Eindhoven University of Technology

MASTER

# The Dialogue Tool

## studying the effect of a new intervention method on feedback dialogues between teacher and student

d'Anjou, B.E.M.; Sellier, N.

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# The Dialogue Tool: Studying the effect of a new intervention method on feedback dialogues between teacher and student

Bernice d'Anjou, s132544,

Ontwerpen & Onderzoeken/Technology

Nine Sellier, s136054

Ontwerpen & Onderzoeken/Physics

Practical Educational Research 10 EC

EINDHOVEN UNIVERSITY OF TECHNOLOGY

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Datum

15 januari 2020

Roepnaam M. Achternaam (student 1)

Bernice d'Anjou

Roepnaam M. Achternaam (student 2)

Nine Sellier

Handtekening (student 1).

Handtekening (student 2).

*Lever de ondertekende verklaring in bij de coördinator van Onderzoek van Onderwijs*

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***Summary***

Feedback dialogues can support students in developing self-regulation skills, which are essential in educational models such as Project Based Learning. However, prior studies on the effectiveness of feedback dialogues showed that current feedback processes are often ineffective. To support teachers and students in increasing the effectiveness of their feedback dialogue, the *Dialogue Tool* was designed. This study investigates how the *Dialogue Tool* influences the feedback dialogue in a mixed methods field experiment in a secondary school in the Netherlands. The usage of the *Dialogue Tool* also influenced the content that was being discussed, the students showed a small increase in reflective thinking activities when they were using the *Dialogue Tool* and an increase in student engagement was observed, especially after using the *Dialogue Tool* for a second time. This study is the first exploration to validate the classroom tool *Dialogue Tool* that supports teachers and students in improving the effectiveness of their feedback dialogues.

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## *1.0 Introduction*

Effective feedback processes are important for learners to develop self-regulation skills (Nicol, 2010; Price, Handley, Millar & O'donovan, 2010; Ajjawi & Boud, 2017). These self-regulation skills are described as a process that consists of the selective use of processes, such as metacognitive processes with learning activities, e.g. setting goals, planning, inquiring and evaluating new information (van Beek, 2015). In educational models in which students have to execute processes such as designing, problem-solving and decision making relatively autonomously and over extended periods of time, such as Project Based Learning (Thomas, 2000), students need to develop self-regulations skills in order to succeed (Jones, Rasmussen, & Moffitt, 1997; Thomas, Michaelson, & Mergendoller, 1999) and therefore effective feedback processes are crucial.

In an effective feedback process, the students' inner dialogue is triggered which enables the students to produce meaning from the feedback and make improvements in their future work (Wood, Wood & Middleton, 1978; Laurillard, 2002). However, prior studies on the effectiveness of feedback showed that current feedback processes are often ineffective (Hattie & Timperley, 2007, Nicol, 2010). These studies propose that the process of feedback should contain a sequential combination of the feedback levels *task*, *process* and *self-regulation* (Hattie & Timperley, 2007), that teachers should increase the students' opportunities for *reflecting* on the received feedback (Hattie & Timperley, 2007), that students should have an *active role* in the feedback process (Nicol, 2010) and that students should perceive feedback as *useful* (King et al., 2009), of good *quality* and *quantity* and well *timed*.

In the subject *Onderzoek en Ontwerpen* [research and design], the feedback processes often consist out of a feedback dialogue in which students exchange information about their learning and performance with their teacher and receive verbal feedback from their teacher (Nicol, 2010). During our time working as *Onderzoek en Ontwerpen* teachers in training at secondary schools in the Netherlands, we recognised that these feedback dialogues often lacked the elements that the prior studies proposed (Hattie & Timperley, 2007, Nicol, 2010). To support teachers and students in increasing the effectiveness of their feedback dialogues, we designed a new intervention method, called the *Dialogue Tool.* In this study, the *Dialogue Tool's* influence on the occurrence of the feedback levels, the (reflective) thinking activities and the student engagement

during feedback dialogues and on the student perception of the feedback provided through the feedback dialogues is investigated.

## *2.0 Theoretical Background*

There exists a considerable body of literature on the effectiveness and implications of feedback for learners. In this section, previous work is analysed on the various topics relevant for this study: feedback; levels of feedback; (reflective) thinking activities; student engagement during feedback dialogues; students' perception of feedback. In this analysis, the working definitions and implications for effective feedback practices that are integrated in this study are formulated.

### *2.1 Feedback*

Feedback is commonly defined as "information provided by an agent (e.g. teacher, peer, book, parent, self, experience) regarding aspects of one's performance or understanding" (Hattie & Timperley, 2007, p. 81). However, the provision of feedback does not simultaneously imply that learning occurs, as learners need to interpret and connect the information to their belief systems, learning processes, relations and learning performances (Andrade, 2010; Butler and Winne, 1995; Gamlem & Smith, 2013). According to this view, feedback should be considered as a process rather than a product that is delivered to students, in which students have a more active role (Carless, 2016).

Similarly, many researchers, including Wood, Wood, and Middleton (1978), and Laurillard (2002), who draw on Vygotsky's (1978) social constructivist interpretation of learning, assume that, to be useful, feedback must ultimately trigger the students' inner dialogue. This inner dialogue would involve students actively "decoding feedback information, internalising it, comparing it against their own work, using it to make judgements about its quality and ultimately to make improvements in future work" (Nicol, 2010, p. 504). According to these researchers, students should have an active role in the feedback process, generating it themselves and seeking it out from multiple sources (Nicol, 2010). In addition to this, Nicol and Macfarlane-Dick (2006) argue that feedback is not merely processed in the internal processes of students, but also has an important role in the support and development of self-regulation. Figure 1 shows Nicol and Macfarlane-Dick's (2006) model of self-regulated learning. In this model, feedback is one of the elements of the cyclical internal processes of the student. Our study used the definition of feedback mentioned above as a basis for both the design of the new intervention method used in this study and the set-up of the study.

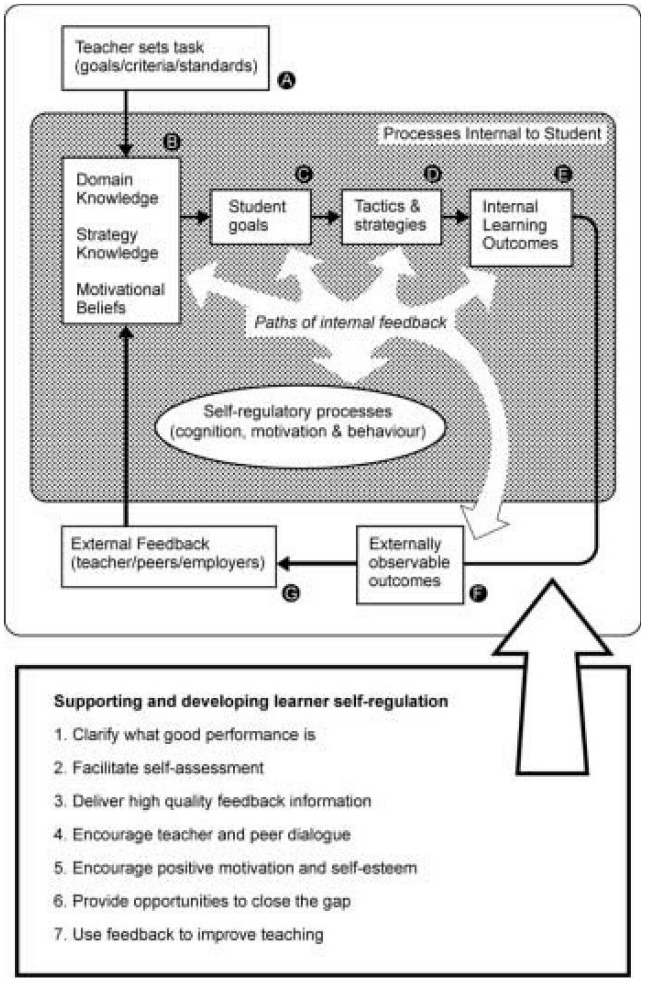


*Figure 1. A model of self-regulated learning and the feedback principles that support and develop self-regulation in students (Nicol & Macfarlane-Dick, 2006)*

### *2.1.1 Feedback Dialogues*

As mentioned above, students should have an active role in the feedback process in order to trigger their inner dialogue for processing feedback (Nicol, 2010). Feedback dialogues provide a clear opportunity to facilitate the active role of students (Prins, Sluijsmans, & Kirschner, 2006; Van der Schaaf et al., 2013; Nicol, 2010). According to Laurillard (2002), an effective dialogue should be adaptive, discursive, interactive and reflective. This means that it should be contingent on students' needs, rich in two-way communicative exchanges, linked to actions related to a task goal and encourage students and teachers to reflect. These four aspects that facilitate an effective dialogue are integrated in the design of the new intervention method used in this study.

### 2.2 Levels of feedback

Hattie and Timperley (2007) stress the importance of the focus of feedback, for which they have defined four levels of feedback: (1) the feedback concerns the task of the student, (2) the feedback concerns the process that is needed to complete a task by the student, (3) the feedback concerns the self-regulation skills of the student and (4) the feedback concerns the personal attributes of the student (Figure 2). According to Hattie and Timperley (2007), the most effective feedback contains sequential combination of the first three levels. Additionally, the fourth level, which concerns the personal attributes of the students, is considered to be the least effective. However, teachers' feedback often focuses on this level (Hattie & Timperley, 2007). This study uses the definitions of levels of feedback in the design of the new intervention method used in this study and investigates the discussed levels of feedback and its' proposed sequence in this study.

