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EDUCATIONAL ASSESSMENT & EVALUATION | RESEARCH ARTICLE

Feedback practice in lower secondary school: Exploring development of perceptions of feedback practice among students and teachers

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Abstract: This article reports on a qualitative study investigating how perceptions of feedback and feedback practice developed over the course of a seven-month development project with students and teachers in ten lower secondary schools. The aim of the study was to contribute to the knowledge about how a development project with teachers can contribute to changes in perceptions and in the practice of formative feedback. The data are based on interviews with students and teachers before and after the development project, and the project builds on Hattie and Timperley's feedback model (2007). The findings reveal changes in perceptions and in the use of feedback in learning processes. It is less evident whether clarifying aims and criteria together with the students, provided opportunities for the students to use feedback as a basis for further learning. Formative assessment practice has been implemented to some extent in the schools, and it is essential to strengthen teachers' feedback practice to enhance student learning.

1. Introduction

Research in formative assessment has revealed promising results as regards its effects on academic achievement (J.A. Hattie & Donoghue, 2016; J. Hattie, 2009; J. Hattie & Timperley, 2007; Kluger & DeNisi, 1996). Assessment becomes formative when the information provided forms a basis for improvement of both student learning processes and instruction by teachers (Black & Wiliam, 1998; Wiliam, 2011). Formative assessment is referred to as the process of closing the gap between a learner's present state and the prospective goal of a learning process (Ramaprasad, 1983; Sadler, 1998). In Wiliam & Thompson's work Wiliam and Thompson (2008), the provision of

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feedback that moves learners forward is described as a strategy for formative assessment. Thus, feedback can be referred to as "processes where the learner makes sense of performance-relevant information to promote their learning" (Henderson et al., 2019, p. 268).

Feedback has been found to have a strong influence on students' learning and it is crucial in assessment for learning (Black & Wiliam, 2018; J. Hattie & Timperley, 2007; Kluger & DeNisi, 1996; Nicol & Macfarlane-Dick, 2006; Shute, 2008; Wiliam, 2011). However, specific aspects of feedback influence on students' learning experience and their responses to feedback. This presupposes not only awareness and understanding of students' perceptions of feedback, but also teachers relating to students' understanding (Black & Wiliam, 2018; Molloy et al., 2020). For feedback to be useful, it is crucial that the feedback message both relate to students' understanding of the learning goal and promote student agency in seeking feedback (Boud & Molloy, 2013; Gamlem & Smith, 2013; Pitt et al., 2020; Winstone & Boud, 2020). Students' perception of feedback from teachers and teachers' responsiveness to students' knowledge and understanding are thus important in relation to the usefulness of the feedback and how it can be used for further learning processes (Black & Wiliam, 2009; Carvalho et al., 2014; Gamlem & Smith, 2013; Pitt et al., 2020). Building on these arguments, feedback can be described as dialogic interaction between students, peer-students, and teachers that includes mutual responses to information provided by the other (Black & Wiliam, 2009; Gamlem & Smith, 2013).

Feedback as dialogues is conceptualised as responsive pedagogy by Smith et al. (2016). Responsive pedagogy is defined as the *"the recursive dialogue between the learner's internal feedback and external feedback provided by significant others, e.g., teachers, peers, parents"* (Smith et al., 2016, p. 9). The recursive process of assessment dialogue between students and teachers, as well as how mutual responses form the feedback, presumes that students and teachers use feedback, respond to it, and engage in dialogue about feedback (Black & Wiliam, 2018; Gamlem, 2019; Nicol & Macfarlane-Dick, 2006; Smith et al., 2016). *"Feedback as dialogue means that the student not only receives initial feedback information, but also has the opportunity to engage the teacher in discussion about that feedback"* (Nicol & Macfarlane-Dick, 2006, p. 210). Teachers' sensitivity and openness towards student learning needs, is, therefore, a crucial dimension of feedback interaction and feedback quality (J.A. Hattie & Donoghue, 2016; Pitt et al., 2020). Furthermore, the enhancement of responsive pedagogy through feedback also involves strengthening students' self-regulation skills and self-efficacy (Bandura, 1997; Andrade, 2010; Nicol & Macfarlane-Dick, 2006; Schunk & Pajares, 2002; Zimmerman, 2002).

In Norway, formative feedback has been anchored in Norwegian policy documents and assessment regulations since 2006 (Ministry of Education and Research, 2020a). The assessment regulations refer to formative feedback as: students' understanding of learning goals; feedback provided by teachers, including information about the next step in the learning process; and student self-assessment. The assessment regulations indicate the kind of formative feedback that should take place in daily teaching and learning activities, such as dialogue in the classroom, oral and written feedback, and non-verbal evidence of students' comprehension and progress (Ministry of Education and Research, 2020). The Norwegian context may warrant special attention, as Norway has implemented policies on formative assessment that are meant to secure students' legal right to quality feedback (Ministry of Education and Research, 2016; Norwegian Directorate for Education and Training, 2018). Alongside implementation of the assessment reforms, the educational authorities have provided substantial support to schools through professional development programs in assessment since 2007 (Tveit, 2018).

Baird et al. (2014) and Tveit (2014) indicate that there has been a lack of research in assessment for learning in the Norwegian context. Teachers in Norway are expected to have implemented formative feedback in classrooms since formative feedback was included in assessment legislation in 2007. Previous studies from the Norwegian context show minor changes in assessment practice in maths since 2007, and Bueie (2017) and Havnes et al. (2012) show that students receive less

feedback in maths than in other subjects in school. To answer the critique, a research and development (RD) project was initiated and developed by a group of seven researchers from four teacher education institutions in Norway. An intervention over seven months was set to study the connection between teachers' feedback practices and students' learning in maths (Gamlem et al., 2019; Haara et al., 2020).

