity to go into DWR seems to depend on the teachers’ openness and willingness to do inquiries into their own and others’ practices. The further education programme—having clear expectation tasks to be done as well as access to the expertise provided through feedback by the university (Postholm, 2016)—may also have strengthened the commitment to the project and created a collective motive to act on the object (Engeström & Sannino, 2010) .

Creating a culture in schools that encourages the using of data to inform practice is a goal (Robinson, 2011). Our findings indicate that teacher agency is transformative, and the changes in schools seem to be durable when commitment to the activity is established. In School 2, the school leaders were more reluctant to stress the use of data or to express clear expectations, and because of this reluctance, it seems that the teachers continued their habit of just sharing experiences about practice without properly exploring it. They were operating as reflective practitioners but not going into a more inquiry-based teaching practice (Hutchinson & Hayward, 2005; Kennedy, 2005). The expertise of the university became not a part of the progression of the DWR, as it was in School 1. Expansive learning is a way to develop new activity, a new form of collective practice. This development seems to happen if the commitment to the activity is established. Specialization can lead to increased understanding and commitment when the teachers find that it can improve their practice.

The school leaders are responsible for establishing and developing a shared understanding and interaction practice (Robinson, 2011). In the schools that have had success in developing an inquiry-based assessment culture, the leaders have managed to establish a culture in the school where learning and development are pervasive characteristics of the school culture.

### ***Data use and PD***

This study further illustrates how collaborative learning activities in PD act as a trigger of self-awareness and are an important source of feedback on professional learning achievements among teachers (Hill, 2016). These activities give insight into the capacity building work of schools and highlight the differences in the knowledge needs of the schools concerning PD and data use when developing assessment literacy (Hopfenbeck et al., 2015; Mausethagen et al., 2018).

Teachers at School 1 are more collectively motivated towards the object; they also have increased interaction with the university when planning and investigating their teaching. The school leadership established new arenas for collaboration; the teachers experienced the demands as stimulating, and they felt inspired by having access to external expertise. In contrast, at School 2, the teachers were less committed to interventions and were unwilling to do a thorough analysis or use data in their investigations.

Our study shows that commitment is important when development projects are initiated from outside the school, and simply to start with the needs of the schools and teachers is not enough in order to engage the teachers in DWR. Similarly, school leaders cannot simply identify the school's needs for development based on a student survey in order to gain teachers commitment to engage in DWR. Our data indicates that further education as a collective activity may lead to increased commitment, as it strengthens the need for interaction and for the use of expertise across boundaries, and this may transform teacher agency. When there is collective motivation towards the common object and when needs are thoroughly investigated, DWR can support the development of PD within schools that are driven by teachers. The study can contribute to the development of theories, practices and tools to be used to develop further knowledge about professional development and data use in data-poor and autonomous contexts, where DWR projects, expansive learning and transformative agency are the main characteristics of these methodological and theoretical foundations.

## Limitations

Using interviews and written reports as research data has clear limitations, as their conclusions may be a result of compliance with the perceived expectations for the work the teachers are supposed to do, and not truthful accounts of their collaborative learning processes. However, given our conceptualization of this DWR project as boundary crossing, these data could also be considered boundary objects (Akkerman & Bakker, 2011; Star & Griesemer, 1989) designed specifically to assist teachers and researchers in navigating between new borders.

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