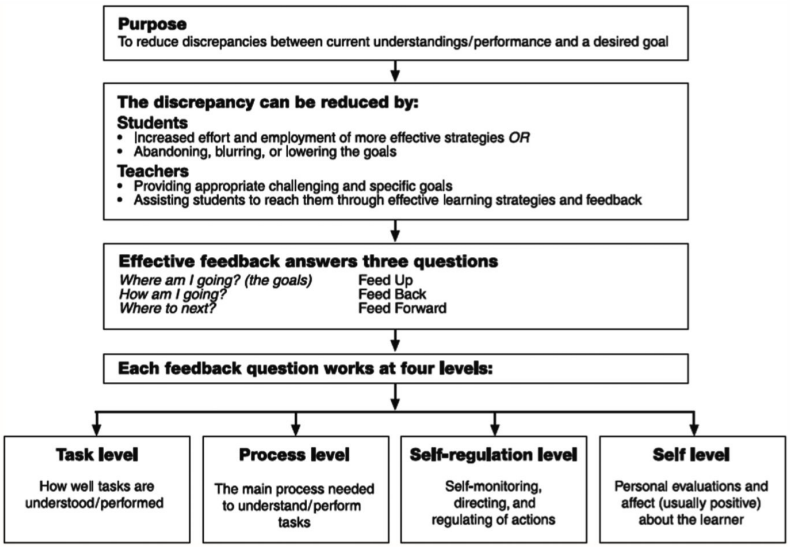


*Figure 2. A model of effective feedback practice (Hattie & Timperley, 2007)*

### 2.3 (Reflective) thinking activities

Previous work by Carless (2016) and Sadler (1998) state that in order to be effective, feedback should stimulate students' reflective thinking. Critically relating a present experience to other situations or prior knowledge can be defined as reflective thinking (Mezirow, 1991; Wallman, Lindblad, Hall, Lundmark, & Ring, 2008; Van der Schaaf et al., 2013). For learners, it can be described as the (un)intentional evaluation of the learners' performance and learning process (Lee, 2005; Van der Schaaf et al., 2013).

Additionally, Van der Schaaf et al. (2013) analysed the (reflective) thinking activities of students during a feedback dialogue of fourth to sixth grade students in secondary education. They found a connection between student engagement in feedback dialogues and the use of (reflective) thinking activities. In this study, Van der Schaaf et al. (2013) used the validated coding scheme of (reflective) thinking activities from Oosterbaan et al. (2010). Building on their work, this study utilises the (reflective) thinking activities as defined by Van der Schaaf et al. (2013) and Oosterbaan et al. (2010) as measurements of this study.

### *2.4 Student engagement during feedback dialogues*

The active role of the students during feedback dialogues, as mentioned above, is translated to the engagement students have during feedback dialogues. This translation from active role of students to *student engagement* enabled the composition of measurable variables for this study.

Prior studies on measuring the engagement of participants during a conversation looked at how long each participant was talking (Mast, 2002) and how often each participant introduced a topic (Blatt, Confessore, Kallenberg & Greenberg, 2008). These studies argued that the duration of speech and amount of topic introductions of a participant could give an indication on their dominance and leadership in the conversation. These studies form the foundation of the measurements of student and teacher engagement during feedback dialogues of this study.

### *2.5 Students' perception of feedback*

Previous work emphasizes the importance of the student perception of the received feedback for the effectiveness of feedback (Andrade, 2010; Hattie & Gan, 2011; King, Schrodt & Weisel, 2009; Gamlem & Smith, 2013) and point to the lack of research on how students perceive and use feedback (Hattie & Gan, 2011). The motivation of learners to act in response to teacher feedback is connected to their perception of feedback (Bangert-Drowns, Kulik, Kulik, & Morgan, 1991; Butler & Winne, 1995; Kluger & DeNisi, 1996). Moreover, King et al. (2009) note that the student perception of the usefulness of feedback is important for its effectiveness and that teachers need to focus on conveying that sense of usefulness to students when providing them with feedback.

Consequently, Van der Schaaf et al. (2013) analysed the perception of the feedback of fourth to sixth grade students in secondary education. They looked at the effect of feedback dialogues between teacher and students in addition to written feedback by

teachers on the work of students. They found that the received feedback, when additional feedback dialogues occurred, was perceived as more useful by students than feedback without additional feedback dialogues. Thus, this study builds on the work by Van der Schaaf et al. (2013) by investigating the effect of a new intervention method on the students' perception of feedback, as its' importance in relation to the effectiveness of feedback practices is illustrated above.

## *3.0 Method*

### *3.1 Aim of this study*

To support teachers and students in increasing the effectiveness of their feedback dialogues, we designed a new intervention method, called the *Dialogue Tool.* The *Dialogue Tool* was designed according to the suggestions of previous studies as to how to best facilitate an effective feedback dialogue**.** By carrying out a mixed methods field experiment with twelve project-teams of fourth-grade students in secondary school and their teachers, the study aims to investigate the *Dialogue Tool's* influence on the occurrence of the feedback levels, the (reflective) thinking activities and the student engagement during feedback dialogues and on the student perception of the feedback provided through feedback dialogues.

Thus, the research aim of this mixed-methods field study was to investigate *how the Dialogue Tool influences the teacher-student feedback dialogue in project-based learning*. This main research question was divided into the following sub-questions:

(a) In what way does the Dialogue Tool influence the levels of feedback that occur in the feedback dialogue?
(b) In what way does the Dialogue Tool influence the (reflective) thinking activities of the students during the teacher-student feedback dialogue?
(c) In what way does the Dialogue Tool influence the student engagement during feedback dialogues?
(d) In what way does the Dialogue Tool influence the students' perception of the usefulness, quality, quantity and timing of feedback?

### *3.2 Context of the study*

*Onderzoek en Ontwerpen* [Research and Design] is a course that secondary schools in the Netherlands can opt to offer to students. The course is taught by teachers, from a variety of disciplines, who use activating didactics and stimulate collaboration with beta-professionals and higher education, who serve as clients in student projects. During *Onderzoek en Ontwerpen*, students are working in a space which is purposely designed for students to collaborate, work on projects and gain practical and technical skills. Every 7 or 8 weeks, the student teams are working on a new project, based on a clients' problem statement. During these projects, the teams are coached by the teacher and can make use of the expert knowledge of beta-professionals.

### *3.3 Participants*

Within the subject *Onderzoek en Ontwerpen* taught in a secondary school in the south of the Netherlands, participants were selected through purposeful sampling (Patton, 2015). The classes were selected according to the following criteria: the class should have a size of six to nine teams of students, due to the scope of this study; the class routine should include having feedback dialogues, to ensure the validity of the control group and test group comparison; the classes should be taught by different teachers, since each teacher approaches the feedback practice differently and these differences should be included in the study for a higher generalisability of the results; the classes should be either in the third or fourth grade, as the students are then used to the PBL approach to learning and having feedback dialogues with their teacher.

Twelve teams of three/four students each (N=48) have been selected to participate in this study. The age range of the participating students was from 13 to 17 years old. Six out of twelve teams (N=24) were in fourth grade of a *havo* class, taught by teacher 1 (T1). The other six participating teams (N=24) were in fourth grade of a *vwo* class, taught by teacher 2 (T2). The participating teachers were both female and had a teaching experience of 4 years. Three teams of the *havo* class and three teams of the *vwo* class were participating in the study as the control group (Table 1), thus following condition 1 (N=24). Three teams of each class were the test group (Table 1) and were following condition 2 (N=24). The teams were purposefully distributed between condition 1 and 2 to have an equal division of participants between the control and test group. Informed consent was collected from the parents of students and the participating teachers before any data was collected. The collected data from the teachers was de-identified and the collected data from the students was completely anonymised.

Table 1

*Division of participants (both students and teachers) in two conditions of this study*

| | **Condition 1** | **Condition 2** |
|---|---|---|
| *havo* class (T1) | 3 teams (N=12) | 3 teams (N=12) |
| *vwo* class (T2) | 3 teams (N=12) | 3 teams (N=12) |

## 3.4 Procedure

### 3.4.1 The intervention: Dialogue Tool

For this study, a new intervention method for supporting feedback dialogues between teacher and students was developed, named the *Dialogue Tool.* The *Dialogue Tool* aims to support the teacher-student feedback dialogue in project-based education and facilitate an active role of the students. The Dialogue Tool exists out of a board, tokens and feedback cards that are to be used actively by teachers and students during the feedback dialogue (Figure 3). Through the tangibility of the board, tokens and feedback cards of the Dialogue Tool both the students and the teacher have equal opportunities for representation in the dialogue.

*Figure 3. The Dialogue Tool*

On the board of the *Dialogue Tool* (Figure 3) several areas are visualised that represent three categories of feedback: task, process and self-regulation. Feedback has the most positive effect when it exists out of a combination of these three levels (Hattie and Timperley, 2007). By visualising the three most effective levels, the *Dialogue Tool* aims to stimulate the teacher and students to give and ask for feedback on these different levels.

At the start of the feedback dialogue, the students first decide about which topic they want to talk about and put their tokens on the category they want feedback on (Figure 5). According to McKeachie (2002), teachers should let students express what kind of feedback they want to receive in order for them to better understand and process the feedback. Through the practice of preparing the dialogue, the students become more

responsible and autonomous and the dialogue becomes adaptive to the students' needs. The teacher places his/her token on a category of feedback after the students have placed theirs. Additionally, according to Hummels en Van Dijk (2015) the use of tangible components, e.g. tokens, works as a catalyst for the engagement of the participants. During the dialogue, both students and teachers move around the tokens, pointing to them and picking them up which should structure the dialogue more explicitly.

On each area that represents a level of feedback a stack of cards are placed. The cards within each category translate the abstract levels of feedback from literature (Hattie & Timperley, 2007) to concrete discussion prompts that guides the teacher and students in their dialogue (Table 2 and Figure 4). At any point during the feedback dialogue a feedback card of a level of feedback chosen by the teacher or students can be picked up and used to fuel the dialogue.