2. AIM and research question

The study described in this article is part of a research and development project (RD project) initiated and developed in Norway and was designed to examine development in students' and teachers' perceptions of feedback and feedback practice during the project period. Perception of feedback as a concept is used to describe informants' interpretation and understanding of feedback, both oral and written, and perceptions of feedback underpin feedback practices (Gamlem, 2015; Gamlem & Smith, 2013; Jónsson et al., 2018). The aim of the study is to examine how the RD project contributed to the development of students' and teachers' perceptions of feedback and feedback practice. The assumption is that changes in feedback practice influence perceptions of feedback (Martínez-Sierra et al., 2020). To our knowledge, few studies have examined the development of both students' and teachers' perceptions of feedback practice during a development project in maths classrooms. The research question addressed in the current study is: *how do students' and teachers' perceptions of feedback and feedback practice develop over the course of a seven-month development project in maths classrooms?*

The larger project is a mixed method study (for details, see, Gamlem et al., 2019; Haara et al., 2020) that builds on the concept of responsive pedagogy as defined above (Smith et al., 2016) and assumes that the development of teachers' formative feedback competence and skills influences student learning. The current study exclusively investigates qualitative data related to the development of students' and teachers' perceptions of feedback and feedback practices (Gamlem et al., 2019).

Despite the national focus on formative assessment and developing teachers' assessment competence, the annual Student Survey 2020, shows that feedback on how to improve learning and student involvement in assessment score poorly in the survey (Norwegian Directorate for Education and Training, 2020). Moreover, Gamlem and Smith (2013) suggest that students are not given sufficient opportunity to use feedback to improve their learning. Nortvedt et al. (2016) found that Norwegian schools have a weak assessment culture when it comes to enhancing student learning in classrooms. To counter this, they suggest that teachers should develop collaborative team work to promote student involvement in assessment (Nortvedt et al., 2016). In addition, several studies indicate a significant failure to make systematic use of aims and criteria in assessment, as well as to involve students in assessments (Havnes et al., 2012; Hopfenbeck et al., 2012, 2013). Several studies have examined perceptions of feedback as an integrated part of assessment for learning from both student and teacher perspectives (Carvalho et al., 2014; Gamlem, 2015; Gamlem & Smith, 2013; Jónsson et al., 2018).

Maths is a challenging subject when it comes to assessment for learning (Havnes et al., 2012), and teaching in maths classrooms seems, traditionally, to be driven by teachers transferring knowledge and feedback on learning to students (Boistrup, 2010; Carless, 2006; Gamlem, 2019; Haara et al., 2020; Wiliam, 2007). Hodgen and Wiliam (2008) explain that formative assessment becomes a key for development of mathematic literacy. Mathematic literacy can be developed through "understanding of the meaning, use and justifications of ideas" (p. 1) and to build a relational understanding of how ideas interrelate. To develop mathematic literacy, students must be engaged in classroom discussions and dialogues where they can express and discuss ideas. Learning aims in mathematic curricula in Norway (Ministry of Education and Research, 2020b) stress modelling, problem solving and expressing solutions. Nortvedt and Pettersen (2015) suggest that efforts should be made to strengthen formative feedback in maths to enhance students' maths achievements. Gamlem (2019) finds that student-teacher interactions in

mathematic classrooms are rarely built on feedback dialogues, which is emphasized as important for learning (Hodgen & Wiliam, 2006; Wolfe & Alexander, 2008). On this basis, we find a study examining feedback in the context of maths education useful.

3. Formative feedback

Formative assessment comprises socially situated activities, and Ruiz-Primo (2011) puts special emphasis on the potential that dialogue and learning conversations in the classroom have for learning. Consequently, feedback is embedded in the quality of interactions between students and teachers (Black & Wiliam, 2005; Ruiz-Primo, 2011). Assessment dialogues can clarify misunderstandings and stimulate students' self-assessment function as a tool for the development of deeper understanding and further learning (Voerman et al., 2012; Wiliam, 2011).

There are several key aspects to how feedback functions as a prerequisite for further learning and development. J. Hattie and Timperley (2007) suggest that feedback should be addressed in a learning context, and feedback is, by this definition, intended, planned, and provided as part of the teaching process (Black & Wiliam, 2009; Boud & Soler, 2016). For students to make use of feedback, it should be both domain-specific and specific in terms of what students need to do to improve (Shute, 2008). As noted by Voerman et al. (2012), feedback on a task will therefore reveal specific and timely information about how to proceed in the learning process. The timing of feedback is also emphasised as an important aspect of feedback quality by Hattie and Timperley (2007), Shute (2008), Wiliam and Leahy (2007), and Gamlem and Munthe (2014) posit that timing relates to level of difficulty and how teachers organise feedback loops. Immediate feedback may be powerful in classroom interactions, while delayed feedback may stimulate processing on the level of challenging tasks (see, for example, Clariana et al., 2000; J. Hattie & Timperley, 2007).

Students' interpretations and use of feedback (Boud & Molloy, 2013; Gamlem & Smith, 2013), as well as teachers' responses to students' interpretations of feedback (Black & Wiliam, 2009; J. Hattie & Timperley, 2007), also presuppose students to be aware of their own learning processes and their perceptions of learning and can thus find feedback to be useful (Boud & Molloy, 2013; Wiliam, 2011). The effect of feedback is mediated by students' ability and their skill at monitoring, directing, and regulating their actions (J. Hattie & Timperley, 2007; Smith et al., 2016; Zimmerman, 2002). Boud and Soler (2016) relate such self-regulatory skills to the notion of sustainable assessment. To become lifelong learners, students need to learn how to seek, receive, and use feedback and to further assess themselves as a source for the enhancement of learning and achievement (Boud & Soler, 2016).

In order to understand the implementation and practice of feedback in schools, it is important to investigate teachers' and students' beliefs and perceptions in respect of formative feedback (Baird et al., 2014; Gamlem & Smith, 2013; Martínez-Sierra et al., 2020). Opfer and Pedder (2011) show that teachers' initial beliefs have an impact on how new practices are implemented, and Gamlem (2015) finds that initial beliefs can function as constraints to changing teachers' assessment practice. Desimone (2009), Gamlem (2015), and Martínez-Sierra et al. (2020) argue that changing feedback practice also rely on teachers working with their understandings and beliefs regarding feedback and that they are introduced to a variety of models for, and examples of formative feedback practice together with external expertise.

Studies have found discrepancies between student and teacher perceptions of feedback practice (Carless, 2006; Gamlem, 2015; Gamlem & Smith, 2013; Havnes et al., 2012; Jónsson et al., 2018). According to Nicol and Macfarlane-Dick (2006) and Hattie and Timperley (2007), shared language seems to be key to feedback enhancing learning through the assessment and mutual understanding of the underlying conditions for feedback. Significant differences between eleventh grade

students' (aged 14) and teachers' perceptions of feedback and the students' use of feedback, particularly in maths, have been found by Havnes et al. (2012).

3.1. Model for feedback

Hattie and Timperley's (2007) well-known and frequently used model for feedback in the enhancement of learning has been applied as an analytical tool in the RD project. The model identifies three key questions related to effective feedback: 1) *Where am I going?* addresses the clarification and discussion of aims and criteria and the characteristics of good performance. This shared understanding of aims and criteria supports the answers to the questions that follow: 2) *How am I going there*? and 3) *Where do I go next*? These are the *feed back* phase[1] and the *feed forward* phase. The answers to these questions should yield high-quality information about current performance and how to improve achievement (J. Hattie & Timperley, 2007; Nicol & Macfarlane-Dick, 2006; Ruiz-Primo, 2011).

In addition to these three questions, Hattie and Timperley (2007) relate powerful feedback to different levels of learning: task, process, self-regulation, and self. Hattie and Timperley argue that feedback on process level and self-regulation are found to be most powerful when it focuses on deep processing and the mastery of tasks. Consequently, feedback is powerful when information about tasks can help the students to improve their strategy processing and self-regulation (Andrade, 2010; Zimmerman, 2002). We argue that the concept of responsive pedagogy explains the importance of assessment dialogue between students and teacher as integrated in the phases in J. Hattie and Timperley's (2007) feedback model aims to enhance learning, self-regulation skills, and self-efficacy (Nicol & Macfarlane-Dick, 2006; Panadero et al., 2018).

4. Method

Here, we present the design of the RD project, which is followed by a description of the methods, participants, data collection tools and data analysis.

4.1. Design of the RD project

The RD project was carried out over the course of seven months in ninth grade (students aged 14) maths classrooms. The project design is based on Hattie and Timperley's feedback model and the three phases of feedback loops (J. Hattie & Timperley, 2007) and on the concept of responsive pedagogy (Gamlem et al., 2019; Smith et al., 2016). The RD project's activities and its framework for teachers' professional learning were developed through close cooperation between the teachers and the research group. Hence, the collaborative design process is supported by previous research on teacher professional learning and sustainability in professional learning related to assessment and or assessment practice (Darling-Hammond & McLaughlin, 2011; Timperley, 2011; Timperley et al., 2007; Wylie & Lyon, 2015). To ensure the project's viability, it was important to create a feasible model for the RD project activities (Evens et al., 2015). Co-constructing the activities with the participating teachers created opportunities for a bottom-up approach, for sharing knowledge and experience, and for improving the fidelity of the project's activities through the teachers' involvement in the planning process (Baird et al., 2014; Van den Berg et al., 2016). The bottom-up approach in the RD project gave teachers responsibility for actions in the classroom during the project period, which is stated as important by Hopfenbeck et al. (2015).

Figure 1 illustrates the development of the RD project through three cycles over seven months, in each cycle introducing and working with one of the concepts in J. Hattie and Timperley's (2007) feedback model: *feedback, self-regulation*, or *self-efficacy*. Although each cycle focused on one of these concepts at a time, all three relate to the main concept of the study: formative feedback. The teachers' experiences in one cycle were incorporated into the next cycle (as indicated by the horizontal arrows) to build an understanding of how feedback is related to self-regulation and self-efficacy (Smith et al., 2016). An assumption of the RD project was that perceptions of feedback underlie feedback practices (Gamlem, 2015; Jónsson et al., 2018). For this reason, there was an emphasis on engaging teachers in an exploration of and

cogent ·· education

Figure 1. Development project design.
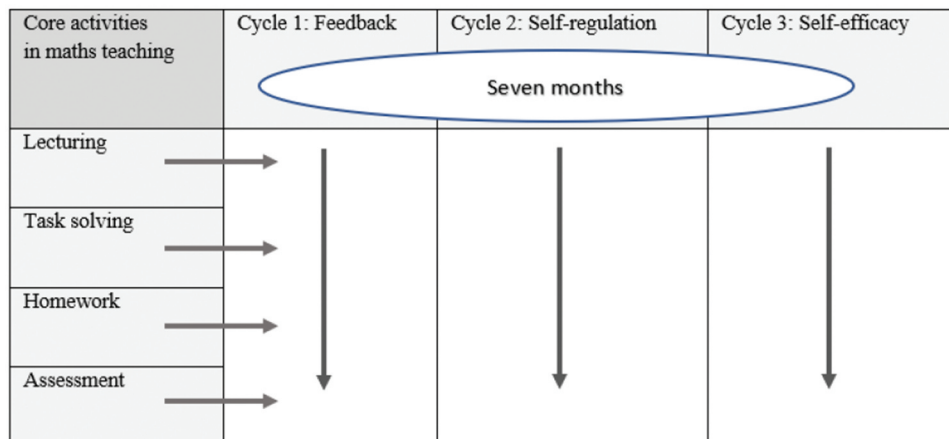
reflection on their initial beliefs regarding feedback. Before starting the RD project, the participating teachers and the research group identified four core activities from the teachers' education practice in maths—lecturing, task performance, homework, and formative assessment (Figure 1)—as specific areas for the development of feedback practice. These core activities were challenged and developed throughout the project in relation to the concepts of feedback, self-efficacy, and self-regulation.