Table 2

*Examples of discussion prompts per levels of feedback (Hattie & Timperley, 2007) on cards*

| **Level of feedback** | Examples |
|---|---|
| Task | *"What needs to be improved in the work of ...?"* |
| | *"... is done correctly and ... is went wrong"* |
| Process | *"How do you want to approach this?* |
| | *"In what way did other students approach this?"* |
| Self-regulation | *"How could you check together that .... is going well?"* |
| | *"How would this fit in your competency development?"* |

*Figure 4. A self-regulation-level card with a discussion prompt. Translated: 'Is it going as you expected?'*

*Figure 5. Two student tokens on the 'process' category*

Lastly, another component of *Dialogue Tool* is a small reflection card, that is used by the students. Before the feedback dialogue tool has started, the students are asked to write down the subject of the conversation, e.g. *"We want feedback on our prototype"* or *"We want feedback on our project proposal"*. This card is then placed in the middle of the board, so that the subject of the dialogue is visible for all participants. This subject can be supplemented by a subject proposed by the teacher. At the end of the dialogue, students are asked to write down the answers to three reflective questions on the back of the card: "What was our goal?", "How did it go?", "What are we going to do in the future?" (Figure 6). According to Hattie and Timperley (2007), these three questions should be covered in the dialogue to facilitate a full circle of reflective thinking for the student. These questions are answered by writing down their answers in order to document and process their feedback dialogue.

*Figure 6. The back of the reflection card. Translated: "What was our goal?" "How did it go?" "What are we going to do in the future?"*

### *3.4.2 Familiarizing exercise of Dialogue Tool*

The teachers were informed on the usage of the *Dialogue Tool* by a Dutch step-by-step manual and by participating in a familiarizing exercise. This exercise was executed with the two researchers. The aim of this exercise was that through practising with the *Dialogue Tool*, the teachers would be able to implement it well into their practice. Furthermore, this exercise was used by the researchers to get insight in the best testing set-up in the context for the tests in this study. In this exercise an example feedback dialogue was enacted by the teachers and researchers.

The students were informed on the usage of the *Dialogue Tool* by the teachers at the start of the first test.

### *3.4.3 Condition 1 (C1)*

During the projects in the subject *Onderzoek en Ontwerpen*, which has a duration of eight weeks, six teams of students had feedback dialogues with the teacher according to their usual timing (around every four to six weeks). The timing of the dialogues was connected to the completion of various phases in the project, such as planning, ideation, implementation etc. The teams of students were all working on different projects with different objectives, but they were in similar phases of their project during the feedback dialogues. Two feedback dialogues per team of around 20 minutes, without using the *Dialogue Tool*, were audio recorded. After these two feedback dialogues, all participating students were asked to fill in the AEQ questionnaire about the perception of the teachers' feedback (Figure 7).

### *3.4.4 Condition 2 (C2)*

Similar to condition 1, the teams of students working in different projects had regularly scheduled feedback dialogues (Figure 7). During this study two feedback dialogues of around 20 minutes, by using the *Dialogue Tool*, were audio recorded. After these two feedback dialogues, all participating students were asked to fill in the AEQ questionnaire about the perception of the teachers' feedback.

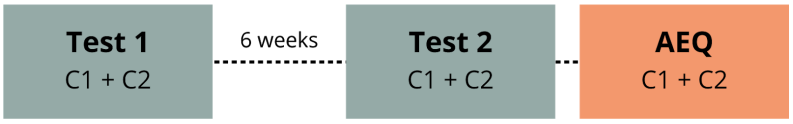


*Figure 7. The timeline of the study*

## *3.5 Measures*

### *3.5.1 Feedback Dialogues*

To answer the first three research questions, the measures consisted of audio recordings of each feedback dialogue between the teacher and a team of students (various durations between 7 and 25 minutes) and video recordings of the actions executed on the board of the *Dialogue Tool.* All feedback dialogues were transcribed, coded and analysed using Atlas.ti. Each segment was formed through speech turn-taking or when a different topic was discussed by the same person.

#### *3.5.1.1 Level of feedback*

One of the variables that was analysed in each feedback dialogue was the level of feedback. These levels of feedback were based on the categorization of Hattie and Timperley (2007), which consists of the feedback levels on "person", "task", "process" and "self-regulation" (Table 3). This model was used because of its' emphasis on self-regulatory purposes, that are often lacking in other models. Three sections of two feedback dialogues, each of 10 minutes, were independently coded by two researchers and gave the interrater reliability of Cohen's Kappa of .681 (percentage agreement 90.7%).

Table 3

*The coding scheme of levels of feedback (Hattie & Timperley, 2007)*

| # | **Level of feedback** | Description | Example |
|---|---|---|---|
| 1.1 | Person | Feedback oriented at the self (person) of feedback recipient (e.g. personality traits) | *"But what does need to be mentioned is that you tried hard, well done."* |
| 1.2 | Task | Feedback oriented at how well a task is performed or understood. | *"You need to hand in one document which includes everything, your concept, your planning and a user manual."* |
| 1.3 | Process | Feedback oriented at processes needed to perform or understand a task. | *"I think it's good that you first create a small part of the app and then test it, look how it works, see how the users react and then continue to the next functionality of the app."* |
| 1.4 | Self-regulation | Feedback oriented at fostering self-regulated learning (e.g. self-monitoring, directing or regulating of actions) | *"What is your goal in this project? To gather existing concepts and merge them together? Or to create a new concept?"* |

#### *3.5.1.2 (Reflective) thinking activities*

The (reflective) thinking activities of students were coded according to the validated coding scheme developed by Oosterbaan et al. (2010); see Table 4. The activities that are associated with reflection are *(2.2) comparing, (2.3) analyzing* and *(2.4) concluding* and

activities that less often occur during reflection are *(2.1) orientating on the task* and *(2.10) describing* (Oosterbaan et al., 2010).

The coding scheme of Oosterbaan et al. (2010) was supplemented with three new codes during the process of analysis, as the data called for more specific codes in some instances: *(2.11b) Repeating text, (2.11c) Repeating others and (2.14) Responses solely for communication.* One segment of a feedback dialogue could include more than one thinking activity. Three sections of two feedback dialogues, each of a duration of 10 minutes, were independently coded by two researchers and gave the interrater reliability of Cohen's Kappa of .719 (percentage agreement 80.9%).

Table 4

*The coding scheme of (reflective) thinking activities from Oosterbaan et al. (2010), adjusted for this study*

| # | **Thinking activities** | Description | Example |
|---|---|---|---|
| 2.1 | Orientating on the task | Collecting information about the characteristics of the inquiry assignment, goals and resources needed | "*But the deadline on Magister, isn't that specific enough [to mention in the planning]?* |
| 2.2 | Comparing | Looking for similarities | *"Last year we were asked to describe something that we wanted to achieve. Now it was like, describe this and this concretely, this was a good guideline."* |
| 2.3 | Analysing | Looking for constituent parts of larger wholes or looking for the different aspects of a problem or line of reasoning | "*So imaging having a house and there is something in its' area that you would like to change but it doesn't influence the house, than it is not of great importance. However, when it does influence something in the house, it may become interesting for us.* |
| 2.4 | Concluding | Categorizing information and look for higher order relationships | *"Yes, so than it might be better to first wonder about what we can adapt and what we can't. So reduce our goal."* |

| | | | |
|---|---|---|---|
| 2.5 | Judging negatively | Negatively assessing performances | "*I think we are really slow.*" |
| 2.6 | Judging positively | Positively assessing performances | "*I think it's going well because everyone is working. Often, you hand out the tasks and then everyone performs them.*" |
| 2.7 | Explaining | Students' raw conclusions, based upon facts and arguments | "*When you are finished with one task and you have still 10 minutes left, you are not going to start with a new task. Otherwise you will have to stop halfway and then after a week you don't remember what you have written down.*" |
| 2.8 | Attributing | Attributing learning outcomes to causal factors | "*When we start to like a project, then our productivity will increase, we will start to work harder and have more fun in doing so.*" |
| 2.9 | Intending | Planning and complying with future actions for improvement | "*We are going to make a more detailed planning.*" |
| 2.10 | Describing | Giving on account of the inquiry process or performances | "*[name] And I have already been working on the bridge and I have been working on the detour routes.*" |
| 2.11 | Repeating | 2.11a Recapitalizing information, summarizing | Used when a student literally repeats his/herself. |
| | | 2.11b Repeating information from text | Used when a student reads text aloud. |
| | | 2.11c Repeating other(s). | Used when a student literally repeats someone else. |
| 2.12 | Irrelevant | Non-relevant utterance | "*I want to have your sweater.*" |
| 2.13 | Inaudible | Inaudible utterance | Used when the audio is inaudible. |
| 2.14 | Responses solely for communication | Only as a means of communication in the conversation | *"Okay."* |

#### *3.5.1.3 Student engagement*

To analyse the student engagement during each feedback dialogue, two types of variables were coded: (1) the time (minutes) that each participant (teacher or students) spent talking in relation to each other during the feedback dialogue, (2) the initiative of switching to a different level of feedback by each participant (teacher or students). According to previous work (Mast, 2002; Blatt et al., 2008), these two variables can be seen as indicators for student engagement in a feedback dialogue.

### *3.5.2 Students' perception of feedback*

To answer the fourth research question, the perceptions of students about the feedback received during feedback dialogues were measured by three scales of the Assessment Experience Questionnaire (AEQ; Gibbs & Simpson, 2003), namely (1) quantity and timing of feedback (6 items), e.g. "*On this course I get plenty of feedback on how I am doing,*" (2) quality of feedback (6 items), e.g. "*The feedback mainly tells me how well I am doing in relation to others,*" (3) usefulness of feedback (6 items), e.g. "*The feedback does not help me with any subsequent assignments.*" The items of each section were measured in a five point Likert-type scale (from strongly disagree to strongly agree). The AEQ was translated to Dutch, in order to be understandable for the Dutch students, and it was digitized using the online service Google Forms. The translated AEQ can be found in appendix 7.2. The students could thus anonymously fill in the AEQ on their laptops through a link provided by the teacher at the end of their second feedback dialogue.