In each cycle, the research group and all participating teachers met for a one-day seminar, of which there were three altogether. Subsequently, three one-day school-based workshops involving one of the researchers were held at each school. The seminars introduced the main concept of the upcoming cycle and included discussion of and reflection on initial beliefs and new experiences, as well as feedback activities (Table 1). In the school-based workshops, the teachers operationalised the concepts introduced in the seminars (such as feedback, self-regulation, and self-efficacy related to the feedback phases and levels of feedback) and discussed and decided on how to implement the concepts related to the core activities in their classrooms. In the next one-day seminar, the teachers shared their experiences and discussed their attempts to try out the feedback activities following the previous school-based workshop. To anchor the RD project, the project design provided opportunities for core activities to be adapted regarding feedback practice in each school and class during each cycle.

Table 1. Feedback activities introduced during the RD project	
Learning partner	Students working together in pairs for a short period of time, subsequently changing partners for a new period. Learning partners is used as an opportunity for students` collaboration and reflections upon tasks and for peer-assessment
Math focus day	The students cooperate during preparation for summative tests
Two-days test	The students work together on part 1 of a test on the first day, followed by taking the whole test individually the second day
Formative use of tests	Test results form a basis for further learning, feed forward
Open questions	Authentic questions stimulating discussion, reflection, and collaboration
Planned dialogues	Classroom dialogues part of the teaching design

4.2. Method and participants

The qualitative method was chosen to get an in-depth understanding and analysis of students and teachers' development of feedback perceptions and feedback practice. The RD project was conducted in ten lower-secondary schools in a region in Norway and involved 1,003 ninth grade students (aged 14) and 40 teachers from 40 different classes. A purposeful sample was defined at schools with at least three parallel classes in ninth grade to meet the size requirements for the analysis of survey data in the overall study. The sample is also regarded as convenient since the potential schools are situated in the region that has the most of the researchers' affiliations. The potential schools were invited to participate in the larger project, and 10 schools volunteered. Students, parents, and teachers at the voluntary participating schools received written information about the RD project and agreed to participate. National ethical research guidelines were followed in the research project (National Committee for Research Ethics in the Social Sciences and the Humanities (NESH), 2018), and the RD project received the ethical approval of the Norwegian Centre for Research Data.

The current study draws on qualitative data collected through interviews with the students and teachers before and after the project period (Briggs et al., 2012). Data from students were collected through focus group interviews. One group of six students from each school, representing different classes, were interviewed, constituting ten groups altogether (N = 60). As far as possible, we sought to have an equal gender representation and diversity in the focus groups. Not knowing the students, we asked teachers to ask random students to volunteer. Data from teachers were collected through group interviews with all teachers participating in the intervention (N = 40), ten groups altogether (Table 2). Since the number of maths teachers varied from one school to the next (i.e., from four to ten), the group sizes also varied. The interviews with students and teachers were administered at their respective school by the researchers.

4.3. Data collection tools

The interviews with students and teachers were conducted using a semi-structured interview guide. They focused on students' and teachers' definitions of feedback, the importance of feedback in maths, the use of feedback relative to learning, the features of teachers' feedback, assessment criteria, and student involvement in feedback interactions. Teachers and students were asked the same questions, adapted to their context and roles (for example, in the interviews with teachers, a question might be phrased as: "Do you introduce assessment criteria to your students?", and in the interviews with students, it was adjusted as follows: "Does the teacher introduce assessment criteria to the class?"). The themes and format of the focus group interviews were piloted prior to data collection, and minor changes were made to wording. All the interviews were recorded digitally, lasted from 40 to 60 minutes, and followed the themes in the interview guide to ensure validity in data collection.

4.4. Data analysis

Data from the interviews with students and teachers were aggregated across the schools through the coding process. All recordings were transcribed, that is all sentences, utterances, and words, from the informants and researchers. The transcripts were analysed using the same coding framework in four steps. The first coding was accomplished through the manual coding of all transcripts by two researchers with the aim of gaining an overall impression of the information

Table 2. Interviews and informants		
Interviews	**Informants**	**Length (min.)**
10 focus group before project (P)	Students (n = 60)	40
10 focus group after P	Students (n = 60)	40–50
10 group interviews before P	Teachers (n = 40)	50–60
10 group interviews after P	Teachers (n = 40)	60

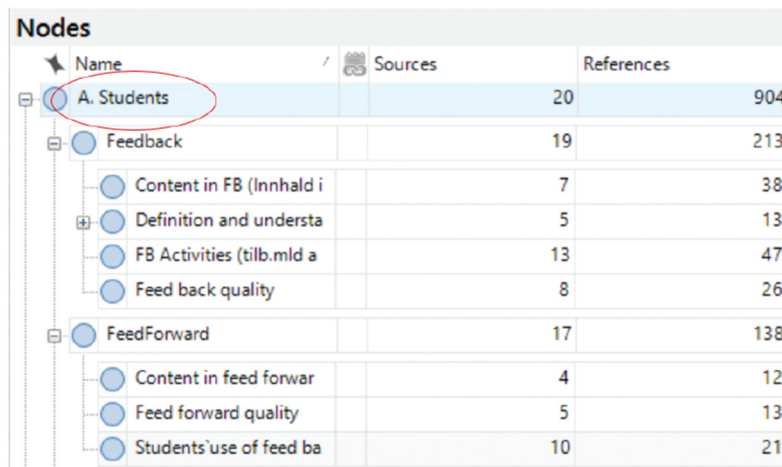| **Table 3. Example of initial coding of a text extract** |
| --- |
| **Group interview teachers before the project from one of the schools** |
| Part of a text condensation (to be examined in the second coding):
 The teachers express awareness of why they give feedback, that is giving feed up, feed back, feed forward and connection to motivation
 They stress that students need oral feedback in class during lessons and this is important. Helps the students forward.
 Some teachers are aware of the importance of the timing of FB, but few examples in the data material.
 Feed forward rarely mentioned, examples are related to students having to check for the right answers in textbooks for themselves or discussing it with their learning partner etc. |

given by the students and teachers. This coding included the mapping of core concepts of the study (feedback phases, feedback activities and content, perceptions of feedback) and sought to identify the when, how, and who in these core concepts and how the informants expressed their appearance (see, Table 3 for one example of the initial coding).

The second coding was deductive, using NVivo 11 software (QSR International), and analysed the first coding data in relation to the concepts of *feed up, feed back,* and *feed forward* (J. Hattie & Timperley, 2007). The third coding concentrated on creating sub-codes based on the main codes: *feed up, feed back,* and *feed forward.* The final coding combined the sub-codes from the third coding and the first (manual) coding within an analysis of the sub-codes and the data material as a whole (Figure 2). The final coding established our findings on perceptions of feedback and teachers' development of feedback practice over the project period. This was accomplished by comparing the codes in each category for students and teachers both before and after the RD project, e.g., in the category *feed back*, the codes content, definition and understanding, feedback activities and feedback quality. To ensure reliability, the coding density in all coding stages was controlled, as was correspondence in coding among the researchers. The systematic coding process in stages of the data material, coherence between research questions and theoretical concepts used also might secure both descriptive validity and as well as basis for analysis and presentation of findings.

The analysis focused on identifying changes in perceptions relating to feedback activities during the project (Table 1) and to core activities (Figure 1). Data were, therefore, analysed along two axes: 1) perceptions of feedback and feedback practices before and after the project period among students and teachers with the aim of identifying changes and development in feedback practices over the project period, and 2) mapping and analysing the various students' and teachers' perceptions of feedback and feedback practices in relation to each other before and after the

Figure 2. Extract from final coding scheme.

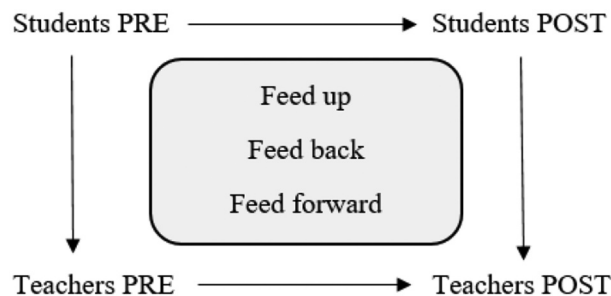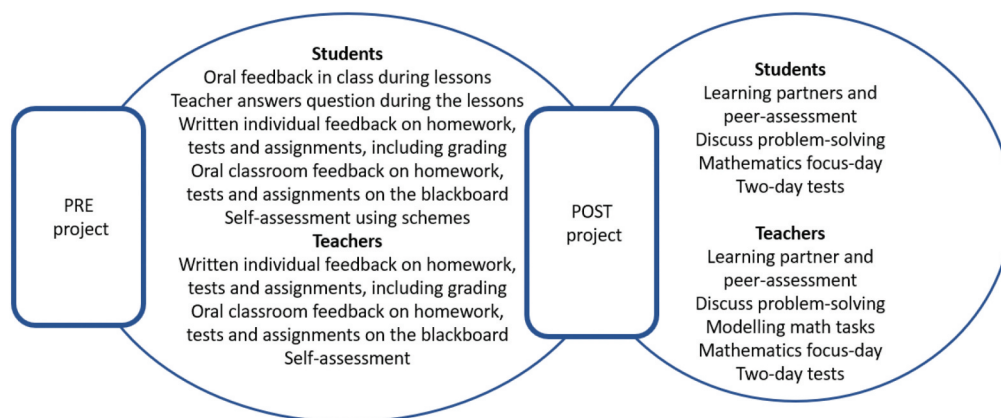**Figure 3. Analysis (PRE = pre-project, POST = post-project).**

Figure 4. Feedback activities pre- and post-project—students and teachers.

project period (Figure 3). For the sake of clarity, our findings on feedback practice in classrooms are based on the informants' narratives on feedback practices, whereas our findings on perceptions are based on interpretations of the informants' feedback narratives and definitions of the concept of feedback.

The analysis revealed differences in feedback practices among the maths classrooms in the schools and among the schools themselves. Conducting an integrated data analysis of all of the students and teachers in the study was considered to be a sensible approach.

5. Findings

The findings are presented thematic as perceptions of feedback, perceptions of feed up, perceptions of feed back, and perceptions of feed forward (J. Hattie & Timperley, 2007). The coding and analysis established these categories as useful concepts for organizing the findings as well as the theoretical framework builds on these concepts.

5.1. Perceptions of feedback

In the pre-project interviews, students and teachers describe feedback as respectively receiving and giving information about the students' achievements. The students emphasise the importance of knowing the level of their performance, expressed as a grade, and they regard grading as an important feature of feedback. Some of the focus groups eagerly discussed the aims and intentions of the teachers providing feedback and argued that feedback should promote learning and achievement and enhance motivation and self-efficacy. They also wish to receive feedback that they can use in the next phase of the learning process. However, the students reported that this rarely happens. One student says:

> *That's what I want, but it never happens. Apparently, there's never enough time, or the teacher doesn't make time for it. We're always in a hurry in maths since we always move on to the next topic.*

Some students refer to the teachers saying "try to think for yourself first" as a strategy when students ask for help, which they regard as counterproductive and demotivating. These understandings of feedback are also present in the post-project interviews.

The teachers' understanding of feedback relates to the aim, purpose, and manner of feedback. The overall aim of feedback is to enhance students' learning and motivation. They also emphasise the importance of correcting and discussing misunderstandings and opportunities to encourage reflection on different solutions to problem-solving in maths.

The teachers stress the importance of students` involvement and response to feedback. Involvement is defined as students expressing their understanding in a mutual dialogue seeking feedback and help. One teacher says: "It is difficult to understand what the students understand." Teachers therefore try to engage students in dialogue about problem-solving in maths. The teachers also refer to specific, positive feedback that uses positive wording to describe achievements on the task level and the processes level as a feature of feedback.