In this study the internal consistency (Cronbach's alpha) of the first scale was adequate: .72 (quantity and timing of feedback). However, the internal consistencies of the second and third scales were inadequate: .62 (quality of feedback) and .69 (what did you do with the feedback). In order to increase the reliability of these scales, we looked at the proposed consistencies of the scales if certain items would be deleted. There was one inconsistent item in scale (2) quality of feedback: *"I don't understand some of the feedback"*. When looking critically at the wording *"some of the feedback"* in this item, it could be said that this was quite ambiguous. The item could thus be interpreted in multiple ways by the participants, e.g. if students didn't understand any of the feedback, they could score the item both as highly positive or highly negative. After removal, the scale (2) was found reliable (5 items; $\alpha = .71$). Similarly, there was one inconsistent item in scale (3) what did you do with the feedback: *"I tend to only read the marks"*. This question was not well fitted to the context of feedback dialogues that the participants

experienced e.g. as the students generally did not receive marks during feedback dialogues. Thus, this item was not consistent with the other items in the scale. After removal, the scale (3) was found reliable (5 items; α = .73).

Other scales from the AEQ (Gibbs & Simpson, 2003), namely (4) amount of distribution of study effort (6 items), e.g. "I do the same amount of study each week, regardless of whether an assignment is due or not," (5) assignment and learning (6 items), e.g. "Tackling the assignments really makes me think," were also included in the questionnaire and filled in by students, but the results were later removed due to the lack of internal consistencies (Cronbach's Alpha): .326 (amount of distribution of study effort) and .439 (assignment and learning). The sixth scale of the AEQ (Gibbs & Simpson, 2003), examination and learning, e.g. "Preparing for the exam was mainly a matter of memorising" was preemptively not included in this study, as the items did not match the examination procedures of the context of this study and they were not relevant for our research angle.

### *3.6 Data Analysis*

The coded content of each feedback dialogue was analysed by visualising the various levels of feedback, (reflective) thinking activities and teacher/student engagement in schematic overviews. Also the observed behaviors of students during the feedback dialogues (e.g. the selecting of a card from the *Dialogue Tool*) was visualised in these overviews. In these schematic overviews both the occurrence and sequence of the variables could be observed. These two factors were compared for the feedback dialogues with condition 1 and 2 and other distinctive patterns were inductively discovered.

Next to this, the quantified occurrences of the coded variables (levels of feedback, (reflective) thinking activities, where token were placed on the *Dialogue Tool* and teacher/student engagement) that were measured in each feedback dialogue were analysed through descriptive statistics. In this analysis the absolute and relative occurrences of the different variables of the feedback dialogues with condition 1 and 2 were calculated and the results were then interpreted by the two researchers. This quantitative data was afterwards compared and complemented with qualitative data and vice versa to get a richer understanding of the found results.

The quantitative results from the AEQ questionnaire were analysed through statistical modelling in the analysis program SPSS (Field, 2013). Firstly, the data was analysed in

terms of skewness and kurtosis. In Table 4, the results of skewness and kurtosis are presented for scale (3), (4) and (5). From these results, it became clear that the data of scale (3) and (5) were normally distributed (Table 5), as the skewness value is .198 and the kurtosis value is -.077 for scale (3) and the skewness value is .043 and the kurtosis value is -.023 for scale (5). These fall within the acceptable range of +-0.5 for skewness and +-1 for kurtosis (Field, 2013). The other scale (4) was non-normally distributed (Table 5), as the skewness value is -.690 and the kurtosis value is -.155 and thus fall outside of the acceptable range. This non-normal distribution was most likely caused by the small sample size (N=48). As there is one variable (scale 4) that is non-normally distributed the non-parametric Mann-Whitney U test was carried out for this data sample. This test was done to test significant differences on the students' scale scores of the AEQ, between condition 1 and 2 and between the two participating classes (*havo* and *vwo*).

Table 5

*The results of the analysis of skewness and kurtosis on the complete data set*

| | *Mean* | *Std. Dev.* | *Skewness* | | *Kurtosis* | |
|---|---|---|---|---|---|---|
| | *Statistic* | *Statistic* | *Statistic* | *Std. Error* | *Statistic* | *Std. Error* |
| Scale (3) (N=48) | 3.611 | .532 | .198 | .343 | -.077 | .674 |
| Scale (4) (N=48) | 3.708 | .478 | -.690 | .343 | -.155 | .674 |
| Scale (5) (N=48) | 3.567 | .542 | .043 | .343 | -.023 | .674 |

## 4.0 Results

To determine the influence of the usage of the *Dialogue Tool* to feedback dialogues in Project-Based Learning, the collected data in terms of levels of feedback discussed, (reflective) thinking activities that occured for students and the student-teacher engagement of dialogues is compared between condition 1 and 2. Additionally the students' perceptions of the received feedback were compared between the two conditions. The results of this comparison are discussed below.

On the whole, when comparing the conditions 1 and 2 in the feedback dialogue visualisations (Table 6), it can be seen that the length of the feedback dialogues with condition 2 (with Dialogue Tool) is longer than the length of the feedback dialogues with condition 1 (without Dialogue Tool). This is confirmed when looking at the average time in minutes of the feedback dialogues with condition 1 ($M$ = 18.75, $SD$ = 4.00) with that of the feedback dialogues with condition 2 ($M$ = 12.08, $SD$ = 2.87). Alongside this, it can be observed that the feedback dialogues with condition 2 have a longer introduction and closing phase than the feedback dialogues with condition 1.

### *4.1 Levels of feedback*

In Table 6, each feedback dialogue is visualised in a timeline which consists of three layers: the levels of feedback, the active participant and (reflective) thinking activities. All feedback dialogues in condition 1 are listed in the left column and all feedback dialogues in condition 2 are listed in the right column. The feedback dialogues are paired per team, thus 1a is the first dialogue of team 1 and 1b the second dialogue of team 1. The dots underneath the third layer indicates the moment that a new feedback card of the *Dialogue Tool* was used in the dialogue.

From these visualisations (Table 6), it can be observed that the dialogues show very diverse sequential patterns in the levels of feedback. There does not seem to be a typical pattern in these sequences across the different dialogues, nor does there seem to be a clear difference in the sequence between condition 1 and condition 2.

However, there are differences between condition 1 and condition 2 in the amount of time spent on each level of feedback. Firstly, in Table 5 can be observed that in C2, the dialogue focuses on a feedback level for a longer period of time. Next to this, table 6 shows the absolute and relative occurrence of each level of feedback divided for dialogues in condition 1 and condition 2 . From this table (Table 7), it can be observed that the level *(1.2) Task* is discussed in relatively equal measure in the feedback

dialogues with condition 1 (41%) and 2 (42%). The other levels *(1.1) Person* and *(1.3) Process* occur relatively more often in the feedback dialogues with condition 2 (1.1: 2%; 1.3: 36%) than with condition 1 (1.1: 1%; 1.3: 28%). Lastly, the level *(1.4) Self-regulation* relatively occurs less in the dialogues with condition 2 (20%) than with condition 1 (30%) (Table 7).

Furthermore, Table 6 shows that during the feedback dialogues with condition 2, the teachers start to talk right after a student has read the text from a feedback card aloud. In the transcripts can be seen that the teachers immediately rephrases the question on the feedback card in their own words. For example:

| | |
|---|---|
| Student: | [reads from a feedback card]<br>"*How have you approached this in other teams?*" |
| T1: | "*So it's about the planning, how have you made a planning last year and how are you making a planning right now?*" |

Another observation from Table 6 is that in various feedback dialogues there are moments in which the teacher is discussing or asking a question in one specific level of feedback and the students respond on another level. This is repeated at least twice, indicating a difference in understanding between teacher and students about the level of feedback that is being discussed. Detailed visualisations of these situations can be observed in Table 8 which visualises the feedback dialogues 8b and 6b in two timelines that consists of two layers: the levels of feedback and the active participant. The boxes on the timelines indicate moments in which the teachers are discussing or asking a question in one specific level of feedback and the students respond on another level.

Table 9 shows the absolute and relative occurrence of the area in which the students and teachers placed their token. From Table 9 can be observed that the students predominantly wanted to discuss and receive feedback on their process. This is also a topic that the teachers wanted to discuss often. The topic the students have the least priority in discussing is self-regulation. This is in contrast with the focus of the teachers, as they often wanted to discuss the self-regulation of students.