After the project, the teachers' arguments for giving feedback related to assessment knowledge and research in assessment for learning and formative feedback. They argued that feedback is important for collecting information about students' learning, as well as being a source of further learning for students. The teachers also strengthened their arguments that feedback should enhance motivation and self-efficacy. As one teacher puts it:

> Motivation is the most important aspect here, that the students are seen and heard, that their effort matters. That is very important. (…) It's the small comments during their work that matter.

5.2. Perceptions of feed up practice

Clarifying the aims and criteria of learning is perceived as the core feature and purpose of the feed up phase (J. Hattie & Timperley, 2007). The results show that, according to the students, this activity was rarely emphasised in classrooms before the project. Learning goals for a maths lesson or for a teaching period are often mentioned only briefly when a new topic is introduced, or else they are written on the blackboard and in the students' plan for the week. Two out of ten schools use assessment rubrics as criteria. In the pre-project interviews, teachers and students alike stated that they do not elaborate on, discuss, or actively use learning goals after they have been presented. Furthermore, many of the students said that they do not know the learning goals at all and use the textbook exclusively for information about learning goals. One student reflects in the pre-interview:

> It would be cool to know what is expected to get a good grade. I don't know if it's easy to set up a list of criteria.

After the RD project, students from some of the schools reported that teachers were now spending more time on explaining to the students what they should do. This included explaining performance criteria. Other students reported being given a test at the beginning of a new topic and the elements in the topic that the students needed to work on being mapped for them. However, these examples come from only some of the schools, and the majority of the schools still do not emphasise the feed up phase. A typical student comment is: "The learning aims are always written on the blackboard, but we never talk about them."

Most of the teachers confirm the students' narratives about the lack of explanation of aims and criteria. Some of the teachers say that it is possible for the students to read the goals for themselves, relate to them individually, and use them as guidelines for rehearsal. At the same time, teachers are aware of the importance of aims and criteria as a basis for feedback, although dialogues with the students is not part of their teaching.

The post-project interviews reveal that they still lacked tools for discussing, and developing an understanding of, the learning goals with the students. As the teachers in one focus group claimed:

> *Students are told what they are supposed to learn, and what the topics are. But I don't know if we do this more now than we used to before. We have the aims that we present at the beginning of each chapter. And then we tell them to tick them off when they feel they've learnt them.*

The students' and teachers' narratives of the feed up phase are in accordance with each other; the teachers seem to be uncertain about how to use the feed up phase for enhancing students' learning. The teachers also express uncertainty about adapting learning goals and work tasks to each student and the whole class. One teacher sigh when she says:

> *If we have communal goal[s] for the learning process at the blackboard, not everybody needs to work with it if they already have reached this goal (...) I don't know what to do then ... or must all students do the same tasks?*

5.3. Perceptions of feed back practice

The *feed back* phase is the most comprehensive and diverse category in our analysis. The data showed complexity in aspects of *feed back*, presented as perceptions of *content and manner* and *activities* related to *feed back*.

5.4. Content and manner of feed back

Most of the students commented in the pre-project interviews that they received imprecise and general feedback, as well as praise for effort. The feedback consisted of short comments, such as "good" and "well done" or "this is wrong", without explanation. However, some of the students said that they received detailed and personalised feedback, and some students also received feedback on what and how to improve (i.e., at task and process level). The students said that they often received feedback after tests. Teachers explain test answers on the blackboard, discuss common misunderstandings and errors with the students, and model problem-solving. The students are expected to connect this feedback to their own test performance and correct their own errors. Many of the students did not use this feedback because of its general nature—it was not directed towards them personally—and they perceived it as "not motivating". Two of the students quoted their teachers:

> "You did it well at the beginning, but then it went wrong at the end."
> "Many of you did the test well, and some did better."

Post-project, many of the students emphasised the value of seeking feedback, especially seeking feedback on what to improve. Although the students reported the same feedback practice both pre- and post-project, most of the students were receiving more detailed feedback afterwards than before. The teachers confirmed the students' descriptions of the content and manner of feedback in the interviews, pre-project. Interestingly, the teachers considered short, positive comments and praise (such as "well done") to be valuable for motivating students and helping them to learn. The teachers also expected student activity and involvement. However, the students' response to these expectations varied among classrooms, according to the teachers. Post-project, the teachers described being more explicit when organising activities to stimulate reflection and learning strategies among students. Instead of focusing on right and wrong answers when providing feedback to the whole class, they focused on the process level and teaching the students how to analyse a maths task. They also accentuated timing and how they use questioning as a tool for feedback. As one teacher commented:

> *Classroom conversation has changed most of all, I give students time to answer and give them time to argue for their solution. When I ask questions in this manner, the students are more active.*

5.5. Feedback activities

The different feedback acitivites pre- and post- project are visualized in Figure 4, showing the added activitiespost-project. Pre-project, oral feedback was the most common feedback activity. Students received individual oral feedback on difficult tasks during lessons. Oral feedback to the class usually related to common misunderstandings and errors which the teacher explained while standing in front of the blackboard. Individual written feedback was commonly given by the teachers on homework, assignments, and, substantially, on tests. Although written feedback contained formative feedback and praise, the students were concerned mostly about grades. Written feedback from teachers was rarely used by the students because they received this feedback at the end of the working process and the students perceived it as summative feedback.

> Mostly, we get feedback on tests at the digital learning platform, and then we don't talk more about it. I think it is better to receive oral feedback. In a way it is more personal.

Self-assessments using schemes and rubrics were also used by the students, but it is not evident how this was followed up by the teachers.

The same pattern of feedback activities occurred in post-project interviews, in addition to the new feedback activities that were introduced in the classrooms: peer-assessment and learning partners. In the words of some students:

> In our class, we try to figure out the answer ourselves, then we ask our partner, and if necessary, we ask the teacher. But he never tells us the answer but gives us clues that can help us further.

The students also reported that the introduction of learning partners made them more engaged in discussion of and reflection on solving maths problem at both task level and process level. The teachers confirmed this, and they have put more emphasis on discussing problem-solving and on modelling maths tasks as well. Some of the teachers reported that the students have improved in using different learning strategies.