Table 6

*Visualisations of the level of feedback, teacher and student participation and thinking activities without (Condition 1) or with Dialogue Tool (Condition 2)*

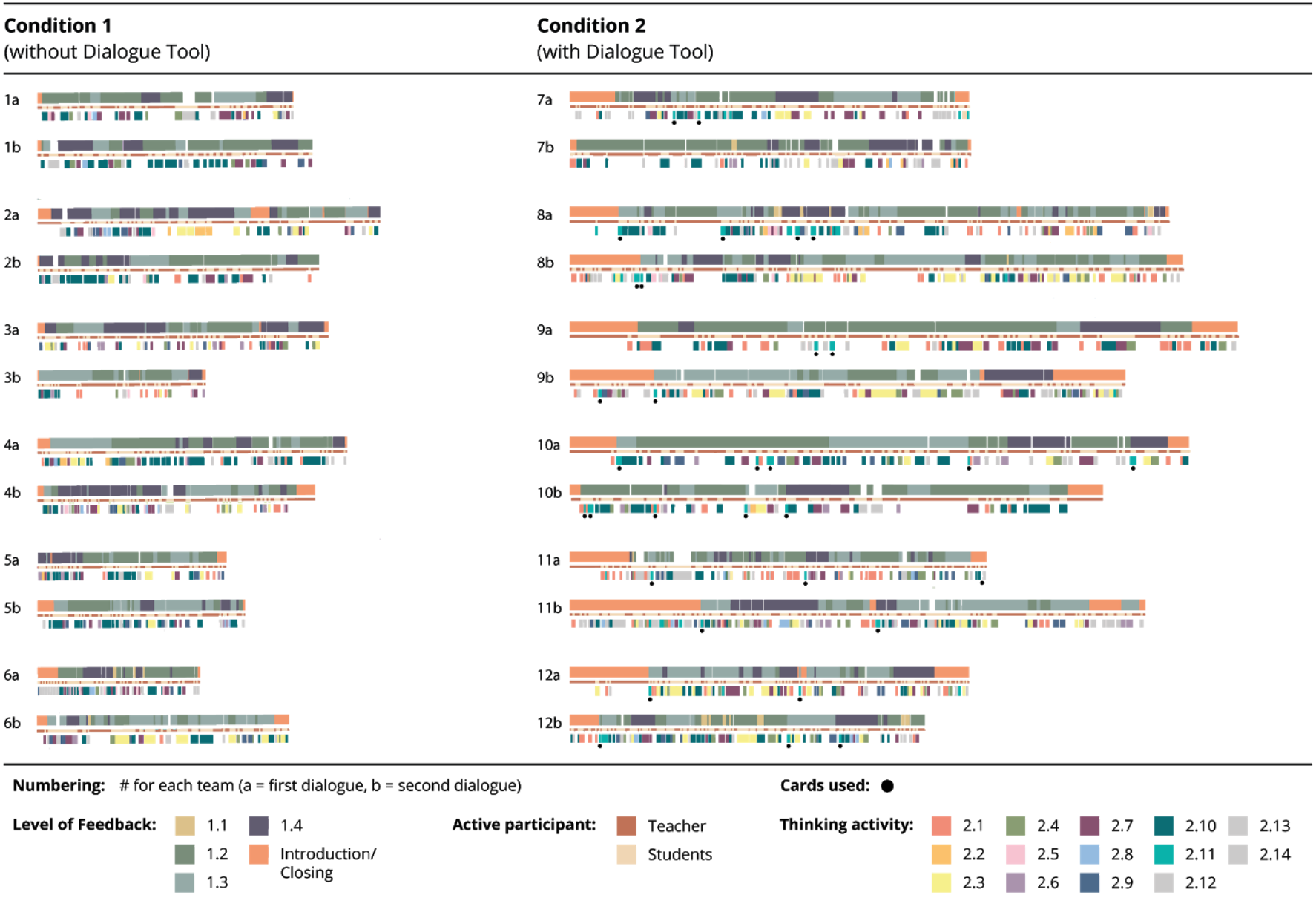

Table 7

*The occurrence of the different Levels of Feedback without (C1) or with Dialogue Tool (C2)*

| | **Condition 1** (without Dialogue Tool) | | **Condition 2** (with Dialogue Tool) | |
|---|---|---|---|---|
| Levels of Feedback | *Absolute frequency* | *Relative frequency (%)* | *Absolute frequency* | *Relative frequency (%)* |
| (1.1) Person | 4 | 0.51 | 24 | 2.08 |
| (1.2) Task | 322 | 41.23 | 486 | 42.15 |
| (1.3) Process | 220 | 28.17 | 411 | 35.65 |
| (1.4) Self-regulation | 235 | 30.09 | 232 | 20.12 |

Table 8

*Example moments from feedback dialogues with alternating levels of feedback between students and teacher*

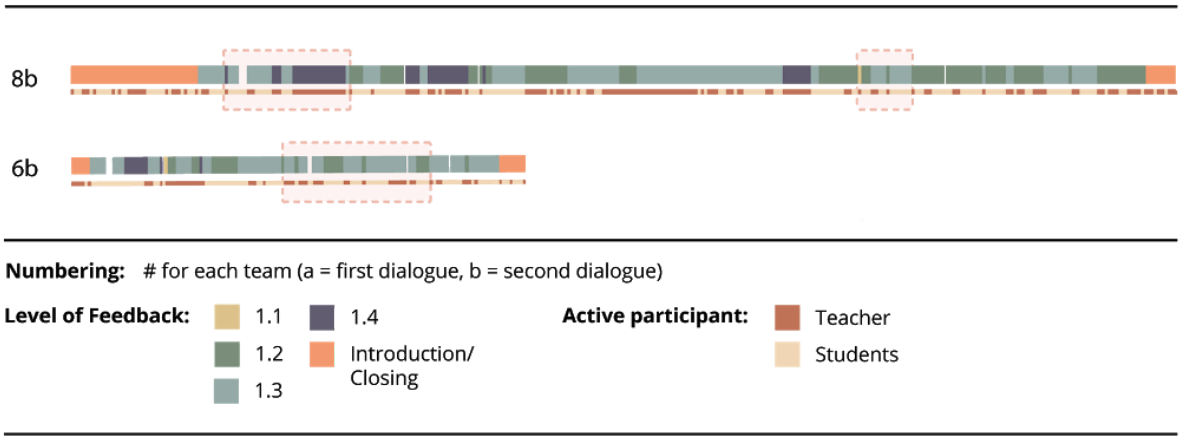


Table 9

*The occurrence of placement of tokens on the levels of feedback on the Dialogue Tool*

| | **Students** (Condition 2) | | **Teacher** (Condition 2) | |
|---|---|---|---|---|
| Levels of Feedback | *Absolute frequency* | *Relative frequency (%)* | *Absolute frequency* | *Relative frequency (%)* |
| (1.2) Task | 11 | 26.83 | 3 | 18.75 |
| (1.3) Process | 24 | 58.54 | 6 | 37.50 |
| (1.4) Self-regulation | 6 | 14.63 | 7 | 43.75 |

### *4.2 (Reflective) thinking activities*

When investigating the visualisations of the feedback dialogues (Table 6) in terms of (reflective) thinking activities of the students, several observations can be made. Firstly, in comparison with the other thinking activities, *(2.10) Describing* occurs often, more in the dialogues with condition 1 than with condition 2. One exception that can be observed is the occurrence of (*2.10) Describing* in feedback dialogues (10a, 10b). In the dialogues with condition 1 *(2.10) Describing* is the predominant thinking activity of the students. Other clear patterns of the other thinking activities could not be observed from these visualisations.

Table 10 shows the absolute and relative occurrence of the different (reflective) thinking activities in condition 1 and condition 2. The quantitative data from Table 10 confirm the observations mentioned above. *(2.10) Describing* occurs relatively more often in the feedback dialogues with condition 1 (30%) than with condition 2 (19%). *(2.5) Judging negatively* and *(2.6) Judging positively* were in absolute terms equal in both conditions, but were relatively different (C1: $F_i$ = 9% C2: $F_i$ = 5%). Another thinking activity that occurred relatively more in condition 1, is *(2.7) Explaining*. That thinking activity was observed to occur in condition 1 as follows ($n_i$ = 67, $f_i$ = 12%) and in condition 2 ($n_i$ = 89, $f_i$ = 8%). Furthermore, *(2.1) Orientating on the task* occurred both absolutely and relatively more often in dialogues with condition 2 ($n_i$ = 119, $f_i$ = 11%) than condition 1 ($n_i$ = 28, $f_i$ = 4%). Thus, more inquiries were made by the students in feedback dialogues that used the Dialogue Tool. Other thinking activities that occurred relatively more often in feedback dialogues with condition 2 than condition 1 were *(2.3) Analysing* (C1: $f_i$ = 7%, C2: $f_i$ = 9%), *(2.4) Concluding* (C1: $f_i$ = 6%, C2: $f_i$ = 7%) and *(2.12) Irrelevant* (C1: $f_i$ = 4%, C2: $f_i$ = 9%), however these differences were quite small. The thinking activity (2.2) Comparing occurred relatively in equal measure (C1: $f_i$ = 2%, C2: $f_i$ = 2%), but in absolute values it occurred more often in condition 2 (C1: $n_i$ = 10, C2: $n_i$ = 23). Moreover, *(2.11a, b, c) Repeating* was a thinking activity that did not occur in the dialogues with condition 1 and that sporadically occurred in the feedback dialogues with condition 2.

Table 10

*The occurrence of the different Thinking Activities without (C1) or with Dialogue Tool (C2)*

| | **Condition 1** (without Dialogue Tool) | | **Condition 2** (with Dialogue Tool) | |
|---|---|---|---|---|
| Thinking Activities | *Absolute frequency ($n_i$)* | *Relative frequency ($f_i$ in %)* | *Absolute frequency ($n_i$)* | *Relative frequency ($f_i$ in %)* |
| (2.1) Orientating on the task | 28 | 4.48 | 119 | 11.07 |
| (2.2) Comparing | 10 | 1.73 | 23 | 2.14 |
| (2.3) Analysing | 41 | 7.08 | 100 | 9.30 |
| (2.4) Concluding | 32 | 5.53 | 72 | 6.70 |
| (2.5) Judging negatively | 21 | 3.63 | 21 | 1.95 |
| (2.6) Judging positively | 32 | 5.53 | 33 | 3.07 |
| (2.7) Explaining | 67 | 11.57 | 89 | 8.28 |
| (2.8) Attributing | 11 | 1.90 | 14 | 1.30 |
| (2.9) Intending | 42 | 7.25 | 70 | 6.51 |
| (2.10) Describing | 176 | 30.40 | 203 | 18.88 |
| (2.11a) Repeating his/herself | 0 | 0.00 | 2 | 0.19 |
| (2.11b) Repeating text | 0 | 0.00 | 46 | 4.28 |
| (2.11c) Repeating other(s) | 0 | 0.00 | 8 | 0.74 |
| (2.12) Irrelevant | 26 | 4.49 | 99 | 9.21 |
| (2.13) Inaudible | 18 | 3.11 | 53 | 4.93 |
| (2.14) Responses solely for communication | 51 | 8.81 | 76 | 7.07 |

Table 11 shows the absolute differences between the relative frequencies of occurrences of the (reflective) thinking activities. This difference was calculated by subtracting the relative frequency of a (reflective) thinking activity in the first dialogue

from the relative frequency of that (reflective) thinking activity in the second dialogue of each team. This was done for both conditions.

From Table 11, several observations can be made. Firstly, the thinking activity *(2.10) Describing* has a significant absolute positive difference between test 1 and 2 for 5 out of 6 feedback dialogues with condition 1, in dialogues 1ab (+29%), 2ab (+37%), 3ab (+10%), 5ab (+25%), 6ab (+9%). For the feedback dialogues with condition 2 significant absolute negative differences can be seen for this thinking activity in 2 out of 6 feedback dialogues, respectively in dialogues 8ab (-8%) and 9ab (-23%), and a significant absolute positive difference for 1 of the 6 dialogues, namely for dialogue 12ab (+15%). From this data it appears that feedback dialogues with condition 1 have an overall increase of the thinking activity *(2.10) Describing* and the feedback dialogues with condition 2 have an overall decrease of that thinking activity. Secondly, absolute positive differences can be observed in 3 out of 6 feedback dialogues with condition 2 (Table 10) for the thinking activity *(2.3) Analysing*, namely 8ab (+20%), 9ab (+13%), 11ab (+8%) and an absolute negative difference for 12ab (-15%). These differences are in contrast with the absolute negative differences from the feedback dialogues with condition 1, namely 2ab (-10%) and 3ab (-8%) and an absolute positive difference of 4ab (+13%). From this it can be seen that there is a strong increase of the thinking activity *(2.3) Analysing* for feedback dialogues with condition 2 in comparison with dialogues with condition 1.

Table 10

*Absolute differences between the relative frequencies of occurrences of the (reflective) thinking activities of dialogues 1 and 2 (relative frequency dialogue 2 - relative frequency dialogue 1)*

| | **Condition 1** (without Dialogue Tool) | | | | | | **Condition 2** (with Dialogue Tool) | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| *Thinking activity* | *Team 1* | *Team 2* | *Team 3* | *Team 4* | *Team 5* | *Team 6* | *Team 7* | *Team 8* | *Team 9* | *Team 10* | *Team 11* | *Team 12* |
| 2.1 | 0.00 | 6.25 | 16.00 | -4.75 | 1.59 | -1.85 | 4.51 | 2.00 | -18.78 | 1.70 | -11.91 | -8.67 |
| 2.2 | -2.56 | -5.88 | 0.00 | -1.24 | 2.74 | 0.00 | 4.11 | -3.89 | 0.91 | 0.00 | -1.00 | 0.07 |
| 2.3 | -2.56 | -9.69 | -8.00 | 12.92 | -4.14 | 2.22 | -2.10 | 19.91 | 13.26 | -1.69 | 7.56 | -15.00 |
| 2.4 | 0.27 | -1.84 | 0.00 | 10.13 | -10.17 | -1.85 | -1.45 | 3.64 | 2.53 | 0.00 | 0.35 | 0.23 |
| 2.5 | -5.13 | -1.84 | 6.00 | -1.75 | -4.56 | -12.96 | 0.00 | -3.68 | 1.82 | -1.70 | 0.68 | -1.27 |
| 2.6 | 0.00 | 2.33 | -4.00 | 0.52 | 4.33 | 7.04 | 7.41 | 1.42 | 3.64 | 1.69 | 3.15 | -3.80 |
| 2.7 | -9.85 | -3.67 | -10.00 | 2.07 | -2.97 | -7.41 | -12.08 | 5.68 | -3.48 | -1.69 | 2.35 | 5.36 |
| 2.8 | 0.07 | -3.92 | 0.00 | -1.75 | -5.09 | 2.59 | 0.40 | -2.04 | -1.64 | 0.00 | 0.94 | 3.90 |
| 2.9 | 7.97 | -15.69 | -10.00 | 4.34 | -2.34 | 15.93 | -1.45 | -10.43 | 7.27 | -5.08 | -1.91 | 1.50 |
| 2.10 | 29.49 | 37.01 | 10.00 | -29.19 | 25.39 | 8.52 | 3.14 | -8.42 | -23.34 | 1.69 | -1.97 | 14.65 |
| 2.11a | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | -1.02 | 0.00 | 0.00 | 0.00 | -1.27 |
| 2.11b | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | -2.90 | -2.87 | 1.26 | 1.70 | 1.41 | 1.40 |
| 2.11c | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | -5.80 | -0.21 | 0.00 | 0.00 | 0.00 | 0.03 |
| 2.12 | 2.63 | -5.88 | 0.00 | 9.09 | -1.80 | -18.52 | 1.93 | 5.48 | 4.54 | 10.16 | 4.06 | 1.30 |
| 2.13 | 2.63 | 0.25 | 6.00 | 6.82 | -10.17 | 2.22 | 0.00 | -8.78 | 12.73 | -1.70 | -1.85 | -7.56 |
| 2.14 | -22.95 | 2.58 | -6.00 | -7.21 | 7.19 | 4.07 | 4.26 | 3.24 | -0.75 | -5.08 | -1.85 | 9.12 |

### *4.3 Student engagement*

Table 12 shows the speech length of the student and teachers for each dialogue. The feedback dialogues are paired per team, thus 1a is the first dialogue of team 1 and 1b the second dialogue of team 1. In the first and fourth column the speech length of the students and teacher is visualised. In the second and fifth column, the relative speech length of the students are given in numbers for each dialogue. In the third and sixth column, the absolute differences of the relative speech length of the students between the first and second dialogue are shown. This difference was calculated by subtracting the relative speech length of the students in the first dialogue from the relative speech length of the students in the second dialogue of each team.

When looking at Table 12, some interesting patterns can be seen. Approximately a third of the dialogues (both in condition 1 and 2) the teacher predominately has the longest length of speech, in another third (both in condition 1 and 2) the speech lengths of the students and the teacher is equal and in another third (both in condition 1 and 2) the students predominantly have the longest length of speech.

However, when looking at the absolute differences of the relative speech length of the students between the first and second dialogue (Table 12), it can be observed that in 5 out of 6 feedback dialogue pairs (test 1 and 2 of one student team) with condition 2 the speech length of the students have an absolute positive difference (dialogue pairs 8ab, 9ab, 10ab, 11ab and 12ab). There is only 1 pair of feedback dialogues from condition 2 that can be observed with an absolute negative difference of student speech length (dialogue pair 7ab). Even more specifically, the total absolute positive difference of student speech length in all feedback dialogue with condition 2 is 44%.

In contrast 3 out of 6 dialogue pairs in condition 1 show an absolute negative difference of the speech length of the students (dialogue pairs 3ab, 4ab and 6ab). For the other 3 dialogue pairs an absolute positive difference can be observed (dialogue pairs 1ab, 2ab, 5ab), but these are smaller than the positive differences of the dialogues of condition 2. Overall, the total decrease of speech length of students for all the feedback dialogues with condition 1 together is 9% (Table 12).

Furthermore, these feedback dialogues can also be investigated by looking at the different teachers that these dialogues were tested with. T1 and her student teams cover 4 out of 5 feedback dialogue pairs where the teacher has a predominantly long speech length (dialogue pairs 3ab, 5ab, 6ab, 7ab, 8ab, 11ab). When comparing the

overall teacher speech lengths between T1 and T2, T1 had 35% more dominance in her speech length in feedback dialogues with condition 2 and 15% more dominance in her speech length in feedback dialogues with condition 1 (Table 12). These percentages can largely be explained by the outlier feedback dialogues 3a, 3b, 7a and 7b from T1 in which the teacher has a 70% dominance on the speech length of the dialogues. Another outlier of T1 are feedback dialogues 6a and 6b, where the students have a speech dominance of 60% in both feedback dialogues (Table 12). In all the feedback dialogues of T2, it can be observed that the students speech length is between 40% and 65%. Compared to the dialogues of T1, the dialogues of T2 are more equally divided for the teacher and student speech length. Every dialogue of T2 has an absolute positive difference in student speech length (dialogue pairs 1ab, 2ab, 9ab, 10ab, 12ab) with the exception of dialogue 4ab, which has an absolute negative difference in student speech length of 11%.

When looking at the different student teams, the distribution of the teacher-student speech length can be specific for each team. A pattern can be discerned in 8 out of 12 feedback dialogue pairs, where the relative teacher-student speech length distribution is equal in both dialogues of test 1 and 2. Interestingly, when observing the visual of the relative teacher-student speech length distributions, a pattern can be seen for 5 out of 6 feedback dialogues pairs with condition 2, in which the dominance of student speech length increases, such that it is larger than the teacher speech length dominance. A rotation of the relative speech length dominance of teacher and students. Contrary to this observation, 5 out of 6 feedback dialogues pairs with condition 1 the relative distribution of teacher-student speech length dominance stays either equal between test 1 and 2 or undergo a minimal shift (Table 12).