Pre-project, the teachers confirmed the students' comments about oral feedback being given in the classrooms and written feedback being given on assignments, tests, and homework. As one teacher said:

> My experience is that students appreciate collective feedback, they see their right and wrong answers and maybe it is motivating to see that something was correct.

The teachers emphasised classroom feedback, as described in the quote, as well as individual instruction regarding tasks during lessons. Thus, post-project, students are more engaged in mutual dialogues by working with learning partners. However, the teachers facilitate the dialogues among the students, and seldom participate in the dialogues. "Maybe learning partner is the most important change, the students can talk to each other instead of waiting for me to provide help", a teacher argues.

Although self-assessment was mentioned in the pre-project interviews, post-project the teachers are more specific in their descriptions of how self-assessment was practised. Self-assessment was referred to as a tool for students' engagement and used mostly for summative assessment. The teachers presented all the feedback activities as opportunities for learning and promoting self-regulation. However, they seemed to expect the students to take individual responsibility for using the feedback as a resource for further learning. Most of the teachers described the timing of feedback as being of prime importance in students' use of the feedback—something that they learnt from the project. As one teacher said:

I discovered that my students did not benefit from my written feedback after their perfor-mances. I must give feedback during the learning process, something that brings them forward from here and now.

5.6. Perceptions of feed forward practice
The analysis demonstrated the perceptions of and features in the *feed forward* process, presented as *activities and content in feed forward* and as arguments by students and teachers in favour of providing such feedback.

5.7. Perceptions of activities and content in feed forward
The interviews with students and teachers, both pre- and post-project, reveal that *feed forward* mostly takes the form of oral responses regarding performance from the teacher to the student in the lesson. Although *feed forward* relates to the task level and the process level, it is predominantly given as general commentary to the whole class. Feedback on performance is normally given at the end of a learning process and often includes a grade. Such feedback seldom points towards the next step in students' learning, however, as exemplified by one student's statement:

After the test, he [the teacher] told us what was correct and how to do it, but we were not going to work on this further, since we had started on a new topic.

Post-project, the students reported that these features of the feed forward phase were still present. However, the students interviewed also found the two-day test and maths focus day to be useful and they reported having more control and feeling less anxious before a test after these new activities had been introduced. As one student observed:

Earlier, when we had a test, we were not able to remember everything, but now we know what we must prepare for. Our teacher writes more about how we should improve, what to do. Before, he just wrote the marks, but now he writes some sentences about how to do it as well.

The teachers confirmed the students' comments in interviews both pre- and post-project. However, pre-project they gave vague explanations for their *feed forward* practices and what they do specifically to inform further learning. They referred to regular assessment meetings taking place twice a year where the students, teachers, and parents discussed each student's performance and decided what to improve and how to improve performance. Post-project, the teachers expressed the value of the *feed forward* phase and tried to give specific, timely feedback adapted to the different students' needs for specific feedback to enhance their learning and performance. However, the teachers struggled with organising the timing of *feed forward* for the individual student, as well as planning for and executing learning dialogues about the next step for learning in the classroom. As one teacher put it:

What I must improve is the possibility of finding time for individual, oral feedback, and that's not easy on a busy school day. Because, if you're going to have a dialogue with each student in a big class for five minutes, then it'll take you a day or two to reach all of them individually. It's not impossible, but it's difficult to manage often enough.

6. Discussion
The study presents multiple answers as to how students' and teachers' perceptions of feedback and feedback practice changed after the RD project. The overall impression is that the RD project has influenced the feedback practice to some extent in maths at the project schools. The teachers seem to have become more aware of the importance of formative feedback, such as through promoting self-regulation and student engagement. The teachers are also more aware of the timing of feedback. The introduction of peer-assessment and learning partners has also been valued by the students. However, it seems that, despite the development of new formative feed-back activities, the teachers are continuing with their former assessment practices, especially when it comes to summative feedback.

From the students' point of view, feedback is understood as grading of performance and summative feedback, although they wish for feedback to enhance motivation and self-efficacy. Students' understanding of the concept of feedback as relating to grading and summative assessment can be seen as the traditional definition of feedback, which is rooted in the school tradition of students being socialised into a summative conceptualisation of feedback (Harrison et al., 2015, 2017; Heitink et al., 2016). The teachers, on the other hand, are more explicit and understand feedback as enhancing motivation and self-efficacy. They justify their feedback practices as contingencies for learning, although the students' experiences differ in terms of their experience of feedback enhancing learning. Post-project, the students reported seeking feedback on what to improve and being more aware of their own role as active learners (Bueie, 2017; Panadero et al., 2018). However, it is not apparent how these particular changes are linked to an understanding of formative feedback as a powerful source of learning. For instance, skills in self-assessment, peer-assessment, and self-regulation are related to one's understanding of learning goals and one's ability to monitor and regulate one's own learning behaviour, as related by Smith et al. (2016) to responsive pedagogy (Panadero et al., 2018; Smith et al., 2016; Zimmerman, 2002).

In our study, the teachers perceive the development of an understanding of learning goals as important; however, the students do not share the same perceptions. This may suggest that, in practice, the dialogue between teachers and students is not sufficiently communicative regarding the feed up phase. Several researchers emphasise the importance of students and teachers developing a common understanding of learning goals and sharing assessment criteria as a basis for learning (Dale & Wærness, 2006; J. Hattie & Timperley, 2007; Wiliam, 2011). The interpretation of learning goals and establishing a common definition and understanding of these are significant in the learning process and in closing the gap between actual and desired achievements (J. Hattie & Timperley, 2007). According to the students, the teachers in this study did not use learning goals actively with the students either pre- or post- project. The teachers relied on the students' ability to interpret the goals for themselves, as well as to use them in support of their further learning. Gamlem and Munthe (2014) also demonstrate; thus, learning goals are found in students' weekly schedules but are not discussed or elaborated upon in the classroom. This lack of a systematic use of aims and criteria may affect the following steps in the feedback loop, which can be seen in the students' reports from the *feed back* phase, such as in the emphasis on correcting errors. The active use of assessment criteria as a basis for feedback relies on students' ownership of and commitment to goals, as well as on assessment criteria (J. Hattie & Timperley, 2007). When the purpose of goals and criteria is not planned for or put into practice in classrooms by teachers as part of an instructional design (Brookhart, 2007; Sadler, 2010), it may lead to an uncertainty among students about how to reduce the gap between actual and desired learning outcomes.