Table 12

*Teacher-student speech length visualisations and percentages of each feedback dialogue without (C1) and with Dialogue Tool (C2)*

| **Condition 1** (without Dialogue Tool) | | | **Condition 2** (with Dialogue Tool) | | |
|---|---|---|---|---|---|
| *Feedback dialogue* | *Student (%)* | *Absolute Difference (%)* | *Feedback Dialogue* | *Student (%)* | *Absolute Difference (%)* |
| 1a | 45.55 | | 7a | 40.56 | |
| 1b | 50.34 | 4.79 | 7b | 35.54 | -5.10 |
| 2a | 44.55 | | 8a | 43.87 | |
| 2b | 46.15 | 1.69 | 8b | 51.54 | 7.67 |
| 3a | 34.01 | | 9a | 41.69 | |
| 3b | 24.46 | -9.55 | 9b | 64.12 | 22.43 |
| 4a | 55.78 | | 10a | 44.49 | |
| 4b | 44.36 | -11.41 | 10b | 48.36 | 3.88 |
| 5a | 45.81 | | 11a | 47.30 | |
| 5b | 51.85 | 6.03 | 11b | 55.38 | 8.08 |
| 6a | 58.43 | | 12a | 49.30 | |
| 6b | 58.07 | -0.36 | 12b | 56.55 | 7.25 |

**Numbering:** # for each team (a = first dialogue, b = second dialogue)

**Active participant:** Teacher Students

Moreover, the feedback dialogues can be observed from another perspective, namely by looking at the initiative of switching between levels of feedback by either the teacher or students. Table 13 shows the initiation of a new feedback level. In the first and third column each feedback dialogue is visualised in a timeline which consists of two layers: the levels of feedback and the active participant. The dots above the first layer indicate when the teacher or one of the students initiated to talk about a new feedback level. The second and fourth column show the relative instances in which a student initiated a new feedback level.

From Table 13 can be seen that the feedback dialogues with condition 2 have a primary equal or student-initiated balance in terms of taking the initiative of switching between different levels of feedback. Simultaneously, the feedback dialogues with condition 1 are

predominantly teacher-initiated. When looking at the descriptive statistics of these dialogues, 7 out of 12 feedback dialogues with condition 2 have a student-initiated balance of 50% or higher (Table 12). Furthermore, 10 out of 12 feedback dialogues with condition 2 increase in terms of student-initiated balance, with the exception of 8a and 8b. In condition 1, all feedback dialogues (12) have an student-initiated balance of 44% and lower (Table 12). Also, in 10 out of 12 feedback dialogues with condition 1 the second test has an increase in teacher-initiation in comparison with the first test, with the exception of 1a and 1b.

Table 13

*Visualisation of initiation new level of feedback and percentages of initiation by students for each feedback dialogue without (C1) and with Dialogue Tool (C2)*

| **Condition 1** (without Dialogue Tool) | | **Condition 2** (with Dialogue Tool) | |
|---|---|---|---|
| *Feedback dialogue* | *Student (%)* | *Feedback Dialogue* | *Student (%)* |
| 1a | 0 | 7a | 25.00 |
| 1b | 30.77 | 7b | 50.00 |
| 2a | 43.75 | 8a | 59.61 |
| 2b | 18.18 | 8b | 41.03 |
| 3a | 17.65 | 9a | 50.00 |
| 3b | 11.11 | 9b | 60.00 |
| 4a | 35.71 | 10a | 0 |
| 4b | 35.29 | 10b | 20.00 |
| 5a | 33.33 | 11a | 56.10 |
| 5b | 29.41 | 11b | 55.00 |
| 6a | 41.67 | 12a | 35.00 |
| 6b | 33.33 | 12b | 52.38 |

**Numbering:** # for each team (a = first dialogue, b = second dialogue)

**Initiation participant:** Teacher Students

### *4.4 The students' perception of feedback*

Three scales of the AEQ were studied: (1) quantity and timing of feedback, (2) quality of feedback, (3) usefulness of feedback. Table 13 shows the mean and standard deviation for each scale in condition 1 and condition 2.

Generally, the students of both conditions had a perception of the feedback between neutral and positive (Table 14). When comparing the scores of the different scales between students of condition 1 and 2, one significant difference was found, namely that the students from condition 1 rated the quantity and timing of the feedback as better ($M$ = 3.76, $SD$ = 0.47) than the students from condition 2 *($M$ = 3.47, $SD$ = 0.56) ($U$ =* 118*, $p$ =* 0.038*).* The differences in scores for the other scales were not found to be significant, see the following results: scale 4 ($U$ = 210, $p$ = 0.100) and scale 5 ($U$ = 242, $p$ = 0.338).

Table 14

*The student perceptions of quantity and timing, quality and usefulness of feedback without (C1) or with Dialogue Tool (C2)*

| | **Condition 1** (without Dialogue Tool) (n=24) | | **Condition 2** (with Dialogue Tool) (n=24) | |
|---|---|---|---|---|
| AEQ Scales | *M* | *SD* | *M* | *SD* |
| (1) Quantity and Timing of feedback | 3.76 | .47 | 3.47 | .56 |
| (2) Quality of feedback | 3.83 | .44 | 3.59 | .49 |
| (3) Usefulness of feedback | 3.59 | .55 | 3.54 | .55 |

## *5.0 Discussion and Conclusion*

In this study, different results were found about the influence of the *Dialogue Tool* on feedback dialogues. In this section, the research questions are answered and discussed in relation to prior research. Furthermore, the limitations of this study and recommendations for future work are discussed.

### *5.1 Level of feedback*

The results show that the *Dialogue Tool* does not seem to impact the sequence of the levels of feedback or whether the levels *task*, *process* and *self-regulation* are covered in a feedback dialogue. It was found that feedback dialogues with and without the *Dialogue Tool* both covered these three feedback levels and that in both conditions, these levels did not follow up on each other in a constructive sequence. According to Hattie and Timperley (2007), the most effective feedback contains a sequential combination of the feedback levels *task*, *process* and *self-regulation.* In the user manual and design of the *Dialogue Tool*, teachers and students were not instructed nor guided to discuss the different levels of feedback in a certain order. This may explain why the dialogues with the *Dialogue Tool* did not show feedback levels in a constructive sequence. Future research should consider the potential effects of guiding teachers and students in the sequence of the feedback levels in feedback dialogues, as this constructive sequence is said to increase the effectiveness of the feedback process (Hattie & Timperley 2007).

The results did, however, show differences in the occurrences of the levels of feedback between feedback dialogues with and without the *Dialogue Tool*. Firstly, feedback on *person*-level had a relatively higher occurrence in conversations that used the *Dialogue Tool.* When looking at the transcripts, it can be seen that feedback on *person* was predominantly given by the students. It may indicate that when students are more vocal, feedback on *person*-level increases. Secondly, feedback on *process*-level occurred relatively more frequently in feedback dialogues that used the *Dialogue Tool.* This can be explained by the fact that the students most often choose to talk about their *process* with their tokens. Finally, in feedback dialogues with the *Dialogue Tool*, the *self-regulation*-level had a relatively lower occurrence. This finding can also be explained by the students' preference, as they chose to talk about *self-regulation* the least.

In conclusion, the *Dialogue Tool* does not seem to impact the constructive sequence of the levels or whether the three levels are covered in a feedback dialogue. However, the findings do suggest that the *Dialogue Tool* influenced the students' ownership of the

feedback dialogue and that this ownership affects the relative occurrences of the four levels of feedback.

### *5.2 (Reflective) thinking activities*

From the results, it is clear that the thinking activity *describing* has a lower relative frequency in feedback dialogues with the *Dialogue Tool* than in feedback dialogues without the *Dialogue Tool,* but these values can be explained by the higher relative frequencies of other thinking activities in dialogues with the *Dialogue Tool*, such as *irrelevant, orientating on task* and *repeating text.* A more interesting insight can be made in terms of the thinking activity *describing,* is that there is a significant increase between the first and second dialogues without the *Dialogue Tool*.

The higher relative occurrence of *orientating on task* and *repeating text* when the students were using the *Dialogue Tool* can be explained by the questions the students had about using the *Dialogue Tool* and the fact that the student read the text from the board and cards of the *Dialogue Tool.* The higher relative occurrence of *irrelevant* can be explained by the increased student leadership. According to the transcripts, the feedback dialogues that used the *Dialogue Tool* contained more jokes and other irrelevant comments by the students.

Furthermore, in feedback dialogues with the *Dialogue Tool*, the thinking activities *comparing, analyzing* and *concluding* each had a higher relative occurrence in comparison to dialogues without the *Dialogue Tool.* However, these differences are only small. Oosterbaan et al. (2010) associate the thinking activities *comparing, analyzing* and *concluding* with reflection and showed that *orientating on the task* and *describing* occur significantly less often during reflection. The *Dialogue Tool* seems to impact these thinking activities in a small amount. To conclude, the students show a small increase in the reflective thinking activities yet also show an increase in the non-reflective thinking activity *orienting on the task*.

### *5.3 Student engagement*

The results demonstrate three things about student engagement. First, it shows that in feedback dialogues without the *Dialogue Tool*, the feedback levels were predominantly initiated by the teacher. When the teachers and students used the *Dialogue Tool*, the initiative was more equally distributed between students and teachers, which could mean that there was a shared leadership of the conversation. This complements the essential element of a feedback dialogue in order for it to be effective, stated by

Laurillard (2002), that it should be discursive, thus rich in two-way communication. This could be observed in our study. Secondly, opposed to the student teams that did not use the *Dialogue Tool*, the student teams that used the *Dialogue Tool* had an overall increase of student speech-length in their second feedback dialogue. Finally, most of the teams that used the *Dialogue Tool* switched from being teacher-dominated to being student-dominated, which did not happen with teams that did not use the *Dialogue Tool.*

Previous studies argued that the duration of speech (Mast, 2002) and amount of topic introductions of a participant (Blatt et al., 2008) could give an indication on their dominance and leadership in the conversation. This allows for the conclusion that the *Dialogue Tool* influenced the leadership and the dominance of the students in their feedback dialogues and suggests that the *Dialogue Tool* increased the student engagement.

### *5.4 The students' perception of feedback*

The result of our study was that the students perceived poorer quantity and timing of the feedback dialogues when they used the *Dialogue Tool*. This may be explained by the difference in duration of the dialogues with and without *Dialogue Tool,* namely that with the *Dialogue Tool*, the length of the feedback dialogues was much longer. This might have a negative impact on the perception of the students. The longer length of the feedback dialogues with the *Dialogue Tool* may be explained by the effect of the *Dialogue Tool* on the student engagement. As the student engagement is higher in the feedback dialogues with the *Dialogue Tool,* the dialogue is more dominated and led by the students. The students often introduced new topics without closing a current topic or started to talk about irrelevant topics.

Also, as the teacher stimulates more engagement of the students during the dialogues with the *Dialogue Tool*, the students often do not get an immediate answer to their questions by the teachers. Instead, the students are asked to discuss the problem in their team and come up with answers themselves. Because of this, the amount of time that was spent on a single topic increased.

So to conclude, the *Dialogue Tool* seems to negatively impact how students perceive the quantity and timing of the feedback dialogues. Andrade (2010), Hattie and Gan (2011) and Gamlem and Smith (2013) emphasize the importance of the students perception of feedback to the effectiveness of feedback. Thus in this regard, the Dialogue Tool seems to have had a negative impact on the effectiveness of feedback, when it is compared

with previous work. Apart from these findings, no significant differences were found in the students' perception between dialogues that did and did not use the *Dialogue Tool.* Furthermore, when the Dialogue Tool is used in practice, the increased duration of feedback dialogues will influence how these dialogues are executed by teachers in the teaching schedule, as they have to deal with time restrictions.

### *5.5 How the Dialogue Tool influences the teacher-student feedback dialogue*

The main aim of this study was to investigate *how the Dialogue Tool influences the teacher-student feedback dialogue in project-based learning*. The usage of the *Dialogue Tool* also influenced the content that was being discussed, which can be seen in relative occurences of feedback levels. Furthermore, the students showed a small increase in reflective thinking activities when they were using the *Dialogue Tool*. Moreover, the findings showed that the *Dialogue Tool* increased student engagement, especially after using the *Dialogue Tool* for a second time. It also influenced the students' perception of quantity and timing of the feedback, as the students that used the *Dialogue Tool* in their feedback dialogues scores this aspect of the feedback as more negative than the students that did not use the *Dialogue Tool.*

### *5.6 Limitations of the study*

The main limitation of the study was that the teachers adjusted their usual practice of feedback dialogues when they were not using the *Dialogue Tool.* For example, their usual practice of feedback dialogues encompassed one-sided feedback monologues, but during the study they asked more questions and involved the students more in the feedback dialogues, because they learned that from their use of the *Dialogue Tool*. Due to these limitations, the feedback dialogues in condition 1 do not fully represent the usual feedback dialogues and thus the comparison between condition 1 and 2 is skewed.

Another limitation of this study involves the different ways in which the two teachers used the *Dialogue Tool.* Both teachers received the same instructions on how to use the *Dialogue Tool*, but in practice their usage was different. T2 often intensively used the Dialogue Tool during her feedback dialogues, shifting her token or pointing her finger to the various levels of feedback she was discussing. In contrast, T1 often only used the *Dialogue Tool* in the first minutes of the feedback dialogue to put her token at a level of feedback, but then continued the dialogue without or rarely using the *Dialogue Tool*. Therefore, the dialogues from T1 in condition 2 were to some degree more similar to

her dialogues in condition 1 compared to T2. These differences in usage have undoubtedly caused a larger variety in the data and should thus be analysed accordingly. On the other hand, the differences in usage are an accurate representation of how the *Dialogue Tool* would be used outside the study as teachers adapt the recommended usage of the *Dialogue Tool* according to their own teaching styles.

Another possible limitation of this study was that the second feedback dialogues of T1 were postponed with several weeks due to unforeseeable circumstances. This resulted in the fact that the students were in a different phase of the project at that time, in comparison with the students that had the feedback dialogues weeks earlier. This might have influenced the content of the dialogues or the state of mind of the students during these feedback dialogues. This could have had an impact on the results of these feedback dialogues.

Lastly, a limitation of the scope of this study is that the sample size, especially of the participating students, was too small to gain more significant insights into the feedback's perception of the students. The sample size limited the statistical analysis that could be executed, as an independent t-test would be preferred for more reliable results, but was not possible due to the non-normal distribution of the results. In future work, a study with a large sample size should be executed to achieve more significant and reliable insights into the students' perception of feedback.

### *5.7 Future work*

In addition to what was mentioned earlier, this study led to several recommendations for future work. In this section, these recommendations are summarized.

The results of this study showed that the student teams that did not use the *Dialogue Tool* each had a specific distribution of the teacher-student speech during the first and second feedback dialogue. This suggests that there can be a feature to a team that influences this speech distribution. For example, that the team consists of a combination of students that encourage each other to speak up more. This study did not examine what kind of characteristic this could have been and previous studies do not mention this effect. Therefore, future work should continue to explore this effect and investigate which team characteristics and classroom interventions can influence it.

According to Laurillard (2002) and Nicol (2010), feedback needs to be processed by students and used in the future in order to be effective. This study has investigated

whether the *Dialogue Tool* influences the way in which feedback is processed by the students during feedback dialogues. Future work should also look for the influences an intervention method such as the *Dialogue Tool* has on how feedback is used by the students after such dialogues. This can be done by a longitudinal study in which the incorporation of feedback by the students can be measured over time.

As a recommendation for future work, a study with a larger sample should be executed to understand the different perceptions of the students of *havo* and *vwo* of feedback dialogues in the two conditions. It is essential to take these different types of students and different teaching styles into account in such a study, as it was observed in the transcripts of the feedback dialogues that these aspects result in very different feedback dialogues. A future study with a larger sample size would also increase the reliability and generalizability of such results, which would be beneficial for the broader applicability of the results for Dutch classrooms.

Lastly, the results showed that the teacher and students did not understand each other at certain times during the feedback dialogues. This became clear when students asked a question in a certain level of feedback, to which the teacher responded on a different level to which in turn the students answered on another level. It appears that both parties did not register what the other was saying, either by not listening or misinterpreting the others' words and can be classified as one-way communication. This inhibited the effectiveness of these dialogues, as Laurillard (2002) mentions that rich two-way communication is essential for an effective feedback dialogue. Future work could investigate the detailed workings of communication during feedback dialogues, to define aspects that cause one-way communication.

### *5.8 Practical Implications*

The practical implications of this study entail that a supportive tangible object can be used in feedback dialogues to increase the student engagement over time. This study confirmed the statement by Hummels en Van Dijk (2015) that the use of tangible components, e.g. tokens, works as a catalyst for the engagement of the participants. In turn this engagement of students leads to a more discursive conversation (Laurillard, 2002), with rich two-way communication, that benefits the overall effectiveness of the feedback dialogue. Furthermore, the awareness of both teachers and students of the existence of different levels of feedback and the explicit discussion of feedback in these levels can be used in the practice to increase the feedback's effectiveness.

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# 7.0 Appendix

## *7.1 Assessment Experience Questionnaire - Dutch translation - Context of O&O*

**Inleiding:**
Deze vragenlijst gaat over het vak O&O en de mondelinge feedback die je van je docent krijgt gedurende de projecten. Deze vragen gaan **specifiek over de feedback gesprekken die je in het huidige project hebt gehad met de docent.**

Geef a.u.b antwoord door je eerste ingeving in te vullen

**Algemene gegevens:**
- Wat is je geslacht
- Wat is je leeftijd?
- In welke klas zit je?
- Wat is het nummer van het team waar je in zit, bij het huidige project van O&O?

**Vragen (Scores: 1 = helemaal niet mee eens tot 5 = helemaal mee eens)**
1. Ik besteed elke week evenveel tijd aan het vak O&O, onafhankelijk van deadlines van opdrachten.

2. Ik kan best kieskeurig zijn over wat ik wil leren en presteer dan alsnog goed.

3. Ik leer alleen de dingen die in de opdrachten voorkomen.

4. Ik moet regelmatig tijd in het vak O&O stoppen om goed te presteren.

5. Het is mogelijk om goed te presteren in het vak O&O zonder er veel tijd in te stoppen.

6. In de weken van de deadlines van de opdrachten stop ik veel meer uren in het vak.

7. Het maken van de opdrachten laat me echt nadenken.

8. Ik leer meer van het uitvoeren van de opdrachten binnen het project dan van het leren over het onderwerp van het project.

9. Bij het maken van de opdrachten kun je hoge cijfers krijgen ondanks dat je het niet helemaal begrijpt.

10. De opdrachten geven hele duidelijke instructies van wat er van je verwacht wordt.

11. Wanneer ik een opdracht maak is het helemaal niet duidelijk wat een goed antwoord zou zijn.

12. De opdrachten zijn niet erg uitdagend.

13. Tijdens het vak O&O krijg ik meer dan genoeg feedback over hoe ik het doe.

14. Feedback wordt snel gegeven..

15. Op mijn opdrachten wordt nauwelijks feedback gegeven als de docent ze bekeken heeft.

16. Wanneer ik iets fout doe of niet goed begrijp dan krijg ik niet veel begeleiding om daar iets mee te doen.

17. Ik zou meer leren als ik meer feedback zou ontvangen.

18. Welke feedback ik ook krijg, het komt te laat om nog zinvol te zijn.

19. De feedback gaat vooral over hoe goed ik het doe in verhouding tot anderen.

20. De feedback helpt me om dingen beter te begrijpen.

21. De feedback maakt duidelijk hoe ik het de volgende keer beter kan doen.

22. Wanneer ik de feedback heb gekregen begrijp ik waarom ik een bepaald cijfer heb gekregen.

23. Ik begrijp sommige delen van de feedback niet.

24. Ik kan zelden uit de feedback halen wat ik moet verbeteren.

25. Ik luister nauwkeurig naar de feedback en probeer te begrijpen wat ermee bedoeld wordt.

26. Ik gebruik de feedback om terug te kijken naar wat ik heb gedaan in de opdracht.

27. De feedback helpt me niet met volgende opdrachten.

28. De feedback stimuleert me om terug te kijken naar stof dat eerder in het vak aan bod kwam.

29. Ik gebruik de feedback niet voor het aanpassen van mijn opdrachten.

30. Ik heb de neiging om alleen naar de cijfers te kijken.