On the whole-class level, teachers seem to spend a considerable amount of time giving feedback after tests and, to some extent, on homework. However, the students reported that classroom feedback on tests and assignments given by the teacher focuses on typical errors and misunderstandings. It is difficult for the students to relate to this feedback since it addresses the whole class in general regardless of the students' individual results. Shute (2008) argues that feedback should be specific and should provide students with details of how to improve their achievement. How useful feedback can be also relates to mutual dialogue between students on learning and teachers promoting students' engagement in dialogue on feedback (Black & Wiliam, 2009; Gamlem & Smith, 2013; Nicol & Macfarlane-Dick, 2006; Smith et al., 2016).

The RD project has drawn teachers' attention to the importance of dialogue and of engaging students in formative feedback. However, the students have not reported on this to the same extent. The findings show that the mutual dialogues mainly have been developed amongst the students, while the teachers are more concerned with asking open questions to stimulate e.g., students` reflections, learning and self-assessment. On an individual level, students are receiving written feedback on tests combined with grades. This information is difficult for the students to relate to, since it requires motivation, self-regulation skills, and time in order to use the information

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to improve learning. The findings indicate that delayed feedback on homework, assignments, and tests is understood as summative assessment by the students. This coincides with previous research by e.g., Ruiz-Primo (2011). Consequently, test grades and written feedback are not likely to enhance further learning since they do not provide realistic and sustainable opportunities for such processes.

The results do not suggest that the development project has influenced the way that feedback is provided to students as a unilateral judgment (Boud & Soler, 2016). Consequently, the study reveals limited perceptions of recursive dialogue as part of the learning process, referred to as responsive pedagogy (Gamlem et al., 2019; Smith et al., 2016). Feedback is provided by teachers to the receiving students and is not used further as part of the instructional design. Although the study shows the development of feedback activities and student involvement in feedback, the dialogue between students and teachers seems to focus mainly on the *feed back* phase in Hattie and Timperley's (2007) feedback model.

One interpretation of the findings is that teachers are potentially caught between the different discourses of assessment found in the assessment regulations in the Education Act (Harrison et al., 2015, 2017; Ministry of Education and Research, 2006). Teachers are expected to practice formative assessment during the school year, consisting of formative as well as summative assessment activities, such as summative tests and grades on performance, all of which aim to enhance learning. However, the assessment traditions in school seem to be deeply rooted in former formal assessment arrangements dominated by summative assessment activities, despite the introduction of formative feedback as a legal right (Ministry of Education and Research, 2020a). These traditions are evident in students' and teachers' perceptions of feedback practice in classrooms, both before pre- and post-project. The overall interpretation of the data material is that teachers are rooted in a summative assessment tradition while simultaneously trying to implement formative assessment as part of their teaching, which in turn may influence their feedback practice. Guskey (2002) claims that changes in teachers' beliefs come from successful experiences when changing practice. The development project seems to have contributed to changes in feedback practice to some extent, especially the *feed back* phase.

7. Concluding remarks

In line with Havnes et al. (2012), Gamlem and Smith (2013), Gamlem (2015), and Jónsson et al. (2018), we have found discrepancies between students' and teachers' perceptions of feedback and feedback practice. After the development project, there was still divergence between students and teachers in their descriptions of the features of feedback identified in the three phases of Hattie and Timperley's feedback model (2007). The teachers emphasize having developed their knowledge of feedback and having begun to change their feedback practice with reference to their changing understanding of and beliefs regarding formative feedback. These changes have also been stimulated through discussions in seminars and workshops, and through the try-it-out phases in the three cycles of the project period. However, the study shows that the teachers' development of feedback practices, especially as these relate to planning and the realisation of recursive dialogue in classrooms, needs to be strengthened and that teachers should be empowered to integrate formative feedback into their teaching. The study also shows the need for students to develop assessment literacy, such as seeking, giving, and using feedback as a source of further learning and to increase their involvement in formative feedback. Previous studies of implementation of formative feedback in the Norwegian context show similar results, and our study indicate a gap between assessment guidelines and legislation and assessment practice in schools still after a long implementation period.

We the authors are aware of limitations in the current study. The in-depth analysis and results might have been strengthened through the conduct of multiple interviews over the course of the project period. This might have provided data about specific triggers for changes in the informants'

perceptions of feedback during the development project, especially because the bottom-up approach to the project design resulted in different development activities in the classrooms. Classroom observation might have provided substantial information regarding dialogic processes in the classrooms. However, the findings reveal the participants perceptions and experiences of feedback dialogues and changes in feedback practices during the RD project, which is the aim of the project. Moreover, to examine the long-term effects and sustainability of a RD project, it would be interesting to conduct a follow-up study after the project period. Hattie and Timperley's feedback model (2007) was useful as a framework for analysis and the presentation of findings. However, we acknowledge that use of a different framework for data analysis and theoretical concepts in the RD project might have brought about different results in the perception of feedback and feedback practice. Despite these conceptual and methodological weaknesses, the RD project study has revealed challenges in the implementation of formative assessment in schools in terms of both students and teachers' perceptions of feedback and feedback practice. Our findings are in line with an evaluation report on the implementation of assessment for learning in Norwegian schools (Norwegian Directorate for Education and Training, 2018). Further, this RD project underpins a need for strengthening teachers` feedback literacy rooted in a distinct understanding of the intentions of changing feedback practice and in accentuate and develop initial beliefs regarding formative feedback.

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Note
1. For the sake of clarity, we use "feedback" to describe feedback in general and "*feed back*" specifically with reference to "*How am I going?*" as used by J. Hattie and Timperley (2007).